

BIDDING DOCUMENT

Package number: T08

Package name: Supply of Equipment, Construction, Installation and Monitoring of Test Run for Acceptance of Main Plant of Long Phu 1 Thermal Power Plant Project

Project: LONG PHU 1 THERMAL POWER PLANT

Release date: Refer to Invitation to Bidding

Issued with the Decision: Refer to Invitation to Bidding

SUMMARY

Part 1. Bidding Procedures

Chapter I. Instructions to Bidders

This chapter provides information to assist Bidders in preparing their bids. The information includes provisions for preparing, submitting, opening, evaluating bids, as well as for awarding contracts.

Chapter II. Bid Data Sheet

This chapter specifies the contents of chapter I, as applied to this bid package.

Chapter III. Criteria for Evaluation of Bids

This chapter sets out the criteria for evaluating bids, including the assessment of the Bidder's qualifications, capacity and experience to perform the bid package.

Chapter IV. Bidding forms

This chapter contains the standard forms that Bidders will be required to complete as part of their bids.

Part 2. Technical Requirements and Specifications

Chapter V. Technical Requirements and Specifications

This chapter introduces the bid package and provide details on the scope of work, technical requirements and specifications, as well as project schedule.

Part 3. CONTRACT

Chapter VI. Contract

This chapter includes the Conditions and Contract Forms.

ABBREVIATIONS

BDS	Bid Data Sheet
ITB	Instructions to Bidders
USD	US Dollar
VND	Vietnam Dong
VNEPS (the System)	Vietnam National E-Procurement System
Decree 214/CP	Decree No. 214/2025/NĐ-CP dated August 04, 2025 of the Government on elaboration of and measures for implementation of the Law on Bidding regarding bidder selection
Decree 17/CP	Decree No. 17/2025/NĐ-CP dated February 6, 2025 of the Government amending and supplementing several articles of the decrees detailing and providing measures for the implementation of the Law on Bidding
Law on Bidding	Law on Bidding No. 22/2023/QH15 dated June 23, 2023 of the National Assembly; Law No. 57/2024/QH15 dated November 29, 2024 of the National Assembly, amending the Law on Planning, the Law on Investment, the Law on Public-Private Partnership Investment, and the Law on Bidding; Law No. 90/2025/QH15 dated June 25, 2025, of the National Assembly on amending and supplementing a number of articles of the Law on Bidding, the Law on Investment in the form of Public-Private Partnership, the Law on Customs, the Law on Value-Added Tax, the Law on Export and Import Duties, the Law on Investment, the Law on Public Investment, and the Law on Management and Use of Public Property.
BOQ	Bill of Quantity

PART I. BIDDING PROCEDURES

CHAPTER 1. INSTRUCTIONS TO BIDDERS

1. Scope of the Bid Package	The Owner, as identified in the Bid Data Sheet (BDS), issues this Bidding Document for the selection of contractors to implement the bid package covering the supply of goods and construction/installation works, services in accordance with the one-stage, one-envelope bidding method. The Package Name, Package Number, Project Name and the Owner are specified in the BDS .
2. Source of Funds	Sources of Funds (or capital-raising methods) to be used for the package are specified in the BDS .
3. Prohibited Acts	3.1. Offering, giving, receiving, or taking bribes in any form. 3.2. Abusing positions or entrusted authority to influence or unlawfully interfere with any aspect of the bidding process. 3.3. Collusive practices, including: a. Entering, with or without undue influence, into arrangements or agreement designed to allow one or more parties to coordinate the preparation of their bids or to withdraw submitted bids, with the intent of ensuring that a particular party wins the bid. b. Agreeing to withhold the provision of goods or services, refusing to sign subcontract agreements, or entering into other arrangements that limit competition to favor a particular bidder. c. Intentionally failing to provide documents proving capacity and experience when requested to clarify the bid, despite participating in the bidding, meeting the requirements of the Bidding Documents, and being assessed by the Owner as qualified and experienced, with the intent to create favorable conditions for another party to win the bid. 3.4. Fraudulent practices, including: a. Forging or falsifying information and/or documents used in the bidding process. b. Deliberately providing inaccurate or misleading information and documents to distort the bid selection outcome. 3.5. Obstructive practices, including: a. Destroying, falsifying, or concealing evidence; submitting false reports; intimidating or coercing parties to obstruct investigations or to hide evidence of bribery or collusion; or

	colluding with supervising, inspecting, or auditing authorities. b. Obstructing the Owner or other bidders during the bidding process. c. Hindering the supervisory, inspection, or audit rights of competent authorities. d. Intentionally making false complaints, petitions, or denunciations to disrupt the bidding process. e. Violating safety or cybersecurity regulations in order to interfere with bidding activities. 3.6. Inequality and non-transparency practices, including: a. Bidding for the bidding package where one is also the Owner or performing tasks of the Owner in contravention of the provisions of the Law on Bidding. b. Participating in both the formulation and appraisal of the Bidding Documents for the same bid package. c. Participating in both the evaluation of the bids and the appraisal of the selection results for the bid package. d. Any individual from the Owner who directly participates in the bidder selection process, serves as a member of the expert or appraisal team responsible for evaluating the bidding result, is a competent person or the head of the Owner, or is the legal representative of a bidder participating in the bid, must not be related by family ties to any individual participating in the same bidding package, as prescribed by the Law on Enterprises. e. Bidding for a procurement or construction package while simultaneously providing consultancy services for the same package, such as cost estimation, technical design, construction drawings, front-end engineering design (FEED), preparation of bidding documents, bid evaluation and appraisal, goods inspection, appraisal of bidder selection results, or contract execution supervision. f. Acting as a bidder for a package under a project where the Owner is an agency or organization in which the person previously worked and held a leadership or managerial position, within 12 months from the date of termination of employment at such agency or organization. g. Imposing specific requirements on trademarks and origin of the goods in the Bidding Documents, except as provided in Point e, Clause 3, Article 10; Clause 2, Article 44; and Clause 1, Article 56 of the Law on Bidding. 3.7. Disclosing documents and information related to the process of selecting contractors, except in cases where

	disclosure is permitted under Point b Clause 8 Article 77, Clause 11 Article 78, Clause 4 Article 80, Clause 4 Article 81 and Clause 2 Article 82 of this Law, including: a. Contents of the Bidding Documents prior to their official issuance as prescribed; b. Contents of bids, including clarification requests made by the Owner and the Bidder's responses during the bid evaluation process; reports prepared by the Owner, the expert group, the appraisal team, the consulting contractor, and relevant professional agencies involved in the bid selection process; recorded documents, minutes of bid review meetings, and individual comments and evaluations for each bid prior to official disclosure as prescribed by regulations; c. The bidder selection results prior to their official disclosure; d. Other documents generated during the bidder selection process that are classified as containing state secrets under applicable laws. 3.8. Contract transfer, including the following acts: a. Transferring to another contractor a portion of the bidding package's tasks that exceeds the maximum value permitted for subcontracting, or includes tasks designated for special subcontractors under the signed contract. b. Transferring to another contractor a portion of the bidding package's tasks whose value does not exceed the maximum subcontracting threshold under the signed contract, but which falls outside the scope of subcontractable tasks as specified in the bid, and without the approval of the Owner or the supervision consultant. c. As the Owner or the supervision consultant, approving a transfer of tasks as described in Point a of this Clause. d. As the Owner or the supervision consultant, approving a transfer of work as described in Point b of this Clause that results in exceeding the maximum value permitted for subcontractors under the signed contract.
4. Eligible Bidders and Eligible Materials, Equipment and Related Services	4.1. An eligible Bidder is an organization meeting all the following requirements: a. A local bidder must be an enterprise, cooperative, cooperative union, cooperative group, public non-business unit, or an economic organization with foreign investment capital, established and operating in accordance with Vietnamese law. A foreign bidder must be registered for establishment and operation under the laws of its home

	country. b. Must have independent financial accounting. c. Must not be undergoing dissolution procedures, have its business registration certificate or cooperative registration certificate revoked, or be insolvent under applicable bankruptcy laws. d. Must be registered on the Vietnam National E-Procurement System (VNEPS) prior to approval of the bidder selection result. e. Must ensure the competition in bidding as prescribed in the BDS. f. Must not be banned from bidding under the Law on Bidding. g. Must not be under criminal prosecution. h. For foreign bidder, it is mandatory to enter into a consortium with a local bidder or subcontract local bidder, unless local bidder is incapable of performing any tasks of bid package. i. Must comply with other regulations as specified in the BDS. 4.2. Eligible Materials, Equipment and Related Services: a. All materials, equipment, and related services to be supplied under the Contract shall be considered eligible if they have a clear and lawful origin. The Bidder must specify symbols, trademarks (if any), and the origin of key materials and equipment. The Owner may request the Bidder to provide supporting documents to verify the origin. For other types of materials and equipment, the Bidder must declare the origin during contract execution. b. The term “origin” means the country or territory where the goods is exploited, raised, cultivated, manufactured, produced or processed through processing or assembly into a commercially recognized product that is substantially different in fundamental characteristics from its original constituents. c. Documents proving the origin of materials and equipment, and eligibility of Related Services may consist of: certificates of origin issued by the competent authority of the exporting country, certificates of quality issued by the manufacturer, bills of lading, deliverables related to materials and equipment, and other supporting documents proving the eligibility of goods and Related Services provided for the package.

	The Owner does not mandate a specific origin of goods (For goods that have origin requirements according to groups of countries or territories as specified in Article 8.1 (n), Section VIII [DOCUMENTS SUBMITTED BY BIDDER], Chapter V, Part II of Bidding Document), Bidder must offer goods that meet the origin requirements or have Vietnamese origin, even if the required origins does not include Vietnam. Bidder offering goods that do not meet the origin requirements of the Bidding Document or are not of Vietnamese origin will be rejected. For other goods, where the Owner does not specify an origin requirement, the Bidder is encouraged to maximize the use of domestically produced goods to mitigate potential risks during tax exemption applications, implementation, and post-clearance inspections. However, the Bidder is encouraged to maximize the use of domestically produced goods to mitigate potential risks during tax exemption applications, implementation, and post-clearance inspections. d. The Bidder must declare the manufacturer of the goods in Form No. 19 (a), Chapter IV. If the Bidder proposes multiple manufacturers for more than one unit of the goods (e.g., two pieces, two items) at the same unit price, the Owner shall require clarification to determine the specific quantity associated with each manufacturer. If the Bidder proposes multiple manufacturers for a single unit of the goods (e.g., one piece), the Bid will not be considered or evaluated. e. Bidder must specifically provide the information as specified in Form No. 19 (a), Chapter IV. In the event of any discrepancies between the information declared in Form No. 19 (a), Chapter IV and the attached documents, the information in Form No. 19 (a), Chapter IV shall serve as the basis for review and evaluation, except in cases where the information declared in Form No. 19 (a), Chapter IV does not exist on the market. f. Any standards for manufacturing, production processes, brands, materials, equipment, or catalog numbers specified by the Owner in Chapter V are for reference and descriptive purposes only, and are not intended to restrict competition. The Bidder may propose alternatives with equal or better quality, provided that sufficient proof is submitted to demonstrate that the alternatives meet or exceed the requirements set out in Chapter V.
5. Contents of Bidding Document	5.1. The Bidding Document consists of Invitation to Bid and Parts 1, 2 and 3 in conjunctions with any clarification issued in accordance with ITB 6 and any Addendum issued in accordance with ITB 7 (if any). 5.2. The Owner shall not be responsible for the accuracy or

	completeness of the Bidding Documents, any addenda, minutes of the pre-bid meeting (if any), documents clarifying the Bidding Documents as specified in ITB 6, or documents amending the Bidding Documents as specified in ITB 7, if such documents were not obtained directly from the Owner via the System. The version of the Bidding Documents issued by the Owner on the System shall serve as the basis for review and evaluation. 5.3. The Bidder shall review all information related to the Invitation to Bid and other Bidding Documents, including any amendments, clarifications, and minutes of pre-bid meeting (if any), in order to prepare the bid in accordance with the requirements of the Bidding Documents.
6. Clarification of Bidding Documents, Site Visit, Pre-Bid Meetings	6.1. A Bidder seeking any clarification of the Bidding Documents shall submit a request to the Owner through the System no later than five (05) working days prior to the Bid Closing Date, or raise questions at the pre-bid meeting (if any) as specified in ITB 6.4. Upon receiving the request, the Owner shall review and respond by providing clarifications through the System no later than two (02) working days before the Bid Closing Date. The clarification shall include the content of the Bidder's request but shall not disclose the identity of the requesting Bidder. 6.2. Any clarification of the Bidding Documents shall not contradict the contents of the approved Bidding Documents. If the clarification results in content that necessitates an amendment to the Bidding Documents, such amendment shall be carried out in accordance with the procedures specified in ITB 7 and 21.2. 6.3. The Owner shall be responsible for monitoring information on the System in order to promptly provide clarifications to the Bidding Documents upon the Bidder's request. 6.4. The Bidder shall be responsible for monitoring information on the System to stay updated on any amendments to the Bidding Documents and changes to the Bid submission deadline (if any), which serve as the basis for preparing the Bid. If any errors occur due to the Bidder's failure to monitor and update such information, resulting in damages during the bidding process, including those related to changes or amendments to the Bidding Documents, Bid submission deadlines, contract negotiation schedules, or other matters, the Bidder shall be solely responsible and shall bear all resulting damages. 6.5. The Bidder is advised to visit and examine the site and

	its surroundings and, at its own responsibility, obtain all information necessary for preparing the Bid and entering into a Contract. All risks and costs associated with the site visit shall be borne solely by the Bidder. 6.6. The Bidder and any of its personnel or agents shall be granted permission by the Owner to enter the premises and land for the purpose of conducting a site visit, but only on the express condition that the Bidder, its personnel, and agents release and indemnify the Owner, its personnel, and agents from and against all liability arising therefrom. The Bidder, its personnel, and agents shall be solely responsible for any accidents, loss or damage to property, or any other loss, damage, costs, or expenses incurred as a result of the site inspection. Where necessary, the Owner shall provide the Bidder with site visit guidelines as specified in the BDS. 6.7. When necessary, the Owner shall organize a Pre-Bid Meeting as specified in the BDS to clarify unclear contents of the Bidding Documents for interested Bidders. The Owner shall issue a notice of the Pre-Bid Meeting on the System. All interested Bidders may attend the Pre-Bid Meeting without prior notice to the Owner. The discussions among the Owner and the Bidders shall be recorded in meeting minutes, and a written clarification of the Bidding Documents shall be issued via the System within a maximum of two (02) working days after the conclusion of the Pre-Bid Meeting. If any amendments to the Bidding Documents are deemed necessary as a result of the meeting, the Owner shall proceed with such amendments in accordance with ITB 7. The minutes of the Pre-Bid Meeting shall not be considered an amendment to the Bidding Documents. The Bidder's failure to attend the site survey or Pre-Bid Meeting, or failure to present a site survey certificate or Pre-Bid Meeting attendance certificate, shall not be grounds for disqualification of the Bidder's Bid.

7. Amendment of Bidding Document	7.1. If it is necessary to amend the Bidding Documents after issuance, the Owner shall publish a decision on the amendment, together with the amended content and the revised Bidding Documents, on the System. Amendments must be made at least ten (10) days prior to the Bid Closing Date. If this timeline cannot be met, the Bid submission deadline shall be extended in accordance with ITB 21.2. 7.2. The clarification and decision on amendment of Bidding Document are part of the Bidding Document. 7.3. The Bidder is responsible for tracking information on the System to update information on amendment of Bidding Document, extend deadline for the submission of Bid (if any) to prepare the Bid. Should occurred errors due to failure to monitor and update information on System cause damages to bidder during bidding process including changes or amendments on Bidding Document, deadline for submission of Bid, contract negotiation time and others, Bidder itself must take responsibility and bear damages during bidding process.
8. Cost for Bidding	The Bidding Documents shall be posted on the System. The Bidder shall pay to purchase the electronic copy of the Bidding Documents when or before submitting its Bid. The Bidder shall bear all costs associated with the preparation and submission of its Bid. The Owner shall not be responsible or liable for any of these costs.
9. Language of Bid	The Bid, along with all correspondence and documents exchanged between the Bidder and the Owner relating to the bid, shall be written in the language prescribed in the BDS.
10. Documents Comprising the Bid	The Bid comprises the following: 10.1. Letter of Bid in accordance with ITB 11; 10.2. Consortium Agreement (for any Bidder in a consortium) using Form No. 03 (prepared by the Bidder) of Chapter IV - Bidding Forms; 10.3. Bid Bond, in accordance with ITB 18; 10.4. Documentary evidence of bidder eligibility, in accordance with ITB 4.1; 10.5. Documentary evidence of the origin of materials and equipment, and eligibility of services, in accordance with ITB 4.2; 10.6. Documentary evidence establishing the eligible signatory of the Letter of Bid in accordance with ITB 19.3;

	10.7. Documentary evidence establishing the Bidder's qualifications and experience in accordance with ITB 12; 10.8. Technical Proposal in accordance with ITB 13. 10.9. Financial Proposal and schedules, in accordance with ITB 11 and ITB 14. 10.10. Alternative Technical Proposal, if permitted, in accordance with ITB 15, together with the corresponding Financial Proposal (if any); 10.11. Any other documents specified in the BDS.
11. Letter of Bid and Schedules	The Bidder shall submit the Letter of Bid and equivalent Schedules using the forms furnished in Chapter IV - Bidding Forms (prepared by the Bidder).
12. Documents Establishing the Qualifications and Experience of the Bidder	The Bidder shall complete the required information in the forms provided in Chapter IV – Bidding Forms to demonstrate its qualifications to perform the contract, in accordance with Chapter III – Evaluation and Qualification Criteria. The Bidder shall prepare original documents for verification upon request by the Owner. In cases where prequalification has been applied, if there are any changes in the Bidder's qualification information between the time of prequalification and the Bid submission, the updated information must be provided. If no changes have occurred, the Bidder shall submit a written confirmation affirming its continued compliance with all the qualification criteria of the package.
13. Technical Proposal	The Bidder shall submit a Technical Proposal that includes a statement of work methods, equipment, personnel, schedule, and any other information as specified in Chapter IV – Bidding Forms, with sufficient detail to demonstrate the adequacy of the Bidder's proposal in meeting the work requirements and completion timeline.
14. Bid Price and Discounts	14.1. The Bid Price means the total price quoted in the Letter of Bid (for the BASE PROPOSAL). Details as specified in the BDS. The offer price for the OPTIONAL PROPOSAL shall be reviewed and procured by Owner in the later stage. 14.2. If the Bidder offers a discount, the percentage of the discount must be clearly stated in the Letter of Bid. This discount shall be understood to apply uniformly across all items listed in the Summary Bid Price Table. 14.3. For construction work: a. The value of the construction work proposed by the Bidder

	in the Bid shall include all necessary costs to perform the construction work in accordance with Chapter V - Technical Requirements and Specifications in the Bidding Documents. The Bidder is responsible for reviewing the construction work items in Form No. A, Chapter IV - Bidding Forms and the actual conditions to propose a suitable bid price table. The "Bill of Quantity" provided in Form No. A, Chapter IV - Bidding Forms, are for reference only. b. The Bidder may add or remove construction work items in the "Bill of Quantity" in Form No. A, Chapter IV – Bidding Forms, to reflect the design and actual site conditions. Any such adjustments must be reflected in the corresponding price proposal in Form No. 20, Chapter IV – Bidding Forms. 14.4. For goods supply: a. The quoted price for goods supply must include all costs necessary to perform the supply scope in accordance with Chapter V – Technical Requirements and Specifications, and the actual conditions of the equipment and systems. b. The Bidder shall quote prices for all items listed in the "Bill of Quantity" in Form No. A and No. B, Chapter IV – Bidding Forms. c. If there are any additional work items or volumes required for project completion, based on Table 8 [Division of Responsibility DOR], Table 8.1 [Division of Responsibility for Insulation], and Table 9 [Bill of Quantities], Section IX [Attachment Documents], Chapter V, Part II and the actual condition of systems, but not included in the "Description" in Form No. A and B, Chapter IV, the Bidder shall provide separate quotations for these additional items. Such quotations must be accompanied by supporting documents or reasonable justifications for consideration, evaluation, and and shall be included in the total Bid Price." 14.5. If the Bidder leaves blank or enters "0" in the "Unit Price" or "Total Price" columns, it will be deemed that the cost for those items has been allocated to other components of the package. The Bidder shall still be responsible for executing such work in full compliance with the Bidding Document, without any additional payment from the Owner, except as reflected in the total bid price. 14.6. The Bid Price must include all applicable taxes, fees, and charges, based on the rates in effect twenty-eight (28) days prior to the Bid submission deadline. If the Bidder declares that the Bid Price is exclusive of such taxes, fees, or charges, the Bid shall be rejected. 14.7. The Bidder shall be fully responsible for the accuracy

	and sufficiency of the quoted price in meeting the requirements of the Bidding Documents. If the final evaluated price (after error correction and deduction of any discounts) is abnormally low and may affect the quality of the contract performance, the Owner shall proceed according to Article 140 of Decree No. 214/2025/NĐ-CP. 14.8. The Bid Price shall be on a lump-sum basis. No price adjustment will be allowed during the execution of the contract.
15. Alternative Technical Proposal in Bid	15.1. Unless otherwise indicated in the BDS, Alternative Technical Proposal(s) shall not be considered. 15.2. The Alternative Technical Proposal(s) shall only be considered if main Bid is evaluated as responsive and the Bidder is ranked the first. In this event, the Bidder shall provide all essential information in order that the Owner to evaluate alternative technical options, including: description, drawings, technical specifications, delivery schedule and other relevant information. The evaluation of Alternative Technical Proposal(s) shall comply with Section 5 Chapter III - Evaluation and Qualification Criteria.
16. Bid Currency and Payment Currency	The currency for bidding and payment shall be as specified in the BDS.
17. Validity Period of Bid	17.1. The Bid shall remain valid for the period which is not shorter than the period specified in the BDS. The Bid valid for a shorter period shall be rejected as non-responsive. 17.2. In exceptional circumstances, prior to the expiration of the bid validity period, the Owner may request Bidders to extend the period of validity of their Bids. If a Bid Bond is requested, it shall also be extended for a corresponding period (equivalent to the extended validity period plus thirty (30) days). If the Bidder refuse the request, its Bid shall not be kept considering and the Bid Bond shall be returned. The Bidder accepting the request shall not change any content of the Bid. The request and the responses shall be made in writing.
18. Bid Bond	18.1. When submitting the Bid and before the deadline for submission of Bid, the Bidder shall provide a bid bond in one or more of the following forms: a. A bank guarantee letter issued by legal representative of domestic credit institution or foreign bank branch established under Vietnamese law, or

	b. A guarantee insurance certificate from domestic non-life insurance enterprise, branches of foreign non-life insurance enterprises established under Vietnamese law Such instruments shall use Form No. 04 in Chapter IV – Bidding Forms, or another form provided it contains the essential content and is subject to the Owner’s approval. If the bid validity period is extended under ITB 17.2, the Bid Bond must also be extended accordingly. For a consortium, the Bid Bond may be provided in one of the following two ways: • Each member of the consortium may submit a separate Bid Bond, provided that the total value is not less than that required in ITB 18.2. If any of the Bid Bonds is found invalid, the consortium’s Bid shall be rejected as non-responsive. If any consortium member commits a violation of the law that results in the Bid Bond not being returned under ITB 18.5, none of the Bid Bonds will be returned. • The Consortium may designate one partner responsible for providing the Bid Bond on behalf of the entire consortium. The Bid Bond may be issued in the name of the consortium or the lead partner, provided that the total value is not less than the amount specified in ITB 18.2. If any consortium member violates the law, resulting in non-return under ITB 18.5, the Bid Bond shall not be returned. 18.2. The value, currency, and validity period of the Bid Bond shall be specified in the BDS. The validity period shall be calculated from the Bid submission deadline to the final day of the Bid Bond's validity, without requiring a full 24-hour extension on that day. 18.3. A Bid Bond shall be considered invalid in one of the following cases: • Its value is lower than required, • Its validity period is shorter than required under ITB 18.2, • It states an incorrect name of the Owner (beneficiary), • It lacks a valid signature, • It is dated before the Bidding Documents were issued, • It includes conditions that are disadvantageous to the Owner. Guarantee letters or guarantee insurance certificates must be signed and (if applicable) sealed by a legal representative of the issuing entity, which must be either a domestic credit institution, a foreign bank branch established under Vietnamese law, a domestic non-life insurance enterprise, or branches of foreign non-life insurance enterprises established

	under Vietnamese law. 18.4. For unsuccessful Bidders, the Bid Bond shall be returned or released within the time frame specified in the BDS, counted from the date of notification of bid results. For the successful Bidder, the Bid Bond shall be returned or released upon submission of the Performance Bond and the effective date of the Contract. 18.5. A Bidder shall forfeit the Bid Bond in the following cases due to violations of the Law on Bidding: a. The Bidder withdraws its Bid or submits a written refusal to perform one or more items proposed in the Bid after the Bid submission deadline and within the bid validity period; b. The Bidder commits any prohibited act under Article 16 of the Law on Bidding or any violation leading to bid cancellation; c. The Bidder fails to submit the required Performance Bond as prescribed in Article 68 of the Law on Bidding and ITB 41; d. The Bidder fails or refuses to engage in contract negotiations (if applicable) within ten (10) days of receiving the negotiation invitation, or refuses to sign the minutes after negotiations (except in cases of force majeure); e. The Bidder fails or refuses to finalize the contract within twenty (20) days of receiving the Contract Award Notification from the Owner, except for force majeure events; f. The Bidder fails or refuses to sign the contract within twenty (20) days of finalizing the contract documents, except in force majeure cases; g. The Bidder refuses or fails to submit the original bid security (guarantee letter or insurance certificate) within five (5) working days from the Owner's request. This will be handled in accordance with the commitment made in the Bid Letter.
19.Format and Signing of Bid	19.1. The Bidder shall prepare the Bid consisting of one original Bid as described in ITB 10 and a number of copies of the Bid as prescribed in the BDS. The cover of the Bid shall be clearly marked "BID ORIGINAL" and BID COPY". In case of any amendments to or replacements for Bid, the Bidder shall prepare one original and a number of copies of the Bid as prescribed in the BDS. The cover of documents shall be clearly marked "MODIFIED BID ORIGINAL", "MODIFIED BID COPY", "SUBSTITUTED BID ORIGINAL", "SUBSTITUTED BID COPY". 19.2. The Bidder shall be responsible for the consistency between the original and the copies. In the event of any discrepancy between the original and the copies of the Bid,

	the following rules shall apply: • In the event of any discrepancy between the original and the copies does not lead to any change to the rank of the Bidder, the original shall prevail. • In the event of any discrepancy between the original and the copies leading change to the rank of the Bidder, the Bid shall be rejected. 19.3. The original Bid shall be typed or written in indelible ink and paginated continuously. The Letter of Bid, Letter of Discount (if any), additional or clarifying documents, Price Schedule, and other forms specified in Chapter IV – Bidding Forms must bear the signature and seal of the Bidder’s legal representative or authorized representative (if applicable). If signed by an authorized representative, the Bid must include either: • An original or notarized Power of Attorney using Form No. 02 in Chapter IV – Bidding Forms, or • A copy of the Company Charter, a certified Decision on the Establishment of a branch, or other documents proving the representative’s authority. These documents must be submitted with the Bid. 19.4. If the Bidder is a consortium, the Bid shall bear the signatures of legal representatives of all consortium’s partners or the partner that represents the consortium according to the consortium agreement. In order to ensure that all consortium's partners are legally bound, the consortium agreement shall bear the signatures of legal representatives of all consortium's partners. 19.5. Any interlineations, erasures, or overwriting in the Bid shall be valid only if they are signed or initialed by the same person who signs the Bid.
20. Sealing and Marking of Bid	20.1. The Bid envelope shall contain the original and the copies of the Bid and clearly marked as “BID”. If the Bidder submits a modified or replacement Bid, the revised documents (including both original and copies) must be placed in separate sealed envelopes and clearly marked as "MODIFIED BID" or "SUBSTITUTED BID", respectively. If the Bidder submits an Alternative Technical Proposal, it shall be enclosed in a separate sealed envelope and clearly marked as "ALTERNATIVE TECHNICAL PROPOSAL". All such envelopes including those containing the Bid, Modified Bid, Substituted Bid (if any), and Alternative Technical Proposal (if any) must be sealed, with the sealing

	method determined by the Bidder in accordance with its internal procedures. 20.2. The outer envelopes shall: - bear the name and address of the Bidder; - be addressed to the Owner in accordance with ITB 21.1; - bear the name of the package in accordance with ITB 1; and - bear a warning: "Do not open before the time and date for Bid opening" for the envelopes containing the Bid, Modified Bid, or Substituted Bid (if any). If the envelopes are not sealed, if the seals are broken during transmission, or if the envelopes are not properly marked in accordance with ITB 20.1 and 20.2, the Bidder shall bear full responsibility. The Owner shall not be liable for the confidentiality or integrity of the Bid if the Bidder fails to comply with these sealing and marking requirements.
21. Deadline for the submission of Bid	21.1. The deadline for submission of Bids shall be the date and time specified in the Invitation for Bids. The Owner shall receive all Bids submitted by Bidders prior to the Bid closing time, as prescribed in the BDS. Upon submission of the Bid, the Bidder shall pay the Owner an amount equivalent to the selling price of the Bidding Document prior to the receipt of their Bid. 21.2. The Owner may extend the deadline for submission of Bids by issuing an amendment to the Invitation for Bids. In such case, all rights and obligations of the Owner and the Bidders under the original deadline shall thereafter apply to the extended deadline.
22. Late Bid	The Owner shall not consider any Bid received after the deadline for submission. Any Bid arriving after the deadline shall be deemed late, rejected, and returned unopened to the Bidder.
23. Withdrawal, Substitution, and Modification of Bid	23.1. A Bidder may withdraw, substitute, or modify its Bid after submission by sending a written notice duly signed by its legal representative or authorized representative, accompanied by a copy of the Power of Attorney in accordance with ITB 19.3. The corresponding substitution or modification of the Bid shall accompany the written notice. These documents shall: - be submitted in accordance with ITB 19 and ITB 20, and the respective envelopes shall be clearly marked "MODIFIED BID," "SUBSTITUTED BID," or "WITHDRAWAL"; and - be received by the Owner prior to the deadline for submission of Bids, in accordance with ITB 21.1.

	23.2. Any Bid requested to be withdrawn in accordance with ITB 23.1 shall be returned unopened to the Bidder. 23.3. No Bid may be withdrawn, substituted, or modified after the deadline for submission of Bids and before the expiration of the Bid validity period specified in the Letter of Bid or any extension thereof.
24. Confidentiality	24.1. Information relating to the evaluation of Bids and the recommendation for Contract Award shall not be disclosed to Bidders or any other persons not officially involved in the evaluation process until the publication of the bidder selection result. Under no circumstances shall information contained in one Bidder's Bid be disclosed to any other Bidders, except for the information announced at the Bid opening. 24.2. Except in cases of Bid clarification as prescribed in ITB 25 or during contract negotiations, the Bidder shall not contact the Owner regarding any matter related to its Bid or the bidding package from the time of Bid opening until the publication of the bidder selection result.
25. Clarification of Bid(s)	25.1. After Bid opening, the Bidder shall clarify its Bid at the request of the Owner. If the Bid lacks documentary evidence of the Bidder's qualifications such as eligibility, capacity, experience, similar contracts, production capability, financial statements, tax declarations and payments, key personnel, or construction equipment the Owner shall request the Bidder to clarify and provide the missing documents. Clarification related to eligibility must not alter essential information regarding the identity of the Bidder. Clarification of technical or financial proposals must not result in any change to essential contents of the Bid or the Bid Price. The Bidder shall acknowledge receipt of the clarification request by submitting a confirmation letter via email. 25.2. The Clarification of Bid between the Bidder and the Owner shall be in writing; 25.3. Within the period specified in the BDS, if the Bid lacks necessary documents proving the Bidder's qualifications (e.g., eligibility, similar contracts, production capacity, financial statements, tax declarations and payments, personnel, or equipment), the Bidder may supplement such documents. The Owner shall consider these supplemental documents as an integral part of the Bid. 25.4. The Clarification of Bids shall be conducted exclusively between the Owner and the Bidder whose Bid requires clarification. The content of the clarification shall be treated as an integral part of the Bid. For clarifications concerning qualifications, technical, or financial criteria, if the Bidder fails to provide clarification before the deadline or if the

	response is inadequate, the Owner shall evaluate the Bid based solely on the information submitted by the original Bid Closing Date. 25.5. Where necessary, the Owner may request in-person clarification from potentially successful Bidders. Such clarification meetings shall be documented, and the information exchanged must be provided objectively and transparently. 25.6. If there is any doubt regarding the authenticity of documents submitted by the Bidder, the Owner reserves the right to verify the documents with the relevant authorities or individuals.
26. Deviations, Reservations, and Omissions	26.1. During the evaluation of Bids, the following definitions shall apply: a. "Deviation" means any variation or departure from the requirements specified in the Bidding Documents. b. "Reservation" means the inclusion of restrictive conditions or the expression of partial or incomplete acceptance of the requirements stated in the Bidding Documents. c. "Omissions" means the failure to submit, either in part or in full, the information or documentation required by the Bidding Documents. 26.2. If a Bidder fails to meet any of the following evaluation criteria eligibility, qualifications, experience, technical, or financial or if the Bid contains deviations, reservations, or omissions that result in the Bid being non-compliant, such Bid shall be rejected, and no further evaluation of other criteria shall be conducted.
27. Determination of Responsiveness	27.1. The Owner shall determine a Bid's responsiveness based on content of the Bid as prescribed in ITB 10. 27.2. A substantially responsive Bid is one that meets all the requirements of the Bidding Documents without material deviation, reservation, or omission. A material deviation, reservation, or omission is one that: a. if accepted, would affect in any substantial way the scope, quality, or performance of the work, or would limit in any substantial way, contrary to the Bidding Documents, the Owner's rights or the Bidder's obligations under the proposed Contract; or b. if rectified, would unfairly affect the competitive position of other Bidders presenting substantially responsive Bids. 27.3. The Owner shall examine all technical aspects of the Bid submitted in accordance with ITB 13, particularly to confirm that all requirements of the Bidding Documents have been met without any material deviation, reservation, or omission.

	Any Bid that is not substantially responsive to the requirements of the Bidding Documents shall be rejected and shall not subsequently be made responsive by the Bidder's correction of the material deviation, reservation, or omission.
28. Nonmaterial Nonconformities	28.1. Provided that a Bid is substantially responsive to the requirements of the Bidding Documents, the Owner may waive any nonconformities in the Bid that do not constitute a material deviation, reservation, or omission. The Owner may also request the Bidder to submit, within a reasonable period of time, any necessary information or documentation to rectify nonmaterial nonconformities related to the documentation requirements. Such requests shall not relate to any aspect of the Bid Price. Failure of the Bidder to comply with the request may result in rejection of its Bid. 28.2. Provided that a Bid is substantially responsive to the requirements of the Bidding Documents, the Owner shall rectify nonmaterial and quantifiable nonconformities related to the Bid Price. For the purpose of Bid comparison only, the Bid Price shall be adjusted to reflect the cost of any missing or nonconforming item or component.
29. Subcontractor (Including Manufacturer and Supplier)	29.1. A subcontractor is an organization or individual that enters into a contract with the Bidder to carry out a portion of the work listed in the Summary of Bid Price. The Bidder shall submit a list of subcontractors and the corresponding work items as prescribed in Form No. 18 (a), Chapter IV - Bidding Forms. If the subcontractors are not identified at the time of bidding, the Bidder must indicate the anticipated work items intended for subcontracting. The use of subcontractors does not relieve the Bidder of any obligations. The Bidder remains fully responsible for the quality, quantity, schedule, and all contractual obligations related to the work performed by subcontractors. The qualifications of subcontractors, manufacturers, or suppliers will not be considered during the Bid evaluation (except for special subcontractors as defined in the Bidding Documents), but shall be subject to final approval during contract execution. The Bidder must independently meet all qualification requirements without reliance on subcontractors. If the Bidder does not propose the use of subcontractors for specific tasks, it shall be deemed to have undertaken responsibility for the entire package. The use of subcontractors not declared in the Bid during contract execution will be treated as a "Contract Transfer" under ITB 3.8. 29.2. [Not applicable.] 29.3. The Bidder shall not subcontract any work items other

	than those listed in the Bid. Replacement or addition of subcontractors not originally proposed shall only be permitted with legitimate justification and prior approval by the Owner. Otherwise, such actions shall be considered a "Contract Transfer." Any bidder who engages in Contract Transfer under Clause 8, Article 16 of the Law on Bidding shall be prohibited from participating in future bidding activities, as prescribed in Article 133 of Decree No. 214/2025/ND-CP. 29.4. The Owner may allow the use of special subcontractors as specified in the BDS. The Bidder must submit a list of such special subcontractors, including their qualifications and work experience, using Form No. 18 (b), Chapter IV - Bidding Forms. The Owner shall evaluate the qualifications of special subcontractors in accordance with the criteria set forth in Clause 2.3, Section 2 - Qualification Criteria, Chapter III - Evaluation and Qualification Criteria. If either the Bidder or its proposed special subcontractor fails to meet these criteria, the Bid shall be deemed nonresponsive. 29.5. The Owner shall not permit the use of subcontractors that have participated in consultancy services related to the Bidder's success in the bidding process. This includes involvement in: preparation or verification of technical designs, construction drawings, cost estimates, FEED designs; valuation; contract supervision and inspection; preparation or appraisal of Request for Pre-Qualification or Bidding Documents; evaluation of Pre-Qualification Applications or Bids; appraisal of prequalification or bidder selection results; project management; contract management; or other consulting services directly related to the package.
30. Incentives in Bidder Selection	30.1. Incentive Rules: a. If a Bidder is eligible for multiple incentives related to capacity, experience, or financial criteria, only the most favorable incentive shall apply for each respective evaluation item. b. If all Bidders are equally eligible for incentives, or none qualify, incentive calculations for the purpose of comparison and ranking shall not be necessary. c. Incentives shall be calculated based on the entirety of the Bidder's proposal, covering consultancy services, supply of goods, and construction. A Bidder qualifies for incentives if its proposed domestic cost components, including consultancy, non-consultancy services, goods of Vietnamese origin, and construction/installation, account for at least 25% of the total package value. d. A Bidder shall be eligible for incentives when supplying goods that meet the minimum ratio of domestic production

	cost as specified in Article 5 of Decree No. 214/2025/ND-CP. e. The Bidder must provide sufficient evidence that the offered goods and services are eligible for incentives in accordance with Clause 1, Article 10 of the Law on Bidding. 30.2. The specific entities entitled to incentives and the corresponding determination methods shall be as specified in the BDS.
31. Bid Opening	31.1. Except as provided under ITB 22 and ITB 23, all Bids received before the deadline for submission shall be opened by the Owner in accordance with ITB 31.5. The Bid opening shall be conducted publicly at the location, date, and time specified in the BDS, in the presence of the Owner and relevant agencies and organizations. The Bid opening shall proceed regardless of the presence or absence of any Bidder's representative. 31.2. Envelopes marked "WITHDRAWAL" shall be opened first and the corresponding Bid shall not be opened, but returned to the Bidder. No Bid withdrawal shall be accepted unless the corresponding withdrawal notice includes valid authorization. 31.3. Envelopes marked "SUBSTITUTED BID" shall be opened next, and the original Bid envelope shall not be opened but returned to the Bidder. No substitution shall be accepted unless the notice of substitution includes valid authorization. 31.4. Envelopes marked "MODIFIED BID" shall then be opened along with the corresponding original Bid. No modification shall be accepted unless accompanied by a valid authorization. Only envelopes that are opened and read out at the Bid opening shall be considered further. 31.5. The Bid opening shall be conducted to every Bid or Substituted Bid (if any) in alphabetical order of the Bidders' names, following these procedures: a. The seals shall be checked and the envelopes marked "BID". "MODIFIED BID" (if any) or "SUBSTITUTED BID" (if any) shall be opened; b. All other envelopes, including original, modified or substitute (if any) shall be opened and read aloud: Bidder's name (including whether submitting independently or as part of a consortium), Bid validity period, implementation schedule, contract duration, Bid Bond value and validity, Bid Price as stated in the Letter of Bid and Grand Total, any discount offered, and other relevant details;

	c. The number of originals and copies submitted, as well as information regarding any Alternative Bid (if applicable), shall be read out; d. The representative of the Owner shall initial or sign key documents such as the original Letter of Bid, Power of Attorney (if applicable), Consortium Agreement (if applicable), Bid Bond, and Letter of Discount (if any). No Bid shall be rejected at the Bid opening stage except for those deemed late under ITB 22. 31.6. The Owner shall prepare a record of the Bid opening, including the contents specified in ITB 31.3. This record shall be signed by the representatives of the Bidders present at the Bid opening. The absence of a Bidder's signature shall not invalidate the record. A copy of the Bid opening record shall be distributed to all participating Bidders and published on the System within twenty-four (24) hours of the Bid opening. The record shall include the following: a. Information of bidding package: • Number of Invitation to Bid; • Name of the bidding package; • Name of the Owner; • Form of bidder selection; • Type of contract; • Time for Completion of the bidding package; • Total number of participating bidders. b. Information about participating bidders: • Bidder's name; • Validity of Bid; • Bid Price; • Discount percentage (%) (if any); • Bid price after discount (if any); • Value and validity of Bid Bond; • Implementation time of bidding package; c. Other related information (if any).
32. Bid Evaluation	32.1. The Owner shall evaluate the Bids based solely on the criteria and methodology stated in this Section and as prescribed in the BDS. The application of any criteria or methods not explicitly set forth in the Bidding Document is strictly prohibited. 32.2. Inspection and Evaluation of Bid validity:

		a. The inspection and evaluation of the validity of the Bid shall comply with Section 1 of Chapter III - Evaluation and Qualification criteria; b. Only Bidders whose Bids are deemed valid shall be considered for subsequent stages. 32.3. Qualification Evaluation: a. The evaluation of Bidder's qualification shall comply with Section 2 of Chapter III - Evaluation and Qualification Criteria; b. Only the Bidders who meet the qualification requirements shall proceed to the next stage of evaluation. 32.4. Technical Evaluation: a. The technical evaluation shall comply with Item 3.1, Section 3 of Chapter III - Evaluation and Qualification Criteria; b. Only the Bidders who satisfy the technical evaluation shall be considered further. 32.5. Financial Evaluation: The financial evaluation shall comply with Section 4 of Chapter III - Evaluation and Qualification Criteria.
33. Price Opening	Bid	[Not applicable.]
34. Ranking Bidders	of	Upon completion of the detailed evaluation of Bids, the Owner shall prepare a ranking list of Bidders in accordance with the criteria and methodology stipulated in the BDS . The Bidder ranked first shall be invited to enter into contract negotiations.
35. Contract Negotiation		35.1. Where necessary, the Owner shall invite the first-ranked Bidder for contract negotiation. The basis for negotiation shall include: a. The Bid Evaluation Report; b. The Bid and any Clarifications submitted by the Bidder; c. The Bidding Document, including any amendments and clarifications issued. Principles of Negotiation: • No negotiation shall be conducted on contents already quoted in accordance with the requirements of the Bidding Document; • No changes shall be allowed to unit prices determined during the financial evaluation. 35.2. Contract Negotiation Contents: a. Resolve ambiguities or inconsistencies between the Bidding Documents and the Bid, or within the Bid itself,

	which could cause disputes or affect the contractual obligations during execution; b. Address deviations proposed by the Bidder using Form No. 23 and 24 of Chapter IV, including any permitted alternatives or substitutions. Deviations or proposals not declared in the Bid shall not be subject to negotiation; c. Discuss proposed key personnel: During negotiation, the Bidder shall not replace any proposed key personnel unless the bid evaluation period exceeds the expected duration stated in the selection plan or in the event of force majeure. Any replacement personnel must meet or exceed the qualification requirements of those originally proposed, and this shall not affect the Bid Price; d. Finalize any matters arising during the bidder selection process (if applicable) to complete the detailed contents of the package; e. Clarify and rectify nonmaterial nonconformities in accordance with ITB 28; f. Identify the taxes applicable to the Bidder in accordance with tax laws, including import duties, special consumption tax (if any), VAT, and any other related tax obligations. The tax rates and values must be explicitly stated in the Contract. g. Contents related to the OPIONAL PROPOSAL. h. Address other essential matters relevant to the finalization of the Contract. 35.3. During the contract negotiation, Both parties shall jointly prepare a draft Contract, including terms and conditions and appendices, detailing the Scope of Works, Price Schedule, and Performance Schedule. 35.4. If negotiations with the first-ranked Bidder fail, the Owner shall consider inviting the next-ranked Bidder for negotiation. If negotiations with the next-ranked Bidder also fail, the Owner shall consider canceling the Bidding in accordance with Point a of ITB 39.1.
36. Conditions for successful bidder	A Bidder shall be proposed as the successful Bidder when all of the following conditions are met: a. The Bidder has an eligible Bid as required in Section 1 of Chapter III - Evaluation and Qualification Criteria; b. The Bidder is qualified as required in Section 2 of Chapter III - Evaluation and Qualification Criteria; c. The Bidder has a satisfactory technical proposal as prescribed Item 3.1, Section 3 of Chapter III - Evaluation and Qualification Criteria; d. The deficient deviation is not more than 10% of the Bid Price for BASE PROPOSAL;

	e. The Bidder meets requirements as prescribed in the BDS; f. The successful Bid Price (including taxes, fees, charges (if any)) is not exceed the approved package price specified in the bidder selection plan. g. In case the approved bid package estimation is lower or higher than the approved bid package price, this estimation shall replace the bid package price as the basis for consideration of winning bid.
37. Publishing of the Bidder Selection result	37.1. Before the deadlines prescribed in the BDS, the Owner shall public notifications of bidder selection result on the System and send the notification of bidder selection result to bidders participating in bidding. Contents of the notification of bidder selection result shall included: a. Name and number of the bidding package; b. Name of the successful Bidder; c. Address of the successful Bidder; d. Successful Bid Price; e. Type of contract; f. Time to implement the bidding package as prescribed in Clause 7, Article 39 of the Law on Bidding and Time for Completion; g. List of unsuccessful Bidders and brief explanation for each of them. h. Plan for finalizing and signing the contract with the selected Bidder. 37.2. Regarding bidding cancellation prescribed in Point a ITB 39.1, the explanation for the bidding cancellation shall be provided in the notification of bidder selection result. 37.3. Upon receiving the notification of the bidder selection result under ITB 37.1, an unsuccessful Bidder may submit a written request or meet directly with the Owner to receive a brief explanation of the specific reasons for their non-selection. The Owner shall respond to such requests within five (05) working days from the date of receipt.
38. Letter of Acceptance and Notification of Award	Together with the notification of the bidder selection result, the Owner shall send the Letter of Acceptance and Notification of Award to the successful Bidder. These documents shall include requirements regarding the performance bond, time for completion, and contract finalization as specified in Chapter VI – Contract, provided that the Bidder is confirmed to be qualified to satisfactorily perform the Contract. The Letter of Acceptance and Notification of Award shall be an integral of the Contract Documents. In the event that the successful Bidder fails to complete and conclude the Contract or submit Performance

		Bond before the deadline mentioned in the Letter of Acceptance and Notification of Award, such Bidder shall be rejected and his Bid Bond shall be revoked as prescribed in Point e of ITB 18.5.
39. Bidding Cancellation		39.1. The Owner shall issue a notice of bidding cancellation in the following circumstances: a. All Bids fail to meet the requirements specified in the Bidding Documents; b. The Owner changes the investment objectives and scope under the approved investment decision, leading to changes in the scope of work and evaluation criteria set out in the Bidding Documents; c. The Bidding Documents fail to comply with the Law on Bidding or other relevant regulations, resulting in the successful Bidder being unable to meet the requirements for performance of the package; d. Organizations or individuals other than the selected Bidder engage in prohibited acts under Article 16 of the Law on Bidding, thereby distorting the bidder selection results. 39.2. Any organization or individual that violates the Law on Bidding and causes a bidding cancellation under Points c or d of ITB 39.1 shall be liable for compensation to relevant parties and subject to penalties in accordance with applicable regulations. 39.3. For bidding cancellations under ITB 39.1, the Owner shall, within five (05) working days, return or release the Bid Bonds to the Bidders, except for the Bidder involved in the violation under Point d of ITB 39.1.
40. Conditions for Signing Contract	for of	40.1. The Bid submitted by the Bidder shall remain valid at the time of contract signing. 40.2. At the time of signing of contract, the successful Bidder shall be determined to meet the technical and financial qualifications to perform the Contract. In case the Bidder is no longer qualified as prescribed in the Bidding Documents, the Owner shall refuse to conclude the contract with the Bidder. In such case, the Owner shall cancel the decision approving the bidder selection result, the Letter of Acceptance, and the Notification of Award, and shall invite the next ranked Bidder for contract negotiation. 40.3. The Owner shall ensure the availability of necessary conditions for timely contract performance, including the arrangement of advance and payment capital, site and other essential conditions.
41. Performance Bond		41.1. Before or at the time the Contract becomes effective, the successful Bidder shall furnish a Performance Bond in the

	form of a bank guarantee issued by a domestic credit institution or a foreign bank branch established under Vietnamese law, or a guarantee insurance certificate issued by a domestic non-life insurance enterprise or a branch of a foreign non-life insurance enterprise established under Vietnamese law. The contents of the Performance Bond shall comply with the form prescribed in Chapter VI – Contract, or another form approved by the Owner. 41.2. The Performance Bond shall not be released in any of the following circumstances: a. The Contractor refuses to perform the Contract after it has become effective; b. The Contractor breaches the terms and conditions of the Contract; c. The Contractor causes delays in Contract performance due to its own fault and refuses to extend the validity period of the Performance Bond accordingly.
42. Handling Complaints in Bidding	Bidders are entitled to file complaints against the bidder selection progress and result to the Owner, competent persons, advisory board at the address prescribed in the BDS, if they believe their legitimate rights and interests have been violated.
43. Monitoring Bidder Selection Progress	In the event that the Bidder detects any actions or contents that are inconsistent with the Law on Bidding, the Bidder shall promptly notify the relevant organizations or individuals responsible for monitoring the bidder selection process, as specified in the BDS.

PART 1. BIDDING PROCEDURES**CHAPTER II. BID DATA SHEET**

ITB 1	- Package Name: Supply of Equipment, Construction, Installation and Monitoring of Test Run for Acceptance of Main Plant of Long Phu 1 Thermal Power Plant Project - Package Number: T08. - Project Name: Long Phu 1 Thermal Power Plant. - Owner: PetroVietnam Long Phu 1 Power Project Management Board.
ITB 2	Sources of Funds (or capital-raising methods): Owner's equity.
ITB 4.1 (e)	Assurance of competitiveness in bidding shall be prescribed as follows: - Bidders participating in bidding as enterprise must not hold shares or capital contributions of more than 30% with: + Vietnam National Industry - Energy Group (PVN). Address: 18 Lang Ha Street, Giang Vo Ward, Ha Noi Capital, Vietnam; and + PetroVietnam Long Phu 1 Power Project Management Board (LP1PP). Address: Thanh Duc hamlet, Dai Ngai commune, Can Tho City, Vietnam, except in cases where: (i) The Bidder is a member company or subsidiary of a state-owned corporation or a corporation whose main production and business lines are consistent with the nature of the bid package of that state-owned corporation or corporation; (ii) The Bidder is a parent company, subsidiary, or member company of an economic corporation or state-owned corporation whose products and services in the bid package are in the main production and business lines of the economic corporation or state-owned corporation and this bid package belongs to the subsidiary or member company. - The participating Bidder does not hold shares or capital contributions in the consulting contractor(s) and vice versa; and they do not each hold 20% or more of shares or capital contributions in the same organization or individual, specifically as follows: + Consulting contractor of technical design: The Kujian Corporation (TKC); + Consulting contractor for cost estimation: Power Engineering Consulting Joint Stock Company 1 (PECC1); + Consulting contractor for cost estimation verification: Institute of construction economics (VKT); + Consulting contractor of Project Management: Not applicable;

	+ Consulting contractor of Supervision: Not applicable; + Consulting contractor of Inspection: Not applicable; + Contract Management Consulting Contractors of the Owner or hired by the Owner : Not applicable; + Consulting contractor of Price appraisal: Not applicable; + Consulting Contractor of Bidding Document preparation and verification: Not applicable; + Consulting contractor of Bids evaluation: Not applicable; + Consulting contractor of Bidder selection results appraisal: Not applicable; + Other consulting contractors directly participate in the bidder selection organizing process. - Bidders participating in bidding must not belong to the same agency or organization directly managing with the consulting contractor (mentioned above). - Bidders participating in bidding must not belong to same agency or organization directly managing with the Owner, unless the bidder is a public non-business unit under state management agency assigned functions and tasks consistent with nature of the bidding package of that state management agency. Public non-business units and enterprises have the same direct management agency and contributed capital when participating in each other's bidding packages not having to meet the independent regulations on legality and financial independence between the bidder and the Owner. - The ratio of shares and capital contribution between parties is determined at the deadline for submission of Bid according to ratio stated in the business registration certificate, establishment decision, and other documents of equivalent value. In case Bidder participates in bidding as a consortium or the consulting bidder selected is a consortium, the capital ownership ratio of other organizations and individuals of the consortium is determined as following formula: $\text{Capital ownership ratio} = \sum_{i=1}^n X_i \times Y_i$ In which: X_i: Capital ownership ratio of other organizations and individuals in consortium member i; Y_i: Workload percentage (%) of consortium member i in consortium agreement; n: Number of members participating in consortium.
ITB 4.1 (i)	In the case of using local subcontractors, the proposed scope and volume of tasks, along with the subcontractors' names, must be

	specified in the Bid. If the Bidder cannot identify the local subcontractor's name at the time of Bid submission, Bidder shall clearly specify the scope and volume of tasks to be performed by the local subcontractors. The Bidder shall submit a commitment to employ local subcontractors for the works mentioned in the Bid in the event of the contract awarded (as per Form No. 18(d), Chapter IV).
ITB 6.6	In case, Bidder needs to conduct a site visit as specified in ITB 6.5, Bidder shall submit a written proposal specifying the desired time for the Owner's preparation.
ITB 6.7	The Owner shall not conduct a Pre-Bid meeting.
ITB 9	The Bid, as well as all correspondence and documents related to the Bid exchanged between the Bidder and the Owner, shall be written in English. Supporting documents and printed literature that are part of the Bid may be in another language provided that they are accompanied by an accurate translation of the relevant passages into English notarized by authorized competent agencies. In case of absence of the translation, the Owner may request the Bidder to supplement when necessary.
ITB 10.11	The Bidder shall submit with the Bid the following additional documents: - Engineering and construction proposals and other documents as specified in Section 3, Chapter III - evaluation and Qualification Criteria of Bidding Document. - Proposal for employing local engineers/bachelors, workers and manual labor where the Works or Contract is performed. - Proposal to use local subcontractors as prescribed in ITB 4.1 (h). - Supporting documents to prove the Bidder's fulfillment of the tax declaration and payment obligation for the latest fiscal year (2024) in the form of Tax declaration and payment receipt/confirmation issued by the tax authority (to be applied for Local Bidder only). - Other documents, which seem to be helpful for the Owner during bid evaluation process. Based on Article 94 of Decree 175/2024/ND-CP, foreign Bidder must submit the license for construction activities after the contract award, which is applied to independent foreign Bidder and/or foreign Consortium member.
ITB 14.1	a) Bid Price means the price to be quoted in the Letter of Bid, including the total price of the Bid (excluding any discounts offered) to perform the package in accordance with Chapter V. b) Bid Price proposal including of all taxes, duties, fees and charges to be born by the Bidder in order to execute and complete the package's scope of work. Bidder is requested to investigate the following relevant applicable laws for: - Corporate Income Tax (CIT);

	- Personal Income Tax (PIT); - Business Registration Tax for Foreign Contractors (BTCC); - Foreign contractor withholding tax arising under Circular No.103/2014/TT-BTC dated 6th August 2014 and any equivalent Vietnamese regulations amending or replacing this Circular 103/2014/TT-BTC applicable to foreign organization(s), individuals doing business in Vietnam or having income in Vietnam, as such law may be varied or replaced from time to time; - Social security, health insurance and unemployment insurance contributions; - Value Added Tax or VAT means tax imposed under Law No.13/2008/QH12 dated 3rd June 2008, as amended by Law No.31/2013/QH13, dated 19th June 2013, and Law No. 106/2016/QH13 dated 6th April 2016, and other related valid regulations of Vietnam any equivalent tax under any Laws of Vietnam amending or replacing such laws; - Import Tax: included in the Bid Price. The Bidder shall acknowledge that the Owner shall apply and obtain the Import Tax exemption to goods, materials, equipment which constitute the fixed assets of the Power Plant, except for those goods, materials, equipment can be produced, manufactured in Vietnam by local manufacturers, in complying with Vietnamese applicable laws. In order to apply the tax exemption, the Contractor has to submit the detail list of goods, materials, equipment to be imported at the Owner's request. In all cases, the Bidder shall be responsible for its own costs, related fees and charges for any Import Tax arising out of goods, materials, equipment, which are unable to apply the tax exemption or which can be produced within Vietnam but the Contractor decides to buy abroad at the Contractor's discretion. Bidder is advised to investigate and adhere to the following applicable laws: ✓ Investment Law No.61/2020/QH14 dated 17/06/2020; ✓ Law on export and import duties No.107/2016 QH13 dated 06/04/2016; ✓ Decree No.134/2016/ND-CP dated 01/09/2016; ✓ Decree No. 18/2021/ND-CP dated 11/03/2021; ✓ Decree No. 31/2021/ND-CP dated 26/03/2021; ✓ Circular No. 45/2013/TT-BTC dated 25/04/2013 of Ministry of Finance; ✓ Circular No. 14/2015/TT-BTC dated 30/01/2015 Ministry of Finance; ✓ Circular No. 38/2015/TT-BTC dated 25/3/2015 Ministry of Finance; ✓ Circular No. 39/2018/TT-BTC dated 20/4/2018 Ministry of Finance;

	✓ Circular No. 01/2023/TT-BKIIDT dated 14/04/2023 Ministry of Planning and Investment. For clearly understanding, Contractor has responsibility to execute all import activities by using the tax exemption list furnished by the Owner, providing explanations to inspection and audit authorities, and implementing the conclusions of such inspections and audits related to the importation of goods within the scope of the contract and shall have to bear for charges, penalties, if any.
ITB 15.1	Not Application.
ITB 16	In accordance with the ordinance on foreign exchange control and current regulations, the Bid currency and payment currency are following: - For costs incur in Vietnam, which includes domestic services, domestically produced goods or overseas-produced goods being sold in Vietnam, to implement the Bid package, Bid currency and Payment currency are in VND. - For costs incur outside Vietnam, to implement the Bid package, Bid currency and Payment currency are in USD or VND. In case of USD, the Bidder shall demonstrate the works using foreign currencies attached to schedule of work items and equivalent foreign currency portion, provided that each work item is quoted in only one currency. For evaluation and comparison of Bids, the Bid currency in USD shall be converted into VND. The exchange rate of VND/USD shall be the selling rate issued by Vietcombank's head quarter and announced on portal.vietcombank.com.vn at the time of the Bid Opening indicated in ITB 31.1.
ITB 17.1	The bid validity period shall be not less than 150 days from the date of the deadline for submission of Bid. The time from the deadline for submission of Bid to the end of twenty-four (24) hours on the date of deadline for submission of Bid is one (1) day.
ITB 18.2	- Currency of Bid Bond: VND or/and USD. - Value of the Bid Bond: in VND is 200,000,000,000 VND; or in USD is 8,000,000 USD. In case the Bid Bond submitted by Bidder is in both VND and USD the exchange rate of USD/VND is 24,740 VND and shall be the basis for the Owner to convert the total value of Bidder's Bid Bonds into VND for comparison with the Value of the Bid Bond in VND above. - The validity period of the Bid Bond shall not be less than 180 days from the date of deadline for submission of Bid. - Original documents proving and showing the person who signs the Bid Bond, is the legal representative of the credit organization or bank or insurance enterprises shall be enclosed. For bidders named in the bidder list with performing acts specified in

	Clause 1, Article 20 of Decree No. 214/2025/ND-CP and released on the System, must implement bid bond measures with triple value of the above required value within two (2) years from the last time these acts are performed. For bidder as a consortium, consortium member performing acts specified in Article 19 of Decree No. 214/2025/ND-CP as mentioned above, must implement bid bond measures with triple value of the bid bond value corresponding to work value proportion taken charge by that consortium member.
ITB 18.4	The unsuccessful Bidder shall be either returned or released the Bid Bond within fourteen (14) days from the date on which the bidder selection result is approved.
ITB 19.1	- 01 Original Bid; - 03 copies of the Bid; - 01 Electronic copy (USB): must be scanned from the Original Bid and provided in Word/Excel format; especially, the Price Bid must be provided in Microsoft Excel format. The information must be assured to be readable by the Owner, not encrypted and must include links for calculation. - In case of any modifications to or substitutes for the Bid, the Bidder must submit the modified or substituted documents in the same number of copies as the original Bid.
ITB 21.1	For bid submission purposes, the Owner's address is: - Attention: PetroVietnam Long Phu 1 Power Project Management Board (LP1PP), address Thanh Duc hamlet, Dai Ngai commune, Can Tho City, Vietnam. - Tel: (84-299) 3 713 333 - Fax: (84-299) 3 713 444 - Email address: longphu1@lp1pp.pvn.vn Deadline for submission of the Bid is in accordance with the Invitation to Bidders.
ITB 25.3	The Bidder may send self-clarification document for the Bid to the Owner within five (05) working days from the date of bid closing time.
ITB 29.4	Special subcontractors: The Bidder is allowed to engage special subcontractors for the following works: - Performing design/engineering (detailed design or overall design) work; - Performing steam turbine and generator erection/installation works. The Qualification criteria for the capability and experiences of special subcontractors are specified in Section 2.3, Chapter III - Evaluation and Qualification Criteria of the Bidding Documents.
ITB 30.2	a) Objects eligible for incentives are as follows: - Foreign contractors in consortium with local contractor(s), where the

	local contractor(s) undertakes at least 25% of the work value of the package, as stipulated in Point d, Clause 1, Article 10 of the Law on Bidding No. 22/2023/QH15; or - Local Bidders participating independently or in a consortium with other local bidders, as stipulated in Point dd, Clause 1, Article 10 of the Law on Bidding No. 22/2023/QH15; or - The Bidder propose domestic costs (costs of consulting, non-consulting, Vietnamese-origin goods, construction/erection, and installation) of at least 25% of the work value of the package, as stipulated in Article 6 of the Decree No. 214/2025/NĐ-CP; or - Goods that have origin in Vietnam; or - Local bidders producing goods of Vietnamese-origin in accordance with the Bidding Document. b) Determining incentives: The Bidder who is not eligible for incentives shall be added an amount equivalent to 7.5% of the Bid Price after error correction and adjustment of deviation, then minus the discount (if any), to the evaluation price of the Bidder for the purposes of comparison and ranking. In compliance with the requirement under ITB 30.2, the Bidder shall declare the amount of domestic costs (costs of consulting, non-consulting, Vietnamese-origin goods, construction, and erection/installation) by VND for determining incentives as specified in Form 20 of Chapter IV - Bidding Forms (Price Schedule). Besides, the Bidder shall fulfill Form No. 22 of Chapter IV - Bidding Forms (Domestic costs eligible for incentives) to prove and ensure the accuracy and consistency of declared figures with Form 20 of Chapter IV - Bidding Forms (Price Schedule). The Bidder shall provide detailed evident documents to demonstrate the proposed domestic costs are eligible for incentives. In case the proposed domestic costs are not accurate, the Owner will re-determine Bidder's domestic costs based on the regulations of competent authorities. c) Incentives for goods originating in Vietnam: according to Article 6 of Decree No. 214/2025/NĐ-CP. The Bidder shall provide the details of evident documents to demonstrate the proposed Vietnamese-origin goods are eligible for incentives. Otherwise, these goods are not considered as eligible for incentives.
ITB 31.1	The Bid opening shall take place, date and time in accordance with the Invitation to Bidder. - PetroVietnam Long Phu 1 Power Project Management Board (LP1PP); - Address: Thanh Duc hamlet, Dai Ngai commune, Can Tho city, Vietnam.
ITB 32.1	The method for evaluation:

	- Qualification evaluation: Pass/Fail; - Technical evaluation: Pass/Fail; - Financial evaluation: The evaluation price method.
ITB 34	Ranking of Bidders: Bidder having the lowest evaluation price (for the BASE PROPOSAL) shall be ranked first.
ITB 36 (e)	Bidder having the lowest evaluation price (for the BASE PROPOSAL).
ITB 37.1	Time limit for sending notification of bidder selection results is five (05) working days, from the date on which the bidder selection result is approved by the Owner.
ITB 42	- Competent person: Board of Members, Vietnam National Industry - Energy Group. - Address: 18 Lang Ha Street, Giang Vo Ward, Ha Noi Capital, Vietnam. - Tel : (+84-24) 3825 2526. - Fax : (+84-24) 3826 5942. The standing department assists the Chairman of the Advisory Board in revolving recommendation : - Legal and Bidding Divisions - Vietnam National Industry - Energy Group. - Address: 18 Lang Ha Street, Giang Vo Ward, Ha Noi Capital, Vietnam. - Tel : (+84-24) 3825 2526. - Fax : (+84-24) 3826 5942.
ITB 43	Address of organization, individual performing monitoring and supervision tasks: Not applicable.

PART 1. BIDDING PROCEDURES
CHAPTER III. EVALUATION AND QUALIFICATION CRITERIA
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PART 1. BIDDING PROCEDURES**CHAPTER III. EVALUATION AND QUALIFICATION CRITERIA****1. INSPECTING AND EVALUATING THE VALIDITY OF THE BID****1.1 Inspecting the Bid**

- a) Inspect the quantity of copies of the Bid;
- b) Inspect the composition of the original of Bid. consisting of: Letter of Bid, Consortium Agreement (if any), Power of Attorney to sign the Letter of Bid (if any); Power of Attorney from bidder's legal representative (if any); Bid Security; documents proving the Bidder's qualifications; technical proposal; and other documents of the Bid as prescribed in ITB 10;
- c) Inspect the consistency between the original and copies to serve the detailed evaluation of the Bid.

1.2 Evaluating the validity of the Bid

A Bid is considered valid if all the following requirements are satisfied:

No.	Items to verify	Requirements
1	Original copy	There is an original of Bid.
2	Letter of Bid	- There is an original Letter of Bid signed and sealed (if any) by the legal representative of the Bidder as required by the Bidding Document; the time of signature shall be after Bidding Document issuance; there are no different bid prices or accompanied disadvantaged conditions to the Owner. - For consortium, the Letter of Bid shall be signed and sealed (if any) by the legal representative of every consortium's member or the assigned consortium's member on behalf of the consortium to sign the Letter of Bid according to the consortium agreement.

No.	Items to verify	Requirements
		<i>Note for notarized Power of Attorney: Power of Attorney duly authorized by a Notary Public, indicating that the person(s) signing the Bid has (have) the authority to sign the Bid and that the Bid is thus binding upon the Bidder.</i>
3	Validity period of Bid	The validity period of the Bid satisfies requirements as prescribed in ITB 17.1.
4	Bid Bond	There is a Bid Bond of which value, validity period, and the Bid Solicitor's name (beneficiary), comply with ITB 18.2 and do not violate regulations in ITB 18.3.
5	Eligibility	The Bidder shall not have its name included in multiple Bid as a single bidder or a consortium's member for the same package. The Bidder shall fulfill the eligibility requirements as stipulated in ITB 4.
6	Consortium Agreement	The consortium agreement (in case of consortium) shall be signed and sealed (if any) of the legal representative of each consortium's member and clearly indicate the scope/tasks to be performed by each member of the Consortium and the corresponding value thereof (%) as well as other provisions in accordance with ITB 4.1 and Form No. 03 of Chapter IV - Bidding Form. The division of work in the consortium must be based on the items listed in the bid price table or according to the tasks within the production process of the items in Form No. 20 Price Schedules. The division must not include tasks that are not part of these items or not part of the production process of these items.
7	Commitment	The Bidder commits in written documentt that (i) within the last 03 years up to the deadline for submission of Bid, Bidder does not have employee (signed labor contract with the Bidder at the time the employee committed the violation)

No.	Items to verify	Requirements
		convicted by the Court of violating the regulations on bidding that lead to serious consequences according to criminal Law in order to let this Bidder win the bid and (ii) comply with the regulations regarding prohibited acts in bidding as stipulated in Point b, Clause 3, Article 16 of the Law on Bidding No. 22/2023/QH15, in accordance with Form No. 18(h) of Chapter IV - Bidding Forms.

The Bidder having a valid Bid will be further evaluated in respect of qualifications and experience. Any non-confirming Bid will be rejected at this stage and not further evaluated.

2. QUALIFICATION CRITERIA

- Qualification evaluation criteria shall be established on a responsive/nonresponsive basis.
- Qualification of a consortium shall be total qualifications of all consortium's members, provided that each consortium's member is qualified to perform their tasks in the consortium (except for the revenue as specified in Section 2.1); if any consortium's member is not qualified to perform their tasks in the consortium, the consortium shall be considered not qualified.
- The subcontractors' qualifications shall not be evaluated when the Bid of the Bidder is evaluated (unless the special subcontractors are employed as stated in the Bidding Document). The Bidder is required to satisfy all qualification criteria (regardless of the subcontractor's qualification).
- The Bidder's qualification shall be evaluated as specified in Items 2.1, 2.2 and 2.3 of this Section. The qualified Bidder is the one satisfying all criteria specified in Items 2.1, 2.2, and 2.3 of this Section.
- In case the Bidder participating in the bid is the parent company (e.g. the corporation) and mobilizes the subsidiary companies or member companies to perform a part of the work of the bid package, the Bidder must specifically declare the part of work for the subsidiary companies or member companies according to Form No. 06, Chapter IV. The evaluation of experience in implementing similar contracts is based on the value, volume of work undertaken by the parent company, the subsidiary companies or member companies in the bid package.
- Bidders who do not meet the capability and experience requirements will have their bids disqualified and will not be evaluated further.

2.1 Qualification criteria for financial capability and experiences.

- The criteria for assessing capacity and experience are carried out according to Table No. 01, Bidder are assessed as meeting all assessment standards. The capacity and experience of the subcontractor (except for special subcontractors) will not be considered when evaluating Bid. Bidder itself must meet the evaluation criteria for capacity and experience.
- In case the currency stated in similar contracts or the Owner's payment confirmation for similar contracts has been performed or the tax declaration or relevant documents proving Bidder's capacity and experience other than VND, when making Bidding Document, Bidder must convert to VND as a basis for evaluating Bidding Document. The conversion shall be subject to the conversion rate of Joint Stock Commercial Bank for Foreign Trade of Vietnam (Vietcombank) on the date of signing the same contract.
- The Bidder's qualification shall be evaluated as per the criteria specified in the Table 3 - Table of qualification criteria below. The qualified Bidder is the one satisfying all criteria specified as following:

Table No. 01

Criteria			Compliance Requirements applicable to the Bidder			Documents
No.	Description	Requirement	Single bidder	Consortium		
				All members combined	Each member	
1	Previous Contract Non-Fulfillment Records	From January 1 st 2022, to the deadline for submission of Bid, the Bidder did not fail to perform any EPC/PC contract due to Bidder’s fault ⁽¹⁾ .	Must meet requirement	Not applicable	Must meet requirement	Form No. 07
2	Obligation of tax declaration and tax payment	The obligation to declare and pay tax of the most recent fiscal year compared to the time of bid closing	Must meet requirement	Not applicable	Must meet requirement	Commitment in the Letter of Bid and Supporting documents as per ITB 10.11

Criteria			Compliance Requirements applicable to the Bidder			Documents
No.	Description	Requirement	Single bidder	Consortium		
				All members combined	Each member	Submission Requirements ⁽⁷⁾
3	Financial Capacity Requirements ⁽²⁾					
3.1	Financial Performance	The net asset value of the contractor in the most recent fiscal year compared to the time of bid closing must be positive. (Net Asset Value = Total Assets - Total Debt)	Must meet requirement	Not applicable	Must meet requirement	Form No. 09 with supporting documents
3.2	Average annual revenue (excluding VAT)	The average annual revenue (excluding VAT) of the latest 03 consecutive (2022, 2023 and 2024) fiscal year compared to the time of bid closing of Bidder has a minimum value of 352,000,000 USD or 8,700,000,000,000 VND .	Must meet requirement	Must meet requirement	Not applicable	Form No. 10 with supporting documents
3.3	Financial resources	The Bidder must prove that it has access to or availability of highly liquid assets ⁽³⁾ , available credit lines (credit lines that are still in use) or other financial sources (excluding contractual payment advances) to meet the requirements for financial resources to implement the bidding package	Must meet requirement	Must meet requirement	Not applicable	Forms No. 11 and 12 with supporting documents

Criteria			Compliance Requirements applicable to the Bidder			Documents
No.	Description	Requirement	Single bidder	Consortium		
				All members combined	Each member	Submission Requirements ⁽⁷⁾
		with a value of 59,000,000 USD or 1,468,000,000 VND. In case the contractor uses the credit provision commitment of a domestic credit institution or a foreign bank branch established under Vietnamese law, the credit provision commitment must meet the following conditions: - Minimum value: 59,000,000 USD or 1,468,000,000 VND; - Validity period of the credit provision commitment: valid in 26 months from the Contract Effective Date; - Signed and stamped by the lawful representative of a domestic credit institution or a foreign bank branch established under Vietnamese law. In case the Financial resources submitted by Bidder is in both VND and USD the exchange rate of USD/VND is 24,740 VND				

Criteria			Compliance Requirements applicable to the Bidder			Documents
No.	Description	Requirement	Single bidder	Consortium		
				All members combined	Each member	
		and shall be the basis for the Bid Solicitor to convert the total value of Bidder’s Financial resources into VND for comparison with the Value of the Financial resources in VND above.				
4	Experience in performing similar contracts ⁽⁴⁾	From January 1, 2015 to the time of bid closing, the Bidder has been fully or substantially completed⁽⁰⁵⁾ as the main contractor (independent or joint venture member)⁽⁶⁾, subcontractor or management contractor⁽⁰⁷⁾ must satisfy at least one of the following conditions: (1) Having at least one (01) EPC Contract for coal fired power plant project with capacity at least 600 MW/Unit with a total of EPC Contract value of 217,600,000 USD or 5,384,000,000,000 VND; Or (2) Satisfy with the following conditions: - Purchase of equipment for industrial constructions project, Grade I with a	Must meet requirement	Must meet requirement	Must meet requirement which is proportionate to the corresponding value in the Consortium Agreement	Forms No. 13 with supporting documents

Criteria			Compliance Requirements applicable to the Bidder			Documents
No.	Description	Requirement	Single bidder	Consortium		
				All members combined	Each member	Submission Requirements ⁽⁷⁾
		total minimum purchase value of 164,000,000 USD (one or more contracts for that project)⁽⁸⁾; and - Construction and/or installation industrial constructions project, Grade I (one or more contracts for that project), with a total minimum value of 1,330,000,000,000 VND⁽⁸⁾; and - Either meet the requirements directly or engage a special subcontractor who meets the criteria specified in Item 2.3, Chapter III [Evaluation and Qualification Criteria].				
5	Ability to warranty, maintain, service, repair, provide spare parts or provide other	The Bidder commits to perform the obligations of warranty, maintenance, service, repair, supply of spare parts or provision of other after-sales services as required by Bidding Documents.	Must meet requirement	Must meet requirement	Not applicable	Form No. 18 (d).

Criteria			Compliance Requirements applicable to the Bidder			Documents
No.	Description	Requirement	Single bidder	Consortium		
				All members combined	Each member	
	after-sales services					

(1) *Non-fulfillment contracts include:*

- *Contracts that are considered as non-fulfilled by the Owner without objection of the Bidder;*
- *Contracts that are considered non-fulfilled by the Owner with the objection of the Bidder, but the litigation is treated as resolved against the Bidder by the arbitrator or the court.*

Non-fulfilled contracts shall not include the contracts that the Owner's decisions are rejected by settlement of disputes. Non-fulfilled contracts shall be determined according to all information about the dispute or litigation that is settled in conformity with the terms of settlement of disputes as mentioned in the corresponding contracts and the Bidder could not file any complaint.

(2) *For evaluation of Bids:*

- *The informative data extracted from audited financial statements shall be converted to VND/USD (as required by the bidding package) when the Bidder makes the Bid. The exchange rate shall be the selling rate published by Vietcombank on its official website portal.vietcombank.com.vn on the fiscal year-end date of audited financial statements.*
- *The value of similar contracts or the Owner's payment confirmation for similar contracts has been performed or the tax declaration or relevant documents proving Bidder's capacity and experience shall be converted to VND/USD (as required by the bidding package) when the Bidder makes the Bid. The exchange rate shall be the selling rate published by Vietcombank on its official website portal.vietcombank.com.vn on the date of signing the respective contract.*
- *For other values in currencies other than VND/USD (as required by the bidding package), the Owner shall use the selling rate published by Vietcombank on its official website portal.vietcombank.com.vn on the date of the Bid closing time to convert such values into VND/USD for the purpose of Bid evaluation.*

- *In case the bid closing time is after the end of the contractor's fiscal year (year Y) and before or on the last day of the 3rd month from the end of year Y: (i) the request for fulfillment of the obligation to declare and pay tax applies to the fiscal year before year Y (year Y-1); (ii) the determination of the contractor's net asset value shall be carried out on the basis of the financial statements of the previous year of year Y (year Y-1, Y-2...); (iii) the requirements for submission of financial statements apply to previous years of year Y (year Y-1, Y-2...).*

(3) Highly liquid assets are cash and cash equivalents, short-term financial instruments, ready-to-sell securities, easy-to-sell securities, commercial receivables, short-term financial receivables and other assets that can be converted into cash within one year. In case the Bidding Document has a requirement on a commitment to provide credit and the contractor uses this commitment to prove financial resources, the contractor must attach a scanned copy of the commitment to provide credit in the Bid.

(4) For similar contracts in which the contractor has entered into as a joint venture member or subcontractor, only the value of the part of the work performed by the contractor shall be calculated. Failing to consider and evaluate the contracts that the contractor has performed as a subcontractor due to illegal bid transfer, violating the provisions of Clause 8, Article 16 of the Law on Bidding.

(5) For item 4.1, "substantially completed" requires the completion of at least 80% of the contract's task volume, as certified by the project owner who contracted with the Bidder. Additionally, this milestone of 80% completion must have occurred from 1st January 2015 to the deadline for submission of bid.

(6) With regard to contracts in which the Bidder has participated as a consortium member or subcontractor, only the value of the performed part of the work by the Bidder is calculated.

(7) Managing contractor means a contractor who does not directly perform part or all of the work of the bidding package but signs a contract with other contractors to perform but the contractor still manages the performance of the contractors under which he has signed a contract, and at the same time still bears all responsibilities and risks related to costs, the implementation schedule, quality of the bidding package and other contents of the bidding package.

(8) This scope of works could be performed by one (01) or multiple contracts.

2.2 Qualification criteria for technical capability ⁽¹⁾

The Bidder's qualification shall be evaluated as specified in Items 2.2.1 and 2.2.2 of this Section. The qualified Bidder is the one satisfying all criteria specified in Items 2.2.1 and 2.2.2 of this Section.

2.2.1 Key personnel

Key personnel can be employees of the Bidder or be mobilized by the Bidder. In case the key personnel proposed by the Bidder in the Bid do not meet the requirements or cannot demonstrate the ability of mobilization (including cases that have been mobilized for the other contracts/projects with the working period coinciding with the implementation time of this bidding package), the Bid Solicitor shall allow the Bidder to supplement or replace. The Bidder shall be allowed to add or replace each of the key personnel position once within an appropriate period of time but not less than 03 working days. In case the Bidder does not have the replacement personnel that meets the requirements of the Bidding Document, the Bidder shall be disqualified. In all cases, if the Bidder declares personnel untruthfully, the Bidder shall not be allowed to replace the other personnel. The Bid of the Bidder shall be rejected, and the Bidder shall be considered fraudulent according to the provisions of Clause 4, Article 16 of the Law on Bidding and shall be handled according to the provisions of Article 133 of Decree No. 214/2025/ND-CP.

The experience of personnel in similar scopes of work shall be shown in the minimum number of years or a minimum number of contracts performed in similar scopes of work. The number of years of experience of key personnel shall be calculated from the time that the personnel start performing similar scopes of work to the time of bid closing. The Bidder must provide the detailed information of key personnel proposed in Form No.14, 15 and 16, Chapter IV - Bidding Forms to demonstrate that the Bidder has sufficient personnel for the key positions that meet the following requirements:

No	Position	Quantity	Descriptive	Evidence document
1	Project Manager	01	- Engineer degree or higher. - Have at least 10 years of experience in the erection/construction field. - Have worked as a Project manager for at least one (01) coal-fired power plant project with capacity at least 600MW/Unit - Language: Fluent in English	- The labour contract or agreement for labour. - The university degree or higher degree. - CV as mentioned in Form No. 15 and Form No.16, Chapter IV. - The evidence document proving the experience in executing similar Contract including the confirmation of Client. (Applicable for Vietnamese personnel only).
2	Site Manager	01	- Engineer degree or higher. - Have at least 07 years of experience in the erection/construction field. - Have worked as a Site Manager for at least one (01) coal-fired power plant project with capacity at least 600MW/Unit - Language: Fluent in English	
3	Chief of Design/Design Manager <i>(In case the personnel of the proposed Special Subcontractor for design work meet this requirement, the Bidder may utilize the personnel of the</i>	01	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 7 years of experience in the field of design. - Has worked as the Chief of Design/Design Manager for at least one (01) coal-fired power plant project with capacity at least 600MW/Unit. - Language: Fluent in English	

No	Position	Quantity	Descriptive	Evidence document
	<i>Special Subcontractor for this position.)</i>			
4	Lead of steam Turbine Engineer <i>(In case the personnel of the proposed Special Subcontractor for Installation work meet this requirement, the Bidder may utilize the personnel of the Special Subcontractor for this position.)</i>	01	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 7 years of experience. - Participated into engineering and/or supervising installation and/or testing & commissioning for at least one (01) coal-fired power plant project with capacity at least 600MW/Unit as a steam Turbine Engineer. - Language: Fluent in English	
5	Lead of Generator Engineer <i>(In case the personnel of the proposed Special Subcontractor for Installation work meet this requirement, the Bidder may utilize the personnel of</i>	01	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 7 years of experience. - Participated into engineering and/or supervising installation and/or testing & commissioning for at least one (01) coal-fired power plant project with capacity at least 600MW/Unit as a Generator Engineer. - Language: Fluent in English	

No	Position	Quantity	Descriptive	Evidence document
	<i>the Special Subcontractor for this position.)</i>			
6	Lead of Boiler Engineer	1	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 7 years of experience - Participated into engineering and/or supervising installation and/or testing & commissioning for at least one (01) coal-fired power plant project with capacity at least 600MW/Unit as a Boiler Engineer - Language: Fluent in English	
7	Lead of BOP Engineer	1	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 7 years of experience - Participated into engineering and/or supervising installation and/or testing & commissioning for at least one (01) coal-fired power plant project with capacity at least 600MW/Unit as a BOP Engineer.	
8	Lead of Electrical Engineer	1	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 7 years of experience - Participated into engineering and/or supervising installation and/or testing & commissioning for at least one (01) coal-fired power plant project with capacity at least 600MW/Unit as an Electrical Engineer.	

No	Position	Quantity	Descriptive	Evidence document
			- Language: Fluent in English	
9	Lead of C&I Engineer	1	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 7 years of experience. - Participated into engineering and/or supervising installation and/or testing & commissioning for at least one (01) coal-fired power plant project with capacity at least 600MW/Unit as a C&I Engineer - Language: Fluent in English	
10	Lead of Installation/Erection engineer	1	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 7 years of experience in installation/Erection work. - Has been responsible for the installation/Erection work of at least one (01) coal-fired power plant project with capacity at least 600MW/Unit . - Language: Fluent in English	
11	Lead of Testing & Commissioning engineer.	1	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 03 years of experience in testing and commissioning work. - Has been responsible for the testing and commissioning work of at least one (01) coal-fired power plant project of capacity at least 600MW/Unit.	

No	Position	Quantity	Descriptive	Evidence document
			- Language: Fluent in English	
12	Lead of Civil Engineer	1	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 7 years of experience in construction works. - Has been responsible for construction work of at least one (01) industrial construction project, Grade I as a Civil Engineer - Language: Fluent in English	
13	QAQC Manager	1	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 7 years of experience in the QA/QC field. - Has been responsible for QA/QC work of at least one (01) coal-fired power plant project with capacity at least 600MW/Unit as a QA/QC Manager - Language: Fluent in English	
14	Planning and Control Manager	1	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 7 years of experience in Planning and Control work. - Experience as Planning and Control Manager for at least one (01) coal-fired power plant project of capacity at least 600MW/Unit. - Language: Fluent in English	

No	Position	Quantity	Descriptive	Evidence document
15	HSE Manager	1	- Have a college degree or higher in construction engineering or occupational safety; - Have a valid safety training certificate, occupational hygiene under group II. - Have at least 03 years of experience in the field of safety assurance in construction/installation of industrial works. - Language: Fluent in English	

Notes:

- Each personnel shall solely be quoted for one position;
- The Bidder shall demonstrate that it has sufficient personnel for the key positions that meet the above requirements by providing details of the proposed key personnel and their experience records using Forms No. 14, 15 and 16 of Chapter IV - Bidding Forms.

2.2.2 Equipment to be mobilized

Bidder shall demonstrate clearly that Bidder has the capability to meet the requirements of the package. Key equipment to perform the package are listed hereafter:

No	Key equipment and characteristics	Min. Number required (unit)	Note
1	Crane truck ≥ 250 tons	01	
2	Crane truck ≥ 150 tons	01	
3	Crane truck ≥ 50 tons	02	
4	Pile driver $> 4,5$ tons or Pile pressing machine ≥ 320 tons	02	

No	Key equipment and characteristics	Min. Number required (unit)	Note
5	Boom Truck $\geq 7,5$ tons	02	
6	Excavator $> 0,5m^3$	03	
7	Bulldozer $\geq 140CV$	01	
8	Dump truck > 10 tons	05	
9	Road roller (Motor $> 85KW$)	02	
10	Diesel Generator ≥ 250 kVA	01	
11	Air compressor ≥ 7.5 bar	02	
12	Electric Winch ≥ 10 Tons	02	

The Bidder shall provide further details of proposed items of equipment to perform the package using the Form No. 17 of Chapter IV - Bidding Forms.

The Bidder may supplement or replace each proposed equipment item only once, within a reasonable period, but not less than three (03) working days. Failure to provide a compliant replacement shall result in disqualification. In any case of false declaration regarding equipment, no replacement shall be permitted, the Bid shall be rejected, and the Bidder shall be deemed fraudulent.

In case the Bidder wins the bid and signs the contract, the Bidder is obliged to mobilize the key personnel and major construction equipment as initially proposed or modified according to the provisions of this Section. In case the Bidder cannot mobilize the key personnel and major construction equipment, the Bidder shall be fined in compliance with the contract and the Bidder's reputation shall be assessed when participating in the other bid package.

Notes:

(1) If the Bidder is a parent company (namely a corporation), he shall declare specific tasks assigned to subsidiary companies using Form No. 06 of Chapter IV - Bidding Forms. The qualifications of the Bidder shall be evaluated according to the value and volume of work performed by the parent company and subsidiary companies.

2.3 Special Subcontractors

The Bid Solicitor shall only consider and evaluate the technical capacity and experience of the proposed Special Subcontractor for the specialized work items where the use of a Special Subcontractor is permitted, as stipulated in Section 29.4 of the Bidding Document (ITB). The specific experience and financial resources of the Special Subcontractor shall not be added to the experience and financial resources of the Bidder when evaluating the Bidder's qualifications and experience. The proposed Special Subcontractor must possess sufficient experience and technical capability to perform the specified work and must meet the following criteria:

STT	Evaluation content	Evaluation criteria	Evidence document
1	Special Subcontractor performing design/engineering (detailed design or overall design) work		
1.1	Engineering experience		
	Specific experience in the engineering of coal-fired thermal power plants.	At least one (01) Coal-fired Thermal power with capacity at least 600 MW/Unit, among which one plant that has been in commercial operation for at least one (01) years from the date of issuance of the Commercial Operation Date (COD), or At least two (02) Coal-fired Thermal power with capacity total at least 600 MW, among which one plant that has been in commercial operation for at least one (01) year from the date of issuance of the Commercial Operation Date (COD).	Forms No. 13 with supporting documents

STT	Evaluation content	Evaluation criteria	Evidence document
1.2	Key Personnel		
1.2.1	Chief of Design/Design Manager: 01 person	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 7 years of experience in the field of design. - Has worked as the Chief of Design/Design Manager for at least one (01) coal-fired power plant project with capacity at least 600MW/Unit or two (02) coal-fired power plant project with capacity total of at least 600 MW. - Language: Fluent in English	- The labour contract or agreement for labour. - The university degree or higher degree. - CV as mentioned in Form No. 15 and Form No.16, Chapter IV. - The evidence document proving the experience in executing similar Contract including the confirmation of Client. (Applicable for Vietnamese personnel only).
1.2.2	Lead Mechanical Design Engineer: 01 person	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 7 years of experience in the field of design - Participated into engineering for at least one (01) coal-fired power plant project with capacity at least 600MW/Unit or two (02) coal-fired power plant project with capacity total of at least 600 MW as Mechanical Design Engineer. - Language: Fluent in English	
1.2.3	Lead Electrical Design Engineer: 01 person	- Bachelor's Degree, Engineer Degree, or higher in a relevant major.	

STT	Evaluation content	Evaluation criteria	Evidence document
		- Have at least 7 years of experience in the field of design - Participated into engineering for at least one (01) coal-fired power plant project with capacity at least 600MW/Unit or two (02) coal-fired power plant project with capacity total of at least 600 MW as an Electrical Design Engineer. - Language: Fluent in English	
1.2.4	Lead C&I Design Engineer: 01 person	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 7 years of experience in the field of design - Participated into engineering for at least one (01) coal-fired power plant project with capacity at least 600MW/Unit or two (02) coal-fired power plant project with capacity total of at least 600 MW as a C&I Design Engineer. - Language: Fluent in English	
1.2.5	Civil Design Engineer: 01 person	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 7 years of experience in the field of design - Participated into engineering for at least one (01) coal-fired power plant project with	

STT	Evaluation content	Evaluation criteria	Evidence document
		capacity at least 600MW/Unit or two (02) coal-fired power plant project with capacity total of at least 600 MW as Civil Design Engineer. - Language: Fluent in English	
2	Special Subcontractor performing steam turbine and generator erection/installation works		
2.1	Erection experience		
	Specific experience in the erection and installation of steam turbine and generator systems of coal-fired thermal power plants with a capacity of at least 600 MW per unit.	The Bidder has completed the erection and installation of steam turbine and generator systems for at least one (01) Coal-fired Thermal power, among which one plant that has been in operation for at least one (01) year (from the date of issuance of the Provisional Acceptance Certificate – PAC or Taking over Certificate - TOC)	Forms No. 13 with supporting documents
2.2	Key Personnel		
	Lead of Steam Turbine Engineer: 01 person	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 7 years of experience. - Participated into supervising installation of steam Turbine for at least one (01) coal-fired power plant project with capacity at least 600MW/Unit. - Language: Fluent in English	- The labour contract or agreement for labour. - The university degree or higher degree. - CV as mentioned in Form No. 15 and Form No.16, Chapter IV. The evidence document proving the experience in executing similar Contract

STT	Evaluation content	Evaluation criteria	Evidence document
	Lead of Generator Engineer: 01 person	- Bachelor's Degree, Engineer Degree, or higher in a relevant major. - Have at least 7 years of experience. - Participated into supervising installation of Generator for at least one (01) coal-fired power plant project with capacity at least 600MW/Unit. - Language: Fluent in English	including the confirmation of Client. (Applicable for Vietnamese personnel only).

3. TECHNICAL EVALUATION CRITERIA

The technical evaluation criteria shall be applied on a Pass/Fail basis for both the BASE PROPOSAL and the OPTIONAL PROPOSAL.

3.1 The technical evaluation criteria for BASE PROPOSAL

No.	Requirements	Responsive	
1	Scope of work description		
1.1	Engineering:		
1.1.1	Scope of Engineering: The bidder shall propose the remaining design scope required to complete the project.	The Bidder propose a complete relatively complete design scope to ensure project completion	Pass
		No proposal or incomplete proposal	Fail

No.	Requirements	Responsive	
1.1.2	Design software: The Bidder shall be equipped with and utilize all necessary specialized design software appropriate to the scope of engineering, including but not limited to the following software: - Structural analysis software; - Equipment design software; - Electrical software; - Pipe stress analysis software; - ThermoFlow software; - Others.	The Bidder has provided a relatively complete list of software and their intended purposes in the bid submission, together with evidence of valid software licenses	Pass
		The Contractor did not propose any design software in the bid submission	Fail
1.1.3	Methodology for Engineering Works: Take over, review the engineering documents handed over from the Owner and finalizing engineering works including Plant performance criteria responsive statement	The methodology is quite detailed, clear, and feasible and responsive Plant performance criteria or not responsive with reasonable demonstration	Pass
		The methodology is general, unclear, and not feasible or not Plant performance criteria responsive statement or Plant performance criteria not responsive without demonstration	Fail
1.2	Supplying:		
1.2.1	Scope of Supply: Understanding of the scope of supply. The Bidder is required to fully propose all system and equipment	The Bidder almost fully and quite clearly understanding the existing materials, equipment at site and materials, equipment to be supplied by the Owner, other Owner's Contractors and remaining portions to be supplied by	Pass

No.	Requirements	Responsive	
	quantities as stipulated in Article 8.1 (o), Section VIII [DOCUMENTS SUBMITTED BY BIDDER] , Chapter V of the Bidding Documents and fill-in Form 19 (a) provided in Chapter IV.	the Bidder. The bidder's proposal is fully compliant with all specified requirements.	
		The Bidder does not have a clear understanding of the scope of supply of the package. No proposal or incomplete proposal	Fail
1.2.2	Methodology for Procurement, manufacturing, transportation, delivery schedules: Procurement, manufacturing, factory test, packing, delivery within scope of the Bidder for the package	The methodology is quite detailed, clear, and feasible	Pass
		The methodology is general, unclear, and not feasible	Fail
1.3	Construction, installation and Commissioning		
1.3.1	Construction and installation: The bidder shall propose the scope of construction and installation works in accordance with the requirements specified in Chapter V [Technical Requirements and Specifications] of the Bidding Documents.	The bidder's proposal is generally compliant with all specified requirements	Pass
		No proposal or incomplete proposal	Fail
1.3.2	Methodology for take over equipment from the Owner: Take over, tally, arrange and preserve the materials and equipment at the construction site handed over from the Owner	The methodology is quite detailed, clear, and feasible	Pass
		The methodology is general, unclear, and not feasible	Fail
1.3.3	Methodology for construction and erection, commissioning:	The methodology is quite detailed, clear, and feasible	Pass

No.	Requirements	Responsive	
	Organization and methodology for construction, installation, commissioning, and acceptance.	The methodology is general, unclear, and not feasible	Fail
1.3.4	Methodology for mobilization of construction/erection equipment: Refer to Section 2.2.2 [Equipment to be mobilized] of Chapter IV.	The Bidder demonstrates that Bidder has the capability to meet the requirements.	Pass
		The Bidder does not demonstrate that Bidder has the capability to meet the requirements.	Fail
1.4	Service		
1.4.1	Understanding of the scope of services	The Bidder presents a relatively complete set of necessary services for the successful execution from the engineering stage through construction, commissioning, acceptance, and up to the Commercial Operation Date (COD) stage.	Pass
		The Bidder fails to present a complete set of necessary services required for the successful execution from the engineering stage through construction, commissioning, acceptance, and up to the COD stage.	Fail
2	The technical requirements shall include applicable standards, system/equipment specifications, any technical deviations (if any), and the materials to be used.		
2.1	Project's standards, regulations, and the latest legal requirements of Vietnamese law regarding the design, procurement, installation, commissioning	The Bidder's proposal substantially complies with the project's standards and regulations, as well as the latest legal requirements of Vietnamese law related to design, procurement, installation, and commissioning.	Pass

No.	Requirements	Responsive	
		The Bidder's Proposal does not comply with the applicable project standards and regulations, nor with the latest legal requirements under the laws of Vietnam, with respect to design, procurement, installation, and commissioning activities	Fail
2.2	Specification of equipment, materials, and systems within scope of supply of the Bidder.	The Bidder has filled in the Technical Schedule of equipment as required in Article 8.1 (d), Section VIII [DOCUMENTS SUBMITTED BY BIDDER], Chapter V. The Bidder's Proposal is generally compliant with the key technical requirements for the materials and equipment within its scope of supply.	Pass
		The Bidder did not complete, or completed the Technical Schedule without compliance comply with the key technical requirements.	Fail
2.3	Technical Deviation	The Bidder's proposal complies with project requirements or the Bidder has proposal technical deviations. However, these are considered acceptable as they do not materially affect the performance, functionality, or compliance with the essential requirements of the project	Pass
		The Bidder's Proposal technical deviations. These deviations have a significant impact on the performance and operational functionality of the proposed equipment.	Fail
2.4		The bidder's proposal is relatively compliant with all specified requirements	Pass

No.	Requirements	Responsive	
	The characteristics and technical specifications of construction materials and supplies are specified in Chapter V of the Bidding Documents	No proposal or incomplete proposal	Fail
3	Execution plan		
3.1	Schedule		
3.1.1	The contract execution period	The bidder proposes a total contract execution period of no more than 22 months from the Contract Commencement Date	Pass
		The bidder proposes a total contract execution period of more than 22 months from the Contract Commencement Date.	Fail
3.1.2	Level 1 schedule of the bidding package	The Bidder has proposed Level 1 schedule that generally complies with the requirements specified in the Bidding Documents. The activities indicated in the Bidder's proposed schedule are generally aligned with the key project milestones	Pass
		The Bidder has not proposed or proposed Level 1 schedule that does not comply with the requirements specified in the Bidding Document.	Fail

No.	Requirements	Responsive	
3.1.3	Methodology for Schedule Management and Control: - The Bidder should provide their control method for the entire project plant schedule, utilizing the critical path method and developing work schedules based on project milestones. - A plan/chart for the mobilization and demobilization of manpower, materials, and equipment should be provided. - A risk assessment for the project schedule should be included. - The Bidder should outline their methods for estimating and maintaining the schedule, identifying and adjusting schedule durations, and recording and reporting the construction schedule status.	It is almost fully detailed and quite clear	Pass
		The information is insufficient or unclear	Fail
3.2	Organizational chart:		
3.2.1	Organizational chart: The Bidder provides an organizational chart and a detailed description of the Bidder's organizational structure (description of each group's responsibilities) at the construction site. The organizational structure may include the following groups: - Technical, Quality, and Schedule Management Department	The Bidder provides organizational chart and a description of the functions and responsibilities of the departments within the Contractor's organizational structure	Pass
		- The Bidder fails to provide an organizational chart or; - The Bidder provides an organizational chart without a detailed description of the department's	Fail

No.	Requirements	Responsive	
	- Safety, Fire Protection, Security, and Environmental Management Department - Materials and Equipment Management Department - Acceptance and Completion Documentation Management Department - Construction Teams.	responsibilities within the Contractor's organizational structure.	
3.3	Quality management approach for the project		
3.3.1	Quality Assurance and Quality Control Plan (QA/QC Plan)	The Bidder presents a QA/QC plan for the stages of design, procurement, fabrication, transportation, construction, installation, and commissioning that is relatively adequate and acceptable	Pass
		The Bidder either does not present a QA/QC plan or presents one that does not meet the requirements.	Fail
3.4	Health, Safety, and Environment (HSE) Plan		
3.4.1	Labor safety measures	The safety measures are relatively appropriate to the actual construction conditions of the project.	Pass
		The Bidder either does not provide the information or presented it in a manner that is not suitable for the actual conditions of the project.	Fail
3.4.2	Fire Protection and Firefighting Measures	Fire prevention and firefighting measures are relatively reasonable and feasible and are relatively consistent with the proposed construction methods.	Pass

No.	Requirements	Responsive	
		There are no reasonable, feasible fire prevention and firefighting measures, or the proposed measures are not consistent with the suggested construction methods	Fail
3.4.3	Environmental sanitation measures	The environmental sanitation measures are relatively reasonable and feasible and are relatively consistent with the proposed methods for executing the contract.	Pass
		There are no environmental sanitation measures, or the provided measures are unreasonable, unfeasible, and not consistent with the proposed methods for executing the contract	Fail
4	Performance guarantees	The Bidder complies with the wastewater discharge and noise level requirements as specified in Article 4.4.3 (Effluent and Sewage Discharge) and Article 4.4.5 (Noise Emissions), Section IV [PERFORMANCE GUARANTEES] Chapter V.	Pass
		The Bidder does not comply with the wastewater discharge and noise level requirements as specified in Article 4.4.3 (Effluent and Sewage Discharge) and Article 4.4.5 (Noise Emissions), Section IV [PERFORMANCE GUARANTEES] Chapter V.	Fail
5	Training program	The Bidder provides training program that relatively meets the requirements specified in Section V [TRAINING REQUIREMENT] , Chapter V.	Pass
		The Bidder does not provide training program or provide but not meet the requirement specified in	Fail

No.	Requirements	Responsive	
		Section V [TRAINING REQUIREMENT], Chapter V.	
6	Warranty period	The Bidder commits to a minimum warranty period of 24 months from the Taking Over Certificate is issued	Pass
		The Bidder does not commit to the warranty or proposes a warranty period of less than 24 months from the Taking Over Certificate is issued.	Fail
7	Counry of Origin of main equipment	The bidder commits to supplying the main equipment with origin as specified in Article 8.1 (n), Section VIII [DOCUMENTS SUBMITTED BY BIDDER], Chapter V.	Pass
		The bidder does not commit to supplying the main equipment with origin as specified in Article 8.1 (n), Section VIII [DOCUMENTS SUBMITTED BY BIDDER], Chapter V.	Fail
Summary of Evaluation		The bidder is rated as 'PASS' when all of the above criteria are met at the level of “PASS”.	Pass
		The bidder is rated as 'FAIL' if any of the above criteria is rated as 'FAIL'.	Fail

3.2 OPTIONAL PROPOSAL:

No.	Requirements	Responsive	
1.	Scope of Supply: The bidder is required to fully propose all system and equipment quantities as stipulated in <i>Attachment - Optional Proposal for materials & equipment belong to PM's ownership, Chapter V</i> of the Bidding Documents and fill-in Form 19 (a) provided in Chapter IV.	- The Bidder clearly understands that procurement of the necessary materials and equipment shall be required in case Power Machines does not transfer the ownership of such materials and equipment to the Owner. And - The Bidder proposes materials and equipment that meet the technical requirements.	Pass
		The Bidder does not have a clear understanding of the scope of supply of the package. No proposal or incomplete proposal	Fail
2	Methodology for Procurement, manufacturing, transportation, and delivery schedules: Procurement, manufacturing, factory test, packing, delivery within scope of the Bidder for the package (including solution for re-using/Optimizing the delivered materials and equipment at site (Condenser unit 1 and SCR))	The methodology is quite detailed, clear, and feasible	Pass
		The methodology is general, unclear, and not feasible or incomplete proposal	Fail
3	Implementation schedule:	The Bidder shall propose a schedule for the execution of design, procurement, and installation works that is consistent with the overall project schedule.	Pass
		The Bidder either proposes a schedule that is not consistent with the overall project schedule or fails to propose a schedule.	Fail
Summary of Evaluation		The Bidder shall be rated as 'PASS' when all of the above criteria are met at the level of “PASS”.	Pass

No.	Requirements	Responsive	
		The Bidder shall be rated as 'FAIL' if any of the above criteria is rated as 'FAIL'.	Fail

4. COMMERCIAL/FINANCIAL EVALUATION CRITERIA

Section 4. Financial Evaluation Criteria

Bid Price for BASE PROPOSAL and Bid Price for OPTIONAL PROPOSAL to be evaluated by **the evaluation price method** as the following steps:

Step 1. Determination of Bid Price;

Step 2. Correct errors (in accordance with the Notes (1)).

Step 3. Adjust deviation (in accordance with the Notes (2)).

Step 4. Determine bid price after error correction and adjustment of deviation, and minus (-) discount (if any) and the bid price shall be converted into VND for evaluation. The exchange rate shall be the selling rate published by Vietcombank on its official website portal.vietcombank.com.vn on the date of the Bid closing time.

Step 5. Determination of the evaluation price:

The determination of the evaluation price shall be carried out according to the following formula:

$$GDG = G \pm \Delta G + \Delta U\text{Đ}$$

In which:

- G is the bid price after error correction and adjustment of deviation, and minus (-) discount (if any) and the bid price shall be converted into VND for evaluation determined in Step 3 of this Section;
- $\Delta U\text{Đ}$ is the value to be added to goods that are not eligible for incentives as prescribed in ITB 30.2;
- ΔG is the value of factors attributed to a common baseline, including:

+ Bidding Currency: In the event that the Bidder submits the bid in both USD and VND, the portion of the bid price quoted in USD shall be converted to VND as a common basis for the purpose of comparison and evaluation, using the approved exchange rate adjusted by the deviation contingency ratio specified in the Revised Total Investment Cost (1.0086% per annum), in accordance with the following formula:

$$\Delta G_i = \frac{USD_i}{n} \times 1,0086\% \times m_1 \times \text{the exchange rate} + \frac{USD_i}{n} \times 1,0086\% \times m_2 \times \text{the exchange rate}$$

in which:

ΔG_i : the value quoted in USD of Bidder i shall be converted to a common baseline.

USD_i : the value quoted in USD of Bidder i.

n : contract implementation time calculated by year (the implementation period is 22 months, therefore $n = 2$)

m : the contingency for exchange rate period ($m_1=1$ and $m_2 = 2$)

the exchange rate: the selling rate published by Vietcombank on its official website portal.vietcombank.com.vn on the date of the Bid closing time.

Step 6. Rank bidders: The Bidder with the lowest evaluation price (after calculating incentives) shall be ranked first.

Notes:

(1) Error correction

Provided that the bid is substantially responsive, the arithmetical errors and other errors shall be corrected on the following basis:

- a) Arithmetical errors include errors due to incorrect addition, subtraction, multiplication and division when calculating bid price.
 - If there is a discrepancy between the unit price and the total price, the unit price shall prevail and the total price shall be corrected; if there is an obvious misplacement of the decimal point in the unit price (10 times, 100 times, 1,000 times), the total price shall prevail and the unit price shall be corrected.
 - In case the Bidder insert no value or insert “0” in the columns “unit price” and “total price”, the Bidder shall be considered allocating the price of this work item to another work item of the procurement, the Bidder shall be responsible for performing

these work items in conformity with the Bidding Documents' requirements without any payment from the Employer during the contract performance.

b) Other errors:

- If a total price is fully filled but the equivalent unit price is left blank, the unit price shall be determined by dividing the total price by the quantity; if a unit price is fully filled but the equivalent total price is left blank, the total price shall be determined by multiplying the unit price and the quantity; if a unit price and the equivalent total are fully filled but the equivalent quantity is left blank, the quantity shall be determined by dividing the total price by the unit price. If the additional quantity determined above is different from the equivalent quantity mentioned in the Bidding Documents, such discrepancy shall be the deviation related to Scope of Supply which shall be adjusted as prescribed in the Step 3;
- Physical unit errors: correct units in conformity with the Bidding Documents' requirements;
- Unit errors: replace “.” (stop) with “,” (comma) and vice versa in conformity with the Vietnamese unit. If the Procuring Entity believes that the stops and commas in the unit price are put in wrong position, the total amount shall prevail and the unit bid price shall be corrected;
- If there is an error in a total corresponding to the addition of subtotals, the subtotals shall prevail and the total shall be corrected;
- If there is a discrepancy between words and figures, the amount in words shall prevail, and the amount in figures shall be corrected. If the amount in words is erroneous, the amount in figures after correction as prescribed in this Section shall prevail.

(2) Adjustment of deviation:

- a) If there is a deviation from Scope of Supply, the deficiency shall be added and the redundancy shall be subtracted according to the equivalent unit price in the Bid;
- If there is a deficiency (deficiency in work item(s) in comparison with the supply requirements) without a equivalent unit price in the Bid, the deficiency shall be adjusted as follows:
- The highest unit prices of work items in deficiency of the Bids satisfying technical evaluation shall prevail for adjustment of deviation; if the Bids satisfying technical evaluation having no equivalent unit prices, the unit prices of the approved estimated costs of the procurement shall prevail; if there is no estimated costs of the procurement, the unit price constituting the price of procurement shall prevail.

- If there is only one bidder passing the technical evaluation, its equivalent unit price shall be prevailed for adjustment of deviation; if the Bid has no equivalent unit price, the unit price of the approved estimated costs of the procurement shall prevail; if there is no estimated costs of the procurement, the unit price constituting the price of procurement shall prevail.
- b) If the Bidder has a Letter of Discount, the correction and adjustment of deviation shall be carried out according to the bid price without subtracting the discount. The rate of deficiency shall be determined according to the ratio of deficiency to bid price mentioned in the Letter of Bid.

5. ALTERNATIVE PROPOSAL IN BID (NOT APPLICABLE).

PART 1. BIDDING PROCEDURES**CHAPTER IV. BIDDING FORMS****(TO BE PREPARED BY BIDDER)**

1.	FORM A	BILL OF QUANTITY – BASE PROPOSAL ¹
2.	FORM B	BILL OF QUANTITY – OPTIONAL PROPOSAL
3.	FORM NO. 01 (a)	LETTER OF BID
4.	FORM NO. 01 (b)	LETTER OF BID
5.	FORM NO. 02	POWER OF ATTORNEY
6.	FORM NO. 03	CONSORTIUM AGREEMENT
7.	FORM NO. 04	BID BOND
8.	FORM NO. 05 (a)	BIDDER INFORMATION
9.	FORM NO. 05 (b)	CONSORTIUM MEMBERS INFORMATION
10.	FORM NO. 06	LIST OF COMPANIES IN CHARGE OF PACKAGE WORKS
11.	FORM NO. 07	NON-FULFIMENT RECORDS OF PREVIOUS CONTRACT
12.	FORM NO. 08	CONFIRMATION LETTER
13.	FORM NO. 09	FINANCIAL SITUATION OF BIDDER
14.	FORM NO. 10	AVERAGE ANNUAL TURNOVER
15.	FORM NO. 11	FINANCIAL RESOURCES
16.	FORM NO. 12	MONTHLY FINANCIAL RESOURCES FOR CONTRACTS IN PROGRESS
17.	FORM NO. 13	SIMILAR CONTRACTS
18.	FORM NO. 14	TABLE OF PROPOSED PERSONNEL FOR KEY POSITIONS
19.	FORM NO. 15	CURRICULUM VITAE OF PERSONNEL FOR KEY POSITION
20.	FORM NO. 16	PROFESSIONAL QUALIFICATIONS OF PERSONNEL

¹ The scope excludes the OPTIONAL PROPOSAL described in FORM B.

21.	FORM NO. 17	EQUIPMENT
22.	FORM NO. 18 (a)	WORK ITEMS PERFORMED BY SUBCONTRACTORS
23.	FORM NO. 18 (b)	LIST OF SPECIAL SUBCONTRACTORS
24.	FORM NO. 18 (c)	OWNER/END USER’S CERTIFICATE.
25.	FORM NO. 18 (d)	CONFIRMATION LETTER OF BIDDER
26.	FORM NO. 18 (e)	NOT APPLICATION
27.	FORM NO. 18 (f)	NOT APPLICATION
28.	FORM NO. 19 (a)	BIDDER'S PROPOSAL FOR GOODS
29.	FORM NO. 19 (b)	TECHNICAL DATA SHEET
30.	FORM NO. 19 (c)	LIST OF SPARE PARTS AND SPECIAL TOOLS
31.	FORM NO. 19 (d)	PROJECT MANAGEMENT ORGANISATION
32.	FORM NO. 19 (e)	CONSTRUCTION PLAN
33.	FORM NO. 19 (f)	PROJECT SCHEDULE
34.	FORM NO. 19 (g)	QUALITY ASSURANCE DOCUMENTS
35.	FORM NO. 19 (h)	HEALTH, SAFETY, ENVIRONMENTAL AND SOCIAL DOCUMENTS
36.	FORM NO. 20	PRICE SCHEDULE
37.	FORM NO. 21	SUMMARY TABLE OF CURRENCY REQUIREMENTS
38.	FORM NO. 22	DOMESTIC COSTS ELIGIBLE FOR INCENTIVES
39.	FORM NO. 23	TECHNICAL DEVIATION DECLARATION FORM
40.	FORM NO. 24	COMMERCIAL DEVIATION DECLARATION FORM

FORM A.**BILL OF QUANTITY - BASE PROPOSAL**

No.	Equipment	Unit	Quantity	Remark
I	SUPPLY EQUIPMENT			
1.				
2.				
...				
II	INSTALLATION			
1.				
2.				
...				
III	CIVIL			
1.				
2				
...				
IV	SERVICES			
1				
2				
...				

Note:

- The Bidder is required to refer to Attachment Table 09. Bill of Quantity, Section IX [Attachment Document], Chapter V. The Bidder is responsible for accurately determining the relevant work items and quantities in accordance with the design (if any) and the technical requirements of Chapter V and fill-in the above-mentioned form (Form A1). After verifying the work items and quantities, Bidder shall submit pricing for each item based on Form No. 20, Chapter IV.
- The price of Spare parts for Operation is for reference only and is not included in the Bid Price or the Contract price if the Bidder wins. The Owner shall purchase them at a later stage.

FORM B.**BILL OF QUANTITY - OPTIONAL PROPOSAL⁽¹⁾**

No.	Equipment	Unit	Quantity	Remark
1.				
2.				
...				

Note:

(1) The Bidder shall extract information from Table 09.4 [materials/equipment/systems belongs Ownership er Power Machines'], Table 09, Section IX [Attachment Documents], Chapter V.

Form No. 01 (a) LETTER OF BID ⁽¹⁾

(Applicable to the Bidder who has no discount offer or has a discount offer submitted in a separate Letter of Discount)

Date: _____ *[insert date of signing of Letter of Bid]*

The package's name: *[insert the package's name specified in BDS]*

Project's name: *[insert the project's name specified in BDS]*

Invitation to Bid No.: *[insert the number of Invitation to Bid]*

To: _____ *[insert the complete and accurate name of the Bid Solicitor as specified in BDS]*.

After carefully examining the Bidding Document and addendum No. _____ *[insert the number of the addendum (if any)]*, we, _____ *[insert the Bidder's name]*, pledge ourselves to perform _____ *[insert the package's name]* in accordance with the Bidding Document with the contract duration of _____ *[insert the total performance duration of all the work as required by the package]* ⁽²⁾ and with the total Bid Price amount _____ *[insert the amount in figures, in words, and currency]* ⁽³⁾ together with the tables of Bid Price.

We hereby declare that:

1. We only participate in this Bid as the Bidder.
2. We are not undergoing a dissolution process, are not thrown into bankruptcy, and do not incur bad debts as prescribed by law.
3. We do not commit violations against regulations on the assurance of competitiveness in bidding.
4. We are not involved in corrupt, fraudulent or conclusive practice and other violations against the Law on Bidding.
5. We are not banned from bidding as prescribed in law on bidding;
6. Every information provided herein is truthful to be the best of our knowledge.
7. We commit that have fulfilled of the obligation of tax declaration and tax payment of the latest fiscal year (2024).
8. Within 03 years before the time of bid closing, the contractor without personnel (signing a labor contract with the contractor at the time the personnel commits the violation) is convicted by the court of violating regulations on bidding, causing serious consequences in accordance with the provisions of the criminal law for the purpose of allowing that contractor to win.

If our Bid is accepted, we shall provide the Performance Bond as prescribed in ITB 41, Chapter I - Instructions to Bidders of the Bidding Document.

This Letter of Bid takes effect within _____ ⁽⁴⁾ days, from _____ *[date]* ⁽⁵⁾.

Legal representative of Bidder⁽⁶⁾
[Full name, position, signature and seal⁽⁷⁾]

Notes:

- (1) Bidder shall provide sufficient and accurate information including names of the Bid Solicitor and the Bidder, effective period of the Bid, which bears the signature and seal (if any) and of the bidder's legal representative.
- (2) The contract duration mentioned in the Letter of Bid shall conform to the Bid and Time Schedule in the Bid.
- (3) The Bid Price mentioned in the Letter of Bid shall be detailed, specified in both number and words, and in conformity with the total Bid Price mentioned in the Grand Total. There shall be only one Bid Price which does not cause any disadvantage condition to the Owner or the Bid Solicitor. If permitted, the Bidder may offer the Bid Price in other currencies and clarify the price in words and figures in respect of each currency.
- (4) Insert number of validity days as prescribed in Section 17.1 of **BDS**. The effective period of the Bid is from the deadline for submission of Bid to its expiration date as prescribed in the Bidding Document. The period of time from the deadline for submission of Bid to 24:00 (midnight) of the bid closing date is considered 01 day.
- (5) Insert the bid closing date as prescribed in Section 21.1 of the **BDS**.
- (6) If the Bidder's legal representative authorizes his/her subordinate to sign the Letter of Bid, a Power of Attorney (Form No. 02 provided in this Chapter) shall be enclosed. If the company's charter or another document permits such subordinate to sign the Letter of Bid, such document shall be enclosed (In this case, the Power of Attorney is not required). Regarding consortium, the Letter of Bid shall be signed by legal representative of every consortium's partner, unless the head/leader of the consortium may sign the Letter of Bid according to the consortium agreement as mentioned in Form No. 03 of this Chapter. Each consortium's partner may give authorization similarly to an independent Bidder. If the Bidder is successfully awarded (become a successful Bidder), it shall present certified true copies of these documents to the Owner/Bid Solicitor before contract conclusion. If information provided is found inaccurate, the Bidder will be considered fraudulent as prescribed in ITB 3.
- (7) If a foreign Bidder has no seal, it shall furnish a certification issued by a competent agency that the signature in the Letter of Bid and any other documents of the Bid belongs to its legal representative.

Form No. 01 (b) LETTER OF BID⁽¹⁾

(Applicable to the Bidder who has a discount offer in the Letter of Bid)

Date: _____ *[insert date of signing of Letter of Bid]*

The package's name: *[insert the package's name specified in BDS]*

Project's name: *[insert the project's name specified in BDS]*

Invitation to Bid No.: *[insert the number of Invitation to Bid]*

To: _____ *[insert the complete and accurate name of the Bid Solicitor as specified in BDS].*

After carefully examining the Bidding Document and addendum No. _____ *[insert the number of the addendum (if any)]*, we, _____ *[insert the Bidder's name]*, pledge ourselves to perform _____ *[insert the package's name]* in accordance with the Bidding Document with the contract duration of _____ *[insert the total performance duration of all the work as required by the package]*⁽²⁾ and with the total Bid Price amount _____ *[insert the amount in figures, in words, and currency]*⁽³⁾ together with the Table of bid price.

In addition, we voluntarily offer a discount of bid price with an amount _____ *[insert the discount amount in figures, in words and in currency]*⁽⁴⁾.

The bid price after deducting discount is: _____ *[insert the amount in figures, in words and in currency]*.

We hereby declare that:

1. We only participate in this Bid as the Bidder.
2. We are not undergoing a dissolution process, are not thrown into bankruptcy, and do not incur bad debts as prescribed by law.
3. We do not commit violations against regulations on the assurance of competitiveness in bidding.
4. We are not involved in corrupt, fraudulent or conclusive practice and other violations against the Law on Bidding.
5. We are not banned from bidding as prescribed in law on bidding;
6. Every information provided herein is truthful to be the best of our knowledge.
7. We commit that have fulfilled of the obligation of tax declaration and tax payment of the latest fiscal year (2024).
8. Within 03 years before the time of bid closing, the contractor without personnel (signing a labor contract with the contractor at the time the personnel commits the violation) is convicted by the court of violating regulations on bidding, causing serious consequences in accordance with the provisions of the criminal law for the purpose of allowing that contractor to win.

If our Bid is accepted, we shall provide the Performance Bond as prescribed in ITB 41 - Instructions to Bidders of the Bidding Document.

This Letter of Bid takes effect within _____⁽⁵⁾ days, from _____ *[date]*⁽⁶⁾.

Legal representative of Bidder⁽⁷⁾
[Full name, position, signature and seal⁽⁸⁾]

Notes:

- (1) Bidder shall provide sufficient and accurate information including names of the Bid Solicitor and the Bidder, effective period of the Bid, which bears the signature and seal (if any) and of the bidder's legal representative.
- (2) The contract duration mentioned in the Letter of Bid shall conform to the Bid and Time Schedule in the Bid.
- (3) The Bid Price mentioned in the Letter of Bid shall be detailed, specified in both number and words, and in conformity with the total Bid Price mentioned in the Grand Total. There shall be only one Bid Price which does not cause any disadvantage condition to the Owner or the Bid Solicitor. If permitted, the Bidder may offer the Bid Price in other currencies and clarify the price in words and figures in respect of each currency.
- (4) The discount is whether applicable to the package or one or several work items (specifying the work items eligible for discounts).
- (5) Insert number of validity days as prescribed in Section 17.1 of **BDS**. The effective period of the Bid is from the deadline for submission of Bid to its expiration date as prescribed in the Bidding Document. The period of time from the deadline for submission of Bid to 24:00 (midnight) of the bid closing date is considered 01 day.
- (6) Insert the bid closing date as prescribed in Section 21.1 of the **BDS**.
- (7) If the Bidder's legal representative authorizes his/her subordinate to sign the Letter of Bid, a Power of Attorney (Form No. 02 provided in this Chapter) shall be enclosed. If the company's charter or another document permits such subordinate to sign the Letter of Bid, such document shall be enclosed (In this case, the Power of Attorney is not required). Regarding consortium, the Letter of Bid shall be signed by legal representative of every consortium's partner, unless the head/leader of the consortium may sign the Letter of Bid according to the consortium agreement as mentioned in Form No. 03 of this Chapter. Each consortium's partner may give authorization similarly to an independent Bidder. If the Bidder is successfully awarded (become a successful Bidder), it shall present certified true copies of these documents to the Owner/Bid Solicitor before contract conclusion. If information provided is found inaccurate, the Bidder will be considered fraudulent as prescribed in ITB 3.
- (8) If a foreign Bidder has no seal, it shall furnish a certification issued by a competent agency that the signature in the Letter of Bid and any other documents of the Bid belongs to its legal representative.

Form No. 02**POWER OF ATTORNEY ⁽¹⁾**

[Location and date] _____

I am _____ *[insert name, ID/passport number, position of Bidder's legal representative]*, the legal representative of _____ *[insert name of Bidder]* at _____ *[insert address of Bidder]* hereby authorizes _____ *[insert name, ID/passport number, position of authorized person]* to perform the following tasks during the participation in the process of bidding for _____ *[insert name of the package]* of _____ *[insert name of the project]* held by _____ *[insert name of the Bid Solicitor]*:

- [Sign the Letter of Bid;
- Sign the consortium agreement (if any);
- Sign documents with the Bid Solicitor during the shortlisting processing, including the request for Clarification of Bidding Document and Clarification of Bid; sign requests for withdrawal, modification or substitutions of Bid;
- Participate in contract negotiation and finalization;
- Sign complaint letter (if any);
- Sign contract with the Owner if the Bidder is awarded the contract.] ⁽²⁾

The authorized person only performs the tasks within the area of competence of a legal representative of _____ *[insert name of Bidder]*. _____ *[insert name of Bidder's legal representative]* is totally responsible for the tasks performed by _____ *[insert name of authorized person]* within the authorization scope.

The Power of Attorney is effective from _____ [date] to _____ [date] ⁽³⁾ and is made into _____ copies with the same legal validity. _____ copies are kept by the authorizer, _____ copies are kept by the authorized person and _____ copies are kept by the Bid Solicitor.

Authorized person

[Full name, position, signature
and seal]

Authorizer

[Full name, position, signature and
seal of the legal representative]

Notes:

(1) The original copy of the Power of Attorney shall be sent to the Bid Solicitor in conjunction with the Letter of Bid as prescribed in ITB 19.3. The Bidder's legal representative may authorize their deputies, subordinates, directors of branches, heads of representative offices of the Bidder to perform the tasks on behalf of the Bidder. The authorized person may use the seal of the Bidder or their seal. The authorized person shall not authorize another person.

(2) Area of authorization includes one or multiple tasks above.

(3) Insert the effective date and expiration date of the Power of Attorney in conformity with the bidding process.

Form No. 03**CONSORTIUM AGREEMENT ⁽¹⁾**

[Location and date] _____

Package: *[insert name of the package]*Project's name: _____ *[insert the project's name]*Pursuant to ⁽²⁾ _____ *[the Law on Bidding No. 22/2023/QH15 dated June 23, 2023];*Pursuant to ⁽²⁾ _____ *[the Government's Decree No. 24/2024/ND-CP dated February 27, 2024 on implementation of some articles on contractor selection of the Law on Bidding];*Pursuant to ⁽²⁾ _____ *[the Government's Decree No. 17/2025/NĐ-CP dated February 06, 2025 amending and supplementing a number of articles of the decrees detailedly providing a number of articles and measures for implementing the law on bidding];*In response to Bidding Document for _____ *[insert name of package]* dated _____ *[insert date written on the Bidding Document];*

Representatives of signatories to the consortium agreement include:

Name of member _____ *[insert name of each consortium's member]*

Mr./Ms. _____

Position: _____

Address: _____

Phone number: _____

Fax: _____

Email: _____

Account: _____

TIN: _____

Power of Attorney No. _____ dated _____ *(in case of authorization).*

The parties have reached a consensus on entering into a consortium agreement with the following contents:

Article 1. General rules

1. Parties voluntarily establish this consortium to participate in the process of bidding for _____ *[insert name of package]* of _____ *[insert name of project]*.

2. Official name of the consortium used in every transaction related to the package with the consent of all parties: _____ *[insert the agreed name of the consortium]*.

3. Every consortium's partner is committed not to unilaterally participate or establish a consortium with another consortium's partner to participate in this package. If awarded the contract, no consortium's partner is entitled to refuse to fulfill the duties and obligations prescribed in the contract except for the written consent of other members. Any partner of the consortium that refuses to perform their duties as agreed shall:

- *Pay damages to other partners in the consortium;*
- *Pay damages to the Owner as prescribed by the contract;*

- *Incur other disciplinary actions _____ [specify the action].*

Article 2. Assignment of duties

All parties unanimously assign to be jointly and severally liable for the execution of _____ *[insert name of package]* of _____ *[insert name of project]* as follows:

1. Leading member of the consortium

All parties unanimously authorize _____ *[insert name of a partner]* as the leading partner (leader) of the consortium who represents the consortium to perform the following tasks ⁽³⁾:

- *[Sign the Letter of Bid].*
- *Sign documents with the Bid Solicitor during the shortlisting processing, including the request for Clarification of Bidding Document and Clarification of Bid; sign requests for Bid withdrawal, modification or substitutions;*
- *Provide Bid Bond for the consortium;*
- *Participate in contract negotiation and finalization;*
- *Sign complaint letter (if any);*
- *Perform other tasks except for contract conclusion: _____ [specify other tasks (if any)].*

2. Tasks of consortium's members with the consent of all parties are specified in the table below ⁽⁴⁾:

No.	Name	Tasks	Proportion value to bid price
1	Name of leading member	- ____ - ____	- ____ % - ____ %
2	Name of second member	- ____ - ____	- ____ % - ____ %
....			
Total		All tasks of the package	100%

The consortium commits to complete all requirements and obligations of the contract.

Article 3. Effect of consortium agreement

1. The consortium agreement takes effect from the day on which it is signed.
2. The consortium agreement expires in the following cases:
 - All parties have fulfilled their duties and finalize the contract;
 - The agreement is unanimously terminated by all parties;

- The consortium is not awarded the contract;
- The bidding for _____ *[insert name of the package]* of _____ *[insert name of the project]* is cancelled as notified by the Bid Solicitor.

The consortium agreement is made into _____ copies with same legal validity, each party keeps _____ copies.

LEGAL REPRESENTATIVE OF LEADING MEMBER

[Full name, position, signature and seal]

LEGAL REPRESENTATIVE OF MEMBER

[Full name, position, signature and seal of each consortium's partner]

Notes:

- (1) Bidder is noted that the project's name and package's name shall be clarified accurately and sufficiently as prescribed in **BDS**.
- (2) Update legislative documents in force.
- (3) Area of authorization includes one or multiple tasks above.
- (4) The Bidder shall specify detailed tasks and proportion value of tasks performed by every consortium's member in accordance with Form No 20 Price Schedules. Division of work for every member shall be in accordance with their own experiences and enclosed supporting documents for evaluation.

Failure to meet this requirement shall result in the rejection of the Bid.

Form No. 04**BID BOND ⁽¹⁾**

Beneficiary: *[insert name and address of the Bid Solicitor]*

Date of issue: *[insert date of issue]*

BID BOND NO. *[insert number of the Bid Bond]*

Guarantor: *[insert name and address of issuing bank, if it is not written in the title]*

We have been informed that _____ *[name of the Bidder]⁽²⁾* (hereinafter called "the Bidder") has submitted to participate in the bid for the execution of _____ *[name of package]* of _____ *[name of project]* under Invitation to Bid.

We hereby act as a guarantee for the Bidder to participate in the bid for this package with an amount of _____ *[amount in figures, in words and currency]*.

This Guarantee takes effect within _____ ⁽³⁾ days, from _____ *[date]* ⁽⁴⁾.

At the request of the Bidder, we, as the Guarantor, hereby undertake unconditionally and irrevocably to pay you, Beneficiary, any sum or sums not exceeding in total an amount of _____ *[amount in figures]* (_____) *[amount in words]* upon receipt by us of your first demand in writing accompanied by a written statement stating that the Bidder is in breach of its obligation(s), because the Bidder:

1. has withdrawn its Bid after the deadline for submission of Bid and during the period of bid validity;
2. has violated Law on Bidding leading bid cancellation as prescribed in Point d of ITB 39.1 in Chapter I – Instruction to Bidder of the Bidding Document;
3. fails or refuses to execute the contract negotiation within 05 working days, from the date on which the notification of contract negotiation sent by the Bid Solicitor is received, excluding force majeure events;
4. fails or refuses to complete the contract within 28 days, from the date on which the notification of bid acceptance sent by the Bid Solicitor is received, or refuses to conclude the contract after the contract completion excluding force majeure events;
5. fails to furnish the Performance Bond as prescribed in ITB 41.1, Chapter I – Instructions to Bidders of the Bidding Document.

If any consortium's member violates regulations of law leading ineligible for Bid Bond return as prescribed in ITB 18.5, Chapter I – Instructions to Bidders, the Bid Bond of all consortium's members shall be revoked.

Consequently, any demand for payment under this guarantee shall be received by us at the address on or before that date.

Legal representative of Bank
[Full name, position, signature and seal]

Notes:

(1) Applicable to Bid Bond in the form of Bid Guarantee issued by a credit institution or a branch of foreign bank established under Vietnamese law. This form is encouraged to be used, if another form that violates any requirements as set out in ITB 18, Chapter I – Instructions to Bidders, is used, the Bid bond shall be considered invalid.

(2) The Bidder may have one of the following names:

- Name of the consortium, for example Bidder A and Bidder B enter into a consortium to make a Bid, their name shall be “consortium A + B”;
- Name of the consortium’s member who is in charge of the Bid Bond for the consortium, for example: consortium A + B + C makes a Bid, if their consortium agreement assigns Bidder A to furnish a Bid Bond for the consortium, the consortium’s name shall be “Bidder A (on behalf of consortium A + B + C)”;
- Name of every consortium’s member separately furnishing the Bid Bond.

(3) Insert as prescribed in **BDS** 18.2.

(4) Insert the deadline date as prescribed in **BDS** 21.1.

(5) Application to consortium.

BIDDER QUALIFICATION

In order to prove the qualification to perform the contract as specified in Part 1, Chapter III - Evaluation and Qualification Criteria, the Bidder shall provide the necessary information using the following forms:

Form No. 05(a)**BIDDER INFORMATION**

Date: _____

Number and name of package: _____

Bidder's name: _____
<i>In case of consortium, name of each member: ____</i>
Place of business registration and operation: ____ <i>[insert province/city where the Bidder registers and operate business]</i>
Year of establishment: _____
Bidder's legal address: ____ <i>[insert the registered address]</i>
Bidder's legal representative information Name _____ Address: _____ Phone number/Fax: _____ Email address: _____
1. Attached are copies of one of the following documents: Certificate of Enterprise Registration, Establishment Decision or equivalent document issued by a competent authority of the country in which the Bidder is operating. 2. Diagram of organizational structure of the Bidder or of the consortium as the case may be.

Form No. 05(b) CONSORTIUM MEMBERS INFORMATION ⁽¹⁾

Date: _____

Number and name of package: _____

Bidder's name:
Consortium member name:
Member's Country of Registration:
Member's Year of Establishment:
Member's Legal Address in Country of Registration:
Member's legal representative information Name _____ Address: _____ Phone number/Fax: _____ Email address: _____
1. Attached are copies of one of the following documents: Certificate of Enterprise registration, an Establishment Decision or equivalent document issued by a competent authority of the country in which the Bidder is operating. 2. Diagram of organizational structure.

Notes: Each consortium's member shall declare information using this Form.

Form No. 06 LIST OF COMPANIES IN CHARGE OF PACKAGE WORKS ⁽¹⁾

No.	Name of subsidiary company, associate company⁽²⁾	Work performed in the package⁽³⁾	Proportion of value to Bid Price⁽⁴⁾	Notes
1				
2				
3				
4				
5				
...				

Notes

(1) If the Bidder is a parent company (e.g. a corporation), it shall declare specific tasks assigned to subsidiary companies, associate companies. The qualification of the Bidder shall be evaluated according to the value and volume of work performed by the parent company, subsidiary companies, and associate companies. If the Bidder is not a parent company, this Form shall not be used.

(2) Insert name of the subsidiary companies, associate companies.

(3) Insert work performed by the subsidiary companies, associate companies.

(4) Insert proportion of value of work performed by the subsidiary companies, associate companies to the bid price.

Form No. 07 NON-FULFILMENT RECORDS OF PREVIOUS CONTRACT ⁽¹⁾

Bidder's name: _____

Date: _____

Consortium's member name (if any): _____

Previous contract non-fulfillment records prescribed in Chapter III - Evaluation and Qualification Criteria

☐ No concluded contract without fulfillment from January 1, ____ [year] prescribed in criterion 1 in the Table of qualification criteria in Section 2.1 of Chapter III - Evaluation and Qualification Criteria.

☐ At least one concluded contract without fulfillment from January 1, ____ [year] prescribed in criterion 1 in the Table of qualification criteria in Section 2.1 of Chapter III - Evaluation and Qualification Criteria.

Year	Unfinished tasks in the contract	Description of contract	Total value of contract (current value, currency unit, exchange rate, equivalent value in VND)
		Description of contract Investor's name: Address: Reasons for contract non-fulfillment:	

Notes:

(1) The Bidder shall declare accurately and truthfully history of contract non-fulfillment; any contract non-fulfillment being not declared shall be considered "fraudulent" and rejected.

Regarding consortium, each consortium's member shall declare information using this Form.

Form No. 08**CONFIRMATION LETTER**

Date:

To whom it may concern

We,

.....

[Name and address of company and country]

hereby confirm and commit that:

1. Within the last 03 years up to the deadline for submission of Bid, we do not have employee (signed labor contract with us at the time the employee committed the violation) convicted by the Court of violating the regulations on bidding that lead to serious consequences according to criminal law in order to let us win the bid.
2. We hereby commit to comply with the regulations regarding prohibited acts in bidding as stipulated in Point b, Clause 3, Article 16 of the Law on Bidding No. 22/2023/QH15, specifically: Arranging, agreeing to refuse to provide goods or services, not signing subcontracting contracts, or engaging in other agreements to limit competition so as to help one party to the win the bid.

Very truly yours,

Date and signature:

Name and title of the signatory:

Name of the company:

Seal/stamp of the company:

Note:

1. Documentary proving the eligibility and competence of signatory shall be enclosed.
2. Regarding consortium, each consortium's member shall make this Form.

Form No. 09 FINANCIAL SITUATION OF BIDDER ⁽¹⁾

Bidder's name: _____

Date: _____

Consortium's member name (if any): _____

Financial Data for Previous ____ Years⁽²⁾

Year 1:	Year 2:	Year n:

Information from Balance Sheet

Total Assets			
Total Liabilities			
Net Worth			
Current Assets			
Current Liabilities			
Working Capital			

Information from Income Statement

Total Revenues			
Profits Before Taxes			
Profits After Taxes			

Attached are copies of financial statements (balance sheets including all related notes, and income statements) for last years⁽³⁾, as indicated above, complying with the following conditions:

1. All such documents reflect the financial situation of the Bidder or consortium's member, and not sister or parent companies.
2. Historic financial statements shall be completed, including all notes to the financial statements as prescribed.
3. Historic financial statements shall correspond to accounting periods already completed, attached are certified true copies of one of the following documents:
 - Inspection record of tax declaration;
 - Tax statement (VAT and enterprise income tax) whose time of submitting certified

by tax authority;

- Documentary evidence on electronic tax declaration by the Bidder;
- Certification of tax liability issued by the tax authority (certifying amount paid in the whole year);
- Auditor's report (if any);
- Other documents.

Notes:

(1) Regarding consortium, each consortium's member shall declare information using this Form.

(2) The number of columns in the Table shall correspond to the period of time prescribed in criterion 3.2 Financial Qualification Criteria Section 2.1 Chapter III - Evaluation and Qualification Criteria.

(3) The period of time above shall correspond to the period of time prescribed in criterion 3.2 Financial Qualification Criteria Section 2.1 Chapter III - Evaluation and Qualification Criteria.

Form No. 10 AVERAGE ANNUAL TURNOVER ⁽¹⁾ FROM THE SUPPLY OF GOODS, AND CONSTRUCTION

Each Bidder or a consortium's member shall fill in this form.

Information supplied should be the Annual Turnover of the Bidder or each consortium's member in terms of the supply of goods, and construction for each year for contracts in progress or completed.

Annual Turnover Data for the Last ____ Years ⁽²⁾	
Year	Amount
Average Annual Turnover ⁽³⁾	

Notes:

(1) Regarding consortium, each consortium's member shall fill in this form.

(2) Refer to the period of time prescribed in criterion 3.2 Financial Qualification Criteria Section 2.1 Chapter III - Evaluation and Qualification Criteria.

(3) Average Annual Turnover shall be determined by dividing total turnover by number of years according to the information supplied.

Form No. 11 FINANCIAL RESOURCES ⁽¹⁾

Specify proposed sources of financing, such as liquid assets, credit limit and other financial means (other than advance payments of the contract), available to meet the financial resources requirements prescribed in Form No. 12 [Monthly Financial Resources for Contracts in Progress] of this Chapter.

Financial Resources of Bidder		
No.	Source of financing	Amount
1		
2		
3		
4		
...		
Total financial resources of Bidder		

Notes:

(1) Every Bidder or consortium's partner shall provide information about their financial resources, enclosed with documentary evidence.

Expected financial resources shall be determined by the following formula:

$$\mathbf{PFR = TFR - MFR}$$

Where:

- PFR is the proposed financial resources to perform the contract (this package);
- TFR is total financial resources of the Bidder (specified in this form);
- MFR is total monthly financial resources required for contracts in progress (specified in Form No. 12).

A Bidder shall be considered responsive to financial resources requirements if Bidder's proposed financial resources (PFR) anticipatively used for this package are no less than the value of financial resources required and prescribed at criterion 3.3. Financial Qualification Criteria Section 2.1 of Chapter III - Evaluation and Qualification Criteria.

If the Bidder encloses a credit commitment issued by a credit institution lawfully operating in Vietnam in the Bid, which promises to lend to the commitment holder (the Bidder) to perform the considered package with minimum amount equivalent to the required value prescribed in criterion 3.3 Financial Qualification Criteria Section 2.1. Chapter III – Evaluation and Qualification Criteria during the contract duration, the Bidder shall be considered satisfying financial requirements for the package and not required to declare information using this Form and Form No. 12.

**Form No. 12 MONTHLY FINANCIAL RESOURCES FOR CONTRACTS
IN PROGRESS ⁽¹⁾**

No.	Contract's name	Contact person of the relevant Owner (address, phone number, fax)	Finish date of contract	Number of remaining months of contract (A) ⁽²⁾	Unpaid contract value, including taxes (B) ⁽³⁾	Monthly financial resources required (B/A)
1						
2						
3						
4						
...						
Total monthly financial resources required for contracts in progress (DTH)						

Notes:

(1) Each Bidder or consortium's member shall provide information below to calculate all required financial resources, which is all value of: (i) current commitments of the Bidder (or each consortium's member) in all contracts being executed or to be executed; (ii) required financial resources of the to-be-considered contract by the Owner. In addition, the Bidder shall provide information about any other financial obligation likely substantially affecting the execution of the to-be-considered contract if the Bidder is awarded the contract.

(2) Number of remaining months of contract at 28 days prior to the deadline for submission of Bid.

(3) Unpaid value of contract at 28 days prior to the deadline for submission of Bid.

Form No. 13**SIMILAR CONTRACTS**

Similar Contracts		
The Contract Agreement No. _____ dated _____	Information:	
Date of Award of Contract: _____	Finish date: _____	
Total Contract Price	_____	
For consortium's member or subcontractor, insert its contribution in total contract price	Value as a percentage of total contract price	Amount: _____
Owner's name: Address: Phone number/Fax: Email:		
Description of similar characteristics prescribed in criterion 4 similar contracts experience Criteria Section 2.1 of Chapter III - Evaluation and Qualification Criteria.		
Similar characteristics required	<i>Similar characteristics of completed contracts⁽¹⁾</i>	

Notes:

Bidder carefully studies Bidding Documents and proposes similar contracts to ensure that it meets the requirements of Bidding Document.

- (1) The Bidder shall specify similar characteristics of similar contracts to demonstrate their responsiveness.
- (2) In case of a Consortium, each member of Consortium shall declare according to this Form. In case Bidder has many similar contracts, each contract shall be declared according to this Form.
- (3) Bidder shall only declare the same contents as the requirements of the bidding package. In case the contract value is not calculated in VND, it shall be converted into VND at the exchange rate as prescribed in Section 2.1 of Chapter III as a basis for evaluation.
- (4) The Bidder must attach copies of relevant documents, including contract(s) and the corresponding documents that have been fully or substantially completed (such as the Taking Over Certificate, Acceptance Protocol, Calculation Table, Final Calculation Table, Liquidation Minutes, or equivalent documents signed by the Client(s)).

Form No. 14 TABLE OF PROPOSED PERSONNEL FOR KEY POSITIONS

Regarding every position prescribed in this Form, the Bidder shall declare detailed information according to Forms 15 and 16 of this Chapter.

Key personnel may be on the contractor's payroll or mobilized by the contractor. In case the key personnel (except for key personnel performing the consultancy work) proposed by the contractor in the Bid do not meet the requirements or fail to prove the ability to mobilize personnel (including cases where personnel have been mobilized for other contracts for a certain time working time coincides with the time of implementation of this bidding package), the procuring entity shall allow the contractor to supplement or replace. Contractors are only allowed to supplement and replace each personnel position once in an appropriate period of time but not less than 03 working days. In case the contractor does not have replacement personnel to meet the requirements of the Bidding Document, the contractor shall be disqualified

The Bidder shall propose personnel for key positions having qualifications satisfying requirements prescribed in Item 2.2.1, Section 2.2 of Chapter III - Evaluation and Qualification Criteria and be available to perform the package; no personnel being in charge of another package with the same working time is proposed in this Table. If the declaration is not truthful, the Bidder shall be considered fraudulent.

1	Position: <i>[insert detailed position in charge]</i>
	Name <i>[insert the employee's name for key position]</i>
2	Position: <i>[insert detailed position in charge]</i>
	Name <i>[insert the employee's name for key position]</i>
3	Position:
	Name
4	Position:
	Name
5	Position:
	Name
....	Position:
	Name

Form No. 15 CURRICULUM VITAE OF PERSONNEL FOR KEY POSITION

Intended title: _____

Bidder's name: _____

Name: _____ Nationality: _____

Profession: _____

Date of birth: _____

Membership of professional associate (if any) _____

Working experience:

Time	Employer	Reference	Position
From _____ to _____		<i>[name, phone number, email address of reference]</i>	

Assigned tasks in the contract:

Specific description of tasks:	Insert relevant tasks and duties performed previously to prove capability of assigned tasks
<i>[insert the tasks assigned to the personnel in Form No. 16]</i>	
.....	

Capability: _____

____ [Specifically describe experience and training courses taken by bidder's personnel for assigned tasks. Specify the tasks given in each project and name/address of the project Owner]

Education: _____

[Summarizing college/university and other specialized courses taken by the bidder's personnel, giving names of schools, attending time, and degrees obtained]

Mother language: _____

Foreign language: _____

Contact: *[name, phone number, email address of the contract]*

I hereby declare that the information provided above is truthful to the best of my knowledge and I am legally responsible for such information.

[Location and date]

[signature, position, full name]

Note:

- Each personnel who participate to this package as describe in Form No.14 has to

clarify all information as mentioned in this Form No. 15.

- Bidder has to submit the following documents to prove experience and capability of bidder's personnel, experts to execute this package

- i) The labour contract or agreement for labour.
- ii) The university degree or higher degree.
- iii) The evidence document proving the experience in executing similar Contract including the confirmation of Client. (Applicable for Vietnamese personnel only).

Form No. 16 PROFESSIONAL QUALIFICATIONS OF PERSONNEL

Summarize professional experience in reverse chronological order, and indicate particular technical and managerial experience relevant to the package.

From	To	Company	Project	Position	Relevant technical and management experience

Form No. 17**EQUIPMENT**

The Bidder shall provide adequate information to demonstrate clearly that it has the capacity to meet the requirements for the major equipment listed in Item 2.2.2, Section 2.2 of Chapter III - Evaluation and Qualification Criteria and be available to perform the project. No equipment being proposed of another project with the same schedule is proposed in this Table. If the declaration is not truthful, the Bidder shall be considered fraudulent.

The equipment may be owned by the Bidder or rented provided that the Bidder shall demonstrate clearly that Bidder has the capability to meet the requirements of the package. If an item of equipment is rented, a lease of equipment and documents proving the ownership of the lessor are required. A separate Form shall be prepared for each item of equipment listed or for alternative equipment proposed by the Bidder.

In case the main construction equipment proposed by the contractor in the Bid does not meet the requirements of the bid solicitor to allow the contractor to supplement or replace it. The contractor is only allowed to supplement and replace each equipment once in an appropriate period of time but not less than 03 working days. In case the contractor does not have replacement equipment to meet the requirements of the Bidding Document, the contractor shall be disqualified.

Item of equipment		
Equipment information	Name of manufacturer	Model
	Capacity	Year of manufacture
	Functions	Origin
Current status	Current location	
	Details of current using commitments	
Source	Indicate source of the equipment ☐ Owned ☐ Rented ☐ Leased ☐ Specially manufactured	

Add the following information for the equipment not owned by the Bidder:

Owner	Name of Owner	
	Address of Owner	
	Telephone:	Contact name and title
	Fax:	Telex
Agreements	Details of rental/lease/manufacture agreements specific to the project	

Form No. 18 (a) WORK ITEMS PERFORMED BY SUBCONTRACTORS ⁽¹⁾

No.	Subcontractor's name⁽²⁾	Work items⁽³⁾	Quantity/ Volume⁽⁴⁾	Estimated value⁽⁵⁾	Contract/agreement concluded with subcontractor⁽⁶⁾
1					
2					
3					
4					
...					

Notes:

(1) In case of employment of subcontractors, then fill in this form.

(2) Indicate name of subcontractors. In case names of subcontractors are not determined, this column may be left blank and only the column “Work items” is filled. If the Bidder is selected, it may employ subcontractors with the work items as indicated in the table only with the consent of the Owner.

(3) Indicate name of work items for subcontractors.

(4) Indicate quantity/volume of work/items for subcontractors.

(5) Indicate value of work/items performed by subcontractors as percentage of the Bid Price.

(6) Indicate number of contract(s)/agreement(s); the Bidder shall submit the relevant original or certified true copy of such document(s).

(7) The Owner reserve the right to change and/or replace any subcontractor/vendor if it is found that such subcontractor/vendor does not ensure credibility, quality and finally the list during Contract negotiation.

Form No. 18 (b) LIST OF SPECIAL SUBCONTRACTORS ⁽¹⁾

The Bidder shall provide adequate information to demonstrate clearly that it has the capacity to meet the requirements prescribed in Clause 2.3, Section 2, Chapter III - Evaluation and Qualification Criteria.

No .	Name of special subcontractor⁽²⁾	Work item⁽³⁾	Quantity/ Volume⁽⁴⁾	Estimated value⁽⁵⁾	Contract/agreement concluded with special subcontractor⁽⁶⁾
1		Performing design/engineering (detailed design or overall design) work			
2		Performing steam turbine and generator erection works			

Notes:

- (1) In case of employment of special subcontractor, then fill in this form.
- (2) Bidders indicate the name of special subcontractors.
- (3) The Bidder is only permitted to use special subcontractors for these works.
- (4) Bidders indicate quantity/volume of work/items for special subcontractors.
- (5) Bidders indicate value of work/items performed by special subcontractor(s) as percentage of the Bid Price.
- (6) Bidders indicate number of contract/agreements, enclosed with the original or certified true copy of such document.

Form No. 18 (c) OWNER/END USER'S CERTIFICATE

Date:

To whom it may concern

We, *[Name and address of company and country]*

hereby certify that the *[insert system/equipment or etc.]* named and listed in the *[Name of Contract]*, ordered and purchased by us from *[Name and address of manufacturer]* has *[successfully been designed, manufactured, erected, commissioned and tested]*, including the following information:

[For system/equipment:

- Type and capacity;
- Main design parameters;
- Time of successful operation;

Very truly yours,

Date and signature:

Name and title of the signatory:

Name of the company:

Seal/stamp of the company:

Note:

1. Signatory could be Owner's Project Manager or Owner.

(documentary proving the eligibility and competence of signatory shall be enclosed).

Form No. 18(d) CONFIRMATION LETTER OF BIDDER

Date:

To whom it may concern

We,

.....

[Name and address of company and country]

hereby confirm that we shall:

- [employ local contractors to carry out the works:
 - + ...
 - + ...
- *apply with all codes and standards as specified in Chapter V – Technical Requirements and Technical Specifications.*
- *perform the obligations of warranty, maintenance, service, repair, supply of spare parts or provision of other after-sales services as required by Bidding Documents.]*

We understand that, during Contract performance, failure to comply with this confirmation letter shall cause forfeit the Performance Bond.

Very truly yours,

Date and signature:

Name and title of the signatory:

Name of the company:

Seal/stamp of the company:

Note:

Documentary proving the eligibility and competence of signatory shall be enclosed.

Form No. 18(e): NOT APPLICABLE

Form No. 18(f) : NOT APPLICABLE

FORM No. 19 (a) BIDDER'S PROPOSAL FOR GOODS

No.	Equipment/System	Unit	Quantity	Year of Manufacture	Origin (Country, region of production)	Manufacture
<i>(1)</i>	<i>(2)</i>	<i>(3)</i>	<i>(4)</i>	<i>(5)</i>	<i>(6)</i>	<i>(7)</i>

Notes:

- The Bidder's proposal in this Form shall be extracted into Form No. 20.

FORM No. 19 (b) TECHNICAL DATA SHEET

This section does not intend to list all the scope of work or technical requirements. However, the bidder must comply with the specifications outlined in Chapter V or as agreed upon in the contract at a later stage.

Any additional items, materials, or services not explicitly mentioned here but necessary to ensure the equipment is complete, safe, reliable, and efficient, as per the technical specifications, are considered included within the scope.

During the tendering phase, bidders must submit the following technical datasheet for evaluation. For details, refer to **[Technical Schedule for Proposal]** attached in **Section IX [Attachment Documents]** of Chapter V.

FORM NO. 19 (c)**LIST OF SPARE PARTS AND SPECIAL TOOLS**

1. Start-up and commissioning Spare Parts including consumables, special tools & tackle.

No.	Description of spares (Brand name and Model)	Spare Part Serial Number	Country of origin	Quantity Required per Unit 1	Quantity Required per Unit 2	Price (USD) (VAT excluded, all other taxes and duties included)	VAT other countries (USD) (if any)	Total cost (USD) (VAT, all taxes and duties included)	Remark
1	Start-up and commissioning Spare Parts								
									
2	Special tools and tackle								
	...								

2. Recommended for 02 years operation spare parts.

No.	Description of spares (Brand name and Model)	Spare Part Serial Number	Country of origin	Quantity Required per Unit 1	Quantity Required per Unit 2	Price (USD) (VAT excluded, all other taxes and duties included)	VAT other countries (USD) (if any)	Total cost (USD) (VAT, all taxes and duties included)	Remark

FORM NO. 19 (d)**PROJECT MANAGEMENT ORGANISATION**

Bidder shall attach to this form a project management concept including the project management structure and organisation which shall be capable of undertaking the project on a turnkey basis. Full details regarding proposed management structures incl. engineering, time, cost, procurement, resource, construction, commissioning, and life cycle management should be provided in the Tender.

The Bidder shall submit an organization chart for its Project Management Organization and identify the Key Personnel as required in Chapter III, in their proposal, in accordance with the requirements of the Bidding Documents.

The Bidder shall provide an organizational chart and a detailed description of the Bidder's organizational structure at the construction site. The organizational structure may include the following components:

1. Technical, Quality, and Schedule Management Department
2. Safety, Fire Protection, Security, and Environmental Management Department
3. Materials and Equipment Management Department
4. Acceptance and Completion Documentation Management Department
 - Construction Teams

FORM NO. 19 (e) CONSTRUCTION PLAN

Bidders shall submit its Construction Plan to include the following:

- 1) Mobilization plan;
- 2) Logistics plan (fuel, power, water, communications, accommodation, supplies, etc.);
- 3) Laydown area proposal including location and requirements by schedule;
- 4) Health and safety concept;
- 5) Transportation and storage concept;
- 6) Description of site services during construction;
- 7) Estimated project staffing and labours during construction on a monthly basis;
- 8) Accommodation concept for staff and labour during project construction.

FORM NO. 19 (f) PROJECT SCHEDULE

Bidders shall submit its overall Project Programme (time schedule) of no more than **22** months days overall indicating main targets and key dates, phases and dependencies including engineering, procurement, fabrication, delivery, construction & erection, testing and commissioning to meet the required completion date according to the time for completion shown in the Bid Data Sheet.

As a minimum, the following breakdown shall be provided in the bar chart:

- 1) Commencement date;
- 2) Engineering and design;
- 3) Procurement/manufacturing time of long lead items;
- 4) Site mobilization;
- 5) Site preparation;
- 6) Major foundations (additional breakdown required);
- 7) Major structures (additional breakdown required);
- 8) Systems erection (additional breakdown required);
- 9) Testing & Commissioning (additional breakdown required);
- 10) Provisional readiness;
- 11) Taking over.

The schedule shall further show all dates when the Bidder requires interfaces with those of Owner.

FORM NO. 19 (g)

QUALITY ASSURANCE DOCUMENTS

The bidder shall submit the following other additional information:

- 1) Quality policy and quality assurance system of the Bidder;
- 2) Tentative quality assurance plan for the project including inspections and testing.

FORM NO. 19 (h) HEALTH, SAFETY, ENVIRONMENTAL, AND SOCIAL DOCUMENTS

Bidder shall submit its health, safety and environmental management system (HSE) document, including but not limited to:

- Environmental policy (covering site drainage, air and water pollution, chemicals substances and waste/hazardous waste management, and other environmental issues as identified in the project's HSE);
- Health and safety policy;
- Occupational health and safety management plan;
- Environmental management plan;
- Community safety management plan;
- Security management plan;
- Construction safety management process;
- Environmental and occupational health and safety monitoring process;
- Incident/accident investigation process;
- HSE training process;
- Grievance redress mechanism.

The Bidder's HSE document must satisfy and get along with the project's requirements and not conflict with the relevant Vietnamese regulations.

The Contractor shall develop and submit its HSE to the Owner for approval no later than 30 days after the commencement date. The Contractor shall operate, maintain, and update (if necessary) its HSE during the project's implementation. The requirement on HSE of the Contractor is also applied to the subcontractor and the third parties involved in.

FORM NO. 20 **PRICE SCHEDULES - SUMMARY**
BASE PORTION

Project:

Package:

No	Price Schedule	Amount		Note
		Local Currency	Foreign Currency	
I	Total value of works (Total value 1.1+1.2+2+3+4) before Taxes			
1.1	Price Schedule No 1.1: Cost of Local Goods.			
1.2	Price Schedule No 1.2: Cost of Imported Goods.			
2	Price Schedule No 2: Cost of Installation			
3	Price Schedule No 3: Cost of Construction			
4	Price Schedule No 4: Cost of Services			
II	Total of Taxes			
5	Corporate income tax (CIT)			
6	Value Added Tax (VAT)			
7	Other taxes, fees and charges			
III	Total of offer Price include taxes and related costs (I + II)			

Note.

- The detailed price list of bid prices (Price Schedule No. 1.1, 1.2, 2, 3, 4) have been fully prepared and completed in accordance with Form No. 20 and Form No. A1.
- The total bid price submitted by the Bidder must include all taxes, fees, charges, and contingency costs, which shall be appropriately allocated within the bid price. The bid price is a lump-sum, fixed price and shall remain unchanged throughout the contract implementation period.

PRICE SCHEDULE NO. 1.1: COST OF LOCAL GOODS

No	Description	Unit	Quantity	Amount (VND)	
				Price without Taxes	Total without Taxes
....	(1)	(2)	(3)	(4)	(5)
I	Total (without Taxes)				
II	Taxes				
					
					
III	Total (include Taxes)				

PRICE SCHEDULE NO. 1.2: COST OF IMPORTED GOODS

No	Description	Unit	Quantity	Price without Taxes, Import Taxes		VAT taxes	Other taxes (if any)	Price include Taxes		Amount	
				VND	USD			VND	USD	VND	USD
....	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Total										

PRICE SCHEDULE NO. 2: COST OF INSTALLATION

No	Description	Unit	Quantity	Amount (VND)	
				Price without Taxes	Total without Taxes
....	(1)	(2)	(3)	(4)	(5)
I	Total (Without Taxes)				
II	Taxes				
					
					
III	Total (Include Taxes)				

PRICE SCHEDULE NO. 3: COST OF CONSTRUCTION

No	Description	Unit	Quantity	Amount (VND)	
				Price without Taxes	Total without Taxes
....	(1)	(2)	(3)	(4)	(5)
I	Total (Without Taxes)				
II	Taxes				
					
					
III	Total (Include Taxes)				

PRICE SCHEDULE NO. 4: COST OF SERVICES

No	Description	Unit	Quantity	Amount (VND)		Amount (USD)	
				Price without Taxes	Total without Taxes	Price without Taxes	Total without Taxes
....	(1)	(2)	(3)	(4)	(5)	(6)	(7)
I	Total (without Taxes)						
II	Taxes						
							
							
III	Total (include Taxes)						

Notes:

1. The value of each unit price will be stated in the Summary of Bid Price in Form No. 20.
2. For columns (1), (2), and (3) of the Price Schedule Tables (from Price Schedule Table No 1.1 to Price Schedule Table 4, the Bidder must extract data from Form No. A1 of the Bidding Documents, to quote the corresponding price for each work item/task.

The following instructions are mandatory requirements in the Bidding Documents:

- Bidders are required to thoroughly review: (i) The actual conditions for design, supply, construction, and installation provided by the Bid Solicitors, (ii) Technical design documents and technical requirements and survey of the current status of the Project, the supply of materials and equipment on the market, and the sources of construction materials. This is to accurately re-evaluate the items and volume of work, including all parts of the work or volume that Bidder anticipates will be required to complete the Project, and to quote a total price for the bid package.
- The elements constituting the Bid Price include, but are not limited to, the following cost items: direct costs of materials, labor, machinery and equipment, field testing, other direct costs; general costs and Bidder's profit; fees; insurance premiums that Bidder must purchase; customs clearance costs; transportation of machinery, materials, and equipment to the construction site; other construction-related costs allocated in the Bid Price, such as temporary and auxiliary works (e.g., yards, worker housing, warehouses, construction electricity and water, etc.); costs for obtaining various types of guarantees as required by the Bidding Documents; insurance costs, including compensation for repair of existing roads used by the Bidder's vehicles and equipment to transport materials; environmental protection costs for impacts caused by Bidder; warranty costs; costs for permanent or temporary rental of a staging area to dump excess sand (if any), which must be accompanied by a written agreement from the local authorities; and costs for loading, unloading, transporting, dumping, and leveling all excess sand from the Project to the staging area; compensation costs if the current elevation is lower than the design elevation (if any); costs for reinforcing or relocating existing infrastructure works of the Investor within the project site; costs for ensuring site security and safety; other costs necessary to perform the work within the scope of the bid package; and contingency costs for unforeseen risks related to volume and price fluctuations during the contract performance period.
- Bidder must provide the unit price and total amount corresponding to each work item stated in the Detailed Bidding Price. If Bidder does not provide a unit price and total amount for a specific work item, the cost for that item will be considered as included in the unit prices and total amounts of other items. However, the provisions on error correction and deviation adjustment must still be observed

during the bidding process.

- *The quantities given in the Bidding Price Details Table are based on Bill of Quantities specified in Form No. A1 of Chapter IV of the Bidding Documents. If the Bidder finds that the quantity listed in the Bill of Quantities differs from that in the approved technical design documents, the Bidder is responsible for notifying the Bid Solicitors and preparing a separate quotation for the discrepant quantity for the Owner's consideration. This difference must not be included in the bid price.*
- *For any work items or volumes that Bidder anticipates will be required but are not included in the Bill of Quantities, or are different from the quantities listed (either increased or decreased), Bidder must notify the Bidder Solicitor and prepare a separate quotation for the difference. These differences should not be included in this form so that the two parties can negotiate during the contract negotiation process.*
- *Regarding import tax: According to current Vietnamese law, imported materials and equipment used to create fixed assets for the Long Phu 1 Thermal Power Plant Project are exempt from import tax. To make the most of this tax exemption, Bidder is responsible for studying current regulations, the list of imported goods, and the list of goods that can be produced domestically. Bidder must propose a list of goods for import so that the Owner can register this list with customs and apply it during contract implementation. If the Bidder chooses to import materials or equipment that can be produced domestically, all associated taxes are considered included in the bid price and will be borne by the Bidder.*
- *The Owner shall authorize the Bidder to handle all procedures related to the importation process including but not limited to customs declaration and import tax payment for the clearance of imported goods, in accordance with applicable legal regulations. The Bidder shall be responsible for paying all applicable taxes and any additional taxes (if any), providing explanations to inspection and audit authorities, and fully implementing the findings or conclusions resulting from such inspections and audits, insofar as they relate to goods imported within the Bidder's scope of work. All costs for the above responsibilities are considered included in the Bidder's bid price.*
- *The Bid Price is a lump sum price, inclusive of value-added tax (VAT) and all applicable taxes, duties, levies, fees, charges, and other financial obligations (if any), both within and outside the territory of Vietnam, that the Bidder shall bear for the full completion of the Works as specified in Chapter V, except for import duties on goods, materials, equipment, and the corresponding VAT that are exempted under the prevailing laws or applicable tax incentives granted to the Project. In case such exemptions are not granted, the Bidder shall remain responsible for paying such taxes, and they shall be deemed included in the Bid Price.*

PRICE SCHEDULE NO. 5: COST OF OPTIONAL PROPOSAL

No	Description	Unit	Quantity	Price without Taxes Import Taxes		VAT taxes	Other taxes (if any)	Price include Taxes		Amount	
				VND	USD			VND	USD	VND	USD
....	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Total										

NOTE:

Refer to a.2.4, Chapter 5 [in current stage, the negotiation between the Owner and Power Machine for transferring the ownership of the equipment/systems in this group a.2.3. from PM to the Owner has not yet been finalized. In the event that the transfer of ownership can not be taken place, the Owner reverses the right to sign contract with the Contractor who has the lowest offer price for OPTIONAL PROPOSAL.

Therefore, during the preparation of the bidding documents, the Owner requests the Bidder to provide an optional Quotation for the procurement of the equipment/systems in this group [Price Schedule No.5, Chapter IV – Bidding Forms]. The Contractor is advised that this quotation is for reference only and shall not be included in the Bidder's bid price.]

FORM NO. 21 SUMMARY TABLE OF CURRENCY REQUIREMENTS**Work/Expense:** *(fill in the task or type of expense)*

Currency Type	Amount
Local Currency (VND): _____	
United state dollars (USD): _____	

Form No. 22 DOMESTIC COSTS ELIGIBLE FOR INCENTIVES ⁽¹⁾

No.	DESCRIPTION	AMOUNT
I	PROCUREMENT	
1	Name of item No. 01	
	Bid Price	(I)
	Expenditures on imported equipment/material (<i>Imported Cost Portion</i>)	(II)
	Other outward expenditures (<i>if any</i>)	(III)
	Taxes	(IV)
	Domestic Cost	$P(G1) = (I) - (II) - (III) - (IV)$
2	Name of item No. 02	
	Bid Price	(I)
	Expenditures on imported equipment/material (<i>Imported Cost Portion</i>)	(II)
	Other outward expenditures (<i>if any</i>)	(III)
	Taxes	(IV)
	Domestic Cost	$P(G2) = (I) - (II) - (III) - (IV)$
	...	
n	Name of item No. N	
	Bid Price	(I)
	Expenditures on imported equipment/material (<i>Imported Cost Portion</i>)	(II)
	Other outward expenditures (<i>if any</i>)	(III)

No.	DESCRIPTION		AMOUNT
		Taxes	(IV)
		Domestic Cost	$P(GN) = (I) - (II) - (III) - (IV)$
	<i>Sub-Total – Procurement Domestic Cost</i>		<i>$P(G) = P(G1) + P(G2) + \dots + P(GN)$</i>
II	SERVICES COSTS		
1	Name of item No. 01		
		Bid Price	(I)
		Expenditures on imported equipment/material (<i>Imported Cost Portion</i>)	(II)
		Other outward expenditures (<i>if any</i>)	(III)
		Taxes	(IV)
		Domestic Cost	$C(G1) = (I) - (II) - (III) - (IV)$
2	Name of item No. 02		
		Bid Price	(I)
		Expenditures on imported equipment/material (<i>Imported Cost Portion</i>)	(II)
		Other outward expenditures (<i>if any</i>)	(III)
		Taxes	(IV)
		Domestic Cost	$C(G2) = (I) - (II) - (III) - (IV)$
	...		
n	Name of item No. N		
		Bid Price	(I)
		Expenditures on imported equipment/material (<i>Imported Cost Portion</i>)	(II)

No.	DESCRIPTION	AMOUNT
	Other outward expenditures (<i>if any</i>)	(III)
	Taxes	(IV)
	Domestic Cost	$C(GN) = (I) - (II) - (III) - (IV)$
	<i>Sub-Total – Construction Domestic Cost</i>	$C(G) = C(G1) + C(G2) + \dots + C(GN)$
IV	TOTAL DOMESTIC COST	$G = E(G) + NC(G) + P(G) + C(G)$

Note:

(1) In case the goods are not eligible for incentives, Bidder shall not declare this Form.

Form No. 23 TECHNICAL DEVIATION DECLARATION FORM

Bidder is requested to carefully study the Bidding Document and declare technical deviations (if any):

Deviation No.	Reference to Bidding Document		Description of Deviation and Reason for Change
	Clause, page	Description in Bidding Document	
Technical Deviations			
<i>[To be inserted]</i>			
<i>[To be inserted]</i>			
<i>[To be inserted]</i>			
<i>[To be inserted]</i>			
<i>[To be inserted]</i>			
<i>[To be inserted]</i>			
<i>[To be inserted]</i>			
<i>[To be inserted]</i>			
...			

Form No. 24 COMMERCIAL DEVIATION DECLARATION FORM

Bidder is requested to carefully study the Bidding Document and declare commercial/financial deviations (if any):

Deviation No.	Reference to Bidding Document		Deviations
	Clause, page	Description in Bidding Document	
Commercial/Financial Deviations			
<i>[To be inserted]</i>			
<i>[To be inserted]</i>			
<i>[To be inserted]</i>			
<i>[To be inserted]</i>			
<i>[To be inserted]</i>			
...			

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PART II - TECHNICAL REQUIREMENTS AND SPECIFICATIONS

CHAPTER V

TECHNICAL REQUIREMENTS AND SPECIFICATIONS

I. General introduction of the project and bid package

1.1 General introduction of the project

a. Project overview:

- Project name: Long Phu 1 Thermal Power Plant
- Owner: Vietnam National Industry - Energy Group originated from Vietnam Oil & Gas Group (Petrovietnam - PVN);
- Owner's representative: Long Phu 1 Power Project Management Board (LP1PP);
- Capital sources: Owner's equity
- Investment decision: Decision no.: 479/QĐ-DKVN dated Jan 17, 2025

b. Location:

- Location: Long Phu 1 Thermal Power Plant is located in the Long Phu Power Center with total capacity of 4,400MW approved by the Ministry of Industry and Trade in Decision No. 1233/QĐ-BCT dated October 23, 2007. Long Phu 1 Thermal Power Plant consists of 2 units, with a capacity of 1200MW (2x600MW) with total estimated land area of 115 hectares, located at Thanh Duc Hamlet, Dai Ngai Commune, Can Tho city, located on the right bank of Hau River, which is 1.3 km downstream from Dai Ngai estuary.
- Site status: Hydro meteorological data collected at the Soc Trang gauging station from 1978 to 2007 at two phases, preparation of Long Phu power complex – General Plan and Long Phu 1 power plant project – Feasibility Study Report, site data are mainly as follows:

No.	Parameter	Unit	Data		
			Min	Max	Average
1	Ambient temperature	C deg	13.1	37.2	26.7
2	Relative Humidity	%		100	84
3	Atmospheric Pressure	mbar	1002	1020	1009
4	River Temperature	C deg	25.0	32.4	29.4

- Existing technical infrastructure for the location:

- + Water source:
 - Water source for Power Plant will be taken from Hau River
 - Water for construction : The Owner has constructed a water treatment plant of ground water to serve the construction site.
- + Power connection: According to electric connection agreement No. 2310A/EVNNPT-TTĐN dated 17th July 2012
 - Unit 1: connect to Long Phu 220 kV switch yard
 - Unit 2: connect to Long Phu 500 kV switch yard
 - Power for construction will be supplied from local power supply company to existing LV transformers at site area.

c. Project Scale:

- Scale and Level of Construction: Energy Construction – Level 1
- Capacity: 2 x 600 MW;
- Operating hour: 6,500 hour/year;
- Structure: 01 Boiler + 01 Steam turbine + 01 Generator
- Efficiency: $\geq 42.22 \%$;
- Auxiliary Power Consumption: $\leq 10.7 \%$;
- Boiler efficiency: $\geq 87.36 \%$;
- Guaranteed Gross Unit heat rate: $\leq 2,037$ kcal/kWh;
- Capacity of main boiler up to coal firing: $\leq 40 \%$ RO;
- Coal Consumption: ~ 3.2 million tons/year;
- Dust Emission: ≤ 50 mg/Nm³;
- SO_x Emission: ≤ 300 mg/Nm³;
- NO_x Emission: ≤ 450 mg/Nm³;
- Main fuel: Bituminous and Sub-bituminous coal imported from Australia or Indonesia, Diesel Oil as auxiliary start-up fuel.

d. Status and information of the Project:

The Project has been commenced in January 2015 through EPC contract No. 9488/HD-DKVN dated 27th December, 2013 and its Amendment No. 9226/HD-DKVN, signed on 30th December, 2014 by PVN and the Consortium of Power Machines (PM) – PetroVietnam Technical Services Corporation (PTSC). On 28th January, 2019, PM officially sent a Notice of the EPC Contract termination to the Owner caused by U.S. sanctions on its Russian Contractors, so the Project is being suspended until now, except for the implementation of preservation and maintenance works at site. EPC contract was officially terminated.

The current status of the previous EPC contract is summarized as follows:

According to EPC Consortium's Report at the time of contract termination, the Project has completed about 77% of scope of work (Report No. 49 attached).

Item	Description	Progress (%)	Note
1	Engineering	85.23%	
2	Procurement	85.1%	Including 54 Vendors/Subcontractors for 69 subcontracts
3	Construction	56.75%	
Total		77.56%	

Up to now, LP1PP has summarized the entire design documents, procurement, delivered equipment, erected equipment as **Table 1** (for reference) as attached.

During the negotiation and contract signing stage, the Previous Contractor submitted the List of deviations, see **Table 3 as attached** (These deviations will be accepted by the Owner during project implementation without the need for the Bidder to submit design change requests).

During the project execution, the PM's Contractors/Suppliers requested technical changes, summarized in the List of Design Change Request (DCR), see **Table 4** (These deviations will be accepted by the Owner during project implementation without the need for the Bidder to submit design change requests), and List of Non-Conformance Report (NCR), see **Table 5 as attached** (The Bidder shall repair these NCRs).

Materials and equipment delivered to the site are stored in warehouses and yards. List of delivered materials/equipment and attached MINUTES OF GOODS, MATERIALS, EQUIPMENT RECEIPT (MGMERs) as described in **Table 6 as attached**.

Contact list of subcontractors/suppliers signed contract with Power Machines to supply materials/equipment for Long Phu 1 Project is listed in **Table 7 as attached in** for Bidder information

The previous EPC Contract's Technical Specification/Scope of Work for implement the project based on Vol II - Technical Specification/Scope of Work (Original Technical Specification Request For Proposal) **as attached in Appendix 1**.

The status of civil work is presented in the tables **Table 2.1-** Design, construction status and Scope of works-civil part and **Table 2.2-** Design, construction status and scope of works for structural steel works of major items attached to the Bidding Document.

1.2. General introduction of the bidding package

1.2.1. The package's information

Name of Package: Supply of Equipment, Construction, Installation and Monitoring of Test Run for Acceptance of Main Plant of Long Phu 1 Thermal Power Plant Project.

- Capital Resources: Owner's equity.
- Bidding method: International competitive Bidding, offline selection.
- Bidding procedure: Single-stage one envelope.
- Contract type: Lump-sum contract.
- Duration of contract performance: 22 months.

1.2.2. Scope of Works

1.2.2.1 General:

Project restart execution plan has divided into multi packages which grouped followings:

- Main Plant Package (this package)
 - + The Group of materials/equipment/systems to be supplied by the Bidder
 - + The Group of materials/equipment/systems is supplied by the Owner
 - The Group of materials/equipment/systems currently stored at the construction site
 - The Group of materials/equipment/systems to be procured by the Owner and handed over to the Bidder for erection, commissioning
 - The Group of paid materials/equipment/systems is under previous EPC Contractor's Ownership (Power Machine)
- Other Balance of Plant (BOP) packages
 - o The Group of systems/buildings implemented by other Contractors.

For more detail, the Bidder refer to Table 08 [Division of Responsibility] and Table 09 [Bill of Quantities]

1.2.2.2 Service:

1.2.2.2.1 Inspection:

The Bidder shall inspect the condition of the following materials & equipment at site:

- The Driving motor for Boiler Feed Pump No.1: Due to an incident during the lifting of the boiler feed pump motor, the wooden package was broken and some areas on the motor casing were slightly deformed. The Bidder shall carry out an inspection and propose a remedial solution (if any). The implementation cost for remedial action (if any) will be negotiated and executed between the Owner and the Bidder at addendum of the contract.

- Main Cooling Water Piping:

+ The Bidder shall drain the water from the pipeline, clean it, inspect the current condition, and submit a report assessing the overall level of pipeline corrosion at the Bidder's own expense. If necessary, the Bidder shall propose an anti-corrosion solution.

+ In the event that the Bidder proposes an additional anti-corrosion solution for the pipeline, the Bidder is requested to submit the cost for the supply, installation, testing, and operational training of the anti-corrosion system, as per the Bidder's assessment report, the implementation cost for anti-corrosion solution (if any) will be negotiated and executed between the Owner and the Bidder at addendum of the contract.

- 06 sets of counterpart relay ABB – RED 670 located at 500 kV/220 kV Switchyard: Currently, six (06) relays have been installed in the Bay housings at the switchyard. The Bidder shall coordinate with the 500 kV/220 kV switchyard operating Company (EVNNPT) to conduct a survey and assess the condition of these six relays, and submit remedy solution (if any) to ensure that the protection coordination between these six relays and the relays on the power plant side operates safely and correctly in accordance with Vietnamese regulations. The implementation cost for remedial action (if any) will be negotiated and executed between the Owner and the Bidder at addendum of the contract.

1.2.2.2.2 Engineering:

- In general, based on the existing design documentation of the Project as attached in **Appendix 1.1 Document designed by the former EPC contractor**, the Bidder shall refer to, utilize, or revise (if necessary) these documents to finalize the design of the Project. This must be done in accordance with the principles of optimization regarding materials, equipment and minimize altering any equipment or systems that have already been installed or procured by the Owner, as well as without affecting the overall layout of the project or without affecting or improving the overall performance of the Plant and guarantee the project schedule.
- Scope of engineering including but not limit the following works to finalize the design of the Project:
 - + Main Plant Package (this package)
 - The Bidder shall complete all Basic Designs for the systems, including system descriptions, design parameters, operating principles, and applicable standards, perform equipment sizing calculations (Sizing Calculation document); and prepare P&ID/PFD diagrams for mechanical, single line diagrams, schematic diagrams for electrical, and I&C equipment to serve as the basis for the detailed design.
 - The Bidder shall complete all Detailed Designs for Bidder's scope of works including Piping Layout, Pipeline list, Stress analysis calculation, Isometric drawings, Valve list, Equipment & cable routing layout, Grounding & lightning protection layout, Illumination layout, Electrical-list & BOQ and logic diagram, Structural/construction drawings, Manufacturing/shop drawings, etc.

- Protective device coordination study, including calculations, tabulation of relay settings and relay coordination curves for all power systems
- + Other Balance of Plant (BOP) packages
 - Finalize of layout and overall connection drawings for all Equipment and Material Items (such as the overall Plot Plan, the Long Phu Power Center Site Plan, the layout of the Turbine Building area, the Central Control Building, the Intake Structure, overall pipe racks, cable routes, rainwater drainage routes, internal roads, architecture, and overall Plant landscaping...etc.), as well as a 3D model of the Plant.
 - Management of the interface between equipment systems under the scope of the Bidder and other related systems/packages including interface drawings/ diagrams, process parameters at terminal points.
 - Finalize sizing, calculate and issue the overall plant water balance diagram, compressed air balance diagram, overall plant electrical single line diagram, finalize overall plant electrical load list.
 - Issue the overall plant design criteria, calculate and issue overall plant electrical protection/ interlock, overall plant process interlock
 - Management overall plant design, comment and issue root cause analysis of abnormal/incident which relating to improper design.

1.2.2.2.3 Construction & erection/ installation

- The Bidder shall prepare the erection/installation procedures, method statements, safety statements, erection/installation schedules including the taking over and tally the existing materials, equipment at the construction site and materials, equipment procured by the Owner and materials, equipment provided by the Bidder.
- Perform the construction, erection/installation of equipment/systems in accordance with respective procedures, method statements, safety statements, schedules submitted by the Bidder and approved by the Owner.

1.2.2.2.4 Testing & commissioning

- The Bidder shall prepare and submit the procedures for piping flushing (chemical cleaning, Oil cleaning, water cleaning, air flushing); Supply and install the temporary systems for piping flushing and steam blowing; Supply all necessary consumable for piping flushing and steam blowing; Carry out the piping flushing activities; Dismantle the temporary systems, prepare reports and acceptance documentation, and restore and reconnect the permanent systems.
- The Bidder shall perform testing and commissioning of the system/equipment within scope of the Bidder to ensure system/equipment ready for load test and overall plant commissioning include but not limited to the following:
 - + Loop check, checking signals between the control system and field devices (I/O check), instrument calibration, mechanical adjustment, alignment.
 - + Function check by simulation including interlock, protection, operational sequences.

- + Coordinate to verify the basic operation of the equipment and system, motor solo run, verifying mechanical operation conveyor belts, valves, rotating pumps, etc. such as vibration, rubbing, alignment... during no-load run of the system/equipment etc..
- Supervise and coordinate to resolve any abnormalities/damages (if any) as well as coordinate in tuning / adjustment within Bidder scope during commissioning of entire the plant process.
- In case of any abnormality or incident occurring during the whole plant commissioning process, the Bidder shall coordinate with the overall commissioning Contractor to investigate the root cause, assess the incident, and determine the responsibilities of the relevant parties.

1.2.2.2.5 Training:

- Training on the maintenance and operation of equipment/systems within the Bidder's scope.

1.2.2.3 Supply

- Supplying of all materials and equipment including tool & tackles, consumables, lubricants for erection and spare part for start-up & commissioning within Bidder's scope of supply.
- Packaging, transporting, customs clearance of imported goods, insurance, domestic transportation to the construction site, unloading, storing, preserving the materials and equipment within Bidder's scope of supply and erection.
- The Bidder shall design and procure materials and equipment for connection to the 500 kV/220 kV switchyard, including connection transmission lines, protection coordination, control coordination, SCADA/EMS, telecommunications, etc., in accordance with the applicable laws and regulations of Vietnam.

1.2.2.4 Detail scope of supply and service

a. Scope of engineering, supplying, construction & erection, testing & commissioning

In order to the Bidder to better understand the scope of supply and service to be performed, the Owner has divided the design, supply, construction, installation, and commissioning activities groups as Project restart execution plan above mentioned. The Bidder's main scope of supply and service for each group is outlined as follows:

a.1. The Group of materials/equipment/systems to be supplied by the Bidder

The Bidder shall be responsible for the design, procurement, supply, customs clearance, and transportation of materials/equipment to the construction site, as well as installation, testing, commissioning, and coordination with the commissioning Contractor for the overall plant commissioning.

- For the coordination of operation, control and protection between the Power Plant and the Switchyard, the Bidder shall perform the following tasks:

- + The Bidder shall be responsible for the design, supply, and complete installation of the control, measurement, Scada/EMS, Communication and protection coordination system between the Power Plant and the Switchyard.
- + The Bidder shall provide a Master Junction Cubicle to be installed at the bay housing of the 500 kV and 220 kV switchyard. This cubicle will serve as the main interface point between the Power Plant and the Switchyard.
- + All signals related to protection, measurement, SCADA/EMS, Communication, control, circuit breaker status, isolator status, earthing switch status, current, voltage, etc., from the Switchyard shall be connected to this Master Junction Cubicle. The LP1 Power Plant will connect to this cubicle to receive signals from the Switchyard and to send signals from the Power Plant back to the Switchyard.
- + The Bidder shall coordinate with EVNNPT to determine the exact installation location of the cubicle and identify all relevant signals exchanged between the Switchyard and the Power Plant to be routed to this cubicle.
- + In special cases where certain signals cannot be routed to the Master Junction Cubicle, the Bidder shall carry out the connections at alternative locations as designated by EVNNPT.

a.2. The Group of materials/equipment/systems is supplied by the Owner

a.2.1. The Group of materials/equipment/systems currently stored at the construction site

- The Bidder shall receive the handover of materials and equipment from the Owner, and shall organize the management and preservation of such items during the installation preparation and installation period. The list of materials and equipment to be handed over by the Owner to the Bidder is detailed in **Table 6.1 – List of Materials and Equipment Handed Over by the Owner to the Bidder**.

- The Bidder shall perform the installation (including providing installation guidance experts, if needed), testing, pre-commissioning, and coordinate with the commissioning Contractor for the overall plant commissioning.

- The Bidder shall inspect the condition of the existing materials & equipment mentioned in 1.2.2.2.1.

a.2.2. The Group of materials/equipment/systems to be procured by the Owner and handed over to the Bidder for erection, commissioning

The Bidder shall perform installation under the supervision of the TA provided by Owner, conduct testing and commissioning, and coordinate with the commissioning contractor for the overall plant commissioning.

a.2.3. The Group of materials/equipment/systems is under Power Machine's Ownership

The Bidder shall perform installation under the supervision of the TA provided by Owner, conduct testing and commissioning, and coordinate with the commissioning Contractor for the overall plant commissioning.

a.2.4. Optional case for equipment/system in this group: *in current stage, the negotiation between the Owner and Power Machine for transferring the ownership of the equipment/systems in this group a.2.3. from PM to the Owner has not yet been finalized. In the event that the transfer of ownership can not be taken place, the Owner will consider allowing the Bidder to procure these equipment/systems. Therefore, during the preparation of the bidding documents, the Owner requests the Bidder to provide an optional Quotation for the procurement of the equipment/systems in this group [Price Schedule No.5, Chapter IV – Bidding Forms], so that the Owner may consider signing a contract addendum with the Bidder if necessary. The Bidder is advised that this quotation is for reference only and shall not be included in the Bidder's bid price.*

The detailed technical requirements including scope of work of these materials & equipment are stipulated in *Attachment - Optional Proposal for materials & equipment belong to PM's ownership.*

a.3. The Group of systems/buildings implemented by other contractors

- The Bidder shall design, supply and install power cables (MV and LV) and electrical hardware interlock/control cables including all necessary accessories, and connect them to the Transformers, Switchgears, PCCs, MCCs, Distribution Boards (DBs) with the systems/buildings in this group.
- The Bidder shall design, supply and install fiber cable, instrument cable and perform the connection of the control systems of these systems in this group to the plant's DCS.
- The Bidder shall design, supply and install service/instrument air to these systems/buildings.
- The Bidder shall design, supply and install service/potable/demineralized water to these systems/buildings.
- The Bidder shall design, provide, install piping for supply Steam for system/buildings in this group.
- The Bidder shall design the pipe routing, and shall provide and install the piping system for supplying Diesel oil to the systems/buildings in this group;
- The Bidder shall design, supply and connect pipe/trend and pump to the wastewater sump pit of each in this group to the Plants wastewater system include rainwater, oily drain water, sanitary wastewater and other wastewater sump pit of this group.

- The Bidder responsible for designing, supply, construction the pipe/cable routing with all associated pipe/cable trench, cable tray, duct banks, pipe/cable racks required for above pipe/cable to the systems/buildings in this group.

The exact terminal points are defined in Item **3.3 – Terminal Points** of this chapter.

The Bidder's scope of work for each group includes, but is not limited to, the tasks summarized in **Table 08 Division of Responsibility** and **Table 08.1: Division of Responsibility for Insulation** as attached.

b. Scope of Civil work

The bill of quantities for the facilities/items/works has been prepared based on the design drawings and technical requirements provided by the Owner and is for reference only. Based on its own capabilities and experience, the Bidder is responsible for thoroughly reviewing and checking the design drawings, technical specifications, design status and construction status as specified in Chapter V and at the actual construction site. The Bidder shall adjust the quantities, and add or remove facilities/items/works as necessary to ensure consistency with the actual scope of construction and technical requirements for the completion of construction and installation of all facilities/items/works under this package. The lump-sum price (covering all works under the package) must be carefully calculated to ensure completion with the required quality and schedule, without any additional cost and without increasing the Contract Price.

‘Table 2.3: The detailed Bill of Quantities for reference purposes only - Civil part’ is attached for reference purposes only. Some facilities/items/works in Table 2.3 have not yet had their quantities calculated. Based on its professional experience and capabilities, the Bidder is responsible for reviewing and recalculating the quantities for all facilities/items/works within the scope of this package, including those that have or have not yet been designed. The Bidder should also consider including a reasonable contingency quantity to account for any unforeseen facilities/items/works.

The scope of detailed design; supply of materials, goods, and equipment; construction, fabrication, erection and installation works under this Bid shall include, but not be limited to, the facilities/items specified in **Table 2.1-** Design, construction status and Scope of works-civil part and **Table 2.2-** Design, construction status and scope of works for structural steel works of major items attached to the Bidding Document. The Bidder shall thoroughly inspect the existing design status and construction status in order to accurately and adequately determine the quantity and scope of work required to complete all items of the package and hand them over for use in accordance with applicable regulations.

Based on the actual conditions of the facilities/items, the Bidder shall conduct a site survey to assess and propose any necessary renovation, repair, or replacement works (if any); prepare construction drawings (detailed design), modify construction drawings

(detailed design) in accordance with current requirements; and provide equipment, materials, goods, construction materials, fabrication, machinery, labor, etc., for the execution and completion of construction and installation works, including but not limited to the items and works specified in **Table 2.1 and Table 2.2**.

The Bidder shall be responsible for carrying out the repair, remediation, and renewal works for all previously constructed parts of all facilities/items under this package.

For the facilities/items under this package whose piles, foundations, RCC structures, or steel structures have already been constructed and installed, but during the contract implementation additional piles, foundations, RCC structures, or steel structures are required, the Bidder shall be responsible for carrying out these additional works without any additional cost and without increasing the Contract Price.

For **Appendix 2: Civil part- Attachments** (Including the list of attached documents and attached documents), It should be noted that design drawings and calculation sheets bearing alphabetical revision codes (e.g., A, B, C, D, etc.) are considered not yet approved. For such design documents, the Bidder shall be responsible for finalizing the design and submitting it to the Owner for approval. Upon approval, the revision codes of these documents shall be updated to numerical formats (e.g., 0, 1, 2, 3, etc.). Even for the design documents that have been approved, the Bidder shall still be responsible for redesigning them upon request from the Owner.

In addition to the scope of work indicated in the above **Table 2.1 and Table 2.2**, the Bidder shall carry out the following scope of work requirements:

(1) Detailed design/Construction design

The detailed design/construction design works for all facilities/items under this package fall within the scope of this package.

The design work includes, but is not limited to, the following tasks:

- Update and finalize the existing incomplete design if the design documents have not been completed.
- Even for the design documents that have been approved, the Bidder shall still be responsible for redesigning them upon request from the Owner.
- Carry out the design for all facilities/items that have not yet been designed.

(2) Coordinate with the plant's fire protection contractor

Coordinate with the plant's fire protection contractor, the Bidder shall be responsible for the design and construction of the items under this package in accordance with the latest fire protection regulations and submitting them to the Owner for approval.

The Bidder shall be responsible for the design and construction of the items under this package in accordance with fire protection requirements, including but not limited to the following tasks:

- Design and construct: embedded openings, pre-installed supports, and accessible locations for the fire protection contractor to install equipment hangers and mounting brackets.
- The Bidder shall be responsible for the design and construction of the items under this package in accordance with fire protection requirements, such as: fire-rated doors, fireproof paint, fire-resistant coverings, fire spread prevention solutions, etc. if required by the applicable fire protection regulations.
- Design the layout of escape routes, emergency exits, and fire safety clearances in accordance with the applicable fire protection regulations.

(3) Removal of corrosion preservation materials from existing starter rebars and anchor bolts.

Due to the temporary suspension of construction, the existing starter bars and anchor bolts have been covered with anti-corrosion preservation materials by the Owner. Therefore, in order to proceed with the next construction steps, the Bidder shall carry out the following tasks:

- For the reinforcement starter bars, the Bidder is responsible for demolishing 100% of the area of the preservation layers, cleaning the steel, checking and testing to evaluate the quality of the steel. In case the reinforcement starter bars do not fully meet the design load-bearing capacity, the bidder will prepare and submit a corrective action proposal to the owner for approval before proceeding to the next step.
- For the foundation anchor bolts that have been imbedded in the concrete, the Bidder is responsible for removing the temporary concrete cover used for anti-corrosion protection, removing the layer of grease, and thoroughly cleaning all dirt and rust. The Bidder is responsible for checking the existing condition of the bolts. In case the bolts are warped, cracked, broken or any other damage, the bidder is responsible for preparing and submitting to the owner corrective action proposal for approval before proceeding to the next step.

(4) Inspection of piling works prior to pile cap construction

For the items where piling works have been completed but pile caps have not yet been constructed, the Bidder is responsible for excavation work, inspecting, measuring, testing, and evaluating the current condition, integrity and load-bearing capacity of the piles. Therefore, these tasks are within the scope of this package.

In case the inspection results indicate that any pile head has been displaced beyond the allowable limits, or any pile is found to be cracked, broken, otherwise damaged, or

fails to meet the required test load capacity, etc. The Bidder shall report this matter to the Owner.

The scope of work including preparing a site report, preparing and submitting a corrective action proposal, and implementing corrective measures for the aforementioned issue shall be under the responsibility of the previous piling contractor. Therefore, these tasks are not within the scope of this package.

The Bidder shall be responsible for redesigning the pile layout and pile caps related to the failed piles. The revised design documents shall be attached to the corrective action proposal mentioned above. This design work falls within the scope of this package.

(5) For the construction works of Oil wharf, the Bidder shall also be responsible for the following tasks:

- + Dredging works in front of Oil Import wharf and transportation of dredged materials shall be carried out to the designated disposal area. The expected disposal location is Islet No. 3, Nhon My Commune, Can Tho City. The Bidder shall be responsible for liaising with the relevant local authorities to complete all necessary procedures prior to the commencement of dredging and disposal activities. The Bidder may propose an alternative disposal site or follow the requirements of the competent authorities. However, in all cases, the Bidder must complete all necessary procedures to execute the works without any change to the Contract Price.
- + Design, supply, and installation of navigational buoys and aids to navigation for wharf access (if required).
- + Preparation and completion of the application dossier for adjustment of the Port Construction Location Agreement (if required), to be submitted by the Owner to the competent authority for approval.
- + Preparation and completion of the Maritime Safety Assurance Plan prior to the commencement of port construction works, for submission to and approval by the competent authority through the Owner, and implementation in accordance with the approved plan.
- + Preparation and completion of the relevant documents within the Bidder scope of work to support the Owner in completing the application dossier for port opening declaration to be submitted to the competent authority.

(6) Communication system; network cables and Wi-Fi,...

The Bidder shall be responsible for supplying equipment, materials, and goods, as well as carrying out the installation and construction of the communication system and warning system, network cabling, Wi-Fi, etc., for the facilities/items that require such systems and are within the scope of this package. For further details, refer to the specific scope of work for each item in the **Table 2.1**.

(7) Interface of Work Scope for Road and pavement; Paving, concrete paving, Crushed stone paving.

Road and pavement for the entire plant; Paving, concrete paving, crushed stone paving for the entire plant are within the scope of work of this package.

The interface between the access road and the ramps of facilities not included in the scope of this package is divided as follows: the boundary of responsibility is at the base of the ramp.

The interface between the paving and the facilities not included in the scope of this package is divided as follows: the boundary of responsibility is the outer edge of the plinth protection all around the building/structure.

(Refer to general illustration drawing no. II.1 Interface/ LP1-TKC-11UVY-A-A1-DAL-9701 for further details.)

(8) Interface of Work Scope for Storm drainage

Storm drainage for the entire plant is within the scope of work of this package.

The interface for stormwater drainage from facilities not included in the scope of this package is divided as follows:

- The stormwater drainage ditches surrounding the base of these facilities, intended to collect roof runoff and convey it to the connection manholes, are under the responsibility of another contractor.
- The above-mentioned connection manholes, along with other drainage channels, drainage pipes, other manholes, etc., shall fall within the scope of work of this package.

(Refer to general illustration drawing no. II.1 Interface/ LP1-TKC-11UVY-A-A1-DAL-9701 for further details.)

(9) Interface of Work Scope for Domestic & Potable supply system

Domestic & Potable water supply system for the entire plant is within the scope of work of this package.

Interface for Domestic & Potable water supply to facilities not included in the scope of this package shall be divided as follows: the connection points, pipelines, fittings, equipment, etc., from the outer edge of the perimeter of such facilities are within the scope of work of this package.

(10) Interface of Work Scope for Wastewater collection system leading to the wastewater treatment plant

Wastewater collection system leading to the wastewater treatment plant for the entire plant is within the scope of work of this package.

Interface for wastewater collection from facilities not included in the scope of this package shall be divided as follows: the collection pits, pipelines, drainage channels, etc., from the outer edge of the perimeter of such facilities to the wastewater treatment plant are within the scope of work of this package.

(11) Interface of Work Scope for Duct bank

The duct bank, as highlighted in green, is within the scope of work of this package. Refer to Drawing No. II.2 Interface/ LP1-TKC-10UMY-E-E2-DAL-8000_001 for further details on the duct bank of this package.

The Bidder shall note that the scope of duct bank works under this package includes, but is not limited to, the areas highlighted in green.

(12) Interface of Work Scope for Pipe Rack

The Bidder shall refer to **Table 2.1, Table 2.2** for detailed information on the pipe racks included in the scope of work of this package.

The Bidder shall note that the scope of pipe rack works under this package includes, but is not limited to, the areas highlighted in yellow. Refer to Drawing No. II.3 Interface/ LP1-TKC-10UMY-M-G1-DGA-1365_001 for further details on the pipe rack of this package.

(13) Corrective action for NCR (Non-Conformance Report)

Currently, there are two open NCRs, No. LP1-LP1PP/PM-PTSC-M-NCR-086 and LP1-LP1PP/PM-PTSC-C-NCR-128 (Refer to Folder III-OTHER DOCS/ III.8-NCR), which have not yet been closed. These NCRs are related to the items of this package.

For LP1-LP1PP/PM-PTSC-C-NCR-128, the Bidder shall be responsible for redesigning the pile layout and pile caps related to the failed piles. The revised design documents shall be attached to the corrective action proposal. This design work falls within the scope of this package.

NCR No. LP1-LP1PP/PM-PTSC-M-NCR-086 concerns some structural steel components of the Power House Building and the Central Electrical and Control Equipment Building, which have been fully erected but still have some stains caused by soil, cement water, packaging materials, and some rust marks. These defects have not yet been rectified; therefore, the NCR remains open.

NCR No. LP1-LP1PP/PM-PTSC-C-NCR-128 concerns some piles of the Condensate Storage Tank Unit #2, Busduct Supporting Structure Unit #2, and Unit Auxiliary Transformer (12BCT12/12BCT22), which have pile head coordinates deviating beyond the allowable limits. These defects have not yet been rectified; therefore, the NCR remains open.

The proposal of corrective actions, implementation of such actions, and the closure of the above-mentioned NCRs are not within the scope of work of this package.

The Bidder is requested to submit an optional quotation for the above-mentioned works. Please note that these unit prices will not be included in the bid price and will be

considered by the Owner at a later stage. The quoted prices shall include all associated costs until the NCRs are closed.

For NCR-086, please quote the unit price based on 1 m² of surface area to be cleaned and touch-up painted if necessary.

For NCR-128, please quote the unit price per 1 meter of pile length to be driven.

(14) Corrective action for Site Minutes no. LP1/PTSC/PR/SM-001 & -003

Currently, there are two open Site Minutes, No. **LP1/PTSC/PR/SM-001 & -003** (Refer to Folder III-OTHER DOCS/ III.9-Site Minutes), which have not yet been closed. These Site Minutes are related to the items of this package.

Due to the impact of construction activities, the anchor bolts of 8 foundations in the Pipe Rack between SCR & ESP from Gridline 21b to 1d (including: 21a1, 19b, 18b, 17a, 17, 16a, 15a1, 12c&12b), as well as the anchor bolts at pedestal P2 of foundation 12TZ-PC6B under the Flue Gas Recirculation Duct Line G1, have been found to be abnormally deformed and misaligned. For further details, please refer to Site Minutes No.: LP1/PTSC/PR/SM-001 & -003.

The proposal of corrective actions, implementation of such actions, and the closure of the above-mentioned Site Minutes are not within the scope of work of this package.

If the proposal of corrective actions requires redesigning these foundations, then such redesign work shall fall within the scope of this package.

The Bidder is requested to submit an optional quotation for the above-mentioned works. Please note that these unit prices will not be included in the bid price and will be considered by the Owner at a later stage. The quoted prices shall include all associated costs until the Site Minutes are closed.

Please quote the unit price per 1 foundation.

(15) Locks, Keys and Keying System

Locks, Keys and Keying System for the entire plant is within the scope of work of this package.

The design, procurement and installation work for this scope shall comply with specification No. 11-2010-K-G-SPC-2210-V2G3-SEC-XIX as attached in Appendix 2/ III-OTHER DOCS/ III.1-RFP specification.

(16) Common Temporary Facilities Serving Construction, Security work

All works related to the repair, new construction, maintenance, and management during the use of the common temporary facilities serving the construction of the entire plant shall fall within the scope of this package.

The common temporary facilities serving the construction include, but are not limited to, the following items: temporary roads, drainage, fencing, gates, lighting, construction power supply, construction water supply, water spraying for dust suppression at the construction site, install CCTV system for site security, etc.

The security works for the entire plant fall within the scope of this package.

(17) Other necessary works to complete the facilities/items within the scope of this package

The Bidder shall be responsible for performing and completing all additional, incidental works or unspecified works not explicitly listed in the above scope of work, but which are necessary to be carried out and completed to ensure that the facilities/items are constructed in a complete and synchronized manner, fully meeting the technical requirements, standards, and conditions for inspection, acceptance, handover, and commissioning in accordance with applicable regulations.

The Bidder shall carry out these works without any additional cost and without increasing the Contract Price.

c. Other scope of work

In addition to the design, supply, transportation, construction, installation, and commissioning works as described in Item 1.2.2.a and 1.2.2.b above, the Bidder shall also perform, but not be limited to, the following tasks:

- The Owner has constructed the groundwater treatment system for providing water in construction works. The Bidder shall be responsible for procuring the required chemicals, performing operating and maintenance work for the water treatment system to ensure a continuous water supply for construction in Bidder's scope as well as self-agreements to share the water for construction to the other contractors of another packages at the Site in ensuring of mutual benefit of Parties;
- The Owner has constructed the power supply system for construction. The Bidder shall be responsible for maintaining the construction power system, purchasing electricity from the local utility, supplying construction power within the Bidder's construction area, and coordinating and agreeing on the provision of power to other Contractors at the site;
- The Bidder shall be responsible for security management, including the supplying, installation, and operation of surveillance camera systems (provide images and video recordings to the Owner, if requested), as well as the provision of security guard services for the entire construction site;
- The Bidder shall provide all necessary consumables and temporary facilities throughout the project execution period, up to the Commercial Operation Date (COD) of Unit 2. Coal, oil, and limestone for commissioning shall be supplied by

- the Owner according to commissioning schedule submitted by the Contractor and approved by the Owner;
- The Bidder shall conduct a site survey of the current construction and installation status of the Power House, CECB, and Boiler steel structure, and shall study the applicable fire protection regulations. The Bidder shall coordinate with the Owner's Contractor who responsibility in EPC the Plant's Fire protection system to determine appropriate fire protection solutions for the aforementioned buildings, and shall supply materials and carry out fireproofing works in compliance with the prevailing regulations;
 - Manage the HSE of the construction site within Bidder's scope of works in compliant with under overall construction site HSE management responsible by the Owner;
 - Providing special tools & tackles for erection, spare parts for commissioning & testing within the Bidder's scope;
 - Preparation of the Plant Handbook;
 - On the basis of the O&M procedures for individual equipment from the Owner's other Contractors and from the Bidder, the Bidder is responsible for consolidating the O&M procedures for the systems and the whole plant, which are assembled from these individual equipment;
 - Providing all necessary documents and dossiers to the Owner and/or on behalf of the Owner for the completion of all needed agreements and permits/licenses including but not limited as followings:
 - + Agreement on technical design, test/ commissioning for connection of power plants to the national power system;
 - + Agreement on technical design, test/ commissioning for the tariff metering system and transmission of tariff metering data system, Electricity Market WAN Connection, DIM Information Management, Bidding Client system for Vietnam Competitive Generation Market (VCGM);
 - + Agreement on technical design, test/ commissioning for SCADA/EMS and communications system;
 - + Agreement on technical design, test/ commissioning of protection relay system;
 - + Surface Water Exploitation Permits;
 - + Environmental License for industrial/domestic waste water, flue gas emission, noise and vibration, hazardous waste treatment,...);
 - + Import license for telecommunication equipment, Temporary import license for construction equipment of the Bidder;
 - + Transportation permits for oversize and overweight within bidder scope of supply;
 - + Obtaining acceptance Dossier for synchronizing for the first time;

- Prepare Dossier and provide explanations to the competent Authorities including State Audit Council (if required) to obtain the necessary approvals on operation of boiler and overall plant.
- Any agreements, permits, or certificates not explicitly mentioned but required under Vietnamese law for the installation, connection of the plant to the national grid and operation of the systems and equipment within the Bidder's supply and installation scope shall be arranged and obtained by the Bidder as required.
- Quality Inspection of imported equipment within Bidder scope;
- Prepare and implement the Oil Spill Risk Prevention and Response Plan, Fire Prevention and Fighting Plan, Environmental Incident Prevention and Response Plan, Chemical Incident Prevention and Response Plan, etc. in accordance with current regulations during the construction and commissioning phase as well as reporting, explain to the competent authorities until approval/consent is obtained;
- Coordinate with the commissioning contractor to perform the testing in accordance with the regulations of the Ministry of Industry and Trade and the Electricity Regulatory Authority, including: Decision No. 25/QĐ-ĐTĐL dated March 26, 2019 on the Testing and Testing Supervision Procedure; Decision No. 52/QĐ-ĐTĐL dated August 4, 2015 on Guidelines for Implementing Generator Capability Curve Testing at coal-fired thermal power plants participating in the Competitive Electricity Market; and the latest updated versions of the aforementioned documents must be applied;
- The Bidder shall commit to providing a warranty period of no less than 24 months from Taking over Certificate issued for all materials and equipment within the Bidder's scope of supply and installation.
- Any Scope of work not explicitly mentioned but required for the installation and operation of the systems and equipment within the Bidder's supply and installation scope shall be obtained as necessary.

Based on the aforementioned package division approach, the Owner has prepared the Bill of Quantities for this package as presented in the attached **Table 09 – Bill of Quantities**. This Bill of Quantities has been developed in accordance with the Owner's current requirements and understanding. The Bidder shall be responsible, based on its professional experience and thorough knowledge of the prevailing Vietnamese legal regulations applicable to supercritical coal-fired power plants, for completing the relevant scope of work under the Bidder's responsibility (including the optional items) in **FORM A1. BILL OF QUANTITY BY BIDDER, Chapter IV**, for the Owner's review and evaluation.

II. Schedule Requirements

2.1. Project schedule

The Project's schedule target to reach Commercial Operation Date (COD) in 2027

- Receiving reverse power supply via the Station transformer in 10/2026.
- Unit 1 will commence commercial operation in 09/2027.
- Unit 2 will commence commercial operation in 12/2027.

2.2. Schedule of the Bidding Package

The Bidder's procurement, installation, testing and commissioning activities must be completed not later than 22 months from Commencement Date (CD).

The Bidders shall provide a detailed schedule for this PC package with various activities and milestones on taking over, transition phases, and synchronization with the other project activities and timelines which are bases to determine the delay damage.

Levels of the Time Schedule are defined as follows:

- **Level 1 Time Schedule:** Major works in the developing construction drawing design, procurement, manufacturing, installation the remaining items to finalize the Plant, testing, and acceptance shall be indicated. In addition, the schedule must also be aligned with the key project milestones specified in Section 2.1 above.
- **Level 2 Time Schedule:** The Time Schedule shall be structured with the Detailed Work Schedule. The level of detail should be achieved to all of the elements in the Technical Specifications of the project can be monitored compared to the basic progress of the Contract. Typical work activities should include but not be limited to the following:
 - + Milestones;
 - + Engineering works: Detail time schedule for construction drawing design are required;
 - + Submission of documents;
 - + Procurement (for remaining equipment);
 - + Manufacturing and factory tests;
 - + Delivery;
 - + Foundation works;
 - + Taking over equipment works from the Owner;
 - + Erection/Installation/Finishing works;
 - + Construction machines, tools mobilization schedule
 - + Man power mobilization schedule
 - + Resource allocation schedule
 - + Training.

- + Testing;
- + Commissioning, Testing and Acceptance/Hand-over;

A preliminary risk assessment of the Project Schedule, including risk identification, category, assessment, and mitigation action plan time-tracking, is to be developed and submitted to the Owner for review and comment.

- Level 3 Time Schedule:

- + The Time Schedule Level 3 needs to be structured so that the information can run compatible with the Time Schedule Level 2. Most of the work activities in the Time Schedule Level 3 shall not exceed one month with the Time Schedule Level 2.
 - + The human resources, construction material, plant equipment supply, and construction equipment/vehicles requirements with a table comparing the expected progress and actual progress need to be clear. All task's consequences and constraints should be clear, and proper set-up. A full risk assessment of the Project Schedule, including risk identification, category, assessment, and mitigation action plan, is to be developed and submitted to the Owner for review and comment.
 - + The Level 3 Time Schedule is to be reviewed in the Monthly Progress Meeting.
- Level 4 Time Schedule:**
- + A Time Schedule for consecutive 2 weeks shall be published weekly concerning construction, acceptance, and the major tasks during the engineering and procurement of work. Originally, the scheduled time of each work activity should not exceed 7 days. Human resources and equipment requirements with a table comparing the expected progress and actual progress need to be clear. Delayed items in the previous week and forecast of completion date for each activity shall be determined. Basic information of work for the next 2 weeks should be compatible with the Level 3 Time Schedule.
 - + The mitigation plan and actions are to be updated time by time and submitted to the Owner for review and comment.

2.3. Project Schedule Submission

The PC Bidder shall submit a detailed schedule for this PC package with various activities and milestones on taking over, transition phases, and synchronization with the other project activities and timelines which are bases to determine the delay damage.

Description	No. Req'd⁽¹⁾	Date of Timing⁽²⁾	Submitted for⁽³⁾	Note
Level 1 Time Schedule: Preliminary Critical Path Network and Time Bar Diagram	6P/1E	B	I	
Level 2 Time Schedule: Agreed Critical Path Network and Agreed Time Bar Diagram	6P/1E	CD + 01 month	A	Officially Approval
Level 2 Time Schedule	6P/1E	CD + 02 month	A	Include risk assessment
Level 3 Time Schedule	6P/1E	Monthly	I	In the Monthly Progress Report
Level 4 Time Schedule	6P/1E	Weekly	I	In the weekly Progress Report
Note (1):	P = Prints/Hard Copy; E = Electronic Copy; Number is the number required of each type.			
Note (2):	B = With Bid; CD = Commencement Date of the Contract			
Note (3):	I = Information/Reference; A = Approval;			

III. GENERAL REQUIREMENT AND DETAIL REQUIREMENT

3.1. GENERAL REQUIREMENT

3.1.1 General Technical Requirements.

[Refer to PII.CV.SIII.SS3.1 – Article 3.1.1. General Technical Requirements]

3.1.2 Project Management and Site Services.

[Refer to PII.CV.SIII.SS3.1 - Article 3.1.2. Project Management and Site Services]

3.1.3. Engineering Services.

[Refer to PII.CV.SIII.SS3.1 - Article 3.1.3. Engineering Services]

3.1.4. Quality Assurance Requirements.

[Refer to PII.CV.SIII.SS3.1 – Article 3.1.4. Quality Assurance Requirements]

3.1.5. Electrical Requirements

Electrical requirements shall be in accordance with Volume II-F/1&2 Technical specifications for Electrical Equipment as attached in *Appendix 1*.

3.1.6. Instrument and control requirements.

Instrument and control requirements shall be in accordance with Volume II-E Technical specifications for Instrumentation and control as attached in *Appendix 1*.

3.1.7 Civil technical specifications

3.1.7.1 General technical specifications

All design; supply of materials, goods, and equipment; construction, fabrication, erection, and installation works shall comply with the applicable laws of Vietnam, as well as the current Vietnamese Codes and Standards.

In the event of any discrepancy between Vietnamese Codes/Standards and foreign standards (as required in the technical requirements/instructions listed in the table below), the more stringent code or standard shall apply.

The design and adjustment of construction drawings for the following components including: pile and foundation design; superstructure design; architectural design; finishing works design; design of sanitary and water supply and drainage systems; electrical power supply design; lighting system design; HVAC system design; lightning protection system design from the roof and connection to the plant's grounding grid; coordination with equipment suppliers to obtain input data for equipment layout design of relevant items, etc. as well as the supply of equipment, materials, goods, fabrication, construction machinery, manpower, etc. for the construction and installation of all works under this package, must comply with the technical requirements/instructions as listed and attached below:

No.	Technical specifications	Document number
1.	General specification and design criteria for civil and structural work	11-2010-K-G-SPC-2210-V2G1 (Volume: II-G/1)
2.	General specification and design criteria for architectural work	11-2010-K-G-SPC-2210-V2G2 (Volume: II-G/2)
3.	Technical specification for civil, structural and architectural work	11-2010-K-G-SPC-2210-V2G3-SEC-I to 11-2010-K-G-SPC-2210-V2G3-SEC-XXX (Volume: II-G/3)
4.	Technical requirements for the design and construction works of: power supply; lighting system; HVAC system; lightning protection system from the roof and its connection to the plant's grounding grid.	11-2010-K-G-SPC-2210-V2K5 11-2010-K-G-SPC-2210-V2F2-SEC-VII 11-2010-K-G-SPC-2210-V2F2-SEC-IX 11.2010-K-E-DWG-2341&2343
5.	Design basis report for civil, structural and architectural work	LP1-TKC-10XXX-C-C1-CRT-0001
6.	specification for colour schemes of architectural work	LP1-TKC-10XXX-A-A1-SPC-0005
7.	Specification for painting	LP1-TKC-10XX-M-G1-SPC-2022
8.	General notes, standard notes, standard details for structural steel drawings	LP1-TKC-10XXX-C-C1-DRD-0002 to -0005, and -0010
9.	General notes, standard notes, standard details for RCC structure drawings	LP1-TKC-10XXX-C-C1-DRD-0006 to -0009; LP1-TKC-10UHA-C-C1-CAL-0545; LP1-TKC-10XXX-SKC-C-REB-001.
10.	General notes, standard notes, standard details for General Architecture; Concrete wall; Door, Window, Finishes; Sanitary and Plumbing fixtures; Suspended ceiling; Water supply pipe size drawings	Folders: General Architecture; Concrete wall; Door, Window, Finishes; Sanitary and Plumbing fixtures; Suspended ceiling; Water supply pipe size.

3.1.7.2 Specific technical specifications

No.	Item	Requirements
1.	Reinforcement bar	Compliant with ASTM A615 standard: - Plain round steel bars, Grade 40; - Deformed steel bars, Grade 60. Or equivalent TCVN standard.
2.	Cement	Compliant with ASTM C150 standard: - OPC Type I cement shall be used for superstructure components; - OPC Type II cement shall be used for foundations and underground structures.
3.	Preformed single metal	- Preformed single metal: Zinc and aluminum alloy coating class AZ-200 as per AS 1397, Steel grade 550Mpa, with a minimum thickness of 0.645 mm (including the thickness of the aluminum-zinc coating and the paint layer). - Painting system: Top side: 5 microns anti-corrosive epoxy primer + 20 microns polyester top coat; Back side: 5 microns anti-corrosive epoxy primer + 5 microns polyester top coat. - Or equivalent coating system. - The corrugation height of the roofing and cladding metal sheet is determined based on the results of load-bearing and deflection calculations. - A service life of more than 25 years is required, and the product must be warranted for at least 20 years against corrosion in the Long Phu 1 environment.
4.	Structural Steel	- All rolled sections compliant with ASTM A36. - Plates for built up sections compliant with ASTM A36, ASTM A572 grade 50, ASTM A588 grade 50.
5.	Connection Bolts	Compliant with ASTM A325, ASTM A325F, or ASTM A490 Type 3.
6.	Piles	- The type of Piles shall be of precast/ Prestressed (centrifugal spun or square piles)/ Cast-in-situ/ Driven/ Bored piles as per relevant US/ Vietnamese Codes and Standards. Comply with the technical requirements specified in the attached documents No. 11-2010-K-G-SPC-2210-V2G1 and 11-2010-K-G-SPC-2210-V2G3-SEC-VII
7.	Preformed sandwich insulated metal sheet for roofing	- Preformed single metal: Zinc and aluminum alloy coating class AZ-200 as per AS 1397, Steel grade 550Mpa, with a minimum thickness of 0.645 mm (including the thickness of the aluminum-zinc coating and the paint layer).

	and cladding	- Painting system: Top side: 5 microns anti-corrosive epoxy primer + 20 microns polyester top coat; Back side: 5 microns anti-corrosive epoxy primer + 5 microns polyester top coat (the painting back side will be applied for side contact with insulation). Or equivalent coating system. - The corrugation height of the roofing and cladding metal sheet is determined based on the results of load-bearing and deflection calculations. - A service life of more than 25 years is required, and the product must be warranted for at least 20 years against corrosion in the Long Phu 1 environment. Preformed sandwich insulated metal sheet for roofing and cladding consists of three detailed layers: + Layer 1: Metal sheet grade 550 Mpa, with a minimum thickness of 0.645 mm (including the thickness of the aluminum-zinc coating and the paint layer). + Layer 2: Insulation layer shall be Polyurethane foam with a 90% closed cell structure. Density 37 Kg /cu.m determined in accordance with the procedure specified in ASTM D 1622-63 or as specified in the general specification of Architectural work for various building. + Layer 3: Metal sheet grade 550 Mpa, with a minimum thickness of 0.645 mm (including the thickness of the aluminum-zinc coating and the paint layer).

3.2. DETAILED REQUIREMENTS

In general, three (3) types of documents are provided as follows:

- The requirements specified in this bidding document.
- The technical documents/procurement specifications issued by PM/TKC during the previous EPC implementation stage (2014–2018).
- The original Request for Proposal from the Owner during the previous bidding stage **(Volume II - Technical Specification/Scope of Work (Original Technical Specification Request For Proposal - RFP) as attached in appendix 1)**.

All technical requirement documents referred to or incorporated herein shall be deemed applicable and binding as integral parts of this technical requirement.

In the event of any ambiguity or conflict between the documents listed above, the document with higher priority shall prevail in interpretation.

This updated document is not intended to provide a comprehensive description, indicate the status of all contract packages, or list all related documents. The Bidder is responsible for thoroughly reviewing, studying, and finalizing the engineering design, as well as

supplying materials/equipment/services to ensure completeness, high reliability, and ease of operation and maintenance.

3.2.1 STEAM GENERATOR AND AUXILIARIES

- 1) Boiler un-procured pipings
- 2) Boiler insulation & skin casing/lagging
- 3) Coal Bunker
- 4) Coal Feeder
- 5) Coal Mills
- 6) Selective Catalytic Reduction (SCR)
- 7) Ammonia Unloading & Storage System
- 8) Rotating Air Pre-Heater Equipment (RAPH)
- 9) Boiler Fans
- 10) Boiler PC/Gas/Air Ducts & Auxiliaries
- 11) Fuel Oil Transferring and Pressurizing System
- 12) Auxiliary Boiler

Refer to [PII.CV.SIII.SS3.2 – Article 3.2.1 Steam Generator and Auxiliaries]

3.2.2 STEAM TURBINE GENERATOR AND AUXILIARIES

- 1) Steam Turbine
- 2) Generator
- 3) LPH 2-3-4
- 4) HPH 6-7-8
- 5) Deaerators
- 6) Boiler Feed Pumps & Booster Pumps
- 7) Condensate Extraction Pumps
- 8) Cooling Water Pumps
- 9) Turbine Oil Purification System
- 10) Condensate Polishing System
- 11) Condenser and LP#1 & DC#1
- 12) Condenser Air Extraction Equipment
- 13) Condenser WaterBox Priming Vacuum Pump
- 14) Condenser Online Tube Cleaning System & Debris Filter
- 15) Chemical Dosing System

Refer to [PII.CV.SIII.SS3.2 – Article 3.2.2 Turbine Generator, Auxiliaries]

3.2.3 POWER CYCLE PIPING, VALVES, SPECIALTIES AND THERMAL INSULATION

- 1) HP Piping (Power cycle Piping) and Hanger Support
- 2) HP & LP Bypass Valve

- 3) Control Valve
- 4) HP Safety Valves including Silencers
- 5) HP Valve & Piping Specialties
- 6) Thermal Insulation

Refer to [PII.CV.SIII.SS3.2 – Article 3.2.3 Power Cycle Piping, Valves, Specialties And Thermal Insulation]

3.2.4 INSTRUMENTATION AND CONTROL

- 1) General Requirements
- 2) Design Principles
- 3) General Scope of Works
- 4) Distributed Control System (DCS)
- 5) Steam and Water Analysis System (SWAS)
- 6) Environment Monitoring System (EMS)
- 7) Rotating Machine Condition Monitoring System (RMCMS)
- 8) Plant Communication System & SCADA
- 9) CCTV Monitoring System
- 10) Field Instrument, Control Valve and Actuator
- 11) Instrumentation Hardware
- 12) Instrumentation and Control Cable
- 13) Panel, Junction Box, Local Panel, Rack
- 14) Subsystem

Refer to [PII.CV.SIII.SS3.2 - Article 3.2.4 Instrumentation And Control]

3.2.5 ELECTRICAL

- 1) Generator Transformers
- 2) Unit Transformer
- 3) Station Transformer
- 4) Aux. Transformer
- 5) 220kV, 500kV Interconnection System
- 6) 10kV & 3kV Segregated Phase Busduct
- 7) 10kV, 3kV MV Switchgears
- 8) 220 DC system
- 9) 400V PCC MCC ACDB & DCDB and NSPB
- 10) Emergency DG Set
- 11) Generator Circuit Breaker
- 12) Isolated phase busduct
- 13) MV Power, LV Power & Control Cables
- 14) Relay Panels & Metering Panels
- 15) UPS System

- 16) Neutral Grounding Resistor
- 17) Grounding & Lightning System
- 18) Illumination System
- 19) Cable routing (Cable trench, Cable Tray, ductbank and all accessories)

Refer to [PII.CV.SIII.SS3.2- Article 3.2.5 Electrical requirement]

3.2.6 BALANCE OF PLANT

- 1) Waste Water Treatment System
- 2) Compressed Air Equipment
- 3) Hydrogen Generation Plant and CO2 Cylinders
- 4) Nitrogen Gas Cylinders
- 5) Heating, Ventilation and Air Condition (HVAC)
- 6) Main CW Piping and Auxiliary CW Piping
- 7) Intake Chlorination System
- 8) Miscellaneous Cranes & Hoist
- 9) LP Valves & Specialties (*exclude LP Valve in Water Treatment Plant*)
- 10) Miscellaneous Horizontal Pumps
- 11) Miscellaneous Vertical Pumps & Sump Pumps (*exclude 8 pumps in Water Treatment Plant*)
- 12) Field Fabricated Tanks (*exclude 2 Demin Tanks*)
- 13) Shop Fabricated Tanks
- 14) LP Piping and Specialties (*exclude LP Piping in Water Treatment Plant*)
- 15) Elevator for Boiler, PHB, CECB
- 16) TG Hall EOT Crane
- 17) CCCW Heat Exchange

Refer to [PII.CV.SIII.SS3.2 – Article - Balance of Plant]

3.2.7 CIVIL & MAJOR STRUCTURAL STEEL WORK

The Bidder shall carry out the design; supply of materials, goods, and equipment; construction, fabrication, erection and installation in compliance with all technical requirements and the scope of work clearly specified in **Section 1.2.2.4/ b**; **Section 3.1.7**; **Table 2.1** - Design, construction status and Scope of works-civil part;

And Table 2.2: Design, construction status and scope of works for structural steel works of major items.

3.2.8 ELECTROSTATIC PRECIPITATOR - ESP (OWNER'S SCOPE)**3.2.9 FLUE GAS DESULFURIZATION – FGD (OWNER'S SCOPE)****3.2.10 LIMESTONE HANDLING - GYPSUM HANDLING SYSTEM (OWNER'S SCOPE)****3.2.11 FIRE PROTECTION AND DETECTION SYSTEM (OWNER'S SCOPE)****3.2.12 COAL HANDLING SYSTEM (OWNER'S SCOPE)****3.2.13 ASH and MILL REJECT HANDLING SYSTEM (OWNER'S SCOPE)****3.2.14 WATER TREATMENT PLANT (OWNER'S SCOPE)**

Any additional items, material, services which are not specifically mentioned here but are required to make the equipment complete in every respect in accordance with the technical requirements for safe, trouble free & efficient operation and guaranteed performance, shall be deemed to be covered within the scope of this package.

3.3. TERMINAL POINTS

Based on the division of packages, the Owner list out the interface between this package and other packages as **Table 10**, (*i.e. 220kV/500kV Substation, Coal Handling System; Ash Handling System & Mill Reject System; Limestone & Gypsum Handling System; Chimney; Water Treatment Plant; ESP & FGD; Boiler; Intake Water; Warehouse, Workshop, Canteen, etc.*). The Bidder is responsible for researching and clarifying with the Owner/other Contractors (if necessary) to avoid unnecessary disputes during the contract implementation.

IV. PERFORMANCE GUARANTEES

Refer to [PIL.CV.SIV - Performance Guarantees]

V. TRAINING REQUIREMENT

The Bidder will provide the Training program including Oversea Training and O&M Training at Site, On-job Training is not in Bidder's scope. The detailed materials & equipment which needed to be provided training program are indicated in Table 8 DOR including *i)* Group of materials/equipment/systems to be supplied by the Bidder and *ii)* Group of materials/equipment/systems currently stored at the construction site.

Total training man-months as bellows:

No.	System	Days	No. Trainees			Remarks
			Operation	Maintenance	Total	
a) Training at Bidder's Premises (Oversea)						
1	Effluent Treatment System	5	5	5	10	
2	Distributed Control System (DCS)	20	12	6	18	
b) O&M Training at Site						
No.	System	Days			No. Trainees	Remarks
1	Ammonia unloading and storage system	5	5	5	10	
2	Turbine Oil Purification System	1	5	5	10	
3	Condensate Polishing System	1	5	5	10	
4	Effluent Treatment System	9	5	5	10	
5	Generator Transformers Unit 1	3	5	5	10	
6	Station Transformer and Auxiliary Transformers	5	5	5	10	Training – 5 man/days for oil transformers & 5 man/days for dry type transformers
7	Distributed Control System (DCS)	3	5	5	10	

8	Intake Chlorination System	5	5	5	10	
9	HVAC System (except Admin building, Workshop, Warehouse, Canteen and Separate Packages BOPs)	10	5	5	10	
10	HP & LP Bypass Valves	1	5	5	10	
11	Control Valve	1	5	5	10	
12	HP Safety Valves including Silencers	1	5	5	10	
13	HP Valves & Piping specialties	1	5	5	10	
14	LP valves & specialties	1	5	5	10	
15	Generator Circuit Breaker	2	5	5	10	
16	400V PCC/MCC, ACDB & DCDB	8	5	5	10	1 trainer per 8 days
17	Relay Panels & Metering Panel	5	5	5	10	1 trainer per 5 days.
18	220 DC System (with Lead Acid Battery)	4	5	5	10	Training – 1 trainer per 4 days
19	UPS	4	5	5	10	Training – 1 trainer per 4 days
20	Emergency DG Set	1	5	5	10	
21	Rotating Machine Condition Monitoring System (RMCMS)	7	5	5	10	
22	CCTV Monitoring System	1	5	5	10	

23	Online Environmental Monitoring System	2	5	5	10	
24	- Plant communication System Technology - SCADA - VCGM/DIM - Cyber security license	3	7	3	10	
25	Boiler and BOP Field instruments	2	0	10	10	
26	Coal feeder	2	5	5	10	
27	RAPH	10	5	5	10	
28	Auxiliary Boiler	8	5	5	10	
29	Condenser Online Tube Cleaning System	1	5	5	10	
30	Steam and Water Analysis System (SWAS)	3	5	5	10	
31	TG Hall EOT Crane	1	5	5	10	
32	Compressed Air System	1	5	5	10	
33	Generator Transformers Unit 2 (at Site)	3	5	5	10	
34	Unit Transformers	3	5	5	10	
35	Hydrogen Generation Plant	5	5	5	10	
36	CCCW Heat Exchanger	1	5	5	10	

The above training program is estimated time line for Bidder's proposal preparation, in case of Bidder consider that this is need more duration/Trainers/Trainees, Bidder could propose the additional program to the Owner for consideration.

VI. Testing and commissioning

6.1 General

Upon completion of erection, the Bidder shall be responsible for conducting inspections, testing, adjustments, cleaning, flushing, and necessary preparations to ensure that each system and equipment component is complete, safe, and ready for commissioning works.

The Bidder shall conduct all tests within its scope, and the Owner shall be given the opportunity to witness these tests.

The whole of the works shall be tested in accordance with the standards adopted for the Project and the Bidder's quality plans and testing procedures which are reviewed and agreed by the Owner.

The Bidder shall provide qualified and experienced mechanical, electrical, instrumentation, operations, testing, and supervisory personnel, as required to coordinate with commissioning Contractor in all phases of the commissioning, and plant testing phase.

The Bidder shall furnish all standard and special test instruments, tools, and equipment, and shall provide all consumables including commissioning water, chemicals (such as ammonia and chemicals for the chemical dosing system, etc), lubricating oils, greases as well as all commissioning spare parts and other necessary materials required for commissioning activities up to the COD of Unit 2.

The Bidder shall be responsible for supplying electric power during installation and until the completion of commissioning activities under its scope. Thereafter, upon handover to the Owner for overall plant commissioning, the responsibility for supplying electric power shall be assumed by the Owner.

Coal, oil, and limestone for commissioning shall be supplied by the Owner.

The Bidder shall also provide skilled construction craftsmen and labor support as necessary.

The Bidder shall arrange and schedule adequate sub-contractor's service engineer for installation, checkout, testing, coordinate in start-up, and initial operation of Plant, components, and systems, as required.

The Bidder shall be responsible for modification, rectifying any issues and replacing any defective components of the equipment and systems within Bidder's scope during the commissioning period.

The Bidder shall be responsible for implementing HSSE management measures to ensure safety throughout all construction and commissioning activities.

All commissioning areas shall maintain safe conditions, including proper PPE for personnel, visible hazard signage, available firefighting equipment, verified emergency stop functions, and application of valve tagging and pad-locking procedures to ensure isolation and protection during commissioning activities.

Compliance with the Hazardous Material Control Plan is required. Chemicals must be stored safely with trays under glass containers, in well-lit, ventilated areas away from hazards. The First-In, First-Out (FIFO) principle shall be followed to avoid chemical deterioration or expiry.

The Bidder shall ensure strict implementation of Permit to Work (PTW) and Lockout–Tagout (LOTO) procedures. A valid PTW must be issued, kept on-site, and accompanied by an Isolation Request Form with relevant drawings. Only designated LOTO Engineers are authorized to apply or remove locks and tags.

All measurements shall be performed using properly calibrated test instruments in compliance with applicable Vietnamese standards and relevant international test codes. The Bidder shall provide the Owner with a list of commissioning test equipment, accompanied by valid calibration certificates.

6.2 Testing and commissioning

An erection checklist prepared and maintained by the Bidder shall be countersigned by the Owner after the satisfactory completion of each part of the systems. Copies of Site erection inspection document files for items of systems shall be distributed prior to commissioning.

The Bidder shall demonstrate the correct alignment of equipment intended to be coupled with other rotating parts (e.g., motors, generators, reduction gears) during site installation. The alignment results shall be subject to the Owner's satisfaction. The alignment results shall be entered into an appropriate alignment report sheet which shall be countersigned by the Owner and the Bidder.

After completion of erection, non-destructive and pressure testing as appropriate, further tests including commissioning function trials shall be made on individual items of Plant and their alarm and shut-down systems to satisfy the Owner that the Plant is ready to be safely commissioned.

The Bidder shall submit a comprehensive description of each test, including the type and classification of all test equipment. This documentation shall be submitted for review at least 90 days prior to the proposed test date.

Certificates shall be issued for each test made. Group certificates are acceptable for the tests of cabling and similar items.

Mechanical and electrical/control function tests, interlock/ protection test shall be performed on all parts of the turbine, boiler, associated auxiliary systems, and generators within scope of Bidder.

Commissioning checks on mechanical parts shall include:

- Individual commissioning runs (test runs) of all rotating equipment such as motors, pumps, dampers, compressors, fans, dosing equipment, etc.;
- Functional tests of the mechanical equipment, process system, alarm and tripping systems.

The Bidder shall perform testing for Bidder's scope and shall not be limited to the following items and tests mentioned.

6.2.1 Mechanical Equipment

All pressure parts shall be hydrostatically tested in accordance with ASME procedures. Pre-commissioning activities shall include check for free rotating before coordinate with commissioning Contractor to carryout individual runs of all rotating auxiliary equipment.

The Bidder shall be responsible for preparing and submitting all necessary applications to obtain approval for the boiler installation and other pressure equipment, including tanks, heaters, air tanks, and pressure cylinders within Bidder's scopes, in accordance with applicable Vietnamese regulations.

The Bidder shall also be responsible for performing oil flushing and chemical cleaning activities, including the supply, installation, operation, and dismantling of necessary equipment, as well as oil sampling and the provision of analysis certificates upon completion of the flushing process. These activities shall include, but not be limited to, the following:

- + Prepare and submit the piping flushing procedures (including chemical cleaning, oil cleaning, water cleaning, air flushing, etc.). This scope will be executed for the following system:
 - Chemical cleaning for main boiler and feed & condensate water system (both water and steam sides)
 - Oil cleaning shall be performed for all lubrication and hydraulic systems associated with major rotating equipment, including but not limited to: HPU, Gearboxes of Pulverizers, pumps, main turbine and generator lubrication systems, boiler fans, hydraulic oil systems, and other systems utilizing motor drives
 - Water cleaning/flushing for all ancillary pipelines relating to water system such as closed cooling water, stator cooling water, Demin water distribution system...etc.
 - Air flushing for compress air system piping
- + Provide flushing procedures including flushing sequence, installation/inspection requirements, consumables and flushing criteria with attachment technical

documents and calculations (P&ID, arrangement, power supply drawings, welding, preliminary schedule, report, etc.).

Supply: The Bidder shall supply all temporary materials/equipment and necessary consumables for piping cleaning, flushing to Long Phu 1 site.

Delivery: Bidder shall be responsible for delivery the equipment and materials to Long Phu 1 site.

Installation, erection: Bidder shall be responsible for the following:

- + Install/erect the temporary materials and equipment for cleaning, flushing, steam blowing in accordance with the document approved by Owner.
- + Dismantle, clearance for the temporary system including wastewater disposal, restore and reconnect the permanent systems.

The Bidder shall supply, install, pressure test, and dismantle all temporary piping, silencers, supports, and exhaust systems required for steam blowing activities, including but not limited to the following activities:

- + Engineering: The Bidder shall complete design for the temporary steam blowing system, including but not limited to the following:
 - Piping and Instrumentation Diagrams (P&IDs)
 - General Arrangement (GA) drawings
 - Isometrics of temporary piping
 - Stress analysis of temporary and permanent piping for steam blowing loads (including reaction forces at anchors/supports, thermal expansion, dynamic loads during blow)
 - Detailed calculations for blow parameters (mass flow, velocity, pressure, temperature, momentum criteria)
 - Selection and sizing of temporary piping (including silencers, target plates, blind flanges, temporary supports, and expansion loops/devices)
 - Design of temporary supports and anchors for all temporary piping to withstand dynamic loads.
 - Selection and sizing for temporary valves, drains, vents, and instrumentation.
 - Detailed steam blow procedure development, including sequence, target plate installation/inspection, and blow criteria (sound, visual, target plate impression).
 - + Supply: The Bidder shall supply steam blowing and temporary equipment in accordance with the steam blowing procedure approved by Owner to Long Phu 1 site.
- Delivery: Bidder shall be responsible for delivery the equipment and materials to Long Phu 1 site.
- Installation, erection: Bidder shall perform Installation/erection, alignment temporary steam blowing system according to approved drawings by the Owner, perform dismantling and clearance as well as reconnect permanent piping after finish steam blowing phase.

+ Detail requirements of steam blowing preparation works

Codes & Standards: All design, fabrication, installation, and testing shall comply with relevant international codes and standards, including but not limited to:

- ASME B31.1 (Power Piping)
- ASME Boiler and Pressure Vessel Code (BPVC) Sections I, II, V, VIII, IX
- AWS D1.1 (Structural Welding Code – Steel)
- API RP 11SC (Recommended Practice for Steam Blow of Pipelines) - if applicable, or equivalent power plant specific guidelines.
- Local statutory requirements and environmental regulations.

Materials: Temporary piping materials shall be suitable for the design temperatures and pressures and the number of blowing cycles. Minimum requirements shall include P11/P22/P91 equivalent for high-temperature sections and A106 Gr. B/C for lower temperature sections, where applicable.

Silencers: Temporary silencers shall be designed to effectively reduce noise levels during steam blowing to acceptable limits as per local regulations and project specific requirements (e.g., 85 dB at 1 meter).

Target Plates: The Bidder shall supply suitable target plates to assess the cleanliness of the piping.

- Safety Interlocks & Controls: Temporary system shall incorporate necessary safety features and controls to prevent accidental release or uncontrolled operation

6.2.2 Electrical Equipment

The following checks and test measurements shall be made during erection and commissioning in accordance with standards and procedures approved by the Owner:

- Verification of screwed tighten connections for proper assembly;
- Terminals and terminal connections for correct assembly;
- Checking of earthing connections and testing of earthing resistance;
- Measurement of insulation values;
- Wiring Continuity Tests, loop test;
- Check Fire proof partitioning;
- Marking, inscription, provision of designation plates;
- Voltage checks;
- Polarity checks in the case of D.C. voltages;
- DC system, UPS, and battery system tests;
- Fuses, over-current trips, short-circuit trips, time settings, relay settings;
- Check Transformer oil levels;

- Transformer Voltage Testing;
- Check Safety signs and warning signs;
- Secondary circuit test, current and voltage transformer measurement test;
- Setting/calibrating indicators, feedback signals to the central control room etc;
- Checks on wiring and cabling for conformity with the constructional circuit drawings and plans;
- Dielectric tests;
- Emergency Generator Check & Test;
- Protection Relay Test of Generator Step-up Transformer (GSUT) and Unit Auxiliary Transformer (UAT), Station Transformer, 500kV, 220kV overhead line for System prior to Energizing;
- Isolated Phase Bus Test (IPB Test);
- GSUT Tap changer Test;
- Generator Circuit Breaker and Bus test;
- Generator protection relay test;
- Overall Electrical Interlocking Protection Test;
- Power Energizing (Power Receiving from Grid);
- Energizing LV & MV Switchgear / MCC, DB, LCP;
- Motor Solo Running Test;
- Trip tests;
- Fault monitoring system;
- Test for Dispatch Instruction Management (DIM), Tariff Metering test and sealing, SCADA, Hot line;
- Functional test on electrical equipment.

Tests on the transformers

- During installation: checking of complete delivery, checking of core earthing and insulation of active part from tank, HV sample tests of transformer oil in accordance with IEC, or equivalent Standards;
- Checking for perfect electrical and mechanical correctness and for the airtightness of individual main connections system;

- The Bidder shall be responsible for transformer oil filling, filtering, sampling, and analysis, with the sampling report to be certified by an independent third-party laboratory;
- Prior to energization of any auxiliary equipment or system, the Bidder shall submit the commissioning check results to the Owner for review.

Tests on the earthing and lightning protection system

- Acceptance tests and measurements of the earthing installations in accordance with IEC Standards.

Tests on the lighting system

- Proof of the average and minimum new value of lighting densities, checking of correct operation both electrically and mechanically.

Prior to energization of Generator Transformers, Unit Transformers, Station Transformer from National Grid, the Bidder shall submit the pre-commissioning check results and relevant acceptant certificates (including respective firefighting acceptant certificates which provided by the Owner) to apply permit for energization from NSMO (National Electricity System and Market Operation) Company.

6.2.3 Control and Monitoring Equipment

During the erection period, and before the corresponding plant items is put into operation, all control and monitoring equipment shall be tested.

i) These group tests shall include calibration, functional testing, and energization of the control system:

- Checking and energization of DCS, PLC control system;
- Calibration tests of all analog measuring loops including all remote indications and recorders and the input signals used for closed loop control;
- Testing of all binary transmitters by actuating the plant mounted transmitters. Those which cannot be actuated at the primary element shall be simulated as close as possible to their sensors;
- Wiring test of all control cabling in the field, relay room and control rooms combined with the function tests;
- Testing of all control modules in the control room;
- Calibration for instruments;
- Instrument Leakage/Pressure test;

ii) Individual functional testing of remote control of drives, circuit breakers, solenoid valves, actuators etc.

- Testing of open loop devices especially all sequence logic equipment using simulated inputs.
- iii) Testing of all interlocks and safety protections to ensure safe operation.
- iv) Testing of the alarm annunciation and event recorder system in connection with all field and control room devices using simulated inputs.
- v) Testing and raw tuning of all closed loop controls.
- vi) Control sequences dry-run with simulation
- vii) Testing of insulation between cable screen and ground.

6.2.4 Subsystems

For the auxiliary systems below, the Bidder shall be fully responsible for commissioning and guarantee testing until final completion and handover to the Owner.

List of systems:

- Ammonia unloading and storage system,
- Turbine Oil Purification System,
- Condensate Polishing System,
- Intake Chlorination System,
- Effluent Treatment System,
- Emergency DG Set,
- Compressed Air System,
- Auxiliary Boiler,
- Hydrogen Generation Plant,
- HVAC System.
- Others.

Upon completion of the commissioning tests, the Bidder shall develop statements of remarks and shortcomings (punch lists), indicating the corresponding corrective measures and schedules for their elimination, and shall monitor the implementation and closure of these corrective actions.

6.3 Report

After erection and commissioning checks of individual Plant have been completed, the Bidder shall submit the test report of commissioning checks to the Owner for review.

The test documentation shall include, but not be limited to, the following:

- Design documents, specifications, P&IDs, and other related technical documentation;
- List of testing equipment;

- Approved test procedures and detailed descriptions;
- Exceptions observed during the test;
- Calibration records of all test instruments used;
- Comprehensive test results and completed data sheets;
- Instrument calibration certificates;
- Alignment reports;
- Functional test records;
- Interlock/ Protection test reports
- Punch list
- Conclusion.

All documents shall be signed by the Bidder's authorized representative and, where applicable, countersigned by the Owner or their representative upon review or witnessing.

Group test certificates may be submitted for repetitive or similar items (e.g., cable insulation tests), provided that traceability and completeness are ensured.

The Owner's approval of the test documentation shall serve as a basis for the issuance of the Mechanical Completion Certificate for the relevant system or component.

The Bidder shall submit all test documentation at least 14 days prior to the expected Mechanical Completion date for timely review.

VII. SPARE PARTS, SPECIAL TOOLS

The Bidder shall supply one complete set of special tools and tackles along with the equipment required for the erection, assembly, dis-assembly & maintenance of the equipment. The Bidder shall include in Bidder's scope of supply all the necessary start-up, commissioning spare parts.

The Bidder is requested to propose a list of recommended for 2 years operation spare parts for the Owner to consider purchasing during operation the Power Plant in later stage

The Bidder to fill-in Form No. 19 (c). List of spare parts and special tools, Chapter IV – Bidding Forms.

VIII. DOCUMENTS SUBMITTED BY BIDDER

8.1 During the bidding phase:

During the bidding phase, the bidder must submit, at a minimum, the following technical documents for the Owner's evaluation in accordance with the provisions in Item 3. [TECHNICAL EVALUATION CRITERIA] of Chapter III:

- a) To demonstrate a clear understanding of the scope of work for the bidding package, the Bidder must provide a detailed description of their proposed scope of work, which shall include, but not be limited: design, procurement, supply, construction and installation, commissioning, and other related services required for successful project completion;
- b) The Bidder shall provide documentation demonstrating ownership of specialized design software appropriate to the scope of engineering, as well as evidence of valid software licenses;
- c) Confirmation of compliance with the project's standards, regulations, and the latest legal requirements of Vietnamese law regarding the design, procurement, installation, commissioning, and other related services;
- d) The Bidder shall complete the detailed Technical Schedule of equipment, materials, and systems within the scope of supply, using the template “**Technical Schedule for Proposal**” attached in [Attachment Documents] of this Chapter;
- e) The Bidder shall comply with the technical requirements as stipulated elsewhere in item 3.2 Detailed Requirements. In case of any deviations, the Bidder shall submit a deviation Sheet as Form No.23 [TECHNICAL DEVIATION DECLARATION FORM] in chapter IV of bidding document.
- f) The Bidder shall submit the contract execution period and the Level 1 schedule as described in Section 2.2 of this Chapter;
- g) The Bidder shall submit Technical solutions for organizing and executing the work including Technical solutions, implementation plan for engineering, manufacturing, transportation, delivery schedules, Construction and erection, commissioning, etc;
- h) The Bidder shall provide an organizational chart and a detailed description of the Bidder's organizational structure at the construction site. The organizational structure may include the following components:
 - Technical, Quality, and Schedule Management Department

- Safety, Fire Protection, Security, and Environmental Management Department
 - Materials and Equipment Management Department
 - Acceptance and Completion Documentation Management Department
 - Construction Teams
- i) The Bidder must present the quality management approach for the project. The minimum requirements include: Quality Management System; Quality Assurance and Quality Control Plan (QA/QC Plan); QA/QC personnel; Procedures for quality control of materials and equipment; Quality control of construction and installation; etc.
- j) The Bidder shall present a Health, Safety, and Environment (HSE) Plan to ensure compliance with the current legal regulations of Vietnam. The HSE Plan must include, at a minimum, the following contents: labor safety measures; fire prevention and firefighting measures; and environmental sanitation measures.
- k) The Bidder shall: i) fill in the auxiliary power consumption data for the systems and equipment provided by the Bidder as specified in **4.4.2. Auxiliary Power Consumption**; ii) ensure compliance with the wastewater parameters and noise level requirements as specified in **Section 4.4.3. Effluent and Sewage Discharge and section 4.4.4. Noise emissions**
- l) The Bidder shall provide a training program that meets the requirements specified in Section V. TRAINING REQUIREMENT.
- m) The Bidder shall commit to a minimum warranty period of 24 months from the Commercial Operation Date (COD) for:
- + All materials and equipment within the Bidder's scope of supply and
 - + All materials and equipment within the Bidder's scope installation.
- n) The Bidder shall commit to supplying the key equipment/systems with the country of origin (CO) specified in the table below:

<u>No.</u>	<u>Equipment/System</u>	<u>Country of Origin Requirement</u>	<u>Q& E Requirement</u>	<u>Submission Evidence</u>
1	Generator transformer Unit 1 and its Auxiliaries, including OLTC, Bushing, Bushing CTs, Buchholz relay, Pressure relay, Oil Temperature Meter, Winding Temperature Meter, Cooling system	From OECD countries or from other countries under a valid license of a company from EU/G7 country or Viet Nam	The Bidder shall demonstrate that: - The OEM has the successful experience and good track records in the design and manufacturing of respective equipment for more than ten (10) years worldwide (up to the deadline for bid submission). - The OEM has supplied the respective equipment for at least one (01) coal power plant with capacity 600MW and one (01) coal power plant shall have at least two (02) years of successful operation from the date of issuing the Taking Over Certificate or Provisional Acceptance Certificate.	- Owner/End-user Certificate (using Form No. 18 (c) furnished in Chapter IV - Bidding Forms) or its equivalent); - Supplementary documents: Company profile, catalogue, reference list, type tests, etc.
2	TU, TI, LA at HV side of Generator transformers			
3	DC and UPS system			
4	Distributed Control System			
5	Generator Circuit Breaker			
6	Relay Panels & Metering Panel			
7	Field instruments			
8	CCCW Heat Exchanger			
9	- HP & LP Bypass Valves; - HP Safety Valves; - Control Valves;			

	- HP Valves			

o) The Bidder must submit the list of vendors for all systems/equipment mentioned in Group 1.2.2.a.1. [Group of materials/equipment/systems to be supplied by the Bidder] and Group 1.2.2.a.2.4 [optional proposal] for Owner reference under Form. 19(a) Chapter IV.

The potential sub-vendors must have experience in supplying the respective equipment for at least one (01) coal-fired power plants with a capacity of 600MW, of which at least one (01) plant must have been in successful operation for a minimum of two (02) years from the date of issuance of the Taking Over Certificate or the Provisional Acceptance Certificate.

Bidders shall be entitled to use the List of Referenced Supplier/Vendor/Subcontractor as Table 11.1 and table 11.2 attached, including but not limited to those listed, for reference in order to fulfill Form 19 (a) accordingly.

8.2 During the execution of the contract:

The bidder shall submit a Master Document List (MDL) that includes, at a minimum, the following documents and/or information

- a) System description and specification
- b) Scope of Interface
- c) Capacity, technology, and equipment specifications, technical datasheet
- d) General arrangement drawings (plan, elevation, section view), P&ID drawings, Single line diagram...
- e) Operation & Control Philosophy
- f) Foundation drawing including loading data
- g) Control system configuration diagram
- h) Recommend Spare part list for 02 years operation
- i) Electrical load list (including power consumer and consumption)
- j) Catalogues
- k) The Bill of quantity to be purchased/manufactured as per scope of work
- l) Training program concept
- m) 3-D modeling (including Equipment, piping and support) (if required)
- n) Operation & Maintenance Manual (O&M)
- o) Water-Balance Diagram within bidder's scope
- p) Other documents which can be helpful for completion of scope of work or required by Owner during engineering phase

IX. Attachment Documents

- Appendix 1: Vol II - Technical Specification/Scope of Work (Original Technical Specification RFP).
- Appendix 1.1 Document designed by the former EPC contractor
- Appendix 2: Civil part- Attachments (Including the list of attached documents and attached documents)
- Table 01: Summarized the entire design documents, procurement, delivered equipment, erected equipment
- Table 2.1: Design, construction status and scope of works- Civil part
- Table 2.2: Design, construction status and scope of works for structural steel works of major items
- Table 2.3: The detailed Bill of Quantities for reference purposes only - Civil part
- Table 03: List of deviations
- Table 04: List of Design Change Request (DCR) & Attachment
- Table 05: List of Non-Conformance Report (NCR) & Attachment
- Table 06: List of delivered materials/equipment & Attachment

- Table 6.1 – List of Materials and Equipment Handed Over by the Owner to the Bidder
- Table 07: Contact list of subcontractors/suppliers
- Table 08: Division of Responsibility (DOR)
- Table 09: Bill of Quantities (*09.1 Supply and erection; 09.2 Civil and architecture; 09.3 Services; 09.4 Optional prices*)
- Table 10: Terminal Point & Attachment
- Technical Schedule for proposal
- Attachment of 2. PII.CV.SIII.SS3.2 -Article 3.2.1 Steam Generator and Auxiliaries;
- Attachment of 3. PII.CV.SIII.SS3.2 -Article 3.2.2 Turbine Generator, Auxiliaries;
- Attachment of 4. PII.CV.SIII.SS3.2 -Article 3.2.3 Power Cycle Piping, Valves, Specialties And Thermal Insulation;
- Attachment of 5. PII.CV.SIII.SS3.2 -Article 3.2.4 Instrumentation And Control;
- Attachment of 6. PII.CV.SIII.SS3.2 -Article 3.2.5 Electrical requirement;
- Attachment of 7. PII.CV.SIII.SS3.2 -Article 3.2.6 Balance of Plant;
- P2CV S3.2.7 - Attachment for Table 2.2
- Table 11.1 - List of referenced Supplier/Vendor/Subcontractor;
- Table 11.2 - List of referenced Domestic Supplier/Vendor/Subcontractor;
- Attachment - Optional Proposal for materials & equipment belong to PM's ownership;
- Table 12 Total Plant Auxiliary Power Consumption

SECTION III

SUB-SECTION 3.1 GENERAL REQUIREMENTS

ARTICLE 3.1.1. GENERAL TECHNICAL REQUIREMENTS

[PII.CV.SIII.SS3.1 – Article 3.1.1]

SECTION III**SUB-SECTION 3.1****Article 3.1.1. GENERAL TECHNICAL REQUIREMENTS****TABLE OF CONTENTS**

CLAUSE NO.	DESCRIPTION
1.00.00	CODES AND STANDARDS
2.00.00	RESPONSIBILITY FOR DESIGN
3.00.00	NAME PLATES (RATING PLATES)
4.00.00	SAFETY AND SECURITY
5.00.00	GUARDS
6.00.00	LOCATION AND LAYOUT REQUIREMENTS
7.00.00	OPERATION, MAINTENANCE AND AVAILABILITY CONSIDERATIONS
8.00.00	MATERIALS
9.00.00	LUBRICATION
10.00.00	LUBRICANTS & CONTROL FLUIDS
11.00.00	OPERATION AND MAINTENANCE
12.00.00	PLANT LIFE AND MODE OF OPERATION
13.00.00	PACKAGING & MARKING
14.00.00	PROTECTION
15.00.00	PAINTING
16.00.00	COLOUR CO-ORDINATION AND FINISH
17.00.00	ENVIRONMENT PROTECTION AND NOISE LEVEL REQUIREMENT
18.00.00	INSPECTION AND TESTING
19.00.00	TRAINING OF OWNER'S PERSONNEL
20.00.00	DEVIATIONS

ATTACHMENTS

ANNEXURE-I LIST OF STANDARDS FOR REFERENCE

ANNEXURE-II CRITERIA FOR LAYOUT

SECTION III

SUB-SECTION 3.1

Article 3.1.1. GENERAL TECHNICAL REQUIREMENTS

1.00.00 CODES AND STANDARDS

- 1.01.00 All equipment, materials and systems will be designed, manufactured and tested in accordance with the latest issue of the relevant internationally acceptable codes and standards such as BS, JIS, DIN, American Standards (G7 Countries' Codes and Standards) as well as Vietnamese Standards and regulations wherever applicable. Alternative codes and standards proposed by Contractors during the project implementation phase will only be accepted if the Contractor can demonstrate equivalency to the specified codes and standards. The use of alternative codes and standards will be subject to the approval of the Owner's Engineer and the Owner.

The following TCVN standards are mandatory and shall be followed:

- Site Data, load and effect
- Fire Fighting
- Environment.

- 1.02.00 The design of plant, equipment and system as specified in the Tender document reflect the state-of-the-art for similar applications. Tenderer shall make an offer strictly in line with the requirement of the specification. However, in addition to the base offer, he may also offer one or more designs, provided such alternative offers do not detract from the quality, safety, operability or durability of the equipment and material as furnished in the base offer. However, Tenderer shall set forth in his proposal the alternative codes / standards and / or design features he proposes and list out clearly specific difference from the Technical Specification, so that a direct comparison can be made by the Owner / Engineer before signing of the Contract.

- 1.03.00 The plant will be designed in compliance with applicable National and International Codes and Standards such as ASME, ASTM, DIN, BS, IEC, IEEE, Vietnamese standards, etc. Wherever specified or required the Plant shall conform to various statutory regulations of the country of Vietnam. Wherever required, approval for the plant supplied under the specification from statutory authorities shall be the responsibility of the Contractor.

- 1.04.00 In the event of any conflict between the codes and standards referred above, and the requirements of this specification, the requirements, which

are more stringent, shall govern.

1.05.00 In case of any change of code, standards and regulations between the date of purchase order and the date the Contractor proceeds with manufacturing, the Owner shall have the option to incorporate the changed requirements. It shall be the responsibility of the Contractor to advise Owner of the resulting effect.

1.06.00 Successful EPC Contractor to furnish two (2) sets of latest of national/inter-national codes and standards applicable for this project, to the Owner.

2.00.00 RESPONSIBILITY FOR DESIGN

2.01.00 The Contractor shall assume full responsibility for the design of the whole and every portion of the Plant, whether or not the design work was undertaken specifically in relation to the Contract and whether or not the Contractor was directly involved in the design work.

2.02.00 Notwithstanding the Owner's wish to receive the benefits of new, advanced and improved technologies, a prime requirement is that all the systems and components proposed shall have been already adequately developed and shall have demonstrated good reliability under similar, or more arduous conditions elsewhere, at least for continuous 2 years in two different power stations.

2.03.00 The successful Contractor shall have to carry out, Pump and sump model studies, Circulating Water Discharge recirculation study, surge analysis, BFP transient analysis and other transient condition studies as may be necessary and as required by the Owner as per proven engineering practice.

2.04.00 The Bid shall include a detailed discussion on the development status of, and the reasons for any changes made in proposed systems or components for the Plant, as compared with similar items previously supplied in other installations cited by the EPC Contractor as reference plants.

2.05.00 The EPC Contractor may also make alternate offers, provided such offers are superior in his opinion in which case adequate technical information, operating feed back, etc. are to be enclosed with the offer, to enable the Owner to assess the superiority and reliability of the alternatives offered. In case of each alternative offer, its implications on the performance, guaranteed efficiency, auxiliary power consumptions, etc. shall be clearly brought out to the Owner to make an overall assessment. In any case, the base offer shall necessarily be in line with the specifications i.e. Base offer

shall be as per the technical specifications and the same will be considered for techno-commercial evaluation.

3.00.00 NAME PLATES (RATING PLATES)

- 3.01.00 Instruction plates, name plates or labels shall be permanently attached to each main and auxiliary item of plant in a conspicuous position. These plates shall be engraved with the identifying name, type and manufacturers serial number, together with the loading conditions under which the item of plant has been designed to operate.
- 3.02.00 Items such as valves, etc. which are subject to hand operation, shall be provided with nameplates so constructed as to remain clearly legible throughout the life of the plant giving due consideration to the difficult climatic conditions to be encountered. Nameplates shall be securely mounted where they will not be obscured in service by insulation, cladding, actuators or other equipment. Direction of flow is also to be engraved.
- 3.03.00 All trade nameplates and labels shall be in English & Vietnamese languages. All measurements shall be in M.K.S. Units.
- 3.04.00 The size and location of nameplates shall be subject to Approval of the Engineer.

4.00.00 SAFETY AND SECURITY

- 4.01.00 The design shall incorporate every reasonable precaution and provision for the safety of all personnel and for the safety and security of all persons and property. The design shall comply with all appropriate statutory regulations relating to safety. All structures and equipment shall be designed and constructed to withstand every foreseeable static and dynamic loading condition, including loading under earthquake conditions, with an adequate margin of safety.
- 4.02.00 Ready and safe access with clear head room shall be provided to all parts of the plant for operation, inspection, cleaning and maintenance.
- 4.03.00 Escape routes and clear ways shall be provided to allow speedy evacuation of the plant in the event of fire or explosion, and the plant layout shall allow for ease of access to all parts of the Works by rescue and fire fighting teams. The plant layout shall be designed to localise and minimise the effects of any fire or explosion. The recommendations of NFPA, OSHA, and Local Regulatory and Statutory authorities etc. as

necessary shall be followed in all respects.

- 4.04.00 The use of corrosive, explosive, toxic or otherwise hazardous materials shall be kept to a minimum during construction and the design of the plant shall minimise the requirement for such materials during operation and maintenance. Where such materials must be used, all necessary precautions shall be taken in the design, manufacture and layout of equipment to minimise the resulting hazard, and all equipment necessary for the protection and first-aid treatment of personnel in the event of accidents shall be provided. Particular attention is drawn to avoid the use of materials containing asbestos in any form.

5.00.00 GUARDS

- 5.01.00 Effective guards and fences must be provided to prevent injury to operators through accident or malpractice.
- 5.02.00 Mesh guards which allow visual inspection of equipment with the guard in place are generally preferable. The guards shall be constructed of mesh attached to a rigid framework of mild steel rod, tube, or angle and the whole galvanised to prevent loss of strength by rusting or corrosion. The guards shall be designed to facilitate removal and replacement during maintenance.
- 5.03.00 All drive belts, couplings, gears, sharp metallic edges and chains must be safely guarded. Any lubricating nipple requiring attention during normal running must be positioned where they can be reached without moving the guards.
- 5.04.00 Guards for couplings and rotating shafts shall be in accordance with BS 5304-1975 or similar approved standard. All rotating shafts and parts of shafts must be covered.
- 5.05.00 Suitable fencing shall be provided to enclose all openings or doorways used for the hoisting and lowering of machinery etc. This fencing must be securely fixed but quickly detachable when required. A secure hand hold must be provided on each side of the opening or doorway.

6.00.00 LOCATION AND LAYOUT REQUIREMENTS

The majority of plant and equipment (excluding steam generator and some other auxiliaries) shall all be of indoor installation. A broad list of buildings housing such equipment is given elsewhere in this specification. Layout should facilitate access for operation-maintenance and inspection

of any one or more equipment/components at a time without disturbing the operation or installation of rest of the plant. Further, Contractor should comply with the criteria given under the various equipment and system specifications as well as those stipulated in Annexure-II attached to this section.

Enclosed General Layout and other tender layout drawings show the location of major installations and auxiliary buildings. The Contractor shall try to retain these locations as far as practicable. The layout of equipment within the power house as shown in the tender drawings is indicative. The Contractor may, subject to Owner's approval alter the same to suit the space requirement of the equipment offered.

Contractor may give as an alternative his own preferred layout clearly indicating the advantages and other implications, if any. Such alternative will not be considered for evaluating the bid, but may be considered with the successful Contractor if Owner/Engineer finds the proposal more attractive in terms of techno-economic consideration.

While developing the layout of buildings the following criteria shall be given effect :

- a) The minimum width of clear access corridors around equipment shall be one (1) meter.
- b) Each building shall have an identified vacant space for equipment unloading & maintenance and preferably a separate bay altogether in buildings housing heavy equipment. Provision for handling equipment by monorail hoist and/or overhead crane shall be made as specified.
- c) The minimum clear height available between two consecutive floor slabs shall not be less than five (5) meters. A clear head room of two (2) meters shall be maintained between the floor and any overhead piping/ cables or other obstruction. Adequate provision for natural ventilation and illumination shall be made as per good engineering practices.
- d) There shall be at least two (2) nos. main access doors, one on either side of each building, of which one shall be minimum 3 meters wide with rolling shutters for equipment entry. For multistoried buildings, at least two (2) nos. regular staircases diagonally opposite to each other shall be provided connecting all the floors and roof. These minimum requirements shall be augmented as required depending on the floor area, statutory requirements and NFPA recommendations.

- e) All buildings shall have provision for toilet and associated effluent discharge system together with facility for drinking water. The criteria for ventilation, fire protection and illumination of building spaces specified elsewhere in this specification shall be complied with.
- f) All rail/road crossings for pipe/cable racks shall be done with minimum 7 meters headroom from top of rail/road to bottom of rack. Similarly top cover over underground pipes/cables shall be minimum one (1) meter. For other detail refer to Annexure-II.
- g) Cubicle for operating personnel shall be located at safe place near the equipment.
- h) All underground cables in the plant shall be placed in covered reinforced concrete cable trenches. Pipes shall in general be routed above ground and on pedestals, and at road crossings, pipe racks shall be provided. Cable racks / pipe racks shall have hand railings in walkways on both sides at appropriate heights.
- i) Concept of various mechanical and electrical equipment location and building dimensions (including column-row spacing) as shown in Plot Plan/Floor Plan drawing are to be adhered to. Any departure from this suggestive layout is primarily not recommended.

7.00.00 OPERATION, MAINTENANCE & AVAILABILITY CONSIDERATIONS

- 7.01.00 Equipment/works offered shall be designed for high availability, high reliability, low maintenance and ease of operation & maintenance. The Contractor shall specifically state the design features incorporated to achieve high degree of reliability, availability, operability and ease of maintenance. He shall also furnish details of availability records in plants stated in his experience list.
- 7.02.00 Ample space for ease of operation and maintenance including equipment removal, tube bundle/cartridge/rotor pulling etc. shall be provided. All valves, gates, dampers and other devices shall be located and oriented in such a way that they are accessible from operating floor levels. Where this cannot be adhered to, platforms and walkways with access ladders shall be provided to facilitate operation and maintenance.
- 7.03.00 Motorised lifting devices, i.e. hoists, chain pulleys, jacks, etc. shall be

provided for handling and carrying out maintenance of any equipment and/or part having weight in excess of 3000 Kg. Suitable beams, hooks etc. for this purpose shall be provided in the buildings.

No lifting arrangement is necessary for part having weight less than 500 Kg. Hoist shall be well protected by environment. Suitable painting and coating covering hoist at outdoor shall be provided.

Lifting devices like lifting tackles, slings, etc. to be connected to hook of the hoist/crane shall be provided by the EPC Contractor for lifting the equipment, accessories covered under this specification.

7.04.00 All similar parts of the equipment shall be made to gauge and shall be interchangeable with and shall be made of same material and workmanship as the corresponding parts of the equipment. Where feasible common components shall be employed in different pieces of equipment in order to optimize the spares inventory and utilization.

8.00.00 MATERIALS

8.01.00 In selecting materials of construction of equipment, the Contractor shall pay particular attention to the atmospheric conditions existing at the Site and the nature of material/fluid handled. Wherever deviations are taken in respect of materials specified, the reasons shall be spelt out clearly in the proposal.

All materials shall be new, and shall be of the quality most suited to the proposed application.

8.02.00 In as far as is possible; materials shall be in accordance with International standard specifications and shall be used in accordance with International codes of practice. Where such standards or codes of practice are not available sufficient information shall be provided to allow the Engineer to assess the suitability of the material for the particular application.

All materials used shall have performed lengthy satisfactory service in similar or more arduous conditions to those proposed by the Contractor.

8.03.00 All parts which could deteriorate or corrode under the influence of the atmospheric, meteorological or soil conditions at the Site, or under the influence of the working conditions shall be suitably and effectively protected so that such deterioration or corrosion is a minimum over the life of the plant.

9.00.00 LUBRICATION

- 9.01.00 Provision shall be made for suitable efficient lubrication where necessary to ensure smooth operation free from undue wear.
- 9.02.00 Non ferrous capillary tubing shall be used throughout.
- 9.03.00 Gear boxes and oil baths shall be provided with filling and drain plugs, both of adequate size. An approved means of oil indication including level switches and temperature indication shall be provided.
- 9.04.00 All high speed gears shall be oil bath lubricated. Low speed gears shall be lubricated by means of soft grease. Removable and accessible drip pans shall be provided to collect lubricant which may drop from operating parts.
- 9.05.00 All lubrication points shall be conveniently situated for maintenance purposes. It must be possible to carry out lubrication from a gangway or landing and without the removal of guarding or having to insert the hand into it. Where accessibility to a bearing for oiling purposes would be difficult a method of remote lubrication shall be fitted.
- 9.06.00 The Contractor shall supply grease gun equipment suitable to service each type of nipple fitted.

10.00.00 LUBRICANTS AND CONTROL FLUIDS

- 10.01.00 The Contractor shall provide a detailed and comprehensive specification for all lubricating oils, greases and control fluids required for the entire plant. A sufficient supply of these shall be provided by the Contractor for initial commissioning, first fill and till Commercial Operation date (COD) of respective units.
- 10.02.00 The Contractor shall supply a detailed schedule giving the lubricant testing, cleaning and replacement procedures. All equipment and facilities necessary for the testing, cleaning and changing of lubricants and control fluids shall be provided. The Contractor shall endeavor to reduce the varieties and grades of required lubricants and control fluids to a minimum, matching them where possible to those already in use in the generating station in order to simplify procurement and minimise storage requirements. All lubricants and control fluids shall be of internationally recognised standards and shall be easily obtainable from a large number of local suppliers. EPC Contractor shall also indicate the equivalent local Vietnamese Standard for the above for easy procurement in future.
- 10.03.00 No lubricant or control fluid shall have toxic or other harmful effects on

personnel or on the environment.

11.00.00 OPERATION AND MAINTENANCE

- 11.01.00 The plant shall be designed and constructed so that operation and maintenance manpower requirements are minimised.

The design and layout shall facilitate inspection, cleaning, maintenance and repair. The importance of continuity of operation is second only to that of safety.

- 11.02.00 Spare parts for equipment shall be interchangeable with the original components and, so far as possible, be of common design and manufacture.

- 11.03.00 All similar standard components/parts of similar standard equipment provided shall be interchangeable with one another. Further identical equipments shall be provided for similar duties so that the same are interchangeable with one another in totality and component wise.

- 11.04.00 All heavy parts (500 Kg and above) must be provided with a convenient arrangement for slinging and handling during erection and overhaul. Any item of plant normally stripped or lifted during periods of maintenance and weighing one tonne or above, shall be clearly marked with its weight.

- 11.05.00 On completion of commissioning, a complete set of tools for the maintenance of the entire plant shall be provided by the Contractor. This shall include all necessary spanners, special wrenches, extraction equipment and any special tools reasonably required by the Engineer. Tools used during erection and commissioning shall not be accepted except with the specific approval of the Engineer.

- 11.06.00 All equipment and major valves should be provided with adequate maintenance approach and facility.

12.00.00 PLANT LIFE AND MODE OF OPERATION

The complete plant including all the equipment and systems individually and collectively shall be designed for continuous operation for an economic service life of thirty (30) years under the prevailing site conditions and for the type of duty intended.

The critical components of the Steam Generators, Turbine-Generators and Auxiliary equipment, the life of which is limited by time and temperature

dependent mechanisms such as thermal stress, creep and low cycle fatigue, are to be designed considering expected (hot, warm and cold) start-up, shut-down and cyclic load variations.

The allowable stresses shall be reduced so that life expectancy to minimum 2,00,000 hours of operation can be achieved. The Contractor shall discuss this aspect in his technical proposal.

The units would be operated on base load with cyclic load variation. The load variation is expected to be as per schedule depending on power demand.

The expected start-ups to be considered as minimum for each unit are:

- Cold start up (temperature of steam turbine $\leq 150^{\circ}\text{C}$): 100 times;
- Warm start-up (<48 h shutdown of unit): 1,000 times
- Hot start-up (<8 h shutdown of unit): 4,000 times
- Very hot start-up (<2 h shutdown of unit): 100 times

13.00.00 PACKAGING & MARKING

All the equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. While packing all the materials, the limitations from the point of view of availability transportation modes in Vietnam shall be taken into account. The Contractor shall be responsible for all loss or damage during transportation, handling and storage due to improper packing.

A Jetty is also provided on Hau river near the plant (by a separate contract) for transportation of heavy equipment by barges up to the project site. From the Jetty, the equipment/material are to be transported by road up to the site.

The identification marking indicating the name and address of the consignee shall be clearly marked in indelible ink on two opposite sides and top of each of the packages. In addition the Contractor shall include in the marking gross and net weight, outer dimension and cubic measurement. Each package shall be accompanied by a packing note (in weather proof paper) quoting specifically the name of the Contractor, the number and date of contract and names of the office placing the contract, nomenclature of contents and Bill of Material.

14.00.00 PROTECTION

Equipment having antifriction or sleeve bearings shall be protected by weather-tight enclosures. Coated surfaces shall be protected against impact, abrasion, discoloration and other damages. Surfaces that are damaged shall be repainted.

Electrical equipment, controls and insulations shall be protected against moisture and water damages. All external gasket surfaces and flange faces, couplings, rotating equipment shafts, bearings and like items shall be thoroughly cleaned and coated with rust preventive compound as specified above and protected with suitable wood, metal or other substantial type covering to ensure their full protection. All exposed threaded parts shall be greased and protected with metallic or other substantial type protectors.

All piping, tubing and conduit connections on equipment and other equipment openings shall be closed with rough usage covers or plugs. Female threaded openings shall be closed with rough usage covers or forged steel plugs. The closures shall be taped to seal the interior of the equipment. Open ends of piping, tubing and conduit shall be sealed and taped.

Returnable containers and special shipping devices shall be returned by the manufacturer's field representative at the Contractor's expense.

15.00.00 PAINTING

15.01.00 General

All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. Surfaces not easily accessible after shop assembly shall be treated before-hand and protected for life of the equipment. Surfaces to be finish painted after installation shall be shop painted with at least two (2) coats of primer. Steel surfaces, which are not to be painted, shall be coated with suitable rust preventive compound subject to the approval of the Owner.

All paints shall be used in accordance with the manufacturer's instructions. No thinners or other substance shall be added to the coating material without the approval of the Engineer. The quality and vendor of the paints shall require approval of the Owner.

All paints, when applied in a normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks or other defects.

All primers shall be well marked into the surface, particularly in areas where pitting is evident and the first priming coat shall be applied as soon

as possible after cleaning, within four hours maximum. The paint shall be applied by brush, roller or airless spray, according to the manufacturer's instructions. Spray painting shall be carried out by operators trained and thoroughly experienced in the use of the equipment. If the drying interval between successive coats, which should not exceed one week, has been so long as to endanger the adhesion of the following coat, the paint already applied shall be lightly rubbed down with fine abrasive paper before putting on the next coat.

Paint spraying on large surfaces shall not normally be done indoors, except with the approval of the Engineer. Spray guns shall not be used outdoors in windy weather or near unprotected surfaces of a contrasting colour and under no circumstances shall spray guns be used where spray may be carried into or onto exposed electrical equipment.

Paint containers shall not be opened until required and the paint shall be mechanically mixed thoroughly before use, and agitated occasionally during use.

Electrical equipment shall be shop finished with one or more coats of primer and two coats of high-grade oil resistant enamel. The interior of all panels' cabinets and enclosures shall be finished with gloss white enamel.

The Contractor shall furnish sufficient touch-up paint for one complete finish coat on all exterior factory surfaces of each item of equipment. The touch-up paint shall be of the same type and colour as the factory applied paint and shall be carefully packed to avoid damage during shipment. Complete painting instructions shall be furnished.

Shop primer for steel and iron surfaces which will have a continuous operating temperature below 35 Deg.C shall be selected by the Contractor, in accordance to the relevant standard. Special high temperature primer shall be used on surface exposed to operating temperature above 35 Deg.C.

The colour scheme shall be submitted during execution of Contract for approval by the Purchaser/Engineer.

15.02.00 **Preparation**

Oil and grease shall be removed from the surface by washing with a suitable detergent, rinsing with clean water, and drying.

Surfaces to be shot blasted shall be cleaned to Swedish Standard SA 2.5 or equivalent, and all dust remaining after cleaning shall be removed.

The priming coat shall be applied without delay.

15.03.00 **Damaged Paintwork**

Any damaged paintwork shall be made good as follows :

- a) The damaged area, together with an area extending 25mm around its boundary, shall be cleaned down to bare metal.
- b) A priming coat shall be immediately applied, followed by a full paint finish equal to that originally applied and extending 50mm around the perimeter of the original damage.
- c) The repainted surface shall present a smooth surface. This shall be obtained by carefully chamfering the paint edges before and after priming.

15.04.00 **Painting Systems**

The requirements for the dry film thickness (DFT) of paint and the materials to be used shall be as stated below, unless otherwise specified elsewhere in this specification.

The specification for Painting are indicated in Appendix-1 Coating System on Metallic Surfaces of document No. LP1-TKC-10XX-M-G1-SPC-2022.

The type and colour of primer & finish coat shall be selected by the Contractor after approval by the Owner.

For detail painting on building & structural steel elements refer Section-IIG/1 & IIG/2 of this specification.

16.00.00 **COLOUR CO-ORDINATION AND FINISH**

16.01.00 Exterior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and with the surrounding landscape.

16.02.00 Interior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and which will be conducive to the comfort, well-being and high productivity of the operators. Operating plant and services provided shall be colour coded for ease of identification.

16.03.00 All finishes shall be durable and as far as possible maintenance free. Finishes shall be easily cleaned.

16.04.00 Final colours and finishes shall be to the Approval of the Engineer.

17.00.00 ENVIRONMENT PROTECTION AND NOISE LEVEL REQUIREMENT

17.01.00 Environment Protection

The plant shall be designed for installation and operation in harmony with the surrounding environment and all measures of pollution control shall be ensured by the Contractor to restrict pollution from the liquid effluent and stack emission within the limits as given below with due consideration of Environment Protection Rules of Vietnam.

In case the concerned authorities stipulate any other conditions not specified hereunder while clearing the project, the same shall also be complied with by the Contractor.

17.01.01 For Liquid Effluent

- a) The effluent discharge from the Plant shall comply with the requirements specified by the Ministry of Natural Resources & Environment, Government of Vietnam.
- b) Any specific requirement of the Environment Authorities over and above the above stipulation.

17.01.02 For Air Emission

- a) Dust - Less than 50 mg/Nm³.
- b) NO_x - Less than 450 mg/Nm³.
- c) SO₂ - Less than 300 mg/Nm³.
- d) CO- Maximum permissible limit of 1000 mg/Nm³.

Regarding emission criteria, the Vietnamese Authority have issued the updated QCVN 19:2024/BTNMT National Technical Regulation on Industrial Emission with a roadmap for application to thermal power plants such as Long Phu 1 from December 31, 2031 with the following emission criteria:

- a) Dust - Less than 35 mg/Nm³.
- b) NO_x - Less than 250 mg/Nm³.

- c) SO₂ - Less than 250 mg/Nm³.
- d) CO- Maximum permissible limit of 400 mg/Nm³

In case of absence of any local Standard for emission from power plants as on date for certain gaseous effluents, the internationally accepted World Bank Standard is to be followed. In case any local standard is published before finalisation of the Contract, the EPC Contractor has to comply the more stringent of the above norm or the new local Standard.

The EPC Contractor shall include in his scope all necessary equipment and measuring instruments to comply with above requirements. Location and accessibility of the instruments shall be properly coordinated.

17.02.00 Noise Level Requirement

The plant will be designed, constructed and provided with suitable acoustic measures to ensure the noise level criteria as per the following stipulations.

- a) All Noise generating equipment shall be provided with properly designed noise hood. Buildings, that will house such noise generating equipment, shall be provided with carefully designed walls with noise barriers that shall limit noise outside the plant boundary as per TCVN 5949 : 1998 for Residential Areas and the same is 75 dBA (day time between 6 AM & 6 PM) & 70 dBA (night time between 6 PM & 6 AM).
- b) Any statutory changes in stipulations regarding noise limitation that may occur in future according to Environment Ministry of Vietnam, during tenure of the Contract, the contractor shall comply with the requirement.

An exception will be made for the plant at startup operations and other big pressure reducing devices operating during emergency periods and for the safety valves.

18.00.00 INSPECTION AND TESTING

18.01.00 Inspection and Tests during Manufacture

- 18.01.01 The method and techniques to be used by the Contractor for the control of quality during manufacture of all plant and equipment shall be agreed with the Owner prior to the Award of Contract.
- 18.01.02 The Owner's general requirements with respect to quality control and the required shop tests are set out elsewhere in this specification.

18.01.03 Before any item of plant or equipment leaves its place of manufacture the Owner shall be given the option of witnessing inspections and tests for compliance with the specification and related standards.

18.01.04 Advance notice shall be given to the Owner as agreed in the Contract, prior to the stage of manufacture being reached, and the piece of plant must be held at this stage until the Owner has inspected the piece, or has advised in writing that inspection is waived. If having consulted the Owner and given reasonable notice in writing of the date on which the piece of plant will be available for inspection, the Owner does not attend the Contractor may proceed with manufacture having forwarded to the Owner duly certified copies of his own inspection and test results.

The Contractor shall forthwith forward to the engineer duly certified copies of the Test Certificates in six copies (one to the Purchaser and five to the Consulting Engineer) for approval. Distribution of six (6) copies of Test Certificates for approval will be two(2) copies to owner and four(4) copies to consultant. These four(4) copies will be further distributed by consultant after approval to owner, site and EPC Contractor. One copy will be retained with the consultant for record purpose.

Further, nine (9) copies of Shop Test Certificates shall be bound with Instruction Manuals referred to elsewhere. Distribution of nine (9) copies of Shop Test Certificates for approval will be Two (2) copies to owner, Three (3) copies to site, Two (2) copies to consultant, Two (2) copies to owner's library / record.

18.01.05 Under no circumstances any repair or welding of castings be carried out without the consent of the Engineer. Proof of the effectiveness of each repair by radiographic and/or other non-destructive testing technique, shall be provided to the Engineer. 18.01.06 All the individual and assembled rotating parts shall be statically and dynamically balanced in the works.

18.01.06 Where accurate alignment is necessary for component parts of machinery normally assembled on site, the Contractor shall allow for trial assembly prior to despatch from place of manufacture.

18.01.07 All materials used for the manufacture of equipment covered under this specification shall be of tested quality. Relevant test certificates shall be made available to the Purchaser. The certificates shall include tests for mechanical properties and chemical analysis of representative material.

18.01.08 All pressure parts connected to pumping main shall be subjected to hydraulic testing at a pressure of 150% of shut-off head for a period not less than one hour. Other parts shall be tested for one and half times the

maximum operating pressure, for a period not less than one hour.

- 18.01.09 All necessary non-destructive examinations shall be performed to meet the applicable code requirements.
- 18.01.10 All welding procedures adopted for performing welding work shall be qualified in accordance with the requirements of Section-IX of ASME code as applicable. All welded joints for pressure parts shall be tested by liquid penetrant examination according to the method outlined in ASME Boiler and Pressure Vessel code. Radiography, magnetic particle examination magnaflux and ultrasonic testing shall be employed wherever necessary/recommended by the applicable code. At least 10% of all major butt welding joints shall be radiographed.
- 18.01.11 All payments in respect of statutory approvals including inspection for design and manufacturer of equipment at shop and site shall be made by the Contractor. Contractor's scope shall also be extended to preparation of all necessary documents, co-ordination and follow-up with the statutory authorities for the above approval.
- 18.02.00 **Performance Tests at Site**
- 18.02.01 The full requirements for testing the system shall be agreed between the Owner and the Contractor prior to Award of Contract. The completely erected System shall be tested by the Contractor on site under normal operating conditions. The Contractor shall also ensure the correct performance of the System under abnormal conditions, i.e., the correct working of the various emergency and safety devices, interlocks, etc.
- 18.02.02 The Contractor shall provide complete details of his normal procedures for testing, for the quality of erection and for the performance of the erected plant. These tests shall include site pressure test on all erected pipe work to demonstrate the quality of the piping and the adequacy of joints made at site.
- 18.02.03 The Contractor shall furnish the quality procedures to be adopted for assuring quality from the receipt of material at site, during storage, erection, pre-commissioning to tests on completion and commissioning of the complete system/equipment.
- 18.03.00 For details of specific tests required on individual equipment refers to respective sections of this specification

19.00.00 TRAINING OF OWNER'S PERSONNEL

The Contractor shall extend all possible assistance and co-operation to the

Purchaser regarding the transfer of technology and developing expertise in the area of engineering operation and maintenance of the Plant.

Number of man-days of training as mentioned below shall be included in his Tender.

19.01.00 **Training at Contractor's Premises**

The details of the training programme will be discussed and finalised with the successful EPC Contractor.

The training may also be arranged by the Contractor in any Plant where the equipment manufactured by the Contractor or his Associates is under installation, operation or testing to enable the trainees to become familiar with the equipment being furnished by the Contractor. All expenses inherently related to the training shall be borne by the Contractor and shall include but not limited to travel expenses (international and inland fares), lodging and per diem charges as well as medical insurance, instructors' fees, program and miscellaneous cost to be incurred during the training.

The training programme shall be adequate for the trainees to acquire the necessary expertise and competence in the area of engineering, operation and maintenance and as trainers for in-house technology transfer programme of the Purchaser.

The Contractor shall be responsible for the development of the Training Module and Programme Schedule which shall be submitted to the Purchaser for approval.

The components of the training modules shall include but not be limited to the training procedures/methodology, instructional materials such as audio visual materials, CDs and slides and manuals for each trainee.

Three (3) sets of the materials included in the training modules shall be handed over to the Purchaser upon completion of the training. An evaluation shall be jointly undertaken by the Contractor and the Purchaser's representative on the adequacy, appropriateness and relevance of the training and the programme effectiveness after the training. The training material shall be in English language only.

The timing of the training should be such that the participants will be conversant with sufficient know-how to participate in the pre-commissioning and commissioning tests of the Plant.

The Contractor shall provide qualified English speaking instructors and

training coordinator(s) during the tenure of the training programme.

The detailed program of training is indicated in Section V. Training Requirements.

19.02.00 Operation and Maintenance Training at Site

The Contractor shall provide a comprehensive training programme related to design application, plant management, operation and maintenance, including trouble shooting, of the Contractor's supplied system and equipment at the Site starting from Start of Commissioning and thereafter up to the Final Acceptance of the first Unit.

19.03.00 On-the-Job Training

N/A

20.00.00 DEVIATIONS

The Contractor is required to submit with his proposal in the relevant schedules a detail list of any and all deviations taken by him clearly without any ambiguity. In the absence of such a list it will be understood and agreed that the Contractor's proposal is based on strict conformance to this specification and no post-contract negotiations would be allowed in this regard.

Unless otherwise specifically indicated in the deviation list, it will be construed and agreed that details indicated in documents & drawings furnished by the Contractor along with the offer is in-line with the specification requirement.

ANNEXURE-I**LIST OF STANDARDS FOR REFERENCE**

The Contractor is required to conduct a comprehensive review of the existing design, manufacturing, and installation status to determine its compliance with the standards specified in the previous RFP. The Contractor shall assess and recommend any necessary modifications to achieve compliance with current standards. All subsequent project works must adhere to current regulations, codes and standards. The regulations, codes, standards applied in each case must be in the latest revision adopted and published at date of order placement. Any conflicts between standards (include standard required to be applied in previous RFP) shall be referred to the Owner who will decide which standard shall govern. The codes/ standards are not list in below which the Bidder intends to apply for the project, Bidder shall propose them for but they should be equivalent or higher than (higher will be preferred) listed once. Owner will review and consider for application

Vietnamese Codes and Standards

Vietnam construction codes and standards: all the design and construction of the project shall be in accordance with the technical regulations, stipulated in the Vietnam construction codes and standards issued by the Ministry of Construction.

- Circular No. 30/2019/TT-BCT dated November 18, 2019 on amendments and supplements to several Articles of Circular 25/2016/TT-BCT on electricity transmission system and Circular No. 39/2015/TT-BCT on electricity distribution system
- Circular No. 39/2022/TT-BCT dated December 30, 2022 on amendments and supplements to Circular No. 25/2016/TT-BCT on electricity transmission system; Circular No. 39/2015/TT-BCT on electricity distribution system; Circular No. 30/2019/TT-BCT on amendments and supplements to several articles of Circular No. 25/2016/TT-BCT on electricity transmission system, and Circular No. 39/2015/TT-BCT on electricity distribution system
- Decree No. 15/2020/ND-CP dated February 03, 2020 on penalties for administrative violations against regulations on postal services, telecommunications, radio frequencies, information technology and electronic transactions
- Decree No. 85/2016/ND-CP dated July 01, 2016, on the security of information systems by classification
- TCVN 11930:2017: Information technology - Security techniques - Basic requirements for securing information system according to security levels

- Circular No. 12/2022/TT-BTTTT dated August 12, 2022 on guidelines for the Government's Decree No. 86/2016/ND-CP on the security of information system by classification
- Circular No. 36/2019/TT-BLDTBXH dated December 30, 2019 Promulgating the list of machinery, equipment, supplies and substances subject to strict requirements on occupational safety and health
- Decision No.55/QĐ-DTDL dated August 22, 2017 of the Electricity Regulatory Authority of Vietnam (ERAV) on Regulations of Technical Requirement and Operation Management of SCADA System.
- Decision 724/QĐ-BTTTT on the basic criteria for ensuring network information security for surveillance cameras
- Circular 01/2023/TT-BKHDT dated April 14, 2023 on list of machinery, equipment, replacement spare parts, specialized transport vehicles, raw materials, supplies, domestically manufactured semi-finished products issued by the minister of planning and investment
- Electrical codes and standards issued along with decision No. 19/2006/QĐ-BCN;
- National technical regulation on water supply and drainage systems for residential and public buildings;
- QCVN 01:2021/BXD National technical regulation on construction planning;
- QCVN 01:2020/BCT National technical regulation on Electric safety;
- QCVN 05:2008/BXD Vietnam Building Code - Dwellings and Public Buildings - Life safety and health;
- QCVN 02:2022/BXD Vietnam Building Code – Natural physical and climate data for construction;
- QCVN 03:2022/BXD National Technical Regulation on Rules of Classifications and Grading of Civil and Industrial Buildings and Urban Infrastructures;
- QCVN QTD-7:2009/BCT National Technical Codes for Installation Power Network;
- QCVN 06:2022/BXD National Technical Regulation on Fire Safety of Buildings and Constructions;

- QCVN 07:2019/BKHCN National technical regulation on steel for the reinforcement of concrete;
- QCVN 16:2023/BXD National Technical Regulations on Products, Goods of Building Materials;
- QCVN 09:2017/BXD National Technical Regulation on Energy Efficiency Buildings;
- QCVN 01:2021/BXD National technical regulation on construction planning;
- QCVN 01:2021/BXD National technical regulation on construction planning;
- QCVN 07: 2012/BLĐTBXH National technical regulation on safe work of lift appliances;
- QCVN 18:2021/BXD National technical regulation on safety in construction
- Other relevant Vietnamese National Technical Codes.
- Proceedings of Vietnam construction standards: The Proceedings of Vietnam construction standards issued by the Ministry of Construction in 1997 comprising 11 volumes and the National technical codes and standards supplemented from that time up to now are applicable;
- The list of codes and standards in Appendix 3 of the instruction on Governmental inspections for the compliance of codes and standards in construction and commissioning of civil and industrial works 2017;
- Other relevant standards.

Civil codes and Standards

Vietnamese National Technical Codes

- QCVN 09: 2017 National technical regulation on energy efficient construction works.
- QCVN 01:2021/BXD, National technical regulation on construction planning
- QCVN 02: 2022 / BXD National technical regulations on natural condition data used in construction
- QCVN 01:2019/BXD National technical regulation on construction planning

- QCVN 02: 2009/BXD Vietnam Building Code – Natural physical and climatic data for construction.
- QCVN QTD-07: 2009/BCT National technical codes for Installation Power Network.
- QCVN 06: 2022/BXD Vietnam Building Code on Fire Safety of Buildings and Circular 1:2023 of QCVN 06:2022/BXD on National Technical Regulation on Fire Safety of Buildings And Constructions
- QCVN 20:2015/BGTVT National technical regulation on aids to navigation
- QCVN 07: 2019/BKHCN National technical regulation on steel for reinforcement of concrete.
- QCVN 18:2021/BXD National Technical Regulations On Safety In Construction
- QCVN 16:2023/BXD National technical regulations on products and goods of building materials.
- QCVN 03: 2012/BXD National Technical Regulation on Rules of Classifications and Grading of Civil and Industrial Buildings and Urban Infrastructures.
- QCVN 03: 2022/BXD National Technical Regulation on Rules of Classifications and Grading of Civil and Industrial Buildings and Urban Infrastructures.
- QCVN 07: 2012/BLDTBXH National technical regulation on safe work of lift appliances.
- Other relevant Vietnamese National Technical Codes.

Vietnamese standards

Standards about loads and impacts

TCVN 2737:2023 Vietnam Standard Design codes - Loads and Actions.

TCVN 9386-2012 Design of structures for earthquake resistances

Standards about soil improvement

TCVN 9355:2012 Ground improvement by Prefabricated Vertical Drain (PVD) – Design, Construction and Acceptance

TCVN 9362:2012	Specifications for design of foundation for buildings and structures
TCVN 9379:2012	Building structures and foundations. Basic rules for calculations
TCVN 9403:2012	Stabilization of soft soil. The soil cement column method
TCXD 189:1996	Vietnam Standard Design codes – Small pile section
TCXD 205:1998	Pile foundation – Vietnam Standard Design codes
TCVN 10304:2014	Pile foundation – Vietnam Standard Design codes
TCVN 7888:2014	Pretensioned spun concrete piles
TCVN 9842:2013	Vacuum consolidation method with sealed membrane for soft ground improvement in transport. Construction and acceptance.
22TCN 244: 1998	Design process of stabilizing soft soil by using Prefabricated Vertical Drain in road subbase construction
TCN 248: 1998	Prefabricated Vertical Drain in construction for earth embankment

Standards about concrete and reinforcement concrete

TCVN 5574:2018	Design of concrete and reinforced concrete structures
TCVN 8163:2009	Steel for the reinforcement of concrete. Threaded coupler splice
TCVN 9345:2012	Concrete and reinforced concrete structures. Guide on technical measures for prevention of cracks occurred under the action of hot humid climate
TCVN 9391:2012	Welded steel mesh for the reinforcement of concrete. Standard for design, placing and acceptance
TCVN 9346-2012	Concrete and reinforced concrete structures. Requirements of protection from corrosion in marine environment

Standards about steel structure

TCVN 5575:2012	Steel structures - Design standard

Pile testing standard

TCVN 9393:2012	Piles - Standard test method in situ for piles under axial compressive load
TCVN 9397:2012	Piles - Method of detection of defects by dynamic low-strain testing
TCXD 88:1982	Piles – Method of site testing

Architecture and finishing

TCVN 4616:1987	Planning of general plan for industrial zones. Design standard
TCVN 4514:2012	Industrial workshops - General plan - Design Standard
TCXD 13:1991	Grades for dwellings and civil works – General principles
TCVN 4604:2012	Industrial enterprises - Production building - Design standard
TCVN 4601:2012	Office buildings - Design requirements
TCVN 5674:1992	Finishing works in building - Construction and acceptance
TCVN 5718:1993	Reinforced concrete roof and floor of buildings. Technical requirements for water-tightness
TCVN 9256:2012	Technical product documentation – Vocabulary – Term relating to technical drawings – General and types of drawings.

Road and paving

22TCN 211:06	Soft pavement – Specifications and design guide
22TCN 223:95	Hard pavement - Specifications and design guide
TCXDVN 104:2007	Urban Roads - Specifications for Design
TCVN 4054:2005	Highway - Specifications for Design
TCVN 8863:2011	Specification for construction and acceptance of the surface treatments using the asphalt cement
TCVN 8819:2011	Specification for Construction of Hot Mix Asphalt Concrete Pavement and Acceptance
TCVN 8858:2011	Cement Treated Aggregate Bases for Road Pavement - Specification for Construction and Acceptance

TCVN 8859:2011 Cement Treated Aggregate Bases for Road Pavement - Specification for Construction and Acceptance

TCVN 8809:2011 Specification for Construction and Acceptance of the Penetration Macadam Layer using the Asphalt Cement

Water supply and drainage systems

TCVN 33:2006 Water Supply - Distribution System and Facilities.

TCVN 3989:2012 System of design documents for construction. Water supply and sewerage. External networks working drawing

TCVN 7957-2008 Drainage and sewerage. External Networks and Facilities. Design Standard

TCVN 5502: 2003 Domestic supply water - Quality requirements

TCXDVN 51-2008 Drainage and sewerage - External Networks and Facilities. Design Standa

Material, construction and inspection

TCVN 4032:1985 Cements – Determination of bending and compressive strengths

TCVN 4314:2003 Building mortar – Specifications

TCVN 9844 – 2013 Requirements of design, construction and acceptance of geotextiles in embankment construction on soft ground

TCVN 9360:2012 Technical process of settlement monitoring of civil and industrial building by geometrical levelling

TCVN 7570:2006 Aggregates for concrete and mortar. Specifications

TCVN 9844-2013 Requirements of design, construction and acceptance of geotextiles in embankment construction on soft ground

TCVN 8860-1-12:2011 Asphalt Concrete. Test methods.

TCVN 8862:2011 Standard test method for splitting tensile strength of aggregate material bonded by adhesive binders

TCVN 6260:2009 Portland blended cements. Technical requirements

TCVN 4033-1995 Pozzolanic Portland cement. Technical requirements

TCVN 2682:2009	Portland cement. Specifications
TCVN 7572 1-20:2006	Aggregates for concrete and mortar.
TCVN 4197:2012	Soils. Laboratory methods for determination of plastic limit and liquid limit
TCVN 7504:2005	Bitumen. Test method for determination of adhesion with paving stone
TCVN 9436:2012	Highway embankments and cuttings – Construction and quality control
TCVN 3105-3120:1993	Fresh heavy weight concrete and heavy weight concrete. Sampling, marking and curing test specimens
TCVN 8871-1:6-2011	Geotextile - Standard test method
TCVN 8864:2011	Standard test method for measuring road pavement surface roughness using a 3.0m straight edge
TCVN 8865:2011	The pavement surface. Method for measuring and assessment roughness by International Roughness Index (IRI)
TCVN 8867:2011	Flexible pavement. Standard test method for determination of elastic modulus of pavement structure using Benkelman beam
22TCN 333-2006	Compaction process of soil, grave in laboratory
TCVN 8828:2011	Heavy concrete. Curing requirements under natural humidity conditions
22TCN 332-06	The California Bearing Ratio in Laboratory
TCVN 7572-2:2006	Aggregates for concrete and mortar. Test methods. Part 2: Determination of particle size distribution
TCVN 7572-16:2006	Aggregates for concrete and mortar. Test methods. Part 16: Determination of sulfate and sulfite content
TCVN 6194-1996	Water quality. Determination of chloride. Silver nitrate titration with chromate indicator (Mohr's method)
22TCN 332-06	Graded Aggregate Base sand Subbases Pavement-Specification for Construction and Acceptance

TCVN 8859:2011	Water for concrete and mortar. Technical specification
TCVN 4506:2012	Guidance for mixing and using of building mortars
TCVN 4459-1987	Hot-rolled carbon steel for building. Technical requirements
TCVN 5709-2009	The California Bearing Ratio in Laboratory
TCVN 1651:2018	Steel for the reinforcement of concrete
Other	
BCV-VOL I, II, III	Viet Nam Building codes and standards
TCVN 1548:1987	Nondestructive testing. Welded jointed. Ultrasonic methods
TCVN 7570:2006	Aggregates for concrete and mortar - Specifications
TCVN 2292:1987	Painting works. General safety requirements
TCVN 2622:1995	Fire protection of buildings - Design requirements
TCVN 3146:1986	Electric welding works. General safety requirements
TCVN 3254:1989	Fire protection. General safety requirements
TCVN 3255:1986	Explosion safety - General specifications
TCVN 33:2006	Water Supply - Distribution System and Facilities
TCVN 7572:16:2006	- Aggregates for concrete and mortar – Test methods
TCVN 3890 - 2023	Fire protection - Fire protection equipment for building and construction - Equipment, Installation
TCVN 3989:2012	System of design documents for construction. Water supply and sewerage. External networks working drawing
TCVN 3991:2012	Fire prevention requirements in building and civil engineering designing. Terms and definitions
TCVN 4032:1985	Cements. Determination of bending and compressive strengths
TCVN 4036:1985	System of building design documents. Symbols for pipelines to be used in sanitary systems
TCVN 4055:2012	Organization of construction activities

TCVN 4447:2012	Earth works. Code of execution and acceptance
TCVN 4453:1995	Monolithic concrete and reinforced concrete structures. Code for execution and acceptance
TCVN 5637:1991	Quality management of construction works. Basic principles
TCXD 170: 2007	Steel structure – Fabrication, installation and acceptance – Specification requirements
TCVN 9361:2012	Foundation works. Check and acceptance
TCVN 9366:2012	Doors and windows
TCVN 5308-1991	Code for the safety technics in construction work
TCVN 4085-2011	Masonry structures. Code for construction and acceptance
TCVN 4087:2012	Use construction machinery - General Requirements
TCVN 5639-1991	Acceptance of equipment after installation - Basic principles
TCVN 5640-1991	Handing over of finished constructions/building. Basic principles
TCVN 5641-2012	Reinforced concrete tank. Code for construction, check and acceptance
TCVN 5674-1992	Finishing works in building - Construction and acceptance
TCVN 9361:2012	Foundation works. Check and acceptance
TCVN 4447:2012	Earth works - Construction, check and acceptance
TCVN 9394:2012	Pile driving and static jacking works- Construction, check and acceptance
TCXDVN 296-2004	Scaffolding - Safety requirements.

International codes and standards

The main international codes and standards for civil part are listed hereunder:

ACI	American Concrete Institute
AIJ	Architectural Institute of Japan
AISC	American Institute o Steel Construction
AISE	Association of Iron and Steel Engineers

AISI	American Iron and Steel Institute
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
BS	British Standards
DIN	German Standardization Institute
EN	European Standards
HEI	Heat Exchange Institute
ISO	International Organization for Standardization
JIS	Japanese Industrial Standards
JSCE	Japan Society of Civil Engineers
JASS	Japan Architectural Standard Specification
JRA	Japan Road Association
OCDI	The Overseas Coastal Area Development Institute of Japan
SIS	Swedish Standards Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Steel Structure Painting Council
IBC	International Building Code
IPC	International Plumbing Code
AASHTO	American Association of State Highway and Transportation Officials
NFPA	National Fire Protection Association
ASHRAE	American Society of Heating, Refrigerating and Air-conditioning Engineers

Other equivalent standards.

Thermal and mechanical standards

Vietnam standards

Vietnamese regulations and standards are applied in design, creation, construction, installation, testing equipment includes:

TCVN 8366 – 2010	Pressure vessels - Requirement of design and manufacture
TCVN 2289 - 1978	Manufacturing processes - General safety requirements
TCVN 6155 - 1996	Pressure vessels – Safety engineering requirements of erection, use, repair.
TCVN 6156 - 1996	Pressure vessels - Safety engineering requirements of erection, use, repair. Testing method
TCVN 5502 - 2003	Domestic supply water - Quality requirements
TCVN 33: 2006:	Water Supply - Distribution System And Facilities - Design Standard
TCVN 4513: 1988	Internal water supply – Design standard
QCVN 01-1: 2018 / BYT:	National technical regulation on Domestic Water Quality
QCVN 14: 2008 / BTNMT	National technical regulation on domestic wastewater
QCVN 40: 2011 / BTNMT	National Technical Regulation on Industrial Wastewater
TCVN 4244: 2005	Lifting appliances – Design construction and survey
TCVN 8242-1: 2009 (ISO 4306-1: 2007)	Cranes - Vocabulary - Part 1: General
TCVN 5206: 1990 (ST SEV 1718-1979)	Loading crane - Safety requirements for counter - Weight and ballast
TCVN 12728: 2019	Boilers - Technical requirement of design, manufacture, installation, operation and maintenance
TCVN 8242-5: 2009 (ISO 4306-5:	Cranes - Vocabulary - Part 5: Bridge and gantry

2005

cranes

International standards

The main codes and standards for mechanical part are listed hereunder:

ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ANSI	American National Standards Institute
AWWA	American Water Works Association
API	American Petroleum Institute
ISO	International Standardization Organization
HEI	Heat Exchange Institute
NFPA	National Fire Protection Association
AGMA	American Gear Manufacturers Association Standards
OSHA	Occupational Safety and Health Act
HIS	Hydraulic Institute Standards
JIS	Japanese Industrial Standards (English version)
DIN	Deutsche Industry Norm (English version)

No.	Standard/Regulation	Content
Standards for Performance Tests		
1	ASME PTC 46-2015	Performance Test Code - Overall Plant Performance
2	ASME PTC 4- 2008 (R2013)	Fired Steam Generators
3	ASME PTC 6 - 2004 (R2014)	Performance Test Code - Steam Turbines
4	ASME PTC 12.2 - 2010 (R2020)	Performance Test Code - Steam Surface Condensers
5	ASME PTC 19.1 - 2018	Performance Test Code - Test Uncertainty
6	IAPWS – IFC97	Properties of Water and Steam
7	ASME PTC 18	Hydraulic Turbines and Pump

8	ASME PTC-11	Fans-Performance Test Codes
9	ASME PTC-4.3 (R2017)	Air Heaters-Performance Test Codes
10	ASME Section V 2019	Nondestructive Examination
Standards for Main Equipment		
1	IEC 60045-1:2020	Steam turbines
2	ASME Boiler and Pressure Vessel Code (BPVC)	Boiler
Standards for Piping		
1	ASME B16.1	Cast iron pipe flanges and flanged fittings.
2	ASME B16.5 2020	Pipe flanges and flanged fittings.
3	ASME B16.9-2018	Factory-made wrought butt welding fittings
4	ASME B 16.11 2016	Forged steel fittings, socket-welding and threaded butt-welding ends.
5	ASME B16.21-2016	Nonmetallic flat gaskets for pipe flanges
6	ASME B 16.25 2017	Butt welding ends
7	ASME B 16.28	Wrought steel butt welding short radius elbows and returns
8	ASME B 31.1 2020	Power piping
9	ASME B 31.3 2020	Chemical plant and petroleum refinery piping.
10	ASME B 36.10 2018	Welded and seamless wrought steel pipe.
11	ASME B 36.19 2018	Stainless steel pipe
12	API 570-2001	Piping Inspection Code: Inspection, Repair, Alteration, and Rerating of In-Service Piping System
13	MSS SP 58	Pipe hangers and supports; Materials, design and manufacture.
14	MSS SP 69	Pipe Hangers and Supports - Selection and Application
15	ASTM D3262 2020	Standard specification for fiberglass
16	ASTM D3517 2019	Standard specification for fiberglass pressure pipe
17	ASTM A53 2020	Standard specification for pipe, steel, black and hot-dipped, zinc-coated, welded and seamless
18	ASTM A126 2004	Standard specification for gray iron castings for valve,

		flange and pipe fitting
19	AWWA C207-07	Class D ring flanges
20	AWWA C207-07	Class E-Steel hub flanges slip on-hub type (275 PSI)
21	ANSI/AWWA C950-95 2020	AWWA standard for Fiberglass pressure pipe
Standards for Pressured Vessels		
1	ASME-BPVC-(Latest Version) -Section VIII -Division 2	Rules for construction of Pressure Vessels
2	ASME-BPVC-(Latest Version)-Part D	Materials Properties (Metric)
3	ASME PTC 12.3	Deaerators
4	HEI 12 th EDITION	Standard for steam surface condenser
5	ASME (Latest Version)	Boiler and Pressure Vessel Code
6	7704-2007	The Directorate for Standards, Metrology and Quality of Viet Nam (STAMEQ) (STAMEQ/TCVN) – Boiler – Technical requirement of design, construction, manufacture, installation, operation, maintenance.
Standards on Valves		
1	ASME B 16.5 2020	Pipe flanges and flanged fittings.
2	ASME B 16.10 2017	Face to face end-to-end dimensions of valves.
3	ASME B 16.25 2017	Butt welding ends
4	ASME B 16.34 20020	Valves-Flanged, threaded and welding end.
5	ASME B 16.104	Control valve seat leakage.
6	BS 5351	Steel ball valves for the petroleum, petrochemicals and allied industries.
7	BS 6755	Testing of valves: Specification for fire type testing requirements.
8	API 609 -2016	Butterfly Valves Double Flanged, Lug-and Wafer-Type
9	API 608 -2020	Metal Ball Valves Flanged, Threaded, and Welding Ends
10	BS: 5152	CI globe valve.
Standards for Pumps		
1	DIN 24 255	End suction centrifugal pumps
2	ISO 2548	Centrifugal, mixed flow and axial pumps; Code for acceptance tests Class C.

3	ISO 3555	Centrifugal, mixed flow and axial pumps; Code for acceptance tests Class B.
4	API 610 2010	Centrifugal Pumps for Petroleum, Heavy Duty Chemical, Gas Industry Services
5	BS EN ISO 9906:2012	Rotodynamic pumps-hydraulic performance acceptance test-Grades 1, 2, and 3
Standards for Compressors		
1	ISO 1217 2016	Displacement compressors – Acceptance tests.
Standards for Lifting Equipment		
1	FEM SECTION 1	Heavy lifting appliances.
2	FEM SECTION 9	Overhead crane.
Standards for Tanks		
1	API 650-2014	Welded Steel Tanks for Oil Storage
2	API 510-2006	Pressure Vessel Inspection Code: In-Service Inspection, Rating, Repair, and Alteration
3	API STD 2610	Design, Construction, Operation, Maintenance, and Inspection of Terminal and Tank Facilities
4	API 2000 2020	Venting atmospheric and low pressure tank
5	API 421	Oil-Water Separators
Standards for Welding		
1	ASME IX	Welding and brazing qualifications
2	EN 287.1	Approval testing of welders-fusion welding. Part 1. Steels.
3	EN 288.3	Specification and approval of welding procedures for metallic materials. Part 3. Welding procedures test for the arc welding of steels.
4	API 1104- 1999	Welding of Pipelines and Related Facilities
5	ISO 15609-1: 2004	Specification and qualification of welding procedures for metallic materials-welding procedure specification
Standards for Vibration		
1	VDI 2056	Evaluation criteria for mechanical oscillation of machine
2	ISO 2372	Mechanical vibration of machines with operating speeds from 10 to 200 rev/s. Basis for specifying evaluation standards.
3	ISO 3945	Mechanical vibration of large rotating machines with speed range from 10 to 200 rev/s. Measurement and evaluation in situ.
4	ISO 7919-2	Vibration standard for Apparatus

Standards for Noise		
1	DIN 45635	Noise measurements for machines
2	ISO 3746	Acoustics. Determination of sound power levels of noise sources. Survey method.
Standards for Fuel Analysis		
1	DIN 51757	Density of liquid fuels
2	DIN 51900	Thermal value of liquid fuels
3	ISO 1928:2009	Coal calorific value
4	ISO 29541:2010, ISO 19579:2006, ISO 587:1997	Coal Ultimate Analysis
5	ASTM D3682-01:2006	Ash analysis
Standards for Coating and Painting		
1	BS 6374 PART 5	Specification for lining with rubbers
2	ISO 1460	Metallic coatings. Hot dip galvanized coatings on ferrous materials.
3	ISO 1461	Metallic coatings. Hot dip galvanized coatings on fabricated ferrous products.
6	ISO 2409	Paints and Varnishes. Cross cut test.
7	ISO 4624	Paints and Varnishes. Tensile test.
6	ISO 4628.3	Paints and Varnishes. Evaluation of degradation of paint coatings.
7	ISO 8501.1	Visual assessment of surface cleanliness.
8	ISO 8504.1	Preparation of steel substrates before application of paints and related products. Surface preparation. Methods Part 1: General Principles.
9	ISO 8504.2	Preparation of steel substrates before application of paints and related products. Surface preparation. Methods Part 2: Abrasive blast-cleaning..
10	ISO 12944	Paints and varnishes — Corrosion protection of steel structures by protective paint systems
11	NFPA 91.122	Metallic coatings. Hot dip zinc coated finished products of steel. Recommendations for design and use of zinc coated products.
12	RAL 840 HR-F2	Color code.
Standards for Steam and Water Sampling		
1	ASME PTC 19.11-2008	Steam and Water Sampling, Conditioning, and Analysis in the Power Cycle
2	ASTM D1066	Standard practice for Sampling Steam
3	ASTM D1192 / D3370	Standard Guide for Equipment and Practices for Sampling Water and Steam
4	ISO 5667.7	Water Quality-Sampling – Part 7: Guidance on sampling of water and steam in boiler plants

Electrical standards

The main codes and standards for Electrical part are listed hereunder:

IEC	International Electrotechnical Commission
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ISA	Instrument Society of America
ASTM	American Society for Testing & Materials
ISO	International Standardization Organization
NEMA	National Electrical Manufacturer's Association
ITU	International Telecommunication Unit
EIA/TIA	Electronic Industries Alliance/ Telecommunications Industry Association Engineering Standards
IEEE	Institute of Electrical and Electronics Engineers

Electrical regulations and codes

The following regulations and codes shall be applied for electrical design of the power plants and the substation:

- Consolidated Official Letter No. 57/VBHN-BCT dated June 6, 2020 of the Ministry of Industry and Trade on the Detail regulation on execution of Electricity Law regarding electrical safety.
- Circular No. 30/2019/TT-BCT dated November 18, 2019 of the Ministry of Industry and Trade on amending and supplementing a number of articles of the Minister's Circular No. 25/2016/TT-BCT of November 30, 2016 The Ministry of Industry and Trade regulates the electricity transmission system and Circular No. 39/2015/TT-BCT dated November 18, 2015 of the Minister of Industry and Trade regulating the distribution power system.
- Circular no. 39/2022/tt-bct dated december 30, 2022 on amendments and supplements to circular no. 25/2016/tt-bct on electricity transmission system; circular no. 39/2015/tt-bct on electricity distribution system; circular no. 30/2019/tt-bct on amendments and supplements to several articles of circular no. 25/2016/tt-bct on electricity transmission system, and circular no. 39/2015/tt-bct on electricity distribution system
- Circular No. 33/2015/TT-BCT dated October 27, 2015, regulations on technical safety inspection for electrical equipment and tools

- Circular No. 25/2016/TT-BCT dated November 30, 2016 of the Ministry of Industry and Trade on the Regulation on Transmission Power Systems;
- Circular No. 39/2015/TT-BCT dated November 18, 2015 of the Ministry of Industry and Trade on the Regulation on Distribution Power Systems;
- Circular No. 42/2015/TT-BCT dated December 1, 2015 of Ministry of Industry and Trade regarding Tariff metering in power system.
- Circular No.31/2014/TT-BCT dated October 2, 2014 of the Ministry of Industry and Trade regarding Detailed regulation on some contents of electrical safety.
- Circular No. 23/2013/TT-BKHCN dated September 26, 2013 of the Ministry of Science and Technology on the Regulation Calibration, verification and testing for group 2 measuring instruments.
- Circular No. 40/2009/TT-BCT of Ministry of Industry and Trade dated December 31, 2009 regarding the National Technical Codes (Volume 5, 6, 7).
- Circular No. 04/2011/TT-BCT of Ministry of Industry and Trade dated February 16, 2011 regarding the National Technical Code for Testing, Acceptance Test for Power Facility (Volume 8).
- Circular No. 40/2014/TT-BCT dated November 5, 2014 of the Ministry of Industry and Trade on the Regulation on the procedure for Dispatching of National Power System.
- Consolidated Official Letter No. 04/VBHN-BCT dated December 31, 2015 of the Ministry of Industry and Trade on the Regulation on the procedure for the Dispatching of National Power System.
- Circular No. 31/2019/TT-BCT dated November 18, 2019 of the Ministry of Industry and Trade on Revision, supplement some articles of Circular Nos. 28/2014/TT-BCT, 40/2014/TT-BCT and 44/2014/TT-BCT regarding the Regulation on the procedure for Dispatching of National Power System.
- Circular No.22/2016/TT-BYT dated June 30, 2016 of the Ministry of Health on the Regulations on National Technical Regulations on Lighting - Permissible level for lighting of the workplace.
- Circular No. 45/2018/TT-BCT dated November 15, 2018 of the Ministry of Industry and Trade on the Regulation on operation of the Vietnam Wholesale Electricity Market and Modifying some articles of the Circular No. 56/2014/TT-BCT.
- Circular No. 03/2017/TT-BTTTT dated April 24, 2017 of MOIC regarding Guidelines for the Government’s Decree No. 85/2016/ND-CP dated July 01, 2016 on the security of information system by classification.

- Decision No. 3138/QD-BKHCN dated 28 October 2019 of the Minister of Science and Technology, correcting Circular No. 07/2019/TT BKHCN, amending Circular No. 23/2013/TT-BKHCN, on group-2 measuring devices.
- Decision No. 13/QD-DTDL dated January 31, 2019 of the Electricity Regulatory Authority of Vietnam (ERAV) regarding the procedure for calculation for payment in Electricity Market.
- Decision No. 105/QD-DTDL dated December 6, 2018 of the Electricity Regulatory Authority of Vietnam (ERAV) regarding the procedure for collecting, handling and managing the tariff metering data.
- Official Letter No. 563/DTDL-TTDL dated September 30, 2011 of the Electricity Regulatory Authority of Vietnam (ERAV) regarding applying the technical requirements to the equipment provided for the power plants joining Vietnam Competitive Generation Market (VCGM).
- Official Letter No. 8482/BCT-DTDL dated September 12, 2011 of the Ministry of Industry and Trade (MOIT) regarding developing the infrastructure for VCGM.
- Decision No.55/QD-DTDL dated August 22, 2017 of the Electricity Regulatory Authority of Vietnam (ERAV) on Regulations of Technical Requirement and Operation Management of SCADA System.
- Decision No. 25/QD-DTDL dated March 26, 2019 of the Electricity Regulatory Authority of Vietnam (ERAV) regarding Testing procedure and Testing supervision.
- Decision No. 1208/QD-EVN dated July 18, 2008 of EVN on the Regulations on Constructing and Managing SCADA system for substations and power plants.
- Decision No. 1232/QD-EVN dated December 21, 2011 of EVN on the Regulation on Metering Management at Terminal Point for Tariff metering points.
- Decision No. 1361/QD-EVN dated November 7, 2018 of EVN regarding the Test and Commissioning Procedure for Surge Arrester/ Lightning Arrester
- Decision No. 1362/QD-EVN dated November 7, 2018 of EVN regarding the Test and Commissioning Procedure for AC Circuit Breaker
- Decision No. 1363/QD-EVN dated November 7, 2018 of EVN regarding the Test and Commissioning Procedure for Earthing system.
- Decision No. 513/QD-EVN dated March 26, 2008 of EVN on the Regulation on the Acceptance of the integrated control system of substations.

- Official Letter No 432/DDQG-CN dated March 20, 2017 of the National Load Dispatch Center (A0) regarding Guiding and Regulation on the Agreement on Communication Connection for Power System Operation.
- Official letter No. 136/DDQG-CN dated January 01, 2021 of the National Load Dispatch Center (A0) regarding Regulation and Guideline for agreement on telecommunication connection for operation of electricity market and tariff metering data collecting system.
- Official Letter No. 1808/EVN-CN&CNTT dated May 6, 2016 of EVN regarding Agreement on Communication Connection with the IEC 60870-5-104 Protocol.
- Decision No. 0103/QD-EVNNPT dated July 11, 2019 of National Power Transmission Corporation (EVNNPT) on the Regulation on Technical Specification of 500kV and 220kV Post Insulators of Power Transmission System.
- Decision No. 0838/QD-EVNNPT dated April 14, 2015 of National Power Transmission Corporation (EVNNPT) on the Regulation on Technical Specification of 220kV Circuit Breakers of Power Transmission System.
- Decision No. 0899/QD-EVNNPT dated July 22, 2013 of National Power Transmission Corporation (EVNNPT) on the Regulation on Technical Specification of 220kV Current Transformers of Power Transmission System.
- Decision No. 1198/QD-EVN dated December 13, 2011 of EVN regarding Coordination and Control Procedure for the Protection Relay Setting Calculation.
- Decision No. 2896/QD-EVN-KTLD-TD dated October 10, 2003 of EVN on the Regulation on technical standard of Integrated Control System, protection configuration, technical specification of relay protection for Overhead line, Transformer Substation.
- QCVN 01:2020/BCT National technical regulation on Electric safety
- 11 TCN 18:2006 Vietnam Electrical Equipment Regulation – Part I: General Requirement
- 11 TCN 19:2006 Vietnam Electrical Equipment Regulation – Part II: Power Transmisison System
- 11 TCN 20:2006 Vietnam Electrical Equipment Regulation – Part III: Distribution Equipment and Substation
- 11 TCN 21:2006 Vietnam Electrical Equipment Regulation – Part IV: Protection and Automation

- QCVN QTD-5:2009/BCT National Technical Regulations on Electrical Engineering - Volume 5: Testing Of Electrical Equipment.
- QCVN QTD-6:2009/BCT National Technical Regulations on Electrical Engineering - Volume 6: Operating, Repairing Electrical Equipment.
- QCVN QTD-7:2009/BCT National Technical Regulations on Electrical Engineering - Volume 7: Installation Power System
- QCVN QTD-8:2010/BCT National Technical Regulations on Electrical Engineering - Volume 8: Technical Regulations on Low Voltage System.
- QCVN 07-3:2016/BXD National Technical Regulation on Technical Infrastructure Works - Trench & Tunnel
- QCVN 07-5:2016/BXD National Technical Regulation on Technical Infrastructure Works – Electricity Supply
- QCVN 07-7:2016/BXD National Technical Regulation on Technical Infrastructure Works - Lighting
- QCVN 09:2017/BXD National Technical Regulation on Energy Efficiency Buildings
- QCVN 12:2014/BXD National Technical Regulation on Electrical Installations of Dwelling and Public Buildings
- QCVN 02:2010/BTTTT National Technical Regulation on Physical/Electrical Characteristics of Hierarchical Digital Interfaces.
- QCVN 7:2010/BTTTT National Technical Regulation on Optical Interfaces for Network Interconnection Equipments Relating to The Synchronous Digital Hierarchy
- QCVN 22:2010/BTTTT National Technical Regulation on Electrical Safety of Telecommunications Terminal Equipments .
- TCVN 9385-2012 Protection of Structures Against Lightning - Guide for design, inspection and maintenance
- Decision 782/QĐ-EVN dated 04/08/2023 Regarding the promulgation of Regulations on control of equipment, adjustment and testing work Testing protective relays in Vietnam National Electricity Group
- Decision No.851/QĐ-EVN dated 25th June 2020 Regulation on equipment control, set and test of protection relay.
- Other relevant Vietnamese regulation

Electrical standards

The main standards apply to Electrical design:

No.	Standard/Regulation	Content
Vietnamese Standards		
1	TCVN 5681:2012	Documentation system for construction design - Indoor lighting - Construction drawing
2	TCVN 5935-1:2013	Power cables with extruded insulation and their accessories for rated voltages from 1kV ($U_m = 1.2\text{kV}$) to 30kV ($U_m = 30\text{kV}$) – Part 1: Cable with rating voltage from 1kV ($U_m = 1.2\text{kV}$) to 3kV ($U_m = 3.6\text{kV}$)
3	TCVN 5935-2:2013	Power cables with extruded insulation and their accessories for rated voltages from 1kV ($U_m = 1.2\text{kV}$) to 30kV ($U_m = 30\text{kV}$) – Part 2: Cable with rating voltage from 6kV ($U_m = 7.2\text{kV}$) to 30kV ($U_m = 36\text{kV}$)
4	TCVN 5935-4:2013	Power cables with extruded insulation and their accessories for rated voltages from 1 kV ($U_m = 1.2\text{ kV}$) up to 30 kV ($U_m = 36\text{ kV}$) - Part 4: Test requirements on accessories for cables with rated voltages from 6 kV ($U_m = 7.2\text{ kV}$) up to 30 kV ($U_m = 36\text{ kV}$)
5	TCVN 7114-1:2008	ECGONOMI – Lighting at workplace – Part 1: Indoor
6	TCVN 7114-3:2008	ECGONOMI – Lighting at workplace – Part 2: Requirements for safety and security lighting at outdoor workplace
7	TCVN 7722-1:2019	Luminaires - Part 1: General requirements and tests
8	TCVN 7722-2-2:2007	Luminaires – Part 2: Particular requirements – Section 2: Recessed luminaires
9	TCVN 7722-2-3:2007	Luminaires – Part 2: Particular requirements –Sections 3: Luminaires for road and street lighting
10	TCVN 7722-2-5:2007	Luminaires – Part 2: Particular requirements –Sections 5: Floodlights
11	TCVN 7995:2009	Standard voltages
12	TCVN 7997:2009	Power cable buried ground - Installation methods
13	TCVN 9208:2012	Installation of electrical cables and wires for industrial projects
14	TCVN 9358: 2012	Installation of equipment earthing system for industrial projects - General requirements
15	TCVN 9385:2012	Protection of structures against lightning - Guide for design, inspection and maintenance

16	TCVN 9888-1:2013	Protection against lightning - Part 1: General principles
17	TCVN 9888-4:2013	Protection against lightning - Part 4: Electrical and electronic systems within structures
18	TCVN 10885-2-1:2015	Luminaire performance - Part 2-1: Particular requirements for LED luminaires
19	TCXDVN 253:2001	Installation of lighting equipment for industrial projects – General requirements
20	TCVN	Other Vietnamese Standards
International Standards		
1	IEC 60034:2020 (all parts)	Rotating electrical machines
2	IEC 60038:021	Standard Voltages
3	IEC 60068 (all parts)	Environmental testing
4	IEC 60071-1:2019	Insulation Co-Ordination - Definitions, principles and rules
5	IEC 60071-2:2018	Insulation Co-Ordination – Application Guide
6	IEC 60076 (all parts)	Power transformer
7	IEC 60079:2020 (all parts)	Electrical Apparatus for Explosive Gas Atmospheres
8	IEC 60085:2007	Electrical Insulation – Thermal evaluation and designation
9	IEC 60099-4:2014	Metal-oxide surge arresters without gaps for a.c. systems
10	IEC 60137:2017	Insulated bushing for alternating voltages above 1000V
11	IEC 60146-1-1:2009	Semiconductor converters - General requirements and line commutated converters - Part 1-1: Specification of basic requirements
12	IEC 60156:2018	Insulating liquids – Determination of the breakdown voltage at power frequency – Test method
13	IEC 60214 (all parts)	On Load Tap Changer (OLTC)
14	IEC 60228:2004	Conductors of insulated cables
15	IEC 60255 (all parts)	Electrical Relays
16	IEC 60269 (all parts)	LV fuses
17	IEC 60282 (all parts)	HV fuses
18	IEC 60296:2012	Specification for unused Mineral Insulating Oils for Transformers and Switchgear

19	IEC 60305:2021	Insulators for overhead lines with a nominal voltage above 1000 V - Ceramic or glass insulator units for a.c. systems - Characteristics of insulator units of the cap and pin type
20	IEC 60358-1:2012	Coupling capacitors and capacitor dividers - Part 1: General rules
21	IEC 60376:2018	Specification of technical grade sulphur hexafluoride (SF6) and complementary gases to be used in its mixtures for use in electrical equipment
22	IEC 60383-1:1993	Insulators for overhead lines with a nominal voltage above 1000 V - Part 1: Ceramic or glass insulator units for a.c. systems - Definitions, test methods and acceptance criteria
23	IEC 60947-3	LV air circuit breaker, DS, ES and fuse combination. (
24	IEC 60445:2017	Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals, conductor terminations and conductors
25	IEC 60502 (all parts) 2021	Power cables with extruded insulation and their accessories for rated voltages from 1kV to 30kV
26	IEC 60529:2020	Classification of Degrees of Protection Provided by Enclosure for Electrical Equipment
27	IEC 60567:2011	Oil-filled electrical equipment - Sampling of gases and analysis of free and dissolved gases – Guidance
28	IEC 60584 (all parts)	Thermocouples
29	IEC 60599:2015	Mineral oil-filled electrical equipment in service - Guidance on the interpretation of dissolved and free gases analysis
30	IEC 60623:2017	Secondary cells and batteries containing alkaline or other non-acid electrolytes
31	IEC 60684 (all parts)	Flexible insulating sleeving
32	IEC 60688:2012	Electrical Measuring Transducers
33	IEC/TS 60815 (all parts)	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions
34	IEC 60865-1:2011	Short-circuit currents - Calculation of effects - Part 1: Definitions and calculation methods
35	IEC 60870-5	Transmission protocol.
36	IEC 60888:1987	Zinc coated wires for overhead line conductors.
37	IEC 60889:1987	Hard-drawn aluminum wire for overhead line conductors
38	IEC 60896 (all parts)	Stationary Lead-acid Batteries

39	IEC 60898 (all parts)	Electrical accessories- Circuit-breakers for overcurrent protection for household and similar installations
40	IEC 60909-0:2016	Short-circuit currents in three-phase a.c. systems - Part 0: Calculation of currents
41	IEC 60947:2020 (all parts)	Low-voltage switchgear and controlgear
42	IEC 61089:1991	Round wire concentric lay overhead electrical stranded conductors
43	IEC 61232:1993	Aluminum-clad steel wires for electrical purposes
44	IEC 61347-2-13:2016	Lamp controlgear - Part 2-13: Particular requirements for d.c. or a.c. supplied electronic controlgear for LED modules
45	IEC 61386:2017	Conduit system for cable management
46	IEC 61395:1998	Overhead electrical conductors - Creep test procedures for stranded conductors
47	IEC 61439 (all parts)	Low-voltage switchgear and controlgear assemblies
48	IEC 61499	International Standard for Distributed Systems
49	IEC 61800 (all parts)	Adjustable speed electrical power drive systems
50	IEC 61869 (all parts)	Instrument transformers
51	IEC 62040 (all parts)	Uninterruptible power systems (UPS)
52	IEC 62052 (all parts)	Electricity metering equipment - General requirements, tests and test conditions
53	IEC 62053 (all parts) 2018	Electricity metering equipment - Particular requirements
54	IEC 62271 (all parts)	High-voltage switchgear and controlgear
55	IEC/TR 62271 - 301:2009	High-voltage switchgear and controlgear – Part 301: Dimensional standardisation of high-voltage terminals (
56	IEC 62305:2020	Protection against lightning
57	IEC 62931:2017	GX16t-5 capped tubular LED lamp - Safety specifications
58	IEC 63013:2017	LED packages - Long-term luminous and radiant flux maintenance projection
59	IEEE-Std 80-2013	Guide for safety in AC Grounding System
60	IEEE Std 81:2012	Guide for Measuring earth resistivity, ground impedance & earth surface potential of a ground system
61	IEEE Std 485:2010	IEEE Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications
62	IEEE Std 665:1995	IEEE Guide for Generating Station Grounding

63	IEEE C37.23:2015	Standard for metal-enclosed bus
64	IEEE C37.013:1997	Standard for AC high-voltage generator circuit breaker rated on a symmetrical current basis
65	IEEE C62.92.2:2017	Guide for the application of neutral grounding in electrical utility systems. Part II - Grounding of synchronous generator systems
66	ANSI C37.90.1:2012	Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus
67	ANSI MC 96.1:1982	Temperature Measurement Thermocouples
68	ASTM B232:2017	Standard Specification for Concentric-Lay-Stranded Aluminum Conductors, Coated-Steel Reinforced (ACSR)
69	ASTM B415-92	Standard Specification for Hard-Drawn Aluminum-Clad Steel Wire
70	ASTM B416-93	Standard Specification for Concentric-Lay-Stranded Aluminum-Clad Steel Conductors
71	ASME	Steam Tables 6th Edition 1993
72	BS 7884:1997	Specification for copper and copper-cadmium stranded conductors for overhead electric traction and power transmission systems
73	BS 159:1992	Specification for high-voltage busbars and busbar connections
74	BS EN 755-2:2016	Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Part 2: Mechanical properties
75	BS EN 755-3:2008	Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Part 3: Round bars, tolerances on dimensions and form
76	BS 3288-1:2014	Insulator and conductor fittings for overhead power lines. Performance and general requirements
77	NFPA 780:2017	Standard for the Installation of Lightning Protection Systems
78	EN 50020:2002	Electrical apparatus for potentially explosive atmospheres Intrinsic safety
79	IEEE	Institute of Electrical and Electronic Engineering (Other Standards where applicable)
80	IEC	International Electrotechnical Commission (Other Standards where applicable)

81	VDE	Verein Deutscher Elektr. (English version) (Other Standards where applicable)
82	NEMA	National Electrical Manufacturer's Association (Other Standards where applicable)
83	ASTM	American Society for Testing and Material (Other Standards where applicable)
84	NFPA	National Fire Protection Association (Other Standards where applicable)
85	ISO	International Standardisation Organisation (Other Standards where applicable)
86		Other equivalent standards

C&I standards

The main codes and standards for C&I part are listed here under:

IEC	International Electrotechnical Commission
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ISA	Instrument Society of America
ASTM	American Society for Testing & Materials
ISO	International Standardization Organization
NEMA	National Electrical Manufacturer's Association
ITU	International Telecommunication Unit
EIA/TIA	Electronic Industries Alliance/ Telecommunications Industry Association Engineering Standards
API	American Petroleum Institute

Other relevant Vietnamese Codes and Standards

No.	Standard/Regulation	Content
Vietnamese Standards		
1	TCVN 7995:2009	Standard voltages
2	TCVN 9208:2012	Installation of electrical cables and wires for industrial projects

3	TCVN 8238:2009	Telecommunication network - Metallic cables for local telephone networks
4	TCVN 8665:2011	Optical fibre for telecommunication network - General technical requirements
5	TCVN 8687:2011	Power plant - 48 VDC for telecommunication equipment. Technical requirements
6	TCVN 8698:2011	Telecommunication network - Cat.5 and Cat.5e communication copper cable - Technical requirements
7	TCVN	Other Vietnamese Standards
International Standards		
1	IEC 60038:2002	Standard Voltages
2	IEC 60068 (all parts)	Environmental testing
3	IEC 60079:2020 (all parts)	Electrical Apparatus for Explosive Gas Atmospheres
4	IEC 60085:2007	Electrical Insulation – Thermal evaluation and designation
5	IEC 60529:2013	Classification of Degrees of Protection Provided by Enclosure for Electrical Equipment
6	IEC 60584 (all parts)	Thermocouples
7	IEC 60623:2017	Secondary cells and batteries containing alkaline or other non-acid electrolytes
8	IEC 60684 (all parts)	Flexible insulating sleeving
9	IEC 60688:2012	Electrical Measuring Transducers
10	IEC 60870-5	Transmission protocol.
11	IEC 61131-3:2013	Programmable controller – Part 3: Programming languages
12	IEC 61207 (all parts)	Gas Analyzers
13	IEC 61386:2017	Conduit system for cable management
14	IEC 61499	International Standard for Distributed Systems
15	IEC 61508	Functional safety of electrical/electronic/programable electronic safety-related systems
16	IEC 61511	Safety instrumented systems for the process industry sector
17	IEC 61850	Communication networks and system for power utility automation

18	IEC 62351	Power systems management and associated information exchange
19	IEC 62443	Security for industrial automation and control system
20	IEC 61869 (all parts)	Instrument transformers
21	IEC 62052 (all parts)	Electricity metering equipment - General requirements, tests and test conditions
22	IEC 62053 (all parts)	Electricity metering equipment - Particular requirements
23	IEEE Std 91:1991	IEEE Standard Graphic Symbols for Logic Functions.
24	IEEE Std 91a:1991	Supplement to IEEE Standard Graphic Symbols for Logic Functions
25	IEEE 802.4:1990	Token Passing Bus LAN
26	IEEE 802.3:2018	CSMA/CD LAN.
27	ANSI S5.3:1983	Graphic Symbols for Distributed Control
28	ANSI/ISA 5.1:2009	Instrumentation Symbols and Identification (R1992) (1984)
29	ANSI C37.1:2007	EMI Interference and Noise
30	ANSI MC 96.1:1982	Temperature Measurement Thermocouples
31	ANSI T1.105:1991	Telecommunications - Digital Hierarchy - Optical Interface Rates and Formats Specifications
32	ANSI/TIA/EIA 568:2001	Commercial Building Telecommunications Cabling Standard
33	ASME	Steam Tables 6th Edition 1993
34	NEMA	National Electrical Manufacturers Association
35	EN 50020	Electrical apparatus for potentially explosive atmospheres Intrinsic safety
36	ISO 4006:1991	Measurement of Fluid Flow in Closed
37	SAMA RC 22.11	(MCAA) Functional Diagramming of Instrumentation and Control Systems.
38	ITS-90:1990	The International Temperature Scale (1990)
39	ISA-TR77.60.04:2013	Displays HMI of power plants using fossil fuels
40	AS 2220.1-1989	Emergency warning and intercommunication systems in buildings – Part 1: Equipment design and manufacture
41	AS 2220.2-1989	Emergency warning and intercommunication systems in buildings. Part 2: System design, installation and commissioning

42	CJC4 -2000	Coordination of Power and Telecommunications
43	ITU–T G.652/653/654/655	Characteristics of optical fiber cable
44	ITU–T G.703:2016	Physical/Electrical characteristics of hierarchical digital interfaces
45	ITU–T G.707:2007	Network node interface for the synchronous digital hierarchy SDH
46	ITU–T G.708:1999	Sub STM-0 network node interface for the synchronous digital hierarchy (SDH)
47	ITU–T G.709:2016	Interface for the optical transport network (OTN)
48	ITU-T G.712:2001	Transmission performance characteristics of pulse code modulation channels
49	ITU-T G.773:1993	Protocol Suites for Q-Interfaces for Management of Transmission Systems - General Aspects of Digital Transmission Systems
50	ITU-T G.774:2001	Synchronous digital hierarchy (SDH) – Management information model for the network element view
51	ITU-T G.781:2020	Synchronization layer functions
52	ITU-T G.783:2006	Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks
53	ITU-T G.784:2008	Management aspects of the synchronous digital hierarchy (SDH) transport network element
54	ITU-T G.798:2017	Characteristics of optical transport network hierarchy equipment functional blocks
55	ITU-T G.803:2000	Architecture of transport networks based on the synchronous digital hierarchy (SDH)
56	ITU-T G.811:1997	Timing characteristics of primary reference clocks
57	ITU-T G.812:2004	Timing requirements of slave clocks suitable for use as node clocks in synchronization networks
58	ITU-T G.813:2003	Timing characteristics of SDH equipment slave clocks (SEC)
59	ITU-T G.826:2002	End-to-end error performance parameters and objectives for international, constant bit-rate digital paths and connections
60	ITU-T G.831:2000	Management capabilities of transport networks based on the synchronous digital hierarchy (SDH)

61	ITU-T G.841:1998	Types and characteristics of SDH network protection architectures
62	ITU-T G.842:1997	Interworking of SDH Network Protection Architectures
63	ITU-T G.957:2006	Optical interfaces for equipment and systems relating to the synchronous digital hierarchy
64	API 670	Machine protection system.
65	ATEX 2014/34/EU	
66	ATEX 1999/92/EC	
67	ITU-T G.958:2006	Digital line systems based on the synchronous digital hierarchy for use on optical fibre cables
68	IEEE	Institute of Electrical and Electronic Engineering (Other Standards where applicable)
69	IEC	International Electrotechnical Commission (Other Standards where applicable)
70	NEMA	National Electrical Manufacturer's Association (Other Standards where applicable)
71	ASTM	American Society for Testing and Material (Other Standards where applicable)
72	ANSI	American National Standards Institute
73	ASME	American Society of Mechanical Engineers
74	NFPA	National Fire Protection Association (Other Standards where applicable)
75	ISO	International Standardisation Organisation (Other Standards where applicable)
76	ISA	Instrument Society of America
77	ITU	Telecommunication Standardization Sector
78	IECEX	Equipment for Use in Explosive Atmospheres
79		Other equivalent standards

Environmental codes and standards

Contractor shall be responsible for implementation of all the requirements in the approved EIA of the Long Phu 1 TPP. Furthermore, Contractor shall be responsible to comply with the requirements of PVN, sponsor(s)/lender(s) (if

any) as well as Vietnamese Regulations and Law on environmental protection even in case these regulations are updated, supplemented or modified.

The Contractor shall follow all current related environmental requirements in his design of the power plants. Furthermore, the Contractor shall be responsible for implementation of all requirements in Vietnamese environmental legislation and Lender's requirements (if any) as well as the amendments, updates of these regulations, etc.

Environmental frameworks are applicable for the Project as minimum requirements including but not limited to the following regulations and standards:

Legal documents

- The Law on Environmental Protection No 72/2020/QH14 was passed by the National Assembly of the Socialist Republic of Vietnam, Session X, promulgated on 17/11/2020 and is valid as of 01/01/2022.
- The Law on Water Resource was passed by the 13th National Assembly of the Socialist Republic of Vietnam, Session 3, on 21/06/2012.
- The Chemical Law No.06/2007/QH12 dated 21/11/2007 was promulgated by the National Assembly, effective on 1/7/2008
- The Biodiversity Law was promulgated by the National Assembly of the Socialist Republic of Vietnam on 16/09/ 2008.
- Decree No. 08/2022 / ND-CP dated January 10, 2022 of the Government on Regulations detailing the implementation of a number of articles of the Law on Environmental Protection.
- Decree 02/2023/ND-CP dated February 1, 2023 of the Government detailing implement a number of articles of the Law on Water Resources
- Decree No. 113/2017 / ND-CP dated October 9, 2017 of the Government regulating Details and guidance on implementation of a number of articles of the Law on Chemicals
- Circular No. 10/2021/TT-BTNM dated June 30, 2021 of the Ministry of Natural Resources and Environment stipulates on environmental monitoring techniques and management of information and quality monitoring data environmental quantity.
- Circular 17/2021/TT-BTNM dated October 14, 2021 of the Ministry of Natural Resources and Environment on supervision exploit and use water resources. Circular No. 39/2010/TT-BTNM dated October 16, 2010 of the Ministry of Natural Resources and Environment nationwide on environmental technical regulations

- Circular No. 32/2017/TT-BCT dated December 28, 2017 of the Ministry of Industry and Trade on detailing and guiding the implementation of a number of articles of the Law on Chemicals and Decree No. 13/2017/ND-CP dated September 2017 of the Government. October 2017 of The Government details and guides the implementation of a number of articles of the Law of chemical
- Circular No. 02/2022/TT-BTNM dated January 10, 2022 of the Ministry of Natural Resources and Environment Regulations detailing the implementation of a number of articles of the Law on Environmental Protection
- Decree No.80/2014/ND-CP dated 06/08/2014 by the Government on the drainage and treatment of wastewater.
- Circular No.39/2010/TT-BTNM dated 16/10/2010 by MONRE on the national technical regulation on the environment.
- Other related legal documents on environmental protection.

Group of Vietnamese environmental standards and regulations

- QCVN 22:2009/BTNMT - National technical regulation on emission of thermal power industry [$K_p=0.7$; $K_v=0.6$].
- QCVN 19:2009/BTNMT- National technical regulation on industrial emission of In-organic substances and dust.
- QCVN 20:2009/BTNMT - National technical regulation on Industrial Emission of organic substances.
- QCVN 05:2013/BTNMT - National technical regulation on ambient air quality.
- QCVN 06:2009/BTNMT - National technical regulation on hazardous substances in ambient air.
- QCVN 26:2010/BTNMT - National technical regulation on Industrial emission of noise.
- QCVN 27:2010/BTNMT - National technical regulation on Industrial emission of vibration.
- QCVN 19:2024/BTNMT - National Technical Regulation on Industrial Emission
- QCVN 08-MT:2015/BTNMT - National technical regulation on surface water quality.

- QCVN 09-MT:2015/BTNMT - National technical regulation on underground water quality.
- QCVN 10-MT:2015/BTNMT - National technical regulation on coastal water quality.
- QCVN 14:2008/BTNMT - National technical regulation on domestic wastewater.
- QCVN 40:2011/BTNMT - National technical regulation on Industrial wastewater.
- QCVN 43:2017/BTNMT - National technical regulation on sediment quality.
- QCVN 03-MT:2015/BTNMT - National technical regulation on the allowable limits of heavy metals in the soils.
- QCVN 07:2009/BTNMT-National technical regulation on hazardous waste thresholds.
- QCVN 50:2013/BTNMT - National technical regulation on Hazardous Thresholds for Sludge from Water Treatment Process.
- QCVN 21:2016/BYT – National technical regulation on high frequency electromagnetic – Permissible exposure level of high frequency electromagnetic intensity in the workplace.
- QCVN 22:2016/BYT – National technical regulation on lighting – Permissible levels of lighting in workplace.
- QCVN 23:2016/BYT - National technical regulation on ultraviolet radiation - Permissible exposure levels of ultraviolet radiation in the workplace.
- QCVN 24:2016/BYT – National technical regulation on noise - Permissible exposure levels of noise in the workplace.
- QCVN 25:2016/BYT – National technical regulation on industrial frequency electromagnetic fields – Permissible exposure level of industrial frequency electromagnetic fields in the workplace
- QCVN 26:2016/BYT – National technical regulation on microclimate - Permissible value of microclimate in the workplace.
- QCVN 27:2016/BYT – National technical regulation on vibration - Permissible levels of vibration in the workplace.
- QCVN 03: 2019/BYT – National technical regulation for fluid milk products.

- QCVN 02: 2019/BYT - National technical regulation on dust - Permissible exposure limit value of dust at the workplace.
- QCVN 08:2023/BTNMT National technical regulation on surface water quality;
- QCVN 09:2023/BTNMT National technical regulation on undergroundwater quality;
- Other related legal documents on environmental protection.
- Other international standards as per Lender’s requirements.

Fire prevention and fighting codes and standards

The design, installation and test of fire prevention and fighting system shall be in accordance with the latest regulations of the codes and standards listed hereunder, with priority taken for Vietnam technical codes and standards.

- TCVN-2622-1995 Fire prevention and protection for buildings and structures - Design requirements;
- TCVN 3254-1989: Fire safety - General requirements;
- TCVN 3890-2023: Fire protection - Fire protection equipments for building and construction - Equipment, Installation;
- TCVN 4513-1988: Internal water supply – Design standard;
- TCVN 4878-2009: Fire protection - Classification of fires;
- TCVN 5040-1990: Fire prevention and protection equipment - Graphical symbols used for protection schemes - Specifications;
- TCVN 5279-1990 Fire and explosion safely - Combustible dusts - General requirements;
- TCVN 5303-1990: Fire safety - Terminology and definitions;
- TCVN 5307-2009: Petroleum and petroleum products terminal – Design requirements;
- TCVN 5684-2003: Fire safety for petroleum and petroleum products facilities – General requirements;
- TCVN 5738-2021: Fire detection and alarm system - Technical requirements;
- TCVN 5739-2023: Fire – Fighting equipment – Coupling heads;

- TCVN 5760-1993: Fire extinguishing system - General requirements for design, installation and use;
- TCVN 6100-1996: Fire protection - Fire extinguishing media – carbon dioxide;
- TCVN 6101-1996 – ISO 6183: 1990 Fire protection equipment Carbon Dioxide extinguishing systems for use on premises Design and Installation;
- TCVN 6102-2020 - ISO 7202: 1987 Fire protection– Fire extinguishing media– Powder;
- TCVN 6379-1998 Fire protection equipment – Fire hydrant – Technical requirements;
- TCVN 6101:1996: Fire protection equipment Carbon Dioxide extinguishing systems for use on premises Design and Installation;
- TCVN 7161-1-2022- Gaseous fire - extinguishing systems - Physical properties and system design - Part 1: General requirements;
- TCVN 7161-9-2009- Gaseous fire-extinguishing systems - Physical properties and system design - Part 9: HFC 227ea extinguishant;
- TCVN 7336 – 2021: Fire protection – Automatic sprinkler systems – Design and installation requirements;
- TCVN 7435-1:2004: Fire protection – Portable and wheeled fire extinguishers - Part 1: Selection and Installation;
- TCVN 7194-2002: Thermal insulating materials - Classification;
- TCVN 7568-14:2015: Fire detection and alarm systems - Part 14: Design, installation, commissioning and service of fire detection and fire alarm systems in and around buildings;
- TCVN 8060-2009: Fire-fighting hoses - Rubber and plastics suction hoses and hose assemblies;
- QCVN 06:2021/BXD National Technical Regulation on Fire Safety of Buildings and Constructions;
- QCVN 02:2020/BCA National Technical Regulation on Stationary Pumps for Fire protection;
- Decree No. 136/2020/NĐ-CP dated November 24, 2020 Detail Regulation on some articles of Fire Prevention and Fighting Law and Law on Amendments to several articles of Fire Prevention and Fighting Law.

- Decree 50/2024/NĐ-CP dated may 10, 2024 amending Decree No. 136/2020/NĐ-CP on providing guidelines for a number of articles of Law On Fire Prevention And Fighting and Law On Amendments to Law On Fire Prevention And Fighting and Decree 83/2017/ NĐ-CP regulation on rescue operations by fire departments

Group of Vietnamese standards and regulations

No.	Standard/Regulation	Content
1.	Law No. 27/2001/QH10	Law No. 27/2001 / QH10 of the National Assembly on the law on fire prevention and fighting
2.	Law No. 40/2013/QH13	Law amending and supplementing articles of the Law on Fire Prevention and Fighting
3.	Decree 136/2020/ND-CP	Detailing the implementation of articles of the Law on Fire Protection and the Law amending and supplementing articles of the Law on Fire Protection
4.	Decree 50/2024/NĐ-CP	Amending Decree No. 136/2020/NĐ-CP on providing guidelines for a number of articles of Law On Fire Prevention And Fighting and Law On Amendments to Law On Fire Prevention And Fighting and Decree 83/2017/ NĐ-CP regulation on rescue operations by fire departments
5.	Decree No. 23/2018 / ND-CP	Decree stipulating compulsory fire and explosion insurance
6.	Circular No. 32/2024/TT-BCA	Amending and supplementing a number of articles of Circular No. 149/2020/TT-BCA dated December 31, 2020 detailing a number of articles and guidelines to implement the Law on Fire Prevention and Fighting and the Law amending and supplementing a number of articles of the Law on Fire Prevention and Fighting and Decree No. 136/2020/ND-CP dated November 24, 2020 detailing a number of articles and measures to implement the Law on Fire Prevention and Fighting and the Law amending and supplementing a number of articles of the Law on Fire Prevention and Fighting and Circular No. 08/2018/TT-BCA dated March 5, 2018 detailing a number of articles of Decree No. 83/2017/ND-CP dated July 18, 2017 on rescue and salvage activities of fire brigades.
7.	QCVN 06-2022/BXD	National Technical Regulation on Fire Safety of Buildings and Constructions
8.	QCVN 02-2020/BCA	National Technical Regulation on Fire Pumps Station
9.	TCVN 2622: 1995	Fire prevention and protection for buildings and structures - Design requirements

No.	Standard/Regulation	Content
10.	TCVN 3890:2023	Fire protection - Fire protection equipments for building and construction - Equipment, Installation.
11.	TCVN 5738:2021	Fire detection and alarm system - Technical requirements
12.	TCVN 5307: 2009	Petroleum and petroleum products terminal – Design requirements
13.	TCVN 6100: 1996	Fire protection - Fire extinguishing media – carbon dioxide
14.	TCVN 4090: 1985	Main pipelines for transporting of oil and oil products – Design standard
15.	TCVN 9385:2012	Lightning protection for construction works - Guide to the design, inspection and maintenance of the system
16.	TCVN 6101: 1996	Fire protection equipment Carbon Dioxide extinguishing systems for use on premises Design and Installation
17.	TCVN 5303: 1990	Fire safety – Terminology and definitions
18.	TCVN 3254:1989	Fire safety - General requirements
19.	TCVN 4878:2009	Fire protection - Classification of fires
20.	TCVN 4879: 1989	Fire protection - Safety signs
21.	TCVN 5040: 1990	Fire prevention and protection equipment - Graphical symbols used for protection schemes - Specifications
22.	TCVN 6103: 1996	Fire protection – Vocabulary – Smoke control
23.	TCVN 6305: 2013	Fire protection - Automatic sprinkler systems
24.	TCVN 7336: 2003	Fire protection – Automatic sprinkler systems – Design and installation requirements
25.	TCVN 7161: 2009	Gaseous fire - extinguishing systems - Physical properties and system design - Part 1: General requirements
26.	TCVN 6379: 1998	Fire protection equipment – Fire hydrant – Technical requirements
27.	TCVN 7435-1: 2004	Fire protection – Portable and wheeled fire extinguishers
28.	TCVN 5279: 1990	Fire and explosion safety - Combustible dusts - General requirements
29.	TCVN 3255: 1986	Explosion safety- General requirements

No.	Standard/Regulation	Content
30.	TCVN 6174: 1997	Industrial explosion materials - Safety code for production, check and accept and test explode
31.	TCVN 5334: 2007	Electrical apparatus for petroleum and petroleum products terminal – Requirements on safety in design, installation and operation
32.	TCVN 5684: 2003	Fire safety for petroleum and petroleum products facilities – General requirements
33.	TCVN 3991: 2012	Standard for fire protection in building design. Terminology – definitions.
34.	TCVN 6160: 1996	Fire protection - High rise building - Design requirements
35.	TCVN 4317: 1986	Warehouses - Basic principles for design
36.	TCVN 4513: 1988	Internal water supply – Design standard
37.	TCVN 6100: 1996	Fire protection - Fire extinguishing media – carbon dioxide
38.	TCVN 6102: 1996	1995 Fire protection– Fire extinguishing media– Powder
39.	TCN 33: 2006	Water supply – Distribution system and facilities - Design standards
40.	TCN 25: 1991	Installation of electric wire in dwellings and public buildings – Design standard
41.	TCN 18-2006	Code of electrical equipment
42.	TCVN 13657-1:2023:	National Technical Regulations on Firefighting Apparatus
43.	TCVN 13657-2:2023	Fire Protection - High Pressure Mist Fire Extinguishing System - Part 2: Technical requirements and test methods
44.	TCVN 13878:2023	Fire protection - Road Tunnels – Design requirements;
45.	TCVN 13877-2:2023	Fire protection - Powder firefighting system - Part 2: Design requirements;
46.	TCVN 13926:2023	Fire protection - Packaged type fire extinguishing systems;
47.	TCVN 5740:2023	Fire Protection - Fire Fighting Hoses;
48.	TCVN 13927:2023	Fire protection - Personal Protective Equipment-Low Stretch Life Safety Rope
49.	TCVN 7568-25:2023	Fire alarm systems - Part 25: Components using radio transmission paths;
50.	TCVN 7568-29 : 2023	Fire detection and alarm systems - Part 29: Video fire detectors

No.	Standard/Regulation	Content
51.	QCVN 03:2023/BCA	National Technical Regulations on Firefighting Apparatus
52.	TCXD 218: 1998	Fire detection and alarm system - General

Group of International standards

The application of foreign and international standards for fire safety and firefighting in Vietnam shall comply with the provisions of Clause 4 Article 1 of the Law on amendments to the Law on fire safety and firefighting dated November 22, 2013; Decision No. 4158/QĐ-BCA-PCCC&CNCH and relevant regulations.

No.	Standard/Regulation	Content
1.	NFPA 10	Standard for Portable Fire Extinguishers
2.	NFPA 11/16	Standard for Low-Expansion Foam
3.	NFPA 12	Standard on Carbon Dioxide Extinguishing Systems
4.	NFPA 13	Standard for the Installation of Sprinkler Systems
5.	NFPA 14	Standard for the Installation of Standpipe and Hose Systems
6.	NFPA 15	Standard for Water Spray Fixed Systems for Fire Protection
7.	NFPA 17	Standard for Dry Chemical Extinguishing Systems
8.	NFPA 20	Standard for the Installation of Centrifugal Fire Pumps
9.	NFPA 22	Standard for Water Tanks for Private Fire Protection
10.	NFPA 24	Standard for the Installation of Private Fire Service Mains and Their Appurtenances
11.	NFPA 25	Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
12.	NFPA 30	Flammable and Combustible Liquids Code
13.	NFPA 70	National Electrical Code
14.	NFPA 72	National Fire Alarm Code
15.	NFPA 80	Standard for Fire Doors and Fire Windows
16.	NFPA 204M	Guide for Smoke and Heat Venting

No.	Standard/Regulation	Content
17.	NFPA 497	Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
18.	NFPA 850	Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations
19.	NFPA 2001	Standard on Clean Agent Fire Extinguishing System
20.	NFPA 50	Standard for Bulk Oxygen Systems at Consumer Sites
21.	NFPA 50A	Standard for Gaseous Hydrogen Systems at Consumer Sites
22.	NFPA 50B	Standard for Liquefied Hydrogen Systems at Consumer Sites
23.	NFPA 51B	Standard for Fire Prevention During Welding, Cutting
24.	NFPA 55	Edition Standard for the Storage, Use, and Handling of Compressed and Liquefied Gases in Portable Cylinders
25.	NFPA 58	Liquefied Petroleum Gas Code
26.	NFPA 75	Standard for the Protection of Information Technology
27.	NFPA 77	Recommended Practice on Static Electricity
28.	NFPA 85	Boiler and Combustion Systems Hazards Code
29.	NFPA 5000	Building Construction and Safety Code
30.	API 2001	Fire Protection in Refineries
31.	API 2218	Fireproofing Practices in Petroleum and Petrochemical Processing Plants

Safety codes and standards

The safety requirements shall be in accordance with the latest regulations of the codes and standards listed hereunder, with priority taken for Vietnam technical codes and standards.

- QCVN 18:2021/BXD National Technical Regulation on Safety in Construction
- QCVN 03:2011/BLĐTBXH (National technical regulation on safe work for electric welding & welding jobs)

- QCVN 17:2013/BLĐTBXH National technical regulation on safe work for Oxy-fuel welding work
- QCVN 20:2015/BLĐTBXH National technical regulation on safe work of Elevating Platform for lifting people
- QCVN 34:2018/BLĐTBXH National technical regulation on safe work in confined spaces
- QCVN 05A:2020/BCT (National technical regulation on safety in production, commerce, use, storage and transportation of hazardous chemicals
- QCVN 03:2021/BCA National Technical Regulations on Firefighting Apparatus

Group of Vietnamese standards and regulations

No.	Standard/Regulation	Content
1.	Law No. 27/2001/QH10	Law No. 27/2001 / QH10 of the National Assembly on the law on fire prevention and fighting
2.	Law No. 40/2013/QH13	Law amending and supplementing articles of the Law on Fire Prevention and Fighting
3.	Decree 136/2020/ND-CP	Detailing the implementation of articles of the Law on Fire Protection and the Law amending and supplementing articles of the Law on Fire Protection
4.	Decree No. 23/2018 / ND-CP	Decree stipulating compulsory fire and explosion insurance
5.	Decree No. 44/2016/ ND-CP	Details some articles of the Law on occupational safety and sanitation, technical inspection of occupational safety, training of occupational safety and sanitation and monitoring of occupational environment
6.	Circular No. 09/2017/TT-BCT	Occupational safety inspection under the management of the ministry of industry and trade
7.	Circular No. 12/2020/TT-BCT	Amendments to the Circular No. 09/2017/TT-BCT on technical inspection of occupational safety and some inspection procedures promulgated together with the Circular No. 10/2017/TT-BCT promulgating procedures for technical inspection of occupational safety of machinery, equipment and supplies subject to strict occupational safety requirements under the management of Ministry of Industry and Trade
8.	Circular No. 18/2023/TT-BCT	Amending, supplementing and abolishing a number of articles of Circulars regulating technical inspection of labor safety under the management authority of the Ministry of Industry and Trade

No.	Standard/Regulation	Content
9.	QCVN 06-2022/BXD	National Technical Regulation on Fire Safety of Buildings and Constructions
10.	QCVN 02-2020/BCA	National Technical Regulation on Fire Pumps Station
11.	TCVN 2622: 1995	Fire prevention and protection for buildings and structures - Design requirements
12.	TCVN 3890:2023	Fire protection - Fire protection equipments for building and construction - Equipment, Installation.
13.	TCVN 5738: 2001	Fire detection and alarm system - Technical requirements
14.	TCVN 5307: 2009	Petroleum and petroleum products terminal – Design requirements
15.	TCVN 6100: 1996	Fire protection - Fire extinguishing media – carbon dioxide
16.	TCVN 4090: 1985	Main pipelines for transporting of oil and oil products – Design standard
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28.	TCVN 6379: 1998	Fire protection equipment – Fire hydrant – Technical requirements
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30.	TCVN 5279: 1990	Fire and explosion safety - Combustible dusts - General requirements
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32.	TCVN 6174: 1997	Industrial explosion materials - Safety code for production, check and accept and test explode
33.	TCVN 5334: 2007	Electrical apparatus for petroleum and petroleum products terminal – Requirements on safety in design, installation and operation
34.	TCVN 5684: 2003	Fire safety for petroleum and petroleum products facilities – General requirements
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36.	TCVN 6160: 1996	Fire protection - High rise building - Design requirements
37.	TCVN 4317: 1986	Warehouses - Basic principles for design
38.	TCVN 4513: 1988	Internal water supply – Design standard
39.	TCVN 6100: 1996	Fire protection - Fire extinguishing media – carbon dioxide
40.	TCVN 6102: 1996	1995 Fire protection– Fire extinguishing media– Powder
41.	TCN 33: 2006	Water supply – Distribution system and facilities - Design standards
42.	TCN 25: 1991	Installation of electric wire in dwellings and public buildings – Design standard
43.	TCN 18-2006	Code of electrical equipment
44.	TCXD 218: 1998	Fire detection and alarm system - General

Group of International standards

No.	Standard/Regulation	Content
1.	NFPA 10	Standard for Portable Fire Extinguishers
2.	NFPA 11/16	Standard for Low-Expansion Foam
3.	NFPA 12	Standard on Carbon Dioxide Extinguishing Systems
4.	NFPA 13	Standard for the Installation of Sprinkler Systems
5.	NFPA 14	Standard for the Installation of Standpipe and Hose Systems

No.	Standard/Regulation	Content
6.	NFPA 15	Standard for Water Spray Fixed Systems for Fire Protection
7.	NFPA 17	Standard for Dry Chemical Extinguishing Systems
8.	NFPA 20	Standard for the Installation of Centrifugal Fire Pumps
9.	NFPA 22	Standard for Water Tanks for Private Fire Protection
10.	NFPA 24	Standard for the Installation of Private Fire Service Mains and Their Appurtenances
11.	NFPA 25	Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
12.	NFPA 30	Flammable and Combustible Liquids Code
13.	NFPA 70	National Electrical Code
14.	NFPA 72	National Fire Alarm Code
15.	NFPA 80	Standard for Fire Doors and Fire Windows
16.	NFPA 204M	Guide for Smoke and Heat Venting
17.	NFPA 497	Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
18.	NFPA 850	Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations
19.	NFPA 2001	Standard on Clean Agent Fire Extinguishing System
20.	NFPA 50	Standard for Bulk Oxygen Systems at Consumer Sites
21.	NFPA 50A	Standard for Gaseous Hydrogen Systems at Consumer Sites
22.	NFPA 50B	Standard for Liquefied Hydrogen Systems at Consumer Sites
23.	NFPA 51B	Standard for Fire Prevention During Welding, Cutting
24.	NFPA 55	Edition Standard for the Storage, Use, and Handling of Compressed and Liquefied Gases in Portable Cylinders
25.	NFPA 58	Liquefied Petroleum Gas Code
26.	NFPA 75	Standard for the Protection of Information Technology

No.	Standard/Regulation	Content
27.	NFPA 77	Recommended Practice on Static Electricity
28.	NFPA 85	Boiler and Combustion Systems Hazards Code
29.	NFPA 5000	Building Construction and Safety Code
30.	API 2001	Fire Protection in Refineries
31.	API 2218	Fireproofing Practices in Petroleum and Petrochemical Processing Plants

Standards for HVAC design

No.	Standard/Regulation	Content
Vietnamese standards		
1	TCVN 3288-1979	Ventilation systems - General safety requirements
2	TCVN 5687-2024	Ventilation-air conditioning design standards
3	QCVN 06:2022/BXD	National Technical Regulation on Fire Safety of Buildings and Constructions
4	TCVN 232-1999	Fire protection equipment for construction and building – Providing, installation, inspection, maintenance.
5	TCVN 4318-1986	System of building design documents - Heating and ventilating - Working drawing
International standards		
1	ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers.
2	ASHRAE 62.1-2013	Ventilation for acceptable indoor air quality
3	Ashrae Handbook 2009 – SI Edition – Fundamental	Fundamental
4	Ashrae Handbook 2010 – PI Edition	Refrigeration
5	Ashrae Handbook 2011 – SI Edition	HVAC Applications
6	Australia ASHRAE AS1668.2-1991	The use of mechanical ventilation and air-conditioning in buildings-part 2: Mechanical ventilation for acceptable indoor air quality
7	AIRAH	Technical Handbook (3rd edition) published by The Australia Institute of Refrigeration, Air Conditioning and Heating (Inc.)
8	ASME B31.5	Refrigeration Piping
9	SMACNA	Sheet Metal and Air Conditioning Contractors National

No.	Standard/Regulation	Content
		Association

ANNEXURE-II

CRITERIA FOR LAYOUT

PLOT PLAN LAYOUT REQUIREMENTS

ITEM SPECIFICATION REQUIREMENT

A. Site conditions to be considered		
1. Prevalent wind direction	Refer Metrological Data.	
B. Layout Requirements		
1. Maximum permissible slope in		
a) Rail track	1 in 400	
b) Road	1 in 30	
c) Sides of unpaved embankment	1 in 2	
2. Required road width		
a) Main roads Refer Vol. II-G.		
b) Auxiliary interconnections	II-G.	Refer Vol.
c) Road to the power house unloading bay :		
• Only for entry to the unloading bay	Yes	
• To pass through the unloading bay	No	
3. Required minimum horizontal distance between the nearest points of		
a) Plant boundary and the boundary of residential area	(Local municipality/factory rule)	
b) Electrical transformer and any other	As per NFPA/applicable statutory Rules	

c)	Fire water supply installation and any statutory building/facility subject to fire risk.	As per NFPA/applicable Rules
d)	Inflammable liquid (fuel oil, etc.) storage statutory & handling installation and their fencing and other buildings/facilities.	As per NFPA/applicable rules

ITEM SPECIFICATION REQUIREMENT

4.	Required minimum vertical clearance	
a)	Under pipes/cable racks at road crossings	7.0 Metres
b)	Soil coverage over underground pipes	1.0 Metre (minimum)
5.	Minimum Clearance between any road edge and building/structure/ any fixed installation.	3 Metres
6.	Required level, above the local developed grade level, of	
a)	top of all roads	150 mm
b)	all outdoor paved areas	150 mm
c)	Temporary storage areas, workshops, offices, residence etc. required at the time of erection work.	Yes
d)	Green belt around power plant area	As per environmental guidelines, Govt. of Vietnam

BUILDING/ EQUIPMENT LAYOUT REQUIREMENTS

A.	Minimum clear space required at all working and walking areas for operating & maintenance personnel	
1.	Horizontal, in all directions	
a)	Adjacent to any electrical equipment, electrical cables, running (rotating/reciprocating) equipment, safety valve or vent/drain pipe outlet, pipe/ equipment of surface temperature exceeding 60°C.	1200 mm
b)	Adjacent to any other plant facilities (including walls/structures)	1000 mm
2.	Vertical (head-room clearance)	
a)	Under any pipe/equipment surface of temperature exceeding 60°C and any electrical cables or other electrical items.	2.0 Metre

- b) Under any other plant facilities (including structures, pipes etc.) 2.0 Metre

ITEM SPECIFICATION REQUIREMENT

3.	For all areas where any equipment (including mm trucks, trolleys and other material handling equipment) will move or maneuver.	Minimum 500	clear in all direction from the outer edges of the equipment
4.	Minimum clear hand space required for		
a)	The application of thermal insulation	100 mm	
b)	Welding work	150 mm	
c)	Bolt tightening	150 mm	
B.	Floors, platforms, staircase, ladders, walls, doors & windows		
1.	Statutory Requirement		As per NFPA, and Rules of the Local regulatory authorities .
2.	Operation & Maintenance Requirement		
a)	Adequate floor space shall be kept to permit dismantling, temporary storing and in-situ maintenance of plant & equipment parts, satisfying the clear space requirements stated above. A separate unloading bay for such purpose is required.	Yes	
b)	Floors or fixed/portable platforms with stairs/ ladders shall be provided for easy approach to any plant item, including valves, instruments, etc. to be operated, observed and/or to be frequently (more than once a month) maintained.	Yes	
3.	Plinth level of all buildings, above the local developed grade level	300 mm	
4.	Minimum access opening required (with rolling shutter) for material transportation, wherever entry of truck is envisaged		3.5M wide x 4M high or, more depending upon the equipment size to be handled.

ITEM SPECIFICATION REQUIREMENT

C. Other Maintenance Requirement

1. Generator stator handling
In case the Generator stator cannot be handled by the turbine house crane, all provisions for its overhauling, including the arrangement to slide the stator on the turbine house floor, the foundation work for stator jacking /lowering assembly, dismantling of building end walls/structures etc. shall be kept. Yes
2. Maintenance of the internals/impellers of all important equipment, like boiler feed pumps, feed water heaters, Surface Condenser, fans of the boiler draft plant, Intake and circulating water pumps, cooling water pumps, coal mills, compressors, blowers, heat exchangers, fuel air oil pumps, filters etc. Shall be possible without disconnecting or dismantling any piping/ducting.
3. Overhauling and handling of the casings for the above items Shall be possible without disturbing/dismantling any piping/ducting not directly connected to them.
4. Crane Approach

Wherever required the unobstructed approach of the crane hook/other hoisting equipment hook to various plant & equipment shall be possible. Yes

D. Central Control Room

All electronic equipment other than those directly associated with control, operation or presentation of displays shall be mounted external to the control room in air conditioned control equipment room. Yes

The EPC Contractor shall describe in his bid the proposed layout philosophy of the Central Control Room and Control Equipment Room and the arrangement of equipment best suited for the system offered by him and as per good ergonomically consideration.

However, as a guide line, following features are given :

- a) False ceiling and false flooring shall be provided.
- b) Uniform height, colouring schemes for cabinets etc. shall be available.

ITEM SPECIFICATION REQUIREMENT

- c) The total area of floor space covered by Control Consoles/Panels in the Control Room shall not exceed 15% of floor area.
 - d) No opening shall be provided from Boiler side.
 - e) Two double leaf doors, suitably located for entering the Control room shall be provided with opening towards the turbine floor.
 - f) Cable entry for the panels/consoles shall be from bottom and suitable openings shall be provided.
 - g) The Control Room lighting shall be designed to provide a glare free uniform illumination. The level of illumination shall be minimum 400 LUX.
 - h) Necessary Air Conditioning shall be provided for Central Control room, Control Equipment Room and SWAS room etc.
 - i) Basic amenities like toilet, Tiffin rooms, wash basins, rest rooms etc. shall be provided near the Control Room.
- E. Toilet and drinking water facility
- Required in all buildings and on all floors wherever operating personnel are to be deployed.

SECTION III

SUB-SECTION

3.1 GENERAL REQUIREMENTS

ARTICLE

3.1.2 PROJECT MANAGEMENT AND SITE SERVICES

[PII.CV.SIII.SS3.1 – Article 3.1.2]

SECTION III**SUB-SECTION
3.1 GENERAL REQUIREMENTS****ARTICLE
3.1.2 PROJECT MANAGEMENT AND
SITE SERVICES****TABLE OF CONTENTS**

CLAUSE NO.	DESCRIPTION
1.00.00	PROJECT MANAGEMENT SERVICES
2.00.00	SITE SERVICES

SECTION III

SUB-SECTION 3.1 GENERAL REQUIREMENTS

ARTICLE 3.1.2 PROJECT MANAGEMENT AND SITE SERVICES

1.00.00 PROJECT MANAGEMENT SERVICES

1.01.00 Responsibility

The Contractor shall identify a separate and independent project management team headed by a Project Manager for the execution of this project. Responsibilities of this project Management team shall cover the areas listed below :

- a) Planning and Monitoring
- b) Engineering Management
- c) Contracts Management
- d) Quality Assurance, Inspection & Expediting
- e) Construction Management
- f) Spares Management
- g) Erection & Commissioning Management

Detailed responsibilities in the above areas are discussed below :

1.02.00 Organization

1.02.01 Headquarters

The headquarters of the project management team shall be headed by a senior level executive designated as the Project Manager who shall be responsible to Owner for the execution of the project. He should have adequate financial power and authority to give decision.

Separately, designated leaders shall be identified for each of the areas mentioned under 1.01.00, who, in turn, will report to the Project Manager for all matters relative to this contract.

1.02.02 Central Co-ordination Cell

The central coordination cell shall have sufficient technical personnel to coordinate technical matters and to quickly resolve day to day queries or references made by Owner and his Consultants without having the need to refer to his headquarters each time.

1.02.03 Site Organisation

The site should have a competent construction manager for all site operations with adequate financial power and sufficient level of authority to take site decisions. The organisation chart for site should indicate the various levels of experts to be posted for supervision in the various fields in civil construction, erection, commissioning etc.

1.02.04 Organisation Chart

The Contractor shall furnish a detailed organisation chart for the project management team, clearly identifying the key personnel in each of the areas mentioned at 1.01.00 above. The expected number of executives at different levels shall also be indicated, separately for headquarters, central coordination cell and site organisation.

1.03.00 Implementation Schedule

The schedule for the completion of the Project would be as follows :

Taken as the date of issue of Notice to Proceed

a)	Unit # 1 synchronization	Third Quarter of 2027
b)	Unit # 2 synchronization	Fourth Quarter of 2027

To achieve these targets, the Contractor shall furnish to the Owner, various schedules as defined below:

1.03.01 Engineering Schedules

These schedules shall cover various design submissions indicating different engineering activities to be performed. Such schedules shall be furnished by the Contractor for each and every plant/systems/ equipment item covered in the scope of this specification.

1.03.02 Manufacturing Schedule

The Contractor shall submit to the Engineer his manufacturing and delivery schedules for all equipment within thirty (30) days from the date of issue of the Letter of Award (LOA). Such schedules shall be in line with the detailed network for all phases of the work of the Contractor. Such schedules shall be reviewed, updated and submitted to the Engineer, once in every two months thereafter, by the Contractor. Schedules shall also include the materials and equipment purchased from outside suppliers.

1.03.03 Erection Schedules

In order to achieve the overall completion schedule, the Contractor shall provide the Owner all the information covering erection sequence, testing and commissioning activities. These schedules may be based on the recommended erection procedures and will be subject to discussions/agreements with the Owner subsequent to the award of contract.

1.03.04 The successful Contractor shall have to provide all the above schedules (i.e. 1.03.01, 1.03.02 & 1.03.03) in a tabular form in addition to that in the form of L2 & L3 networks and these shall necessarily include information not limited to the earliest and latest dates for various activities/submissions and also any related constraints. However, the Contractor shall include in his proposal a Level-1 (L-1) network showing the major activities and various milestones to achieve the above mentioned completion schedule.

1.03.05 The Contractor shall provide the Owner the original disc/software for all such schedules along with requisite no. of copies (as required by the Owner) within an agreed time schedule. This time schedule will be agreed between Owner/ Contractor at the time of award. The Contractor's project management software shall be compatible with that of the Owner and the input data shall be furnished to the Owner in a manner compatible with Owner's project management software, Primavera.

1.04.00 Detailed Responsibilities

1.04.01 Planning & Monitoring

a) Planning

The EPC Contractor shall prepare a Master Network Schedule in the form of PERT network.

The network shall be prepared on a Work Breakdown Structure for the project which sub-divides the project into a set of manageable systems/ sub-systems. The master network will identify milestones

of key events for each system/package in the areas of engineering, procurement, manufacture and despatch and erection and commissioning. The master network shall represent the Level-I plan and will form the basis for development of detailed second and third tier execution plans. The master network shall conform to the overall schedule prescribed by Owner.

The master network should be submitted along with the bid which would be mutually discussed and finalised before the Award of Contract. This master network would clearly indicate the responsibility of the Contractor and project management team. This master network would form a part of the contract. The master network shall also identify a complete list of inputs to be furnished by the Owner which may be required for proper interfacing and tie-up. Scheduled dates for providing such inputs shall also be indicated, which will be mutually discussed and finalised.

b) Monitoring & Progress Reporting

The progress reports would be emanated every month, one from the head office of the Contractor and another from the site office. The progress report emanating from the head office should necessarily include the following sections:

- i) Report on key milestones.
- ii) Management summary indicating critical areas with details of actions initiated and effect of any on the project.
- iii) Action needing attention of the Owner/Consultant.
- iv) Detailed package wise status of engineering submissions, quality plan submissions and approval, procurement manufacture and despatch.

The monthly report generated from the site office should necessarily include:

- i) Report on key milestones.
- ii) Management summary indicating critical areas with details of actions initiated and effect if any on the project.
- iii) Action needing attention of the Owner/Consultant.
- iv) This report would also cover the areas pertaining to the

receipt of the equipment at the port, port clearance, transport, receipt at site, erection and commissioning.

In addition to the above, as the project execution progresses, the Contractor shall also be responsible for generating more frequent reports in the form of fax/e-mail information on progress in critical areas so that actions can be expedited. The exact format of the progress report shall be finalised after award of Contract.

1.04.02 Engineering Management

Based on the master network for the project (L-1) the Contractor will prepare an exhaustive list of engineering activities for the equipment/systems covered in his scope and a detailed programme of accomplishing the same within the time frame specified in the master network. This schedule will form the Level-2 (L-2) network for engineering activities.

Based on (L-2) network, the EPC Contractor shall further develop the Level-3 (L-3) network for engineering activities which will indicate schedule for data availability, drawing release date and document submission dates.

Detailed (L-2) and (L-3) networks would be submitted sequentially by the Contractor within two months from the date of issue of Letter of Award and finalised within one (1) month thereafter.

All such networks shall be provided in Primavera software as well as in other format / software suitable to Owner.

The engineering management team should also co-ordinate all interface engineering activity between the Contractor and the equipment sub-vendors so as to ensure the correctness and completeness of related engineering documentation before the same is submitted to the Owner.

1.04.03 Contracts Management

Based on the master network, the Contractor shall submit L-2 programmes of manufacture and despatch. In addition, the master network shall also include periods considered for site activities viz. erection, commissioning etc. These L-2 programmes would be submitted in 2 months time from the date of award of contract and finalised within one (1) month thereafter. The Contractor will also submit site mobilisation plan. This programme would be submitted at the time of finalisation of award of contract and agreed immediately thereafter so that immediate development of the various activities at site could take place.

The Contractor should also submit L-3 programmes for the manufacturing, despatch of the various items. These networks shall also show the customer hold points (CHP) which have to be cleared by Owner or their authorised representative(s) before further manufacture can take place. These L-3 programmes for the manufacture and despatch would clearly identify responsibilities of the Contractor, sub-Contractor and Owner. These networks shall be submitted within one (1) month of the date of finalisation of the various sub-contracts by the Contractor.

In case all the manufacture is being done by the Contractor then the L-2 programmes would be themselves amplified to cover details of the manufacture, inspection, clearance by Owner and despatch.

The Contractor shall also submit the programme for procurement of boughtout items, detailed shipping schedule and cash flow statement for Owner's approval.

1.04.04 Quality Assurance, Inspection and Expediting

The Contractor shall submit the list of manufacturers/sub-vendors from whom the equipment are expected to be procured and the quality assurance plans thereof for the manufacture shall be approved by the QA group of Owner before the manufacture is commenced. The list of major suppliers would be submitted along with the bid and this shall be mutually discussed & approval will be given by the Owner during contract negotiation meeting prior to placement of Letter of Award. This approved list will be binding to the Contractor. In the said list, Owner reserves the right to include reputed/reliable vendors of his own choice. Regarding the various other sub-vendors, the list would be submitted within six (6) months of the award of the contract that shall be scrutinized by the Owner to accord approval. In such list Owner reserves the right to include vendors of his own choice. No further vendor approval will be given after six (6) months. On the quality plans, the customer hold points will also be identified based on which Owner would give clearance for the

manufacture to proceed further.

Quality assurance/Inspection group of Owner or its representative would issue a material despatch clearance certificate (MDCC) after the inspection clearance which will enable the Contractor to despatch the equipment and claim the payment. In the despatch programme, the Contractor shall indicate a schedule of estimated programme, tonnages specifically identifying various oversize dimensioned consignments (ODC). Further the Contractor will also be required to ensure at all stages of shipment that packing of all shipments despatched are suitable for ocean freight to Vietnam, handling at the port of entry, in-country transportation and preservation at site upto erection. All despatch details & item lists shall be made available to both Owner & site immediately after shipping.

The Contractor shall also expedite all despatches from their own works/works of their sub-vendors, so as to match with the various activities mentioned at 1.04.03 above.

1.04.05 Construction Management

Based on the L-1 Master Network Programme, within two (2) months of the issue of Letter of Award, the Contractor shall submit a programme of construction/erection/commissioning, either in continuation with the manufacture and despatch or separately for the implementation. These programmes would be amplified showing when the civil drawings shall be released by him and construction of civil works shall be completed by him to facilitate start of erection and subsequent activities and shall form the basis for site execution and detailed monitoring. The three monthly rolling programme with the first month's programme being tentative based on the site conditions would be prepared based on these L-3 programmes. The Contractor shall also be involved along with the Owner to tie up detailed resource mobilisation plan over the period of time of the contract matching with the performance targets.

The L-3 programme would be jointly finalised by the site in charge of the Contractor with the Owner's project coordinator as well as the site planning representative. The erection programme will also identify the sequential erectable tonnages that are required for various equipment which should be taken care of in the despatch programmes.

Erection and commissioning of the equipment shall also be done under the supervision of experts from the respective equipment/ system supplier.

1.04.06 Spares Management

Along with the proposal for the plant and equipment, the Contractor shall also submit proposals/schedule for the following:

- a) Mandatory spares
- b) Recommended spares

While the award for mandatory spares will be finalised at the time of the award of contract, recommended spares will be finalised thereafter.

1.05.00 Project Progress Review Meetings

Keeping in mind the overall responsibility of the Contractor it is intended that periodic progress reviews on the entire activities of execution in respect of the Power Plant will be held initially at least once in two (2) months in Ho-Chi-Minh City/site or elsewhere depending on the circumstances and mutual agreement. During peak period it may be held once in a month. These meetings will be attended by reasonably higher officials of the Contractor and their leading sub- contractors and will be used as a forum for discussing all areas where progress needs to be speeded up. Actions will be placed on the concerned agencies and decisions will be taken to expedite/speed up the progress. Minutes of such meetings will be issued reflecting the major discussions and decisions taken and circulated to all concerned for reference and action. The Contractor shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.

In addition to the above, and to streamline the construction and erection at site, a suitable frequency and forum of periodic meetings between the Contractor and the Owner will be decided upon as part of erection coordination procedure. Site co-ordination meeting may be held on weekly basis.

1.06.00 Owner's Consultant

The Owner would appoint a consultant to assist him in some of the areas mentioned at 1.01.00 above. The details of interaction and procedures for coordination between Owner/Owner's Consultant & Contractor/ Contractor's project management team shall be finalised during contract negotiations.

1.07.00 Commissioning Management

- 1.07.01 For commissioning of the various equipment/system covered under the scope of contract, Owner will form an organisation structure which may

consist of the following committees. The Contractor shall nominate his representative on one or more of the committee as decided by the Owner:

- a) Steering Committee
- b) Commissioning Panel.
- c) Working Parties
- d) Testing Teams.

1.07.02 Commissioning documents shall be prepared by the Contractor in the following manner and submitted for Owner's approval :

- a) Field Quality Plan

This document shall be prepared for the various equipment/ systems under commissioning and shall have the following objectives to fulfill and shall be submitted for Owner's approval at least 90 days before their actual commissioning :

- i) Establish design data against which Plant Performance will be compared.
- ii) Set-out the testing objectives and proposals.
- iii) Define the documentation required.

- b) Testing/Commissioning Schedule

These shall be prepared for the various equipment/systems under consideration and shall contain sections like detailed testing method, programme, safety, individual responsibility and results.

- c) Standard Check Lists

Standard check lists are intended for use at the completion of erection to ensure correct erection, testing and to a limited extent operation for repetitive items.

1.07.03 Test Reports

After the completion of commissioning activity of equipment/ systems, the Contractor shall prepare the test reports which shall include all the relevant information related to various commissioning checks, tests carried out, any deviations/commissions noticed with respect to the intended design requirements, sequence of various commissioning activities as actually adopted vis-a-vis as recommended in the procedures, programme schedules achieved and any other such information as

required. These test reports shall be submitted in requisite number of copies to the Owner and this should be duly signed jointly by the Owner/Consultant and the Contractor/Equipment supplier, who are involved during the commissioning activities.

2.00.00 SITE SERVICES

These services shall be rendered by the Contractor as part of the overall project management service. The services shall broadly include but not be limited to the following:

- 2.01.00 Arranging material despatch from the shop by rail/road and/or sea as applicable.
- 2.02.00 Monitoring movement of materials & follow-up as necessary with road transport, port clearance etc. from the time of despatch F.O.R. works/ F.O.B. port of shipment by Contractor till receipt of the same at site.
- 2.03.00 Unloading of materials at port/inside project area/ Road Transportation, transportation to site store, assessment of lost/ damaged items in transit and arranging insurance claims and replacement of lost/damaged items. The Contractor shall submit to the Engineer a report detailing all the receipts during the week as well as storing, preservation of material at site.
- 2.04.00 Issuing materials from site store/open yard from time to time for erection as per the construction programme. The Contractor shall be the custodian of all the materials issued till the plant is officially taken over by the Owner after complete erection and successful trial run & commissioning.
- 2.05.00 Transportation of materials to their respective places of erection and erection of the complete plant & equipment as supplied under this specification.
- 2.06.00 Trial run and commissioning of individual equipment/sub-systems and the plant as a whole to the satisfaction of the Owner, including supply of temporary equipment & services for chemical cleaning, steam blowing as well as performance guarantee tests.

Apart from Boiler, proper chemical cleaning shall be carried out in following pipe lines/equipment before commissioning

- a) Deaerator
- b) Boiler feed suction, recirculation leak-off lines
- c) Boiler Feed discharge line by passing heaters
- d) Attenuation lines
- e) Condensate suction & discharge piping upto de-aerator by passing the feed water heaters.
- f) Fuel oil lines.

Provision for preservation of individual equipment after trial run and commissioning e.g. Nitrogen blanketing etc. as necessary shall also be in the scope of the Contractor.

Safe disposal of effluent after chemical cleaning shall be done by the contractor.

- 2.07.00 Supply and application of the final paints and first fill lubricants on all the equipment to be erected under this specification. Supply of LDO, chemicals, lub oils upto COD.
- 2.08.00 For the purpose of erection and commissioning the Contractor's scope of work shall include but not be limited to the following :
 - 2.08.01 Deployment of all skilled and unskilled manpower required for erection, supervision of erection, watch & ward, commissioning and other services to be rendered under this specification.
 - 2.08.02 Deployment of all erection tools & tackle, construction machinery, transportation vehicles and all other implements in adequate number and size, appropriate for the erection work to be handled under the scope of this specification.
 - 2.08.03 Supply of all consumables, e.g. welding electrodes, cleaning agents, diesel oil, grease, lubricant etc. as well as materials required for temporary supports, scaffolding etc. as necessary for such erection work except those listed under exclusion elsewhere in this specification.
 - 2.08.04 Construction of all civil/structural/architectural works, including construction of foundation for all equipment supplied as required, grouting of equipment on foundation after alignment, and all other incidental civil activities as detailed elsewhere.
 - 2.08.05 All structural steel fabrication and erection work as detailed elsewhere in

the specification.

- 2.08.06 Providing support services for the Contractor's erection staff e.g. construction of site offices, temporary stores, residential accommodation and transport to work site for erection personnel, insurance cover, watch & ward for security and safety of the materials under the Contractor's custody etc. as required.
- 2.08.07 Maintaining proper documentation of all the site activities undertaken by the Contractor as per the proforma mutually agreed with the Owner; submitting monthly progress reports as also any such document as and when desired by the Owner; taking approval of all statutory authorities for respective portions of work under the jurisdiction of such statutes or laws.
- 2.08.08 The Contractor shall provide 'Industrial Relations' unit and 'Medical' unit to take care of his erection staff and the Owner shall have no obligation in the regard.
- 2.08.09 The successful EPC Contractor shall arrange for Tower crane of adequate capacity for speedy erection activities.

2.09.00 Site Organisation

The Contractor shall maintain a site organisation of adequate strength in respect of manpower, construction machinery and other implements at all times for smooth execution of the contract. This organisation shall be reinforced from time to time, as required, to make up for slippages from the schedule without any commercial implication to the Owner. The site organisation shall be headed by a competent construction manager having sufficient authority to take decisions at site.

On award of contract, the Contractor shall submit to the Owner a site organisation chart indicating the various levels of experts to be deployed on the job. The Owner reserves the right to reject or approve the list of personnel proposed by the Contractor. The persons, whose bio-data have been approved by the Owner, will have to be posted at site and deviations in this regard will not generally be permitted.

The Contractor shall also submit to the Owner for approval a list of construction equipment, erection tools, tackle etc. prior to commencement of site activities. These tools & tackle shall not be removed from site without written permission of the Owner.

2.10.00 General Guidelines for Field Activities

- 2.10.01 The Contractor shall execute the works in a professional manner so as to achieve the target schedule without any sacrifice on quality and maintaining highest standards of safety and cleanliness.
- 2.10.02 The Contractor shall co-operate with the Owner and other Contractors working in site and arrange to perform his work in a manner so as to minimise interference with other Contractors' works. The Owner's engineer shall be notified promptly of any defect in other Contractor's works that could affect the Contractor's work. If rescheduling of Contractor's work is requested by the Owner's engineer in the interest of overall site activities, the same shall be complied with by the Contractor. In all cases of controversy, the decision of the Owner shall be final and binding on the Contractor without any commercial implication.
- 2.10.03 The Engineer shall hold weekly meetings with the Contractor at a time and a place to be designated by the Engineer. The Contractor shall attend such meetings and take notes of discussions during the meeting and the decisions of the Engineer and shall strictly adhere to those decisions in performing his Work. In addition to the above weekly meeting, Engineer may call for other meetings either with individual sub-contractors or with selected number of sub-contractors which shall be arranged and attended by the Main Contractor.
- 2.10.04 Time is the essence of the Contract and the Contractor shall be responsible for performance of his Work in accordance with the specified construction schedule. If at any time the Contractor is falling behind the schedule, he shall take necessary action to make good of such delays by increasing his work force or by working overtime or otherwise accelerate the progress of the work to comply with the schedule and shall communicate such action in writing to the Engineer, satisfying that his action will compensate for the delay. The Contractor shall not be allowed any extra compensation for such action.
- 2.10.05 The Owner/Engineer shall however not be responsible for provision of additional labour and or materials or supply or any other services to the Contractor.
- 2.10.06 The works under execution shall be open to inspection & supervision by the Owner's engineer at all times. The Contractor shall give reasonable notice to the Owner before covering up or otherwise placing beyond the reach of inspection any work in order that same may be verified, if so desired by the Owner.
- 2.10.07 Every effort shall be made to maintain the highest quality of workmanship by stringent supervision and inspection at every stage of execution. Manufacturer's instruction manual and guidelines on sequence of erection

and precautions shall be strictly followed. Should any error or ambiguity be discovered in such documents, the same shall be brought to the notice of the Owner's engineer. Manufacturer's interpretation in such cases shall be binding on the Contractor.

- 2.10.08 The Contractor shall comply with all the rules and regulations of the local authorities, all statutory laws including Minimum Wages, Workmen Compensation etc. All registration and statutory inspection fees, if any, in respect of the work executed by the Contractor shall be to his account.
- 2.10.09 All the works such as cleaning, checking, leveling, blue matching, aligning, assembling, temporary erection for alignment, opening, dismantling of certain equipments for checking and cleaning, surface preparation, edge preparation, fabrication of tubes and pipes as per general engineering practice at site, cutting grinding, straightening, chamfering, filling, chipping, drilling, reaming, scrapping, shaping, fitting-up bolting/welding, etc., as may be applicable in such erection and are necessary to complete the work satisfactorily, are to be treated as incidental and the same shall be carried out by the Contractor as part of the work.
- 2.10.10 In case of any class of work for which there is no such specification as laid down in the contract such as, blue matching, welding of stainless steel parts, etc., the work shall be carried out in accordance with the instructions and requirements of the Engineer.
- 2.10.11 It may sometimes be necessary to remove some of the erected structural members to facilitate erection of bigger/pre-assembled equipment. In such cases, the removal and re-erection of such members, which are essential, and if so agreed by the Engineer, will have to be done by the Contractor.
- 2.10.12 Attachment welding of necessary instrumentation tapping points, thermo-couple pads, root valves, condensing vessels, flow nozzles and control valves etc., both for regular measurement and performance testing to be provided on equipment, its auxiliaries or pipelines covered within the scope of this tender, will also be the responsibility of the Contractor and the same will be done as per the instructions of Engineer. The erection and welding of all above items will be the Contractor's responsibility, even if :
- a) Product groups under which these items are released are not covered in the scope of this tender.
 - b) Items are supplied by an agency other than the Contractor.

- 2.10.13 Preservation of all materials/equipment under custody of the Contractor during storage, pre-assembly & erection, commissioning etc., shall be the responsibility of the Contractor. All necessary preservatives and consumables like paints, etc., shall be arranged by the Contractor. Necessary touch up painting, periodic application of preservatives/paints on pressure parts/other equipment even after erection until completion of work shall be carried out by the Contractor. The Contractor shall fabricate piping, install lub oil systems and carry out the acid cleaning of fabricated piping. The Contractor shall also service the lub. oil system, carryout the hydraulic test of oil coolers, etc.
- 2.10.14 It is responsibility of the Contractor to do the alignment etc. if necessary, repeatedly to satisfy Engineer, with all the necessary tools & tackles, manpower, etc. The alignment will be complete only when jointly certified so, by the Contractor's Engineer & Owner. Also the Contractor should ensure that the alignment is not disturbed afterwards.
- 2.10.15 Additional platforms for approaching different equipment as per site requirement, which may not be indicated in drawings, shall be fabricated and erected by the Contractor. The materials required for these works shall be supplied by the Contractor and he will have to fabricate them to suit the requirement.
- 2.10.16 Equipment and material which are wrongly installed shall be removed and reinstalled to comply with the design requirement at the Contractor's expense, to the satisfaction of the Owner/ Consultant.
- 2.10.17 Before erection of any equipment on a foundation, the Contractor shall check and undertake if necessary rectification of foundation bolts, reaming of holes, drilling of dowels, matching of bolts and nuts, making new dowel pin, etc.
- 2.10.18 Assistance for calibrating/testing the power cylinders, valves, gauges, instruments, etc., and setting of actuators coming under various groups shall be provided by Contractor.
- 2.10.19 It shall be the responsibility of the Contractor to provide ladders on columns for initial works till such time stairways are completed. For this, the ladder should not be welded on the column and should be prefabricated clamping type. No temporary welding on any structural member is permitted except under special circumstances with the approval of Owner.
- 2.10.20 Structural materials required for the supporting/operating platforms required for the valves at various levels for the same operation of valves will be arranged by the Contractor.

2.11.00 Safety

Safety and overall cleanliness of work site shall be given top priority.

- 2.11.01 The Contractor shall ensure the safety of all workmen, materials and equipment either belonging to him or to others working at site. He shall observe safety rules & codes applied by the Owner at site without exception.
- 2.11.02 The Contractor shall notify the Owner of his intention to bring to site any equipment or material which may create hazard. The Owner shall have the right to prescribe the conditions under which such equipment or material may be handled and the Contractor shall adhere to such instructions. The Owner may prohibit the use of any construction machinery, which according to him is unsafe. No claim for compensation due to such prohibition will be entertained by the Owner.
- 2.11.03 Storage of petroleum products & explosives for construction work shall be as per rules and regulation laid down in NFPA/other statutory rules and regulations. Necessary approvals as necessary from all statutory authorities shall be the responsibility of the Contractor.
- 2.11.04 The Contractor shall be responsible for safe storage of his and his sub-contractor's radioactive sources.
- 2.11.05 All requisite tests & inspection of handling equipment, lifting tools & tackle shall be periodically done by the Contractor. Defective equipment shall be removed from service. Any equipment shall not be loaded in excess of its recommended safe working load.
- 2.11.06 All combustible waste and rubbish shall be collected and removed from the worksite at least once each day. Use of undercoated canvas paper, corrugated paper, fabricated carton, plastic or other flammable materials shall be restricted to the minimum and promptly removed.
- 2.11.07 The Contractor shall provide adequate number of fire protection equipment of the required types for his stores, office, temporary structures, labour colony etc. Personnel trained for fire-fighting shall be made available by the Contractor at site during the entire period of the Contract.
- 2.11.08 All electrical appliances used in the work shall be in good working condition and shall be properly earthed. No maintenance work shall be carried out on live equipment. The Contractor shall maintain adequate number of qualified electricians to maintain his temporary electrical

installation.

2.11.09 All workmen of the Contractor working in construction site shall wear safety helmets, safety boots and safety belts. The Contractor shall take appropriate insurance cover against accidents for his workmen as well as third party.

2.11.10 All the worksites shall be provided with adequate lighting facilities e.g. flood lighting, hand lamps, area lighting etc. by the Contractor for proper working environment during night times.

2.12.00 Taking Delivery & Storage

2.12.01 The Contractor shall arrange issue of all equipment and materials to be erected under the contract from the stores/open yard at site by signing on standard indent forms. After completion of work, detailed auditing of the materials so issued shall be submitted to the Owner.

2.12.02 The Contractor shall arrange for proper and safe storage of materials till the same are taken over by the Owner as per terms of the contract. Manufacturer's instructions for preservation shall be strictly followed.

2.12.03 All empty containers, packing materials, gunny bags, transport frames and also surplus & unused materials reconciliation prior to completion of contract shall be the property of the Owner & returned to the Owner by the Contractor.

2.13.00 Site Welding & Heat Treatment

2.13.01 Welding shall be done in accordance with AWS/ASME standards and as per instructions of Contractor. Only those welders, who are qualified as per for ordinary welds and as per ASME Section-IX for high pressure welds, shall be employed in the job.

2.13.02 All welders shall be tested and approved by Engineer before they are actually engaged on the work even though they may possess the requisite certificates. The Owner reserves the right to reject any welder without assigning any reason. The welder identification code as approved by the Engineer shall be stamped by the welder on each joint done by them. The Contractor will be responsible for the periodic renewal, re-testing of the welders as demanded by Owner.

2.13.03 The Engineer is entitled to stop Contractor's any welder from his work if his work is unsatisfactory for any technical reason or there is a high percentage of the rejection of joints welded by him, which in the opinion of Engineer will adversely affect the quality of welding even though the

welder has earlier passed the tests. The welders having passed the tests do not relieve the Contractor from his contractual obligations, to check the performance of the welders.

- 2.13.04 All charges for testing of welders including destructive & non-destructive tests if conducted by Owner or by the inspection authority at site shall have to be borne by the Contractor. The necessary test materials and consumables will have to be arranged by the Contractor and all testing facility made available, as required.
- 2.13.05 All welded joints shall be subject to acceptance by Engineer.
- 2.13.06 Preheating/post heating and stress relieving after welding are part of fabrication and erection work and shall be performed by the Contractor in accordance with the instruction of Engineer. Contractor shall arrange to supply heating equipment with automatic recording devices. Also the Contractor shall have to arrange for the labour, heating elements, thermocouples, compensating cables, insulation materials like mineral wools, asbestos cloth, ceramic beads, asbestos rope, etc. required for the heat-treatment and stress relieving works. During pre-heat/stress relieving operations, the temperature shall be measured at one or more points as required by attaching thermocouples and recorded on a continuous printing type recorder. All the record graphs for the heat treatment works carried out shall be got signed by the Engineer prior to the commencement of each cycle and handed over to Engineer on completion. The graphs will be the property of Owner. The Contractor has to provide thermo-chalks temperature recorders, thermocouple attachments, units, graph sheets, etc. required for the job and maintain them in good condition.
- 2.13.07 All electrodes shall be baked and dried in the electric/electrode drying oven to the required temperature and for the period specified by the Engineer before they are used in erection work. The electrodes used shall be of approved reputed manufacture. The electrodes shall meet the requirement of the pipe material. No electrode manufactured more than 12 months ago and the type covered under certificate issued after conducting tests more than 6 months ago shall be used. All electrodes shall be preserved at works and at site as per manufacturer's recommendations.
- 2.13.08 Oxy-acetylene flame or Exothermic chemical heating for stress relieving is not permitted. Heating shall be by means, of electric induction coil or electric resistance coil.
- 2.13.09 It may become necessary to adopt inter layer radiography/MPT/UT depending upon the site/technical requirement necessitating interruptions in continuation of the work and making necessary arrangement for

carrying out the above work.

- 2.13.10 Gas tungsten arc welding process (TIG) shall be adopted for all root pass welds except for structural works until 4.75 mm thickness is deposited. Subsequent welding after root pass can be carried out by manual metal arc welding with coated electrodes. For pipes of thickness less than 6 mm the entire welding has to be carried out by TIG welding.

Fillet weld shall be made by shielded metal arc process as per applicable codes.

However, the Engineer will have the option of changing the method of welding as per site requirement. The method adopted for manual arc welding shall be weaving technique and the width of weaving shall not exceed 1.5 times of the dia. of the electrode.

In case of deviation from welding process and electrodes, the Contractor shall take approval of the Owner prior to adoption of same.

- 2.13.11 The root pass for butt joints shall be such as to achieve full penetration with complete fusion of root edges.
- 2.13.12 Each pass shall be cleared and freed of slag before the next pass is deposited.
- 2.13.13 On completion of each run, craters, weld irregularities, slag etc. shall be removed by grinding or chipping.
- 2.13.14 Each layer of welding shall have an even and smooth appearance.
- 2.13.15 Welding sequence shall be adjusted in such a way that distortion due to welding shrinkage is minimised. Further any movement, shock or vibration during welding shall be avoided to prevent weld cracks.
- 2.13.16 Proper protection of welders and the work shall be taken during periods of rain. No welding shall be carried out when surfaced to be welded are wet from any cause.
- 2.13.17 Following will be stages of inspection during welding :
- a) Two pieces to be joined shall be individually checked for the weld edge preparation and profile dimensionally and to the template. Dye penetrant check shall be carried out on edge prepared surfaces at random. The percentage will depend upon on criticality as specified by Engineer.

- b) Joint fit up will be a stage of inspection. Misalignment after fit up may vary from 0.3 mm to 1.6 mm depending on outside diameter and thickness.
- c) All joints shall be offered for visual inspection after root run. Subsequent welding should be made only after the approval of root run.

2.13.18 All welded joints shall be painted with anti-corrosive paint immediately on completion of radiography and stress-relieving.

2.14.00 *Site Installation / Temporary Works*

Following Temporary works required for site installation work for the project, along with other temporary facilities may be necessary, shall be provided by the Contractor:

2.14.01 Construction Facilities

The construction facilities shall be located in the areas shown in the plot plan and at strategic places with appropriate road connection. These shall primarily include the following:

- Batching Plant & Material Testing Laboratory
- Construction Offices including Canteen
- Construction Stores
- BTG Contractors' area
- BTG Lay down area
- Construction Colony
- Security Housing
- Labour Colony
- Receiving Sub-Station for Construction Power
- Construction Water
- Roads & Drains

2.14.02 Labour Colony

The labour colony shall be located near the Power Plant construction area. The scope of work of the labour colony shall be under the scope of the Contractor. The Contractor, depending on his plan of construction, shall request for adequate space for the labour colony near the site. LP1PP shall provide suitable space near the site for setting up the labour colony.

2.14.03 Construction Offices including Canteen

A construction site office shall be constructed by the Contractor to provide engineering and management support for project execution and to monitor various construction activities at site. LP1PP shall provide necessary space for the construction offices and canteen.

2.14.04 Construction Store

Material used during the construction shall be stored in covered as well as in open storage yards. Reinforcement, Structural Steel, Pipes etc. are considered to be stored in open yard whereas perishable materials like cement etc. shall be stored in covered storage sheds. The Contractor shall plan the construction store based on his material shipment plan.

2.14.05 Open Storage Yard

It shall be developed by leveling and fencing the area and shall have a proper security arrangement for watch and ward of the material stored there.

2.14.06 Batching Plant and Material Testing Laboratory

In order to ensure supply of quality concrete for the project, the Contractor shall set up batching Plants of adequate capacity. A material testing laboratory shall also be set up to ensure the quality of all the building materials like aggregate, cement, stone etc. being used.

2.14.07 Construction Power

LP1PP will provide two feeders of 22 kV from the nearby 110/22 kV sub-station for construction power at one point near the plant. The Contractor shall step down the voltage at suitable level and arrange distribution inside the plant at suitable locations. The Contractor shall arrange adequate capacity DG sets to supply emergency construction power when normal power is not available.

2.14.08 Construction Water

Construction water shall be drawn from deep bore wells to be drilled within plant boundary at different locations in the vicinity of construction work. Construction water can also be drawn from the Hau River. The Contractor shall arrange necessary treatment and distribution of construction water.

2.14.09 Roads and Drains

The roads and drains inside plant as required for construction work, shall

be developed by the Contractor. These roads shall be connected to main access road to plant. The roads shall be suitable for transportation of construction equipment and heavy loads.

2.14.10 Boundary Wall

The boundary wall for the project shall be constructed first for plant security. The details of the boundary wall shall be as indicated elsewhere in the specification.

2.14.11 Construction Colony

A housing colony for accommodation of construction personnel shall be established by the Contractor. This may consist of temporary houses with all basic facilities. The construction personnel may also be accommodated in the nearest township. The Contractor shall plan and develop a construction colony based on his construction personnel requirement.

2.14.12 *Fences and Gates*

Fences and Gates shall be provided around transformer yard, building transformer area, and other areas where fencing is necessary due to statutory requirements. Details of fences and gates shall be as indicated elsewhere in the specification.

SECTION III

SUB-SECTION

3.1 GENERAL REQUIREMENTS

ARTICLE

3.1.3 ENGINEERING SERVICES

[PII.CV.SIII.SS3.1 – Article 3.1.3]

SECTION III**SUB-SECTION
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SECTION III

SUB-SECTION

3.1 GENERAL REQUIREMENTS

ARTICLE

3.1.3 ENGINEERING SERVICES

1.00.00 GENERAL

1.01.01 As part of the overall project management activity, the Contractor shall be responsible for proper engineering and co-ordination of activities during various phases of execution of the contract. The Contractor shall identify a person, designated as Design Project Manager, with whom the Owner, the Consulting Engineer or the Review Consultant shall interact on matters related to engineering as well as execution of the contract. The Design Project Manager shall be the single-point contact person on behalf of the Contractor and shall be responsible for all engineering co-ordination. The Owner/ Consultant/ Review Consultant shall interact with the Project Manager only on all matters of co-ordination between the Owner and the Contractor or on matters involving the Contractor, his manufacturing units and sub-vendors. For the purpose of expediting the Owner or his representative may sometimes interact with the manufacturing units or sub-vendors of the contractors. However such interaction will not, under any circumstance, dilute the responsibility of the Contractor to provide a fully engineered and coordinated package under this contract.

1.01.02 The Design Project Manager and his design team, with the role of overseeing the overall design of the plant, is responsible for reviewing and proposing adjustments in cases where the designs of other packages from the Owner do not comply with the Project's master design

1.02.00 On finalization of the contract, a procedure for exchange of engineering information will be mutually agreed and finalized between the Owner and the Contractor.

2.00.00 DESIGN COORDINATION MEETING

The Contractor and his sub-vendors will be called upon to attend design co-ordination meetings with the Engineer, other Contractors and the Consultants of the Owner during the period of execution of contract. The Contractor including his sub-vendors shall attend such meetings at their own cost at Owner's or Consultant's office or at mutually agreed venue as and when required and fully cooperate with such persons and agencies

involved during those discussions.

3.00.00 CO-OPERATION WITH OTHER CONTRACTORS AND CONSULTING ENGINEERS

The Contractor shall agree to cooperate with the Owner's other Contractors, if any, and Consulting Engineers and freely exchange with them such technical information as is necessary to obtain the most efficient and economical design and to avoid unnecessary duplication of efforts. The Engineer shall be provided with copies of all correspondences addressed by the Contractor to other Sub-contractors, other Owner's Contractors and Consulting Engineers in respect of such exchange of technical information.

4.00.00 GUIDELINES FOR ENGINEERING SERVICES

4.01.00 Prior to commencement of the engineering work as part of design submissions, all aspects of design viz., criteria for selection and sizing of all equipment and systems, design margins etc. including that for structural steel and civil work shall be outlined and these shall form the basis for the detailed engineering work.

4.02.00 Engineering work shall be performed on modern and proven concepts and internationally accepted good engineering practices but fully compatible with the local environments. Owner shall have the right to review and approve the engineering work by themselves and/or through consultant and ask for any clarifications and changes/modifications to the work performed by Contractor.

4.03.00 At any stage during the performance of assignment, the Contractor may be required to make certain changes/modification/improvements in design/ drawing/other documents, which in the opinion of the Owner could result in better improved design, layout, operability, plant availability, maintainability, reliability or economy of the plant and its systems/sub-systems in view of revised and more accurate information/data available at a later date(s) or feedback(s) received during execution / operation of similar units. Such changes / modifications/ improvements required could be identified by Owner and/or consultant and mutually discussed. Owner requires the Contractor to incorporate such action in the subject assignment appropriately without any additional cost liability and time implication to the Owner and same shall be within the responsibilities and scope of the Contractor.

4.04.00 During the course of review of detailed engineering stages, it may be essential in the opinion of Owner to obtain certain classified data for

review purposes only. In case the Owner so desires, the Contractor submit such data to Owner.

- 4.05.00 During the course of review of detailed engineering, it may be essential in Owner's opinion to obtain data and information on similar equipment and plants engineered by the Contractor. In case Owner so desires the Contractor shall submit such data and information to the Owner.
- 4.06.00 It is not the intent to give details of every single task covered in the total engineering work to be carried out by Contractor, however, all engineering work required for the satisfactory completion of the plant/systems as specified shall be carried out by the Contractor. Broadly, the following are the minimum requirements in respect of scope of major items of work:
- 4.06.01 Preparation, updating and finalisation of scheme drawings, control and interlock diagrams, detailed and fully dimensioned layout drawings (plant layout and equipment layout detailed plan, elevation and cross-sectional drawings at different elevations / floor levels) covering all mechanical, electrical, C&I, civil and structural items, equipment, systems and facilities. Drawings and Schedules prepared by the Contractor from time to time, as detailed designs are developed, shall be submitted for Owner's / Consultant's approval before the work is taken up. Revisions, corrections, additions to drawings and schedules shall not be considered to change the scope of work.
- 4.06.02 Preparation of detailed technical specifications including data sheets, tender drawings and bill of material for all bought out items, as also finalisation of corresponding sub-contractors.
- 4.06.03 Review of sub-contractor's data, drawings, design calculations, schedules, bill of materials, instruction manuals etc. for all equipment within Contractor's scope, before forwarding them to Owner/Consultant for approval.
- 4.06.04 Preparation of civil construction drawings for all equipment showing foundation details and full details regarding equipment loads, floor openings, details of embedments etc. required for preparation of civil construction drawings and also as referred at relevant sections of Scope, Terminal Points & Exclusions. These documents shall be preceded by appropriate design calculations, static and dynamic analysis as necessary.
- 4.06.05 Preparation and finalisation of process piping and instrumentation diagrams and schematics, complete in all respects for all systems/packages of the power plant.

- 4.06.06 Preparation of consolidated schedules and bills of materials, including line numbers, tag numbers, source of supply, service conditions, specifications, materials, types and connections details, quantities for items of the plant including dampers, steam traps, strainers, instrumentations, ducting.
- 4.06.07 Sizing of all piping and equipment as per the stipulated design criteria; carrying out of flexibility analysis/dynamic analysis as necessary; hangers & support engineering.
- 4.06.08 All engineering studies as necessary and as required by the Owner for the project shall be carried out by the Contractor.
- 4.06.09 Final revision of all documents including preparation and compilation of Instruction Manuals for installation, commissioning, operation and maintenance for all equipment and systems. Refer clause 5.00.00 for the specific requirement in this regard.
- 4.06.10 Certification and submission of final as-built drawings for all areas.
- 4.06.11 Preparation and compilation of all drawings, schedules and instructions which may be required at site, whether separately mentioned or not.
- 4.06.12 All erection and assembly drawings which may be required at site.
- 4.06.13 For all bought out item packages, the Contractor shall provide complete material / component list along with detail specification, drawings, component part no. etc. during detail engineering stage prior to final approval. Such approved drawing/document shall be made available at site in adequate number prior to commencement of work. Moreover, such document/drawing shall be provided in soft form (CD).
- 4.06.14 Preparation of necessary documentation, design calculations etc. required for submission to all statutory authorities.
- 5.00.00 **OPERATING MANUALS AND MAINTENANCE INSTRUCTIONS**
- 5.01.00 The Contractor shall provide at least six (6) months before the time of commissioning and before taking over of the plant and equipment, all necessary maintenance manuals and operating instructions. The instruction manual shall be submitted in the form of one (1) soft copy and 07 hard copies.
- 5.02.00 To integrate the Plant's overall operation and maintenance procedures, the Contractor is required to identify the necessary operation and maintenance documents provided by other Contractors of the Owner to

support the compilation of the Plant's overall operation and maintenance procedure

5.03.00 The information provided, which shall be contained in loose leaf stiff backed covers, shall include :

- a) A complete inventory of all main items of plant, with identification details.
- b) Service manuals for all plant and equipment giving full descriptions of the main items and auxiliary items such as power packs, hydraulic equipment, actuators, lubricating pumps, etc.
- c) A separate electrical manual covering items such as switchgear, cabling, instrumentation, controls, cabling layouts and wiring diagrams.
- d) A schedule of recommendations for routine maintenance of all electrical and mechanical equipment, recommended inspection point, information on detection, cause and rectifications of troubles & faults.
- e) A lubrication schedule with all necessary drawings diagrams to identify the lubrication points.
- f) Manufacturer's literature.

5.04.00 The instruction manual shall be subject to the approval of Owner.

6.00.00 **Not Applicable.**

7.00.00 **CONTRACT STAGE DOCUMENT SUBMISSION AND APPROVAL PROCEDURE**

7.01.00 Within fifteen (15) days of issue of Letter of Award (LOA) by the Owner, the Contractor shall furnish a schedule of drawings and design document to be submitted by him to the Owner/Engineer indicating dates against each document.

The documents shall be divided into two categories : a) for approval and b) for information/further engineering and co-ordination by the Owner.

In preparing this schedule, the Contractor shall allow four (4) weeks from date of receipt for review and comments by the Owner/Engineer for each submission of a document.

This document submission schedule shall require approval by the Owner/Engineer.

7.02.00 All contract documents shall be marked, without fail, with the name of the Owner, the Project, the specification title and number and the unit designation.

All dimensions shall be in metric units.

All notes, markings etc. shall be in English.

7.03.00 Documents/Drawings, submitted during tender stage, shall be revalidated or revised as required and submitted as certified contract document for approval / information of the Owner/Engineer.

7.04.00 Unless specified otherwise, the following categories of documents/drawings would require approval of the Owner/Engineer:

- a) List of sub-vendors (from Owner only)
- b) System scheme and instrumentation diagrams
- c) Design basis justifying selection of equipment & process parameters where not specified in the Contract
- d) Equipment data sheets and general arrangement drawings
- e) Materials of construction
- f) Layout drawings.
- g) Operation logic diagrams.
- h) Typical control circuit.
- i) Drawings of Instrumentation and control.

7.05.00 Unless specified otherwise, the following categories of documents/drawings would be treated for information by the Owner/Engineer. The Contractor shall, however, incorporate all additional information and clarifications in these documents / drawings as and when desired by the Owner/Engineer.

- a) Equipment foundation drawings.
- b) Equipment cross-section drawings, product literature etc. which

are of proprietary nature.

- c) Predicted performance curves of equipment.
- d) Various bills of quantity, schedules etc.
- e) Piping fabrication drawings, isometrics etc.
- f) Panel wiring diagrams.
- g) Instruction/Operation manuals.
- h) Service manuals and trouble shooting guide for C & I system including field instruments.
- i) Cable schedule and interconnection chart.
- j) Drive/feeder wise control scheme showing all external interfaces.

In essence, the Contractor is solely responsible for corrections and adequacy of design & engineering for documents under this category.

7.06.00 Upon review, the Owner/Engineer shall put his remarks and one of the following action stamps on the drawing/document:

- a) Approved.
- b) Approved with comments
- c) Rejected.
- d) Accepted for information.
- e) Accepted for information with comments.

For action stamps in category (b),(c) & (e), documents must be resubmitted for review by the Owner/Engineer.

Except for action stamp under category (b), (c) & (e), the Contractor can proceed with manufacturing and other sequential activities for those areas of a drawing/document which do not have any review comment by the Owner/ Engineer.

The Owner/Engineer may accord approval in category (b), (c) or (e) in more than one submission of a document till he is satisfied that the intent of the specification has been fully complied with. The Contractor shall be

responsible for delay in such cases and no extension of time shall ordinarily be allowed on such grounds. Approval of contract documents by the Owner/ Engineer shall not relieve the Contractor of his responsibility for any errors and fulfillment of contract requirements.

The Contractor's work shall be in strict accordance with the finally approved drawings and no deviation shall be permitted without written approval of the Owner/Engineer.

7.07.00 Except key plan/general yard plan, any layout drawing requiring scrutiny shall not be drawn to a scale less than 1:50.

7.08.00 For review by the Consulting Engineer, the Contractor shall furnish soft copies of drawings & documents and three (3) prints of each drawing/document. Two (2) prints of such submission shall also be sent to the Owner. After review, comment/approval will be sent to the Contractor. Upon action under category (a) or (e), the Contractor shall directly distribute the documents to the various offices of the Owner and other agencies in number of copies as specified in the contract document. Such distribution copies shall be marked with the reference and date of the letter by which the Owner/ Engineer has accorded his final approval. Penal action shall be taken against the Contractor for any un-authorised revision in the drawings so distributed from the drawings approved by the Owner/Engineer. The contractor shall furnish three (3) CDs of all as built/final drawings for Owner/Consultant site.

7.09.00 In case of contradiction between the stipulations above and those stated elsewhere in the specification, the stipulations herein shall prevail

7.10.00 For details of documentation for Civil, Structural and Architectural works, Vol. II-G may be referred.

8.00.00 **TENDER STAGE DOCUMENT SUBMISSION**

8.01.00 The Contractor shall submit along with his bid all documents/drawings as requested in respective specifications. The documents shall include but not be limited to the following :

- a) All Bid proposal sheets duly filled up.
- b) Detailed experience list and financial resources of the prime Contractor his collaborators/associates in this bid as well as the sub-vendors proposed.
- c) Scheme drawings indicating scope of supply and service as offered

by the Contractor indicating clearly exclusions, if any.

- d) List of terminal points, if applicable.
- e) Equipment GA, Layout, Design Calculations, interlock and other write-up, catalogues/literature etc. as required for clear understanding of the bid submitted.
- f) L-1 network indicating target dates for intermediate milestones and final commissioning of equipment supplied; This network shall be supplemented by a detailed write-up on proposal procedure of project implementation, deployment schedule for Key personnel with their bio-data, schedule of construction machinery etc.
- g) List of suppliers for all bought out items.

9.00.00 STATUS AND REQUIREMENT FOR FINALIZING ENGINEERING WORKS

9.01.00 The code list of existing engineering documents regarding overall plant design as followings. The Bidder shall refer and develop to finalize the overall plant design works:

Code	Code Description
Discipline Identifier	
A	Architecture
C	Civil/Structure/Architecture
E	Electrical
G	General
HS	Health & Safety
I	Instrumentation & Control
M	Mechanical
P	Procurement
PM	Project Management
QA	QA/QC
Package/Lot	
A1	Architectural engineering
G1	General Document applied to all
C1	Civil Engineering Service
C2	Soil Improvement
C3	Chimney
C4	Administration and ancillary houses
C5	Internal road/Drainage/landscape

C6	Fence/gate/security house
CIW	Coal Import Wharf
E1	Switchyard and Main Transformers
E2	Electrical system
I1	Integrated Control and Monitoring System
I2	Communication system and CCTV
M1A	Boiler & Auxiliaries services
M1B	Turbine, Generator & Auxiliaries
M2	Coal Handling System
M3	Water & Waste Water Treatment
M4	Cooling Water system
M5	Air Compressed System
M6	Limestone System BOP
M7	Fuel Oil System
M8	SCR
M9	ESP
M10	FGD
M11	Fire Detection and Protection system
M12	Ash Handling System/Ash Pond OIW Oil Import Wharf
M13	Gypsum handling system AEW Ash Export Wharf
M14	Work shop and Warehouse MBB Mooring Buoy Berth
M15	HVAC EIW Equipment Import Wharf
M16	Other systems LGW Limestone Import Wharf and Gypsum Export Wharf
Document identifier (Excluding Drawings)	
<i>ENGINEERING & DESIGN</i>	
AIL	Alarm & Interlock list
CAL	Calculation
CHK	Check list/ Prompt list
CRT	Design Criteria
DAS	Datasheet
DEG	Design guide
FLC	Flow Chart
FSP	Functional Specification
IDX	Drawings/Document Index
LST	List incl. schedule e.g. Equipment, Line, Tie-Ins, Battery limits, etc.)

MAN	Manual
MTO	Material Take-off/Bill of Materials
PHL	Philosophy/System Description
PHT	Photo
REQ	Requisition
SIL	System input list
SIO	System serial IO list
SOL	System Output list
SPC	Specification/ Scope of Work
REF	Reference
REG	Register
STD	Code/ Standard
TBE	Technical Bid Evaluation
TEN	Technical note/study
TQY	Technical Query
DER	External reference
DES	Earthing System
CONSTRUCTION MANAGEMENT	
CIR	Construction Inspection Report
COS	Construction Strategy
FCN	Field Change Notice
FIR	Field Inspection Report
FQY	Field Query (answered at site)
SIN	Site Instruction
SWO	Stop Work Order
CMS	Construction Method Statement
PROJECT MANAGEMENT	
AGC	Agreement/Contract
CLN	Client Supplied Document
CST	Cost Report
EST	Cost Estimate
HDD	Handover Dossier
IST	Instruction
PCR	Project change request
PLN	Plan
POL	Policy
PRO	Procedure
PRP	Proposal /Tender
REP	Report General
RPT	Progress Report
SCH	Schedule (Project)
TPD	Third Party Supplied Document
VAR	Variance/change
WIN	Work instruction

<i>QUALITY</i>	
AUD	Audit Report
ITP	Inspection and Test Plan
CAR	Corrective Action Request
NCR	Non-Conformance Report
<i>PROCUREMENT</i>	
CTR	Contract Requirements
RIN	Request for Inspection Notice
POD	Purchase Order/POA, Amendment
RFQ	Request for quotation
SPQ	Supplier Query
SPL	Spares List
<i>COMMISSIONING</i>	
CDR	Daily Report
CMM	Commissioning method statement
COM	Commissioning Management
CPL	Punch List
CTP	Commissioning Test Procedure
CWP	Commissioning/Completions Work Pack
DOS	Commissioning Dossier
FAT	Supplier Testing Documents
FTC	Function Test Certificate
ITR	Inspection and Test Report
NOE	Notice of Energization
OTP	Operation Test Procedure
POB	Persons on Site Register
TRN	Training Documents
Drawing identifier	
DAL	Layout
DBD	Block Diagram
DCD	Connection Diagram
DEL	Elevation
DGA	General Arrangement
DID	Installation Detail
DLB	Label, notes, legend & symbol
DLD	Loop Diagram
DLG	Logic Diagram
DLP	Location Plan/Site, Plan/Area Plan
DOA	System overall architecture
DPP	Plot Plan
DPS	Pipe support
DRD	Detail
DRS	Drawings Schedule
DSD	Schematic Diagram

DSE	Section
DSK	Sketch
DSL	Single Line Diagram
ESP	Equipment Seating Plan
DSW	Site Work Drawing
DTD	Termination Diagram
DTL	Three Line Diagram
ISO	Isometric
MSD	Material Safety Diagram
PFD	Process Flow Diagram
P&I	Piping & Instrumentation Diagram
SFD	System Function Diagram
SPD	Safety Philosophy Diagram
UFD	Utility Flow Diagram
TDR	Tender Drawings
DFS	Feasibility Studies Drawings
DSU	Supplier Drawings
DWD	Wiring Diagram
DTR	Heat tracing
DUS	Underground Service
ESP	Equipment Seating Plan

- 9.02.00 Status of the existing engineering works including list of documents, approval status, documents attached in appendix 1.1 for Bidder to study carefully, Bidder has right to utilize or modify to finalize the engineering works which satisfy the Owner's requirements specified in P2CV – 1.2.2.2.2. Engineering and compliant with approved FEED design.
- 9.03.00 Any improve, upgrade, modification which deviate with previous approved design documents, the Bidder shall also submit statements, illustrations including reason, performance affecting, power consumption change...etc. as design change report to Owner for approval.
- 9.04.00 In order to carry out the management overall plant design, the Contractor has right to require the Owner to provide the necessary design documents performed by other Contractors of the Owner to for calculation and design the overall electrical protection/ interlock, overall process interlock, as well as suggest, comment modifying (if any) to ensure the compliant with the Plant's overall design.
- 9.05.00 The Contractor shall also be required to study any trouble, abnormal, incident regarding root cause from design of overall Plant (including Owner's other scopes) to propose the solution, design change report if necessary.

SECTION III

SUB-SECTION 3.1 GENERAL REQUIREMENTS

ARTICLE 3.1.4 QUALITY ASSURANCE REQUIREMENTS

[PII.CV.SIII.SS3.1 – Article 3.1.4]

SECTION III**SUB-SECTION
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3.1.4 QUALITY ASSURANCE REQUIREMENTS****TABLE OF CONTENTS**

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3.00.00	QUALITY ASSURANCE DOCUMENTS
4.00.00	INSPECTION, TESTING AND INSPECTION CERTIFICATES

ATTACHMENTS

ANNEXURE-I	FORMAT OF QUALITY ASSURANCE PROGRAMME
ANNEXURE-II	FIELD WELDING SCHEDULE

SECTION III

SUB-SECTION 3.1 GENERAL REQUIREMENTS

ARTICLE 3.1.4 QUALITY ASSURANCE REQUIREMENTS

1.00.00 QUALITY ASSURANCE PROGRAMME

1.01.00 To ensure that the equipment and services under the scope of Contract whether manufactured or performed within the Contractor's works or at his Sub-contractor's premises or at the Owner's site or at any other place or work are in accordance with the specifications, the Contractor shall adopt suitable quality assurance programme to control such activities at all points, as necessary. Such programmes shall be outlined by the Contractor and shall be finally accepted by the Owner/Authorised representative after discussions before the award of contract. A quality assurance programme of the Contractor shall generally cover the following :

- a) His organisation structure for the management and implementation of the proposed quality assurance programme.
- b) Documentation control system.
- c) Qualification data for Contractor's key personnel.
- d) The procedure for purchase of materials, parts, components and selection of Sub-contractor's services including vendor analysis, source inspection, incoming raw-material inspection, verification of materials purchased etc.
- e) System for shop manufacturing and site erection control including process controls and fabrication and assembly controls.
- f) Control of non-conforming items and system for corrective actions.
- g) Inspection and test procedure both for manufacture and all site related works.
- h) Control of calibration & testing of measuring and testing equipments.
- i) System for quality audit.

- j) System for indication and appraisal of inspection status.
- k) System for authorizing release of manufactured product to the Owner.
- l) System for handling storage and delivery.
- m) System for maintenance of records.
- n) Furnishing of quality plans for manufacturing & field activities detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to each item of equipment/component as per format enclosed at Annexure-I to this section.

2.00.00 GENERAL REQUIREMENTS - QUALITY ASSURANCE

2.01.00 All materials, components and equipment covered under this specification shall be procured, manufactured, erected, commissioned and tested at all the stages, as per a comprehensive Quality Assurance Program. An indicative programme of inspection/tests to be carried out by the Contractor for some of the major items is given in the respective technical specification. This is however, not intended to form a comprehensive programme as it is the Contractor's responsibility to draw up and implement such program duly approved by the Owner/Consultant. The detailed Quality Plans for manufacturing and field activities should be drawn up by the Contractor, separately in the format attached at Annexure-I and will be submitted to Owner/Authorised representative for approval. Schedule of finalisation of such quality plans will be finalised before award.

2.02.00 Manufacturing Quality Plan will detail out for all the components and equipment, various tests/inspection, to be carried out as per the requirements of this specification and standards mentioned therein and quality practices and procedures followed by Contractor's Quality Control organisation, the relevant reference documents and standards, acceptance norms, inspection documents raised etc., during all stages of materials procurement, manufacture, assembly and final testing/performance testing.

2.03.00 Field Quality Plans will detail out for all the equipment, the quality practices and procedures etc. to be followed by the Contractor's site Quality Control organisation, during various stages of site activities from receipt of materials/ equipment at site.

- 2.04.00 The Contractor shall also furnish copies of the reference documents/plant standards/acceptance norms/tests and inspection procedure etc., as referred in Quality Plans along with Quality Plans. These Quality plans and reference documents/standards etc. will be subject to Owner's approval without which manufacture shall not proceed. These approved documents shall form a part of the contract. In these approved quality plans, Owner/Authorised representative shall identify customer hold points (CHP), test/checks which shall be carried out in presence of the Owner's Engineer or his authorised representative and beyond which the work will not proceed without consent of Owner/Authorised representative in writing. All deviations to this specification, approved quality plans and applicable standards must be documented and referred to Owner/Authorised representative for approval and dispositioning.
- 2.05.00 No material shall be despatched from the manufacturer's works before the same is accepted subsequent to pre-despatch final inspection including verification of records of all previous tests/inspections by Owner's Engineer/ Authorised representative, and duly authorised for despatch issuance of Material Despatch Clearance Certificate (MDCC).
- 2.06.00 All materials used or supplied shall be accompanied by valid and approved materials certificates and tests and inspection report. These certificates and reports shall indicate the sheet numbers or other such acceptable identification numbers of the material. The material certified shall also have the identification details stamped on it.
- 2.07.00 Castings and forgings used for construction shall be of tested quality. Details of results of chemical analysis, heat treatment record, mechanical property test results shall be furnished.
- 2.08.00 All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME Section-IX/BS-4870 or other International equivalent standard acceptable to the Owner.
- All brazers, welders etc. employed on any part of the contract at Contractor's/ Sub-Contractor's works or at site shall be qualified as per ASME Section-IX or BS-4871 or equivalent international standard approved by the Owner. Such qualification tests shall be conducted in presence of Owner/his authorised representative.
- For welding of pressure parts and high pressure piping the requirements of IBR shall also be complied with.
- 2.09.00 All non-destructive examination (NDT) shall be carried out in accordance with approved international standard. The NDT operator shall be qualified as per SNT-TC-IA (of American Society of non- destructive

examination). Results of NDT shall be properly recorded and submitted for approval.

2.10.00 All the sub-vendors proposed by the Contractor for procurement of major bought out items including castings, forgings, semi-finished and finished components/equipment list of which shall be drawn up by the Contractor and finalised with the Owner shall be subject to Owner's approval. Quality Plans of the successful vendors shall be discussed, finalised and approved by the Owner/Authorised representative and form part of the Purchase Order between the Contractor and the Vendor.

2.11.00 All the purchase specifications for the major bought-out items, list of which shall be drawn up by the Contractor and finalised with the Owner shall be furnished to the Owner for comments and subsequent approval before orders are placed.

Owner reserves the right to carry out quality audit and quality surveillance of the systems and procedures of the Contractor's or their sub-vendor's quality management and control activities. The Contractor shall provide all necessary assistance to enable the Owner to carry out such audit and surveillance.

Quality audit/approval of the results of tests and inspection will not prejudice the right of the Owner to reject an equipment not giving the desired performance after erection and shall not in no way limit the liabilities and responsibilities of the Contractor in earning satisfactory performance of equipment as per specification.

2.12.00 Quality requirements for main equipment shall equally apply for spares and replacement items.

2.13.00 Repair/rectification procedures to be adopted to make any job acceptable shall be subject to the approval of the Owner.

2.14.00 For quality assurance of all civil works refer to the specifications for civil works.

3.00.00 **QUALITY ASSURANCE DOCUMENTS**

3.01.00 The Contractor shall be required to submit two (2) copies of the following Quality Assurance documents within three (3) weeks after despatch of the equipment :

- a) Material mill test reports on components as specified by the specification.

- b) The inspection plan with verification, inspection plan check points, verification sketches, if used and methods used to verify that the inspection and testing points in the inspection plan were performed satisfactorily.
- c) Non-destructive examination results /reports including radiography interpretation reports.
- d) Factory tests results for testing required as per applicable codes and standards referred in the specification.
- e) Welder identification list listing welder's and welding operator's qualification procedure and welding identification symbols.
- f) Sketches and drawings used for indicating the method of traceability of the radiographs to the location on the equipment.
- g) Stress relief time temperature charts.
- h) Inspection reports duly signed by QA personnel of the Owner and Contractor for the agreed inspection hold points. During the course of inspection, the following will also be recorded :
 - i) When some important repair work is involved to make the job acceptable.
 - ii) The repair work remains part of the accepted product quality.
- i) Letter of conformity certifying that the requirement is in compliance with finalised specification requirements.

4.00.00 **INSPECTION, TESTING AND INSPECTION CERTIFICATES**

- 4.01.00 The Engineer, his duly authorised representative and/or an outside inspection agency acting on behalf of the Owner shall have access at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture or erection and if part of the works is being manufactured or assembled on other premises or works, the Contractor shall obtain for the Engineer and for his duly authorised representative permission to inspect as if the works were manufactured or assembled on the Contractor's own premises or works.

- 4.02.00 The Contractor shall give the Engineer/Inspector fifteen (15) days written notice of any material being ready for testing. Such tests shall be to the Contractor's account except for the expenses of the Inspector. The Engineer/ Inspector, unless the witnessing of the tests is virtually waived, will attend such tests within fifteen (15) days of the date on which the equipment is notified as being ready for test/inspection failing which the Contractor may proceed with test which shall be deemed to have been made in the Inspector's presence and he shall forthwith forward to the Inspector duly certified copies of test reports in six (6) copies.
- 4.03.00 The Engineer or Inspector shall within fifteen (15) days from the date of Inspection as defined herein give notice in writing to the Contractor, or any objection to any drawings and all or any equipment and workmanship which is in his opinion not in accordance with the contract. The Contractor shall give due consideration to such objections and shall either make modifications that may be necessary to meet the said objections or shall confirm in writing to the Engineer/Inspector giving reasons therein, that no modifications are necessary to comply with the contract.
- 4.04.00 When the factory tests have been completed at the Contractor's or sub-contractor's works, the Engineer/Inspector shall issue a certificate to this effect fifteen (15) days after completion of tests but if the tests are not witnessed by the Engineer/Inspectors, the certificate shall be issued within fifteen (15) days of the receipt of the Contractor's test certificate by the Engineer/Inspector. Failure of the Engineer/Inspector to issue such a certificate shall not prevent the Contractor from proceeding with the works. The completion of these tests, or the issue of the certificates shall not bind the Owner to accept the equipment should it, on further tests after erection be found not to comply with the contract.
- 4.05.00 In all cases where the contract provides for tests whether at the premises or works of the Contractor or any sub-contractor, the Contractor, except where otherwise specified shall provide free of charge such items as labour, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Engineer/Inspector or his authorised representatives to carry out effectively such tests on the equipment in accordance with the Contractor and shall give facilities to the Engineer/ Inspector or to his authorised representative to accomplish testing.
- 4.06.00 To facilitate advance planning of inspection in addition to giving inspection notice as per Clause 4.02.00, the Contractor shall furnish quarterly inspection programme indicating schedule dates of inspection at customer hold point and final inspection stages. Updated quarterly inspection plans will be made for each three consecutive months and shall be furnished before beginning of each calendar month.

ANNEXURE-I**FORMAT OF QUALITY ASSURANCE PROGRAMME**

Name of Company/ Contractor	NAME OF CONTRACT PACKAGE			QUALITY PLAN FOR						
	Package No. : _____ Contractor : _____			QP No. : _____ Date _____ Rev.No.: _____ Date _____						
Sl. No.	Component & Operation	Characteristics	Class	Type of Check	Quantum of Check	Reference Document	Acceptance Norm	Format of Record	Agency	Remarks

ANNEXURE-II**FIELD WELDING SCHEDULE**

PROJECT : FWS NO :

CONTRACTOR : REV NO. :

PACKAGE : FIELD WELDING CODE :

SYSTEM : PAGE NO. :

Sl No.	Drawing No. for Weld Locations & Identification mark	Description of parts to be welded	Material specification	Dimensions	Process of Welding	Type of Weld	Electrode Filler Specification	WPS No.	Minimum Pre-heat Temperature	Heat Treatment Temperature [Holding Time in secs]	NDT Method Quantum	NDT Specification Number	Acceptance Norm Ref.	Remarks

The Field Welding Schedule should be submitted for :

- o Pressure Parts
- o Tanks/Vessels
- o Piping
- o Heavy/Important Structural Steel
- o Heat Exchangers
- o Bus Ducts

SECTION III

SUB-SECTION

3.2 DETAILED REQUIREMENTS

ARTICLE

3.2.1 STEAM GENERATOR AND AUXILIARY

[PII.CV.SIII.SS3.2 – Article 3.2.1]

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CHAPTER V – SECTION III

SUB-SECTION 3.2

ARTICLE 3.2.1 STEAM GENERATOR AND AUXILIARY

The Article is intended to cover the design, supply, construction/erection and commissioning of Steam Generator and Auxiliaries for 2x600 MW Long Phu–1 Power Plant.

The scope of work for Steam Generator and Auxiliaries includes the following portion:

- Boiler un-procured pipings (*boiler vents, drains, valves and other auxiliaries*).
- Boiler insulation, skin casing, Refractory and accessories for Water Wall, Header, External Parts, External Piping outside of Water Wall for Two (2) Boiler.
- Fuel supply system to 24 Boiler Burners including 6 Coal Bunker/Boiler, 6 Coal Feeder/Boiler, 6 Coal Mills of capacity 55tons/hr per each for one Boiler which are successively connected to each other.
- Selective Catalytic Reduction (SCR) for DeNO_x System (*including Reactor, Module Catalyst, Insulation, Piping, Valves, Instruments, Ammonia Dosing Skid, Sonic Horn, Common Ammonia Unloading & Supply System for SCR Unit 1&2 ...*) composed of 2 reactors/Boiler.
- Two (2) Rotary Regenerative Air-Preheater (RAPH) System for each Boiler (*Casing, Heating Element, Sootblower, HP Washing Pump...*).
- Boiler Fans (*2 Primary Air Fans/Boiler, 2 Secondary Air Fans/Boiler, 2 Induced Draft Fans/Boiler, 2 Flue Gas Recirculation Fan/Boiler, 2 Mill Seal Air Fans/Boiler*).
- Pulverized Coal/Air/Gas Ducts (*Expansion Joint, Ducts, Steel Structure & Maintenance Platform for Ducts, Insulation & Lagging, Dampers, electrical and instrument & control, Steam Coil Air-Preheater SCAPH, Air-Gas Mixer, Air Preheater Hopper, Expansion Joints ...*).
- Fuel Oil Transferring and Pressurizing System (*including drain oil pump skids, pressurizing pump skids, diesel oil filling pump skids*).
- Auxiliary Boiler

Given the very tight schedule, the Owner shall prioritize the separate installation of the Boiler proper to complete the closed circuit, perform hydrostatic testing, and apply anti-corrosion medium to the Boiler pressure parts (in case if long-term waiting occurring while finalizing other relevant Plant systems).

All documents for Boiler Proper by TKZ are attached in *Attachment for 2. PII.CV.SIII.S3.2 -Article 3.2.1, item 2. Boiler Insulation, "Engineering document for Boiler Proper*.

Accordingly, the following information is provided for Bidder to continue coordinating and completing the other scope necessary to finalize the Steam Generator and Auxiliaries.

1. Boiler un-procured pipings

1.1 Status

This section covers the remaining vent, drain piping, instrument piping, valves and other auxiliaries which are not part of pressure parts, hereinafter called “*Un-procured pipings*”. These unprocured pipings have been shown in the existing drawings (location, dimension, steam parameters, design code, etc.), but the detailed design has not been completed.

- Engineering: 0%
- Procurement: 0%
- Installation, erection: 0%
- Commissioning: 0%

1.2 Scope of work

- Engineering: N/A

Note: The detailed scope is defined based on the existing P&ID and drawings in *Table 10-Terminal Point List/Table 10-Attachment, IX. T05 Boiler*. The Owner shall finalize the detailed engineering for the un-procured pipings and hand-over to Bidder for procurement, installation and commissioning.

Un-procured pipings are described in the following P&ID drawings for Bidder’s coordination:

- (1) LP1-TKZ-10HAC-I-M1A-P&ID-0003-K P&ID for Water Economizer
- (2) LP1-TKZ-10HAD-I-M1A-P&ID-0004-H P&ID for Lower Part of Furnace Front & Rear Water Wall
- (3) LP1-TKZ-10HAD-I-M1A-P&ID-0005-H P&ID for Lower Part of Furnace Right & Left
- (4) LP1-TKZ-10HAD-I-M1A-P&ID-0006-H: P&ID for Upper Part of Furnace Front & Rear Water Wall
- (5) LP1-TKZ-10HAD-I-M1A-P&ID-0007-G: P&ID for Upper Part of Furnace Right & Left Water Wall
- (6) LP1-TKZ-10HAG-I-M1A-P&ID-0008-K: P&ID for Start-up Assembly and Recirculation
- (7) LP1-TKZ-10HAG-I-M1A-P&ID-0009-I: P&ID for Recirculation Station (including Pump)
- (8) LP1-TKZ-10HAH-I-M1A-P&ID-0010-I: P&ID for Ceiling WW, bypass tube from Furnace WW to Convection Water Wall
- (9) LP1-TKZ-10HAH-I-M1A-P&ID-0011-H: P&ID for Convection Side and Rear Water Wall
- (10) LP1-TKZ-10HAH-I-M1A-P&ID-0012-H: P&ID for Platen Superheater Stage 1

- (11) LP1-TKZ-10HAH-I-M1A-P&ID-0013-H: P&ID for Platen Superheater Stage 2
- (12) LP1-TKZ-10HAH-I-M1A-P&ID-0014-H: P&ID for Platen Superheater Stage 3
- (13) LP1-TKZ-10HAH-I-M1A-P&ID-0015-H: P&ID for HP Convective Superheater (Superheater Stage 4) and Main Steam
- (14) LP1-TKZ-10HAJ-I-M1A-P&ID-0016-J: P&ID for Reheater Stage 1 2 3 & Cold Reheat Steam
- (15) LP1-TKZ-10HAJ-I-M1A-P&ID-0017-H: P&ID for Reheater Stage 4 & Hot Reheat Steam
- (16) LP1-TKZ-10HCB-M-M1A-P&ID-7501-F: P&ID for Steam Sootblowing System
- (17) LP1-TKZ-10HCC-M-M1A-P&ID-7502-C: P&ID for Smart Cannon (Water Washing Pipeline)
- (18) LP1-TKZ-10HBK-I-M1A-P&ID-0021: P&ID for Boiler Furnace
- (19) LP1-TKZ-10HHA-I-M1A-P&ID-0027: P&ID for Boiler Burners

For reference, refer to “List of remaining pipelines, valves, I&C equipment” in attachment.

- Supply: The Bidder shall be responsible for the complete procurement of the un-procured pipings total for two (2) Boiler. Base on relating P&ID drawings above mentioned, the Bidder shall study carefully, estimate and propose the lump sum quote for un-procured pipings and including in Bid price proposal, any extra cost caused from deviation with design of the Owner/Owner’s Contractor shall be included in this proposal.
- Delivery: Bidder shall be responsible for transportation of these un-procure pipings to Long Phu 1 site, and storage.
- Installation, erection: Bidder shall perform installation, erection, alignment, etc... for this scope in accordance with the drawings approved by the Owner.
- Commissioning: Refer to [Table 09 Bill of Quantities]

1.3 Detail requirements

Specific requirements (steam parameters, dimension, materials, ...) are described in P&ID and existing drawings.

1.4 Performance guarantee (N/A)

1.5 Attachments

- (1) List of remaining pipelines, valves, and I&C equipment

2. Boiler Insulation & Skin Casing/Lagging

2.1 Status

- Engineering

The insulation is previously designed by TKZ (Boiler supplier) and shall be finalized by the Owner in the next phase of Project. The Boiler insulation is designed in accordance with following documents:

Insulation & Lagging for Water Wall

- LP1-TKZ-10HBB-M-M1A-SPC-7506: List of Boiler Refractory Materials
- LP1-TKZ-10HBB-M-M1A-SPC-7507: Specification of Boiler Skin Casing/Lagging

*Insulation & Lagging for Header, External Parts, External Piping outside of Water Wall (exclude thermal insulation for LPH 2-3-4 and Deaerator, which were mentioned in **Article 3.2.3** Power cycle piping, valves, specialties and Thermal Insulation).*

- LP1-TKZ-10HBB-M-M1A-SPC-7505: List Insulation and Skin Casing of External Parts
- LP1-TKZ-10HBB-M-M1A-SPC-7564: List of Insulation for Boiler External Parts
- LP1-TKZ-10HBB-M-M1A-SPC-7578: List of Skin Casing for Boiler External Parts

And corresponding installation drawings as attached in “*Engineering document for Boiler Proper*”

– Procurement

(i) The item 10 to item 51 stated in specification LP1-TKZ-10HBB-M-M1A-SPC-7505 (page 15-17) has been delivered to Site by PM since 2018 as “*Boiler Platform Warmbox*” (see *Bill of materials for Boiler Platform of Warmbox* as attached for detailed status)

(ii) The remaining materials for Boiler insulation and lagging is not procured by PM.

– Installation, erection: 0%

– Commissioning: 0%

2.2 Scope of work

– Engineering: The Owner shall finalize the detailed design (including revise all installation drawings and specification) for Boiler insulation and lagging for procurement and installation.

– Procurement and Construction:

Base on relating list of Insulation, lagging and Skin Casing documents mentioned, the Bidder shall study carefully, estimate and propose the lump sum quote for Boiler Insulation & Skin Casing/Lagging within Bidder’s scope and including in Bid price proposal, any extra cost caused from deviation with design of the Owner/Owner’s Contractor shall be included in this proposal

(i) The Owner shall be in charge for procurement and installation for Boiler refractory materials and platform of warmbox.

(ii) The Bidder shall be in charge of remaining insulation materials for 2 (two) Boiler.

(iii) Specially, for specification LP1-TKZ-10HBB-M-M1A-SPC-7506: Boiler refractory materials and insulation for water wall, please refer to table below for Bidder's scope of work:

No.	Description of Materials	Standard ASTM	Quantity	Consumption (Kg/m ³)	Total Mass (Kg)	Scope of work by
1	Refractory chamotte concrete Bulk Density 2400Kg/m ³	ASTM C401	22m ³	2400	52800	Owner
2	Insulating Heat-resistant vermiculite concrete Bulk Density 770-840Kg/m ³	ASTM C196	106m ³	800	84800	Owner
3	Phosphate-Bonded refractory mixture Bulk Density 2850Kg/m ³	ASTM C704	2.21m ³	2790	6165.9	Owner
4	Mortar for chamotte brickwork	ASTM C144	0.33m ³	1370	452.1	Owner
5	Blankets of the fire resistant ceramic fiber 38x610x5000mm, density as supplied 128Kg/m ³	ASTM C892	991m ³	128	126848	Bidder
6	Stitched material (rock) wool mats based on basaltic rocks covered with stainless steel mesh on one side 70x900x2000mm, density as supplied 100Kg/m ³	ASTM C592	83m ³	100	8300	Bidder
7	Stitched material (rock) wool mats based on basaltic	ASTM C592	83m ³	100	8300	Bidder

No.	Description of Materials	Standard ASTM	Quantity	Consumption (Kg/m ³)	Total Mass (Kg)	Scope of work by
	rocks covered with galvanized mesh on one side 70x900x2000mm, density as supplied 100Kg/m ³					
8	Stitched material (rock) wool mats based on basaltic rocks covered with stainless steel mesh on one side 60mm, density as supplied 100Kg/m ³	ASTM C592	204m ³	100	20400	Bidder
9	Stitched material (rock) wool mats based on basaltic rocks covered with galvanized mesh on one side 60mm, density as supplied 100Kg/m ³	ASTM C592	49m ³	100	4900	Bidder
10	Stitched material (rock) wool mats based on basaltic rocks covered with stainless steel mesh on one side 50mm, density as supplied 100Kg/m ³	ASTM C592	373m ³	100	37300	Bidder
11	Stitched material (rock) wool mats based on basaltic rocks covered with galvanized mesh on one side 50mm, density as supplied 100Kg/m ³	ASTM C592	946m ³	100	94600	Bidder

No.	Description of Materials	Standard ASTM	Quantity	Consumption (Kg/m ³)	Total Mass (Kg)	Scope of work by
12	Straight brick chamotted 250x124x65mm Density, 2000Kg/m ³	ASTM C155	1360pcs	4.2	5712	Bidder
13	Wire mesh (galvanized) Ø1.6mm 15x15mm	ASTM A641 A641M	13465m ²	2.57	34605.1	Bidder
14	Wire mesh welded from stainless steel wire Ø5mm 100x100mm	ASTM A479 A479M	3320m ²	3.16	10491.2	Bidder
15	Wire Ø0.9mm of steel grade AISI 304	ASTM A479 A479M	74480m	0.005	372.4	Bidder
16	Wire Ø1.6mm of steel grade AISI 304	ASTM A479 A479M	44500m	0.016	712	Bidder
17	Wire Ø6mm of steel grade AISI 304	ASTM A479 A479M	31625m	0.22	6957.5	Owner
18	Wire Ø8mm of steel grade AISI 304	ASTM A479 A479M	5170m	0.395	2042.2	Owner
19	Filled silica cord Ø8mm	ASTM C892	700m	0.05	35	Bidder

* Note:

- Total estimated weight for Boiler insulation & refractory materials for one (1) Boiler is 505.8 tons.
- Under specification LP1-TKZ-10HBB-M-M1A-SPC-7506, the refractory and insulation materials have been supplied for one Boiler with factor of margin 10% vs this list.

(iv) All materials listed in

- LP1-TKZ-10HBB-M-M1A-SPC-7564: Boiler insulation for external parts and
- LP1-TKZ-10HBB-M-M1A-SPC-7507: Boiler skin casing & lagging for water wall

shall be procured and installed by Bidder.

(v) For specification LP1-TKZ-10HBB-M-M1A-SPC-7578: Boiler casing & lagging for external parts, the Bidder shall procure and installed all items except (item 10 to 51 which have been delivered to Site and installed by the Owner)

(vi) Delivery, erection/construction, commissioning and other scope of work: The Bidder shall refer to Table 08 [Division of Responsibility] to perform works for Boiler insulation & lagging with scope of work as stated from point (i) to (iv).

2.3 Detail Requirements

The Bidder shall comply with design and/or instruction by the Owner for scope of work of Boiler Insulation & lagging. The list of existing engineering documents for Boiler insulation & lagging is attached for Bidder's implementation and shall be finalized by the Owner during contract execution.

2.4 Performance Guarantee

Ensure the surface temperature remains within safe limits $\leq 60^{\circ}\text{C}$.

2.5 Attachments

- (1) Engineering document for Boiler Proper.
- (2) Bill of materials for Boiler Platform of Warmbox.

3. Coal Bunker

3.1 Status

The status is as follows:

- Supplier: Dai Dung Metalitic Manufacturer
- Engineering: 100% with 12/12 coal bunkers are equipped for two (2) Boilers. Each coal bunker's capacity $\approx 825 \text{ m}^3$ sized for approx. 12 hours operation at Boiler Maximum Continuous Rate (BMCR).

All related drawings and calculations for Coal Bunker are attached:

- Erection Drawing LP1-DDC-11UMA-C-C1-DSW-3194
- Assembly Drawings LP1-DDC-11UMA-C-C1-DRD-3194
- Sizing Calculation LP1-TKC-10HFG-M-M2-CAL-0053
- Procurement: 12/12 coal bunker for two (2) units delivered to Site with total weight $\approx 1,028$ tons, remaining accessories are not delivered to Site.
- Installation, erection: The bunkers were installed and erected in position in steel structure with acceptance of installed weights respectively 492tons for Unit 1 ($\approx 93.36\%$) and 492tons for Unit 2 ($\approx 93.36\%$) as confirmed by Acceptance Protocol No. *PTSC-HF-ACQ-Coal Bunker*.

- Commissioning: 0%

Status of all equipment and materials (drawing name, mass, delivery, erection, ...) is shown in cl. 3.5 attachment [*Bill of materials and Detailed Status for Coal Bunker*].

3.2 Scope of work

- Engineering: The Bidder shall revise and/or complete the remaining coal bunker design, including measures to prevent coal blockage and clogging.
- Supply: The Bidder shall furnish the remaining materials in accordance with the attached Bill of Materials (BoM), as well as any additional materials required for the completion of the system based on the new design for 2 (two) Boiler.
- Delivery: Bidder shall be responsible for customs clearance, transportation to Long Phu 1 site, and storage.
- Installation, erection (equipment): Bidder shall perform installation, erection, alignment, etc... in accordance with Supplier's manual and erection, and Bidder's ITP approved by Owner

The installation/ for Coal Bunker is complied with drawings:

- LP1-DDC-11UMA-C-C1-DSW-3194: Erection drawings for Coal Bunker
 - LP1-DDC-11UMA-C-C1-DRD-3194: Manufacturing drawing for each part of Coal Bunker.
- Commissioning: Refer to [Table 08 Division of Responsibility]
 - TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility]

3.3 Detail Requirements (N/A)

3.4 Performance guarantee (N/A)

3.5 Attachments

- (1) Erection, Assembly Drawings
- (2) Sizing Calculation LP1-TKC-10HFG-M-M2-CAL-0053
- (3) Bill of materials and Detailed Status for Coal Bunker
- (4) Goods delivered to Site-fully formatted Coal Bunker
- (5) Acceptance Protocol No. PTSC-HF-ACQ-Coal Bunker

4. Coal feeder

4.1 Status

- Supplier: FL Smidth
- Engineering: 100% The Boiler is equipped with 6 Vertical Coal Feeders per Unit, 12 Coal Feeders in total include peripheral items (conveyor, coal valve, inlet and outlet gate) between Coal bunkers and Coal Mills, local control cabinet, remote

control panel, embedded instruments, drive motor of each. For detail, refer to specification No. LP1-TKC-11ERA-M-M1A-SPC-2046.

All related documents are attached in “Engineering Document for Coal Feeders”.

- Procurement: 12 sets (100%) of Coal Feeders have been delivered to Site since 07/2017 ($\approx$ 165 tons) and fully stored in Owner’s indoor warehouse.

For more details, refer to “Goods delivered to Site for Coal Feeder” in attachment.

- Installation, erection: 0%
- Commissioning: 0%



4.2 Scope of work

- Engineering: N/A
- Supply: N/A
- Delivery: N/A
- Installation, erection: Bidder shall perform installation, erection, alignment, etc... for equipment in accordance with Supplier’s manual and erection, and Bidder’s ITP approved by Owner.

Refer to E&C manual for Gravimetric Belt Weigh Feeder Unit 1 No. LP1-FLS-11HFB-G-M1A-MAN-0007-E and Unit 2 No. LP1-FLS-12HFB-G-M1A-MAN-0007-D

- Commissioning: Refer to [Table 08 Division of Responsibility]
- TA Service for erection/construction, commissioning, training service to Owner’s personnel: Refer to [Table 08 Division of Responsibility]

4.3 Detail Requirements (N/A)

4.4 Performance guarantee (N/A)

4.5 Attachments

- (1) Engineering documents for Coal Feeders
- (2) Goods delivered to Site for Coal Feeders

5. Coal Pulverizers/Mills

5.1 Status

- Supplier: Loesche
- Engineering: 100%. The Boiler is equipped with Six (6) Coal Mills/Unit (total 12 coal mills), capacity 55 tons/Mill (operation configuration with 5 Work+1 Standby).

Each Coal Mill is of vertically pressurized bowl mill type and completed with Mill and Classifier, Mill Motor, Gearbox, Spring Assembly, Knife Gate Valve, Hydraulic Cabinet (HSLM) and Instrumentation of each. For detail, refer to specification LP1-TKC-11HFC-M-M1A-SPC-2051.

All related documents are attached in “Engineering Document for Coal Mills”.

- Procurement: 08/12 delivered to Site. The Owner shall purchase, transport 04/12 remaining Coal Mills stored at Loesche’s Warehouse to LP1 Site and hand over to the Bidder to perform further activities.

For more details, refer to “Goods delivered to Site for Coal Mills” and “Detail Packing List for 4 Coal Mills stored at Loesche’s warehouse” in attachment.

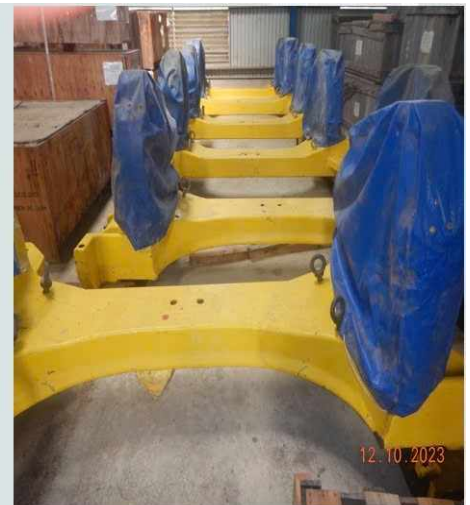
- Installation, erection: 0%
- Commissioning: 0%



Classifier Motor



Mill Main Motor
Indoor storage



Bearing Block



Photo: Coal Mills at Site

5.2 Scope of work

- Engineering: N/A
- Supply: N/A
- Delivery: N/A
- Installation, erection: Bidder shall perform installation, erection, alignment, etc... for 12/12 Coal Mills in accordance with Supplier's manual and erection, and Bidder's ITP approved by Owner.

Bidder shall refer to Assembly Description Manual No. LP1- LES-11HFC-PM-M1A-MAN-10-B:

- Commissioning: Refer to [Table 08 Division of Responsibility]
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility]

5.3 Detail Requirements (N/A)

5.4 Performance guarantee

The requirements of Coal Pulverizers are detailed in Data Specification Sheet (Appendix -3) of LP1-TKC-11HFC-M-M1A-SPC-2051

Performance Guarantees on Pulverizer capacity, fineness, wear life etc shall comply with the requirements stipulated in relevant clauses of Attachment F of LP1-TKC-11HFC-M-M1A-SPC-2051

Noise Level shall be less than 85 dBA with 1 meter of equipment

The Parties (Owner, Contractor) shall note the performance of this component in case it affects the overall performance of the Plant to determine the responsibility of each Party respective to each Party's scope of work (supply, installation, commissioning).

5.5 Attachments

- (1) Specification No. LP1-TKC-11HFC-M-M1A-SPC-2051

- (2) Engineering documents for Coal Mills
- (3) Goods delivered to Site for 8 Coal Mills Loesche
- (4) Detail Packing List for 4 Coal Mills stored at Loesche's warehouse

6. SCR System

6.1 Status

- Supplier: Termokimik (Italy)
- Configuration: Two SCR systems, one for each Steam Generator shall be provided. Each SCR system will include two (2) SCR assemblies.
- Engineering: 100% The SCR for Boiler is designed. For details, refer to Specification No. LP1-TKC-11HS-M-M1A-SPC-2052 and Design Basic Report No. LP1-TKC-10HS-M-M1A-CRT-0040.

All related documents are attached in “Engineering Document for SCR”.

- Procurement:

- Manufacturing: 99% for both units (Catalyst Unit 2 are not manufactured)

Each SCR system shall include the following main components:

- All necessary Steel Structure and Maintenance Platform
 - 2 Reactor per each Unit
 - Catalyst module
 - Hoist and Crane for SCR equipment Maintenance
 - SCR Duct from Boiler outlet to RAPH inlet (including Expansion Joint, Dampers, Duct Specialties) and SCR insulation
 - Ammonia dosing and injection system, all interconnection pipelines within equipment of SCR System (including Valves, Instruments and their Hook-up/Pneumatic Materials for Instrument installation)
 - Sonic Horn for Catalyst Cleaning
 - 01 main control cabinet, 1 Ammonia leak detector cabinet, 1 Ammonia Gas Analysis Cabinet, all cable tray, cable tray support, cable routing to connect from electrical and I&C Equipment from SCR to main control cabinet
 - Delivery: 9.51% of SCR system. Main steel structure of SCR System Unit 1&2 $\approx$ 360 tons is delivered to Long Phu Site and the remaining is stored at Termokimik's warehouse.

For more details, refer to “Goods delivered to Site for SCR system” and “Detail Packing List for SCR system stored at Termokimik's warehouse” in cl. 6.5 attachments.

The Owner shall purchase these remaining equipment to LP1 Site and hand over to the Bidder to perform further work.

- Installation, erection: Steel structure of Unit 1 has been also partially installed 133/180tons as confirmed by Acceptance Protocol *PTSC-11SCR-ACQ-0001*.

The system installed from elevation +42.235m (below this elevation is Rotary Air-Preheater RAPH steel structure) as shown in drawing LP1-TKZ-10HXX-M-M1A-DGA-7001: Balance of Power Block Layout

6.2 Scope of work

- Engineering: N/A
- Supply: N/A
- Delivery: N/A
- Installation, erection: Bidder shall perform installation, erection, alignment, etc... for SCR system in accordance with Supplier's manual and erection, and Bidder's ITP approved by Owner.
- Commissioning: Refer to [Table 08 Division of Responsibility]
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility]

6.3 Detail Requirements (N/A)

6.4 Performance guarantee

Performance guarantee is required in LP1-TKC-11HS-M-M1A-SPC-2052, The Parties (Owner, Contractor) shall note the performance of this component in case it affects the overall performance of the Plant to determine the responsibility of each Party respective to each Party's scope of work (supply, installation, commissioning) included following:

- NOx at outlet of the SCR assembly
- Ammonia slip (untreated ammonia) after SCR
- Pressure drop across SCR system

6.5 Attachments

- (1) Specification and Design Basic Report for SCR
- (2) Engineering documents for SCR
- (3) Good delivered to Site for SCR by Termokimik.
- (4) Detail packing list for SCR.
- (5) Acceptance Protocol.

7. Ammonia Unloading & Storage System

7.1 Status

- Supplier: Integrated Flow (USA)
- Engineering: 100%

- Procurement: 0%
- Installation, erection: 0 %
- Commissioning: 0%

7.2 Scope of work

- Engineering: Bidder shall revise and/or update the engineering with reference to the existing document in accordance with the Owner's requirement.
- Supply:
 - Bidder shall furnish the equipment & accessories based on the design/specification developed by Bidder under Owner approval. The scope of supply for both units includes the main components:
 - Two (2) storage tanks of Ammonia capacity 90m3/each
 - One (1) Ammonia vaporization skid with 2x100% ammonia evaporators/vaporizers
 - Two (2) Ammonia compressors
 - One (1) Ammonia Dilution Skid and valves located in interconnected piping between equipment along with 2 junction boxes for Ammonia Tanks, 1 Unloading Panel, 1 Ammonia Detector Alarm.
 - For more details, refer to specification No. LP1-TKC-10QCJ-M-M1A-SPC-2059.
 - Bidder shall furnish the following materials and as follow:
 - Spare part for start-up, commissioning
 - Special tools and tackles.
- Delivery: Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and storage.
- Installation, erection: Bidder shall perform installation, erection, alignment, etc... for Ammonia system in accordance with Supplier's manual and erection, and Bidder's ITP approved by Owner.

Refer to Instruction Manuals For Dilution Pump No. LP1-IFS-11QCJ-G-M8-MAN-0001-0 and Ammonia Compressor Instruction Manuals No. LP1-IFS-11QCJ-G-M8-MAN-0001-B

- Commissioning: Refer to [Table 08 Division of Responsibility]
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility]

7.3 Detail Requirements

The Bidder shall refer to clause 9.00.00 "Specific Requirements – Technical", Specification LP1-TKC-10QCJ-M-M1A-SPC-2059.

Additional, refer to RFP Volume II-B – Section I – Item 11.00.00 and 12.00.00 for original requirements.

7.4 Performance guarantee

Refer to item no 11.00.00 “TESTS” in Specification for the stipulations regarding performance guarantee test at site.

The ammonia gas flow from one evaporator shall be 1100 kg/hr (*to be confirmed upon final selection of SCR vendor), will vary based on boiler load.

7.5 Attachments

- (1) Specification No. LP1-TKC-10QCJ-M-M1A-SPC-2059
- (2) Engineering documents for Ammonia System

8. Air Pre-heater (RAPH) Equipment

8.1 Status

- Engineering: 100% with 2 RAPH per unit. Each RAPH Unit is three-sector regenerative air heaters type and is designed under Specification No. LP1-TKZ-10HLX-M-M1A-DEG-7510.

All related documents are attached in “Engineering Document for RAPH”.

- Procurement:
 - Manufacturing: 100%
 - Delivery: 100% with Four (4) sets of RAPH have been fully delivered to Site since 12/2017 (with estimated weight $\approx$ 2,420 tons)

For more details, refer to “Goods delivered to Site for RAPH” and “Bill of Materials” in attachment.

- Installation, erection: 12.47% ($\approx$ 302/2,420 tons) with main rotor housing, rotor spider fully installed as confirmed by Acceptance Protocol No. *PTSC-11APSEQP-ACQ-0001* and *PTSC-11APSEQP-ACQ-0002*.

Total 523 tons have been performed as per Confirmation Protocol No. *PTSC-11APS-EQP/CPQ/0001* and *PTSC-12APS-EQP/CPQ/0002*.

The remaining equipment such as heating elements is stored in Site’s warehouse.



8.2 Scope of work

- Engineering: N/A

- Supply: N/A
- Delivery: N/A
- Installation, erection: Bidder shall perform installation, erection, alignment, etc... for RAPH system in accordance with Supplier's manual and erection, and Bidder's ITP approved by Owner.

Refer to RAPH Drawing manual No. LP1-HUK-11HLD-G-M1A-MAN-0014-B and RAPH Erection manual No. LP1-HUK-11HLD-G-M1A-MAN-0015-A

- Commissioning: Refer to [Table 08 Division of Responsibility]
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility]

8.3 Detail Requirements (N/A)

8.4 Performance guarantee

The Boiler thermal and aerodynamic calculation technical data for designing air pre-heaters stated in LP1-TKZ-10HLX-M-M1A-DEG-7510, the Parties (Owner, Contractor) shall note the performance of this component in case it affects the overall performance of the Plant to determine the responsibility of each Party respective to each Party's scope of work (supply, installation, commissioning)

8.5 Attachments

- (1) Specification No. LP1-TKZ-10HLX-M-M1A-DEG-7510
- (2) Engineering documents for RAPH
- (3) Goods delivered to Site for RAPH
- (4) Bill of Materials of RAPH
- (5) Confirmation and Acceptance Protocol

9. Boiler Fans

9.1 Status

- Supplier: Howden
- Engineering: 100%

All related documents are attached in "Engineering Document for Boiler Fans".

- Procurement:
 - Manufacturing: 100%, The Boiler Fans are provided under specification LP1-TKC-11H-M-M1A-SPC-2053 with 20 sets for 02 Boilers, including:
 - Four (4) Secondary Air (SA) Fans (2x50%), include of each with drive motor, inlet silencer, lube oil skid, embedded instruments
 - Four (4) Primary Air (PA) Fans (2x50%), include of each with drive motor, inlet silencer, lube oil skid, embedded instruments

- Four (4) Induced Draft (ID) Fans (2x50%), include each with drive motor, lube oil skid and 02 sealing air fans for anti-leaking of flue gas during emission, embedded instruments
- Four (4) Flue Gas Recirculation (FGR) Fans (2x50%), of centrifugal design
- Four (4) Mill Seal Air Fans (MS) (2x100% for the pulverizers of each boiler).
- Two (2) common Vibration Monitoring System VMS for 5 types of fans
- Delivery: 0%, 20 sets of Boiler Fans have been manufacturing and fully stored in Howden's Warehouse as per "Detail Packing List for Boiler Fans".
- Erection, installation: 0%

9.2 Scope of work

- Engineering: N/A
- Supply: N/A (The Owner shall purchase, transport these equipment to LP1 Site and hand over to the Bidder to perform further activities).
- Delivery: N/A
- Installation, erection: Bidder shall perform installation, erection, alignment, etc... for 20 sets of Boiler Fans in accordance with Supplier's manual and erection, and Bidder's ITP approved by Owner.
- Commissioning: Refer to [Table 08 Division of Responsibility]
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility]

9.3 Detail Requirements (N/A)

9.4 Performance guarantee

Preliminary "Input Data" for "Technical Assignment for Design of Draft Equipment for the Boiler to 600MW Power Unit, Long Phu – 1 and performance guarantee are specified in TPP LP1-TKC-11H-M-M1A-SPC-2053, the Parties (Owner, Contractor) shall note the performance of this component in case it affects the overall performance of the Plant to determine the responsibility of each Party respective to each Party's scope of work (supply, installation, commissioning)

9.5 Attachments

- (1) Specification No. LP1-TKC-11H-M-M1A-SPC-2053
- (2) Engineering documents for Boiler Fans by Howden
- (3) Detail Packing List for Boiler Fans

10. Boiler Coal/Air/Gas Ducts and Specialities

10.1 Status

In this section, The Boiler Coal/Air/Gas Ducts and Specialities (hereinafter called “*Ducting System*”) shall include:

- The boiler ducting for coal, cold/hot primary air, cold/hot secondary air, flue gas, ventilation, sealing air and another ducting needed for smooth operation of Boiler.
- Supporting steel structure, hanger & support for boiler ducting, platforms for maintenance of Dampers, equipments located on *Ducting System*.
- Dampers and their accessories on *Ducting System*.
- Expansion Joints (Metallic and Non-metallic type) on *Ducting System*.
- Steam Coil Air-Preheater for pre-heating cold secondary air installed at outlet of SA fans.
- Air-gas mixer for creating a mixture of hot secondary air and flue gas recirculation before being injected into the boiler for combustion
- Insulation & lagging for *Ducting System*.
- Instruments (pressure transmitters/switches, temperature sensors/thermocouple, flow transmitters,...) and their hook-up materials located on *Ducting System*.

– Engineering

(i) *Ducting System* is previously designed by TKZ (Boiler supplier) in accordance with following drawings:

- LP1-TKZ-10HBK-I-M1A-P&ID-0021: P&ID for Furnace
- LP1-TKZ-10HFE-I-M1A-P&ID-0022: P&ID for Primary Air
- LP1-TKZ-10HLA-I-M1A-P&ID-0023: P&ID for Secondary Air
- LP1-TKZ-10HHL-I-M1A-P&ID-0024: P&ID for Combustion Air
- LP1-TKZ-10HNA-I-M1A-P&ID-0025: P&ID for Flue gas from Boiler to Chimney
- LP1-TKZ-10HFW-I-M1A-P&ID-0028: P&ID for Sealing Air to Mills & Coal Feeder
- LP1-TKZ-10HHE-I-M1A-P&ID-0029: P&ID for Coal Duct from Mills to Burner

For clearly understanding of design of existing *Ducting System*, the Bidder is advised to scrutinize “*Engineering documents for Boiler Coal/Air/Gas Ducts*” (including attached documents)

Based on operational functions, *Ducting System* is divided by TKZ into the following lines (including the corresponding line assembly drawings for *Ducting System* except insulation):

No	Line	Line Assembly Drawing	Name of Drawing
1	P	LP1-PWR-10HHE-M-M1A-DSW-6374-B	Coal Ducts from Pulverizers to Boiler Burners
2	G1	LP1-PWR-10HNA-M-M1A-DSW-6081-D	Gas Ducts from Air Pre-heater to ESP
3	G2	LP1-PWR-10HNA-M-M1A-DSW-7471-D	Gas Ducts from ESP to ID Fans
4	R	LP1-PWR-11HNF-M-M1A-DSW-6105-C	Gas Recirculation Duct to Boiler
5	V2	LP1-PWR-10HFE-M-M1A-DSW-7483-D	Cold Primary Air Ducts from PA Fans to Air Pre-heater & into V3 Line
6	V3	LP1-PWR-10HFE-M-M1A-DSW-7399-E	Hot Primary Air Ducts from Air Preheater to Mills
7	V5	LP1-PWR-10HLA-M-M1A-DSW-7341-C	Cold SA Ducts from SA Fans to Air Pre-heater
8	V6	LP1-PWR-10HLA-M-M1A-DSW-7253-D	Hot SA Ducts from RAPH to Boiler Burners
9	V7	LP1-PWR-10HLA-M-M1A-DSW-6186-C	Hot SA Ducts from Withdrawal point to bottom air blowing nozzle
10	V8	LP1-PWR-10HHL-M-M1A-DSW-6227-B	Hot SA Ducts from Withdrawal point to side air blowing nozzle
11	V9	LP1-PWR-10HLA-M-M1A-DSW-6240-B	Hot SA Ducts from Withdrawal point to upper air blowing nozzle
12	V10	LP1-PWR-10HBK-M-M1A-DSW-6033-B	Warmbox Ventilation air Ducts for Main Boiler
13	S1	LP1-PWR-10HFW-M-M1A-DSW-7364-C	Suction air Ducts of Mills Seal Air Fans
14	S2	LP1-PWR-10HFW-M-M1A-DSW-7317-D	Air Ducts from Sealing Air Fans to Mills
15	S3	LP1-PWR-10HFW-M-M1A-DSW-7372-D	Sealing Air Ducts to Coal Feeder
16	C1	LP1-PWR-10HFE-M-M1A-DSW-6278-C	Cleaning Air Ducts to Mills

(ii) The detailed design of insulation by TKZ for *Ducting System* is as follows:

No	Line	Insulation Assembly Drawing	Name of Drawing
1	G1	LP1-PWR-10HNA-M-M1A-DSW-6557	Insulation 70mm thk for Line G1 Gas Duct from RAPH to ESP
2	G2	LP1-PWR-10HNA-M-M1A-DSW-6560	Insulation 70mm thk for Line G2 from ESP to ID fan
3	R	LP1-PWR-11HNF-M-M1A-DSW-6563	Insulation 70mm thk for Line R from Gas Recirculation Fans to Boiler Burner
4	V3	LP1-PWR-10HFE-M-M1A-DSW-6566	Insulation 100mm thk Line V3 Hot Primary Air Duct to Coal Pulverizer
5	V5	LP1-PWR-10HLA-M-M1A-DSW-6590	Insulation 70mm thk Line V5 from SA Fans to RAPH
6	V6	LP1-PWR-10HLA-M-M1A-DSW-6569	Insulation 100mm thk Line V6 Hot Secondary Air Duct from RAPH to Boiler Burner
7	V7	LP1-PWR-10HLA-M-M1A-DSW-6572	Insulation 100mm thk Line V7 Hot Secondary Air Duct from Withdrawal Point to Lower Nozzle of Boiler
8	V8	LP1-PWR-10HHL-M-M1A-DSW-6575	Insulation 80mm thk Line V8 Hot Secondary Air Duct from Withdrawal Point to Side Nozzle of Boiler
9	V9	LP1-PWR-10HLA-M-M1A-DSW-6578	Insulation 100mm thk Line V9 Hot Secondary Air Duct from Withdrawal Point to Upper Nozzle of Boiler

(iii) The detailed design for Instruments on *Ducting System* is not performed by TKZ.

– Procurement and delivery

All items of Ducting System is not procured by PM, except following delivered and fully stored at Site:

(i) The Steam-Coil Air Pre-heater (SCAPH) located in line V5 (Cold SA Ducts from SA Fans to Air Pre-heater) has been delivered to Site by TKZ since 2018 (see MGMER No. 806 for Boiler 1 dated 23/01/2018 and MGMER 901 for Boiler 2 dated 23/02/2028) and stored at Site.

(ii) The Non-metallic expansion joints on *Ducting System* have been also delivered by TKZ since 08/2018 (see MGMER 999 for Boiler 1 and MGMER 1000 for Boiler 2 dated 03/08/2028 and stored at Site). The detailed location is as follows:

No	Item Description	Fabrication drawings	Line (*)	Quantity /Boiler	Quantity /2 Boilers
1	Duct 6081-Fabric Expansion Joint 4000x9800	LP1-TKZ-10HNA-M-M1A-DSW-2611	G1	2	4
2	Duct 6105-Fabric Expansion Joint 1200x2200	LP1-TKZ-10HNF-M-M1A-DSW-2612	R	2	4
3	Duct 7483-Fabric Expansion Joint 3200x2600	LP1-TKZ-10HLA-M-M1A-DSW-2613	V2	2	4
4	Duct 7399-Fabric Expansion joint 4000x3510	LP1-TKZ-10HLA-M-M1A-DSW-2614	V3	2	4
5	Duct 7399-Fabric Expansion joint 2440x850	LP1-TKZ-10HLA-M-M1A-DSW-2615	V3	6	12
6	Duct 7341-Fabric Expansion joint 7600x4600	LP1-TKZ-10HLA-M-M1A-DSW-2616	V5	2	4
7	Duct 7253-Fabric Expansion joint 7790x5400 V6-90	LP1-TKZ-10HLA-M-M1A-DSW-2617	V6	2	4
8	Duct 7253-Fabric Expansion joint 5600x4400 V6-91	LP1-TKZ-10HLA-M-M1A-DSW-2618	V6	4	8
9	Duct 7253-Fabric Expansion joint 2000x1800 V6-96	LP1-TKZ-10HLA-M-M1A-DSW-2620	V6	12	24
10	Duct 7253-Fabric Expansion joint 200x400 V6-97	LP1-TKZ-10HLA-M-M1A-DSW-2619	V6	24	48
11	Duct 6186-Fabric Expansion joint 800x400	LP1-TKZ-10HLA-M-M1A-DSW-2621	V7	18	36
12	Duct 6240-Fabric Expansion joint 1200x1000	LP1-TKZ-10HHL-M-M1A-DSW-2622	V9	4	8
13	Duct 6240-Fabric Expansion joint 1200x1000	LP1-TKZ-10HHL-M-M1A-DSW-2623	V9	4	8
*Note: Please see Line Assembly Drawing in engineering section to find installation position of these Non-metallic expansion joints.					

– Construction, erection: 0%

10.2 Scope of work

- Engineering: The remaining engineering work to be finalized by Owner shall be handed-over to Bidder for procurement, installation and commissioning.

The engineering work of Ducting System is on finalization stage and summarized in “*Engineering documents for Boiler Coal/Air/Gas Ducts*” (including attached documents).

Base on relating ducting system documents mentioned, the Bidder shall study carefully, estimate and propose the lump sum quote for Ducting System within Bidder’s scope and including in Bid price proposal, any extra cost caused from

deviation with design of the Owner/Owner's Contractor shall be included in this proposal

– Procurement

In the event of any changes or adjustments by Owner to the construction, fabrication, or detailed manufacturing drawings of Ducting System to ensure proper connection between Boiler and its auxiliary equipment such as Coal Mills, Coal Feeders, Boiler Fans, Air Pre-heater, SCR, ESP, etc. It should be noted that all such changes or adjustments still fall within the Bidder's scope. Therefore, to support the Bidder in estimating the workload, the Owner provides a detailed Bill of Materials for the Ducting System (as attached), summarizing all installation & fabrication drawings in accordance with the current design and corresponding to the Boiler's P&ID.

Based on the current status of the Ducting System, the Bidder shall proceed with the procurement of all remaining materials and equipment, including but not limited to the following tasks:

(i) For Ducting & Supporting Steel Structure, Hanger & Support, Platform (mechanical parts):

The Bidder to refer to below table for procurement (the detailed information is given in “*Bill of Materials for Boiler Coal/Air/Gas Ducts*” as attached

No	Line	Drawing	Name of Drawing	Quantity (1Unit) (Kg)	Quantity (2Unit) (Kg)
1	P	LP1-PWR-10HHE-M-M1A-DSW-6374-B	PC Ducts from Pulverizers to Boiler Burners	269,395.52	538,791.04
2	P	LP1-PWR-10HHE-M-M1A-MTO-6024-A	Maintenance Platform for Pulverized Coal Ducts (Line P)	9,907.20	19,814.40
3	G1	LP1-PWR-10HNA-M-M1A-DSW-6081-D	Gas Ducts from Air Pre-heater to ESP	415,272.04	830,544.08
4	G1	LP1-PWR-10HNA-M-M1A-DSW-6363-C	Steel Structure for Line G1	693,364.21	1,386,728.42
5	G1	LP1-PWR-10HNA-M-M1A-DSW-6308-A	Maintenance Platform for Line G1	6,917.00	13,834.00
6	G2	LP1-PWR-10HNA-M-M1A-DSW-7471-D	Gas Ducts from ESP to ID Fans	156,948.00	313,896.00
7	G2	LP1-PWR-10HNA-M-M1A-DSW-6595-C	Steel Structure for Line G2	342,620.30	685,240.60
8	G2	LP1-PWR-10HNA-M-M1A-DSW-6309-A	Maintenance Platform for Line G2	13,553.00	27,106.00

No	Line	Drawing	Name of Drawing	Quantity (1Unit) (Kg)	Quantity (2Unit) (Kg)
9	R	LP1-PWR-11HNF-M-M1A-DSW-6105-C	Gas Recirculation Duct	323,740.72	647,481.44
10	R	LP1-PWR-11HNF-M-M1A-DSW-6593-C	Steel Structure for Line R	24,147.70	48,295.40
11	R	LP1-PWR-11HNF-M-M1A-DSW-6310-A	Maintenance Platform for Line R	18,174.60	36,349.20
12	V2	LP1-PWR-10HFE-M-M1A-DSW-7483-D	Cold Primary Air Ducts from PA Fans to Air Pre-heater & into V3 Line	84,582.74	169,165.48
13	V2	LP1-PWR-10HFE-M-M1A-DSW-6311-A	Maintenance Platform for Line V2	24,573.00	49,146.00
14	V3	LP1-PWR-10HFE-M-M1A-DSW-7399-E	Hot Primary Air Ducts from Air Preheater to Mills	477,159.33	954,318.66
15	V3	LP1-PWR-10HFE-M-M1A-DSW-6321-B	Steel Structure for Line V3 Row E-H	56,437.60	112,875.20
16	V3	LP1-PWR-10HFE-M-M1A-DSW-6327-A	Steel Structure for Line V3 Row H-J	20,130.90	40,261.80
17	V3	LP1-PWR-10HFE-M-M1A-DSW-6333-B	Steel Structure for Line V3 Row J-K Part 1	24,601.43	49,202.86
18	V3	LP1-PWR-10HFE-M-M1A-DSW-6339-A	Steel Structure for Line V3 Row J-K Part 2	10,249.40	20,498.80
19	V3	LP1-PWR-10HFE-M-M1A-DSW-6312-A	Maintenance Platform for Line V3	25,590.00	51,180.00
20	V5	LP1-PWR-10HLA-M-M1A-DSW-7341-C	Cold SA Ducts from SA Fans to Air Pre-heater	111,242.78	222,485.56
21	V5	LP1-PWR-10HLA-M-M1A-DSW-6313-A	Maintenance Platform for Line V5	5,738.00	11,476.00
22	V6	LP1-PWR-10HLA-M-M1A-DSW-7253-D	Hot SA Ducts from RAPH to Boiler Burners	462,252.47	924,504.94
23	V6	LP1-PWR-10HLA-M-M1A-DSW-6314-B	Maintenance Platform for Line V6	21,045.57	42,091.14
24	V7	LP1-PWR-10HLA-M-M1A-DSW-6186-C	Hot SA Ducts from Withdrawal point to bottom air blowing nozzle	227,302.00	454,604.00

No	Line	Drawing	Name of Drawing	Quantity (1Unit) (Kg)	Quantity (2Unit) (Kg)
25	V7	LP1-PWR-10HLA-M-M1A-DSW-6601-C	Steel Structure for Line V7	93,698.60	187,397.20
26	V7	LP1-PWR-10HLA-M-M1A-DSW-6315-A	Maintenance Platform for Line V7	10,592.00	21,184.00
27	V8	LP1-PWR-10HHL-M-M1A-DSW-6227-B	Hot SA Ducts from Withdrawal point to side air blowing nozzle	2,884.00	5,768.00
28	V9	LP1-PWR-10HLA-M-M1A-DSW-6240-B	Hot SA Ducts from Withdrawal point to upper air blowing nozzle	86,290.00	172,580.00
29	V9	LP1-PWR-10HLA-M-M1A-DSW-6316-A	Maintenance Platform for Line V9	1,488.00	2,976.00
30	V10	LP1-PWR-10HBK-M-M1A-DSW-6033-B	Warmbox Ventilation air Ducts for Main Boiler	13,772.80	27,545.60
31	S1	LP1-PWR-10HFW-M-M1A-DSW-7364-C	Suction air Ducts of Mills Seal Air Fans	1,180.00	2,360.00
32	S2	LP1-PWR-10HFW-M-M1A-DSW-7317-D	Air Ducts from Sealing Air Fans to Mills	10,935.45	21,870.90
33	S2	LP1-PWR-10HFW-M-M1A-DSW-6318-B	Maintenance Platform for Line S2	10,323.50	20,647.00
34	S3	LP1-PWR-10HFW-M-M1A-DSW-7372-D	Sealing Air Ducts to Coal Feeder	4,447.00	8,894.00
35	C1	LP1-PWR-10HFE-M-M1A-DSW-6278-C	Cleaning Air Ducts to Mills	10,239.43	20,478.86
36	C1	LP1-PWR-10HFE-M-M1A-DSW-6319-A	Maintenance Platform for Line C1	6,430.00	12,860.00
Total				4,077,226.29	8,154,452.58

(ii) For Insulation of Ducting System: The Bidder refer to the summary table as below:

Name	Quantity	Units	Weight of 1 line.m,Kg	Total Weight 1m ² , Kg	Total Weight, Kg
Wired mat made of rockwool (wired mat 105) with single-side coating with aluminium foil 100mm thickness	2990	m ³			311950
Wired mat made of rockwool (wired mat 105) with single-side coating with aluminium foil 80mm thickness	38	m ³			3990
Wired mat made of rockwool (wired mat 105) with single-side coating with aluminium foil 70mm thickness	742	m ³			77910
Wired mat made of rockwool (wired mat 105) with single-side coating with aluminium foil 50mm thickness	203	m ³			21315
Aluminium sheet ANSI 3003-H16 1.2mm thickness	31092	m ²		3.3	102604
Aluminium sheet ANSI 3003-H16 0.8mm thickness	943	m ²		2.2	2075
Aluminium sheet ANSI 3003-H16 2mm thickness	702	m ²		5.4	3791
Wire Ø5mm, ASTM A36	69430	m	0.15		10413
Wire Ø1.6mm, AISI 304	100355	m	0.02		2007
Polyuethane sealant PU40 Rockwool	2302	Kg			
Standard items: Self-tapping screw 4.2x13 AISI 304	373630	pcs			
Standard items: Bolt M8x30-5.8 ISO 4014	5220	pcs			
Standard items: Nut M8-6H.5 ISO 4034	5220	pcs			
Standard items: Steel pop-rivet with sunk collar 4x14	33800	pcs			
Standard items: Gasket Frenzelit novaform 221 V5-31	85	m ²			
* Note: The Bill of quantity is for one (1) Boiler.					

(iii) For Dampers and their accessories on Ducting System, the Bidder shall refer following documents

- Dampers for Coal Ducts LP1-TKZ-10XXX-M-M1A-SPC-7031-H
- Dampers for Air-Gas Ducts LP1-TKZ-10XXX-M-M1A-SPC-7030-G

(iv) For Gas-Air Mixer located on line V6 Hot SA Ducts from RAPH to Boiler Burner, refer following fabrication drawing No. LP1-TKZ-10HNF-M-M1A-

DRD-7739. The installation position of Gas-Air Mixer shall follow drawing No. LP1-PWR-10HLA-M-M1A-DSW-7253-D

(v) For another Ducting elements, refer to “*Engineering documents for Boiler Coal/Air/Gas Ducts*”

- Delivery, installation, erection, commissioning and other scope of work: The Bidder shall refer to point 41 of table 08 [Division of Responsibility] to perform works for *Ducting System*.

10.3 Detail Requirements

The Bidder shall comply with design and engineering work by Owner for Ducting System.

10.4 Performance Guarantee (N/A)

10.5 Attachments

- (1) Engineering documents for Boiler Coal/Air/Gas Ducts
- (2) Bill of Materials for Boiler Coal/Air/Gas Ducts.
- (3) Good delivered to Site – 46. SCAPH, 70 – Non metallic Expansion Joint

11. Fuel Oil Transferring and Pressurizing System

11.1 Status

- Supplier: SES International BV
- Engineering: 100%,

The scope for Fuel Oil Transferring and Pressurizing System include 4 pump skids which are designed under Specification No. LP1-TKC-10EG-M-M7-SPC-2043.

The locations of these pump skids are described in following drawings:

- LP1-TKC-10EG-M-M7-P&ID-1040: P&ID for Fuel Oil Unloading, Storage and Handling.
- LP1-TKZ-10HJF-I-M1A-P&ID-0026: P&ID Fuel oil pressuring & atomizing system

All related documents for 4 pump skids are attached in “Engineering Document for Fuel Oil Transferring and Pressurizing System”.

- Procurement:
 - Manufacturing: 100%
 - Delivery: 100%, 4 pump skids have been delivered to Site and fully stored in the indoor warehouse, including the following:
 - One (1) skid of 2 diesel oil transfer/unloading pumps (The unloading Pump skid will not be used for the present system)
 - One (1) skid of 2 drain oil screw pumps with capacity 10m³/h per pump

- One (1) skid of 3 diesel oil pressurizing pumps with capacity 75m³/h per pump
- One (1) skid of 2 diesel oil filling pumps with capacity of 10m³/h per pump
- One (1) PLC to control Pumps skid

For more details, refer to “Goods delivered to Site for Fuel Oil Pumps” in attachments.

- Installation: 0%

11.2 Scope of work

- Engineering: N/A
- Supply: N/A
- Delivery: N/A
- Installation, erection: Bidder shall perform installation, erection, alignment, etc... for Fuel Oil System mentioned in cl. 11.1 accordance with Supplier’s manual and erection, and Bidder’s ITP approved by Owner.
- Commissioning: Refer to [Table 08 Division of Responsibility]
- TA Service for erection/construction, commissioning, training service to Owner’s personnel: Refer to [Table 08 Division of Responsibility]

11.3 Detail Requirements (N/A)

11.4 Performance guarantee

Data specification sheet for fuel oil unloading, pressurizing & filling pump skids are specified in LP1-TKC-10EG-M-M7-SPC-2043, the Parties (Owner, Contractor) shall note the performance of this component in case it affects the overall performance of the Plant to determine the responsibility of each Party respective to each Party’s scope of work (supply, installation, commissioning)

11.5 Attachments

- (1) Specification No. LP1-TKC-10EG-M-M7-SPC-2043
- (2) Engineering documents for Fuel Oil Pump Skids
- (3) Goods delivered to Site for Fuel Oil Pump Skids
- (4) Other documents (P&ID for fuel oil unloading, storage, handling, pressurizing systems)

12. Auxiliary Boiler

12.1 Status

- Supplier: KPA Unicon
- Configuration: 01 common Auxiliary Boiler for 2 (two) Unit

- Engineering: 100% Auxiliary Boiler is ordered under Specification TKC-10QHA-M-M52-SPC-2044 and compliant with RFP Volume: II-B - Section-VI [Auxiliary Boiler]

All related documents are attached in “Engineering Document for Auxiliary Boiler”.

- Procurement:

- Manufacturing: 100%
- Delivery: 100%. Auxiliary Boiler has been fully delivered to Site (≈ 317 tons) since June 2018 including the following materials/equipment:
 - 1 main Auxiliary Boiler capacity 75t/h complete with Water Wall, Steam Drum, Water Economizer, Superheater, Boiler burner, forced draft fans, supporting steel structure, anchor bolts for foundation, insulation & lagging
 - 1 stack of 30m height
 - 1 continuous blowdown tank capacity $1m^3$ and blowdown tank $3m^3$
 - 2 (1W+1S) Feedwater pumps with drive motor and accessories.
 - 1 feedwater Tank $40 m^3$ and 1 deaerator 75t/h
 - 1 chemical dosing skid including chemical tank and pump
 - 1 compressor and 1 air vessel of capacity $2 m^3$ for atomizing air
 - 1 diesel oil tank of Auxiliary Boiler system of capacity $120m^3$
 - Necessary temporary steel structure and materials for construction of control room of auxiliary boiler and combustion air fan room
 - All pipelines, valves, instruments, cable routing to connect various electrical equipment from the field to temporary local control building where MCC for power supply as well PLC for control of Auxiliary Boiler are located.

For more details, refer to “Goods delivered to Site for Auxiliary Boiler” in attachments.

- Installation, erection: The equipment (*Oil Tank, Boiler proper and Chimney with estimated weight $\approx 113/317$ tons*) is partially installed as confirmed by Confirmation Protocol No. *PTSC-10QHA-CPQ-0001*

Equipment installed and remaining stored in the Site’s warehouse shown in the pictures below:



12.2 Scope of Work

- Engineering: N/A
- Supply: N/A
- Delivery: N/A
- Installation, erection: Bidder shall perform installation, erection, alignment, etc... for Auxiliary Boiler in accordance with Supplier's manual and erection, and Bidder's ITP approved by Owner.

Refer to Erection and Commissioning Manual No. LP1-KPA-10QHA-G-M1A-MAN-8004_0

- Commissioning: Refer to [Table 08 Division of Responsibility]
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility]

12.3 Detail Requirements (N/A)

12.4 Performance guarantee

Data specification sheet for AUXILIARY BOILER are specified in LP1 - TKC - 10QHA - M - M52 - SPC - 2044, the Parties (Owner, Contractor) shall note the performance of this component in case it affects the overall performance of the Plant to determine the responsibility of each Party respective to each Party's scope of work (supply, installation, commissioning).

12.5 Attachments

- (1) Engineering documents for Auxiliary Boiler
- (2) Goods delivered to Site for Auxiliary Boiler
- (3) Confirmation Protocol No. PTSC-10QHA-CPQ-0001

SECTION III

SUB-SECTION

3.2 DETAILED REQUIREMENTS

ARTICLE

3.2.2 TURBINE GENERATOR, AUXILIARIES & OTHER FEED CYCLE EQUIPMEN

[PII.CV.SIII.SS3.2 – Article 3.2.2]

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CHAPTER V – SECTION III

SUB-SECTION 3.2

ARTICLE 3.2.2 TURBINE GENERATOR, AUXILIARIES & OTHER FEED CYCLE EQUIPMENT

This section is intended to cover the design, supply, construction and commissioning of Turbine Generator, Auxiliaries & Other Equipment for 2x600 MW Long Phu–1 Power Plant.

1 Turbine & Turbine Auxiliaries

In order to utilize the already manufactured equipment, the Owner is currently proceeding with the purchase of the Turbine & Turbine Auxiliaries and services from the Original Equipment Manufacturer (OEM) to deliver to the Bidder for installation, commissioning to finalize the Turbine & Turbine Auxiliaries with technical support from the OEM's technical advisors (TA) which is supplied/manufactured by GE Vernova. Therefore, the following information is provided to Bidder to coordinate and complete remaining works related to the Steam Turbine & Turbine Auxiliaries system.

1.1 Status:

- Supplier: GE Vernova
- Total 2 Units

(1) Design 100%

The steam turbine is a tandem-compound three (3) casing unit. It consists of a High-pressure (HP) Turbine and Intermediate-pressure (IP) and one (1) x double- flow, Down exhaust Low-pressure (LP) sections.

- 3 casing HP, IP, LP
- Rated Capacity: 600MW
- TB Heat Rate: 1,766 kcal/kWh (~ 48.46 % eff.) at point C 600MW Guarantee
- Speed (rpm): 3,000
- Extraction Steam Exhaust: 8

The main performance parameters are as follows:

- The maximum continuous capacity (TMCR: 600MW).
- Rated main steam pressure ~25MPa (a)
- Rated main steam temperature 566°C
- Reheated steam inlet temperature (TMCR) 566 °C
- Main steam inlet capacity (TMCR) 1,699.13 t/h
- Rated hot reheat steam pressure ~5.0MPa (a)

- Rated hot reheat steam temperature 566°C
- Rated hot reheat steam inlet temperature (TMCR) 566 °C
- Hot reheat steam inlet capacity (TMCR) 1,379.6 t/h
- Rated exhaust pressure (TMCR) 7.6kPa (a)
- Capacity (VWO): 630MW
- Capacity (BMCR): 638.612MW.

(2) Procurement

- Manufacturing 100%

GEV manufactured all items as:

- + Embedded Materials (Excluding anchor bolts).
- + STG Lube oil system.
- + LO reservoir and H2 Seal Oil Unit.
- + Lube oil Conditioner.
- + LP Rotor Bearing and Foundation Frames, anchor bolts.
- + LP Turbine - lower casing and hood
- + Complete system piping, valves and supports.
- + Main/Reheat steam/Control/Intercept valves/Crossover pipes.
- + HP Turbine Section.
- + IP Turbine Section.
- + LP Turbine Rotor.
- + Turbine Exhaust Hood Water Spray System.
- + Turbine Gland steam sealing system.
- + STG jacking oil system (incl. turning gear).
- + Heat Insulation materials.
- + STG Electrohydraulic Control (EHC) system, etc.
- Delivery 5% (~ 62.50 Tons)
 - + 62.50 Tons of goods are shipped to Long Phu Site. (Anchor bolts, Embedment's, Jack post, Equalizer Valves, Reverse Flow valves, Motor Operated valves, Manual operated valves, etc.)
 - + The remaining goods 95%, are stored in GEV's warehouses in different countries. The Owner will purchase and transport to LP1 site.

- (3) Erection: 1% ~ 22.364 tons (Anchor bolts, etc.)



The foundation for steam turbine-generator is complete with Embedment Parts, Anchor Bolts, Foundation Frames...etc.

- (4) Commissioning 0%.

1.2 Scope of work

- Engineering: N/A;
- Supply: N/A (The equipment will be purchased and transported to LP1 site by the Owner).
- Delivery: N/A;
- Installation & Erection:
 - + The foundation with embedded parts for both Steam Turbine have been completed. Bidder shall perform installation, erection, alignment, etc ..for equipment in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner;
 - + The Steam Turbine shall be installed in align with its position with reference to LP1-TKC-10UMA-G-M1B-DSE-1207-3; LP1-TKC-10UMA-G-M1B-ESP-1204-2.
- Commissioning: Refer to [Table 08 Division of Responsibility].
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

1.3 Detail requirements (N/A)

1.4 Performance Guarantee

Steam Turbine performance **had designed and shown in attached heat balance diagrams**, the Parties (Owner, Contractor) shall note the performance of this component in case it affects the overall performance of the Plant to determine the responsibility of each Party respective to each Party's scope of work (supply, installation, commissioning).

1.5 Attachments:

Please see folder [1, 2. STG] in parent folder [3. P2CV S3.2.2 – Attachment] for the following:

- Design Basic Report (DBR):

- + GEV's Heat balance diagrams;
- + GE-STG-D850 outline + heat balance diagram;
- + LP1-TKC-10XXX-M-M1-PFD-1100-B;
- + Steam turbine Application and Design parameters;
- Steam Turbine Generator Technical Specification (extracted from RFP 2013);
- Delivery (List of delivered equipment);
- Detail Design;
- Site pictures of power house building;
- Packing list.

2 Generator & Generator Auxiliaries

During the implementation of the previous EPC contract, the previous EPC Bidder has complied with requirements specified in VOLUME: II-C SECTION-IB [GENERATORS AND GENERATOR SYSTEMS] in the EPC RFP document of the previous EPC contract and its Amendment.

To utilize the already manufactured equipment, the Owner is currently proceeding with the purchase of the Generator & Generator Auxiliaries and services from the OEM (GE Vernova). Therefore, the following information is provided to Bidder as reference to complete other works related to the Generator & Generator Auxiliaries system.

2.1 Status:

- Supplier: GE Vernova
- Total 2 (two) Units

(1) Design 100%

Generator: 2 poles, 3phase, WYE COW, 50 Hz

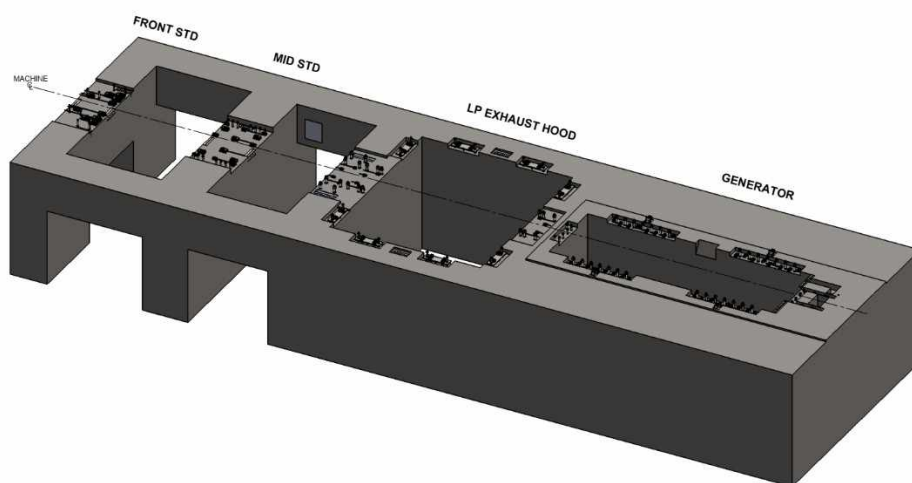
- Total temperature at rating Guaranteed not to exceed: 100 °C on armature by detector, 110 °C on field by resistance.
- Maximum cold gas temperature 46 °C, inlet water temperature 40 °C
- Gas pressure at 75 psig / 517.1 kPa
- Rating 759,000 KVA
- Armature: 19,053 amps
- Armature: 23,000 volts
- Field amps: 4,321
- Exciter: 650 volts
- Power factor: 0.85
- Field winding insulation class: F

- Stator winding insulation class: F
- Field winding temperature rise class: B
- Stator winding temperature rise class: N
- Rating: S1 (continuous)
- Altitude: 3.15 m
- Stator mass: 270,000 kg
- Rotor mass: 75,000 kg
- Generator complete mass: 410,138 kg
- Protection: IP – 54
- Data plate standard: IEC 60034-1 & -3
- Rated speed: 3,000 rpm
- Maximum ambient temperature: 37.2°C
- Minimum ambient temperature: 13.1°C
- Maximum cooling temperature: 40°C

(2) Procurement

- Manufacturing 100%
 - + Generator (incl. Generator Protective Relays, Excitation system, Surge Protection and VT Equipment, Generator Neutral Grounding).
 - + Generator Oil Sealing system.
 - + Generator hydrogen cooling system.
 - + Generator Stator cooling system.
- Delivery 0%;

(3) Erection: 0%;



Foundation for steam turbine-generator with Unisorb installation kit

(4) Commissioning 0%.

Note: The equipment will be purchased and transported to LP1 site by the Owner.

2.2 Scope of Work

- Engineering: N/A;
- Supply: N/A;
- Delivery: N/A;
- Installation & Erection: The foundation with embedded parts for both Generator have been completed. Bidder shall perform installation, erection, alignment, etc ..for equipment in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner. Moreover, the Bidder shall complete all necessary works to connect Generator with other systems/equipment such as generator transformers, bus duct, etc;
- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

2.3 Detail requirements (N/A)**2.4 Performance Guarantee**

Generator's performance data are specified in Attached document no. LP1-GE-10MA-G-M1B-DGA-0001-B GENERATOR REQUISITION SUMMARY, the Parties (Owner, Contractor) shall note the performance of this component in case it affects the overall performance of the Plant to determine the responsibility of each Party respective to each Party's scope of work (supply, installation, commissioning)

2.5 Attachments:

Since GE Vernova provided engineering documents and others for Turbine and Generator in combination format, the Bidder is advised to refer to attachments mentioned above in section **1.5 above**.

In addition, the Bidder shall make references to the electrical systems specified in **P2CV S3.2.5 Electrical requirement**.

3 LP Heater 2-3-4**3.1 Status:**

- Supplier: TKZ;
- Design: 100%; Feedwater heaters specification shown in document no.: LP1 - TKC - 10LAD - M - M21 - SPC - 2005
- Procurement:
 - + Manufacturing: 100%
 - + Delivery: 100%, including Six (6) shell and tube type low-pressure feed water heaters with all necessary accessories for both units;

- Installation & Erection:
 - + LPH 2-3-4 for Unit #1 are accepted;
 - + LPH 2-3-4 for Unit #2 not installed.
- Commissioning: 0%.

3.2 Scope of work:

- Engineering: N/A;
- Supply: N/A;
- Delivery: N/A;
- Installation & Erection:
 - + Although three nos. LP heater 2-3-4 of Unit 1 are accepted, the Bidder shall check the status, alignment and report to the Owner before connecting the piping systems. Additional works (if required) shall be agreed mutually by Both parties.
 - + Bidder shall perform installation, erection, alignment, etc ..for LP heaters of Unit #2 in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner;
 - + Refer: LP1-TKZ-10LCC-M-M1B-MAN-8419-F [Low Pressure Heaters Manual for Erection, Commissioning, Operating, Maintenance].
- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

3.3 Detail requirements (N/A)

3.4 Performance Guarantee

LP Heaters data are specified in Attached document no. LP1 - TKC - 10LAD - M - M21 - SPC - 2005 and it's Heat balance Diagrams enclosed, the Parties (Owner, Contractor) shall note the performance of this component in case it affects the overall performance of the Plant to determine the responsibility of each Party respective to each Party's scope of work (supply, installation, commissioning)

3.5 Attachments:

Please see folder [3. LPH 2 3 4] in parent folder [3. P2CV S3.2.2 - Attachment] for the following:

- Specification for Feed Water Heaters;
- Detail design;
- Goods Delivery at Site;
- And other.

4 HP Heater 6-7-8

4.1 Status:

- Supplier: BHI CO (Korea);
- Design 100%; Feedwater heaters specification shown in document no.: LP1-TKC-10LAD-M-M21-SPC-2005
- Procurement
 - + Manufacturing: 100%, including Six (6) shell and tube type high-pressure feed water heaters with all necessary accessories for both Units 1,2 ;
 - + Delivery: 50%, three (03) HP Heaters 6-7-8 for Unit #1;
- Erection: 50%, HP 6-7-8 Heaters for Unit #1 are accepted;
- Commissioning: 0%.

Note: HP Heaters for Unit #2 are being stored at the manufacturer's warehouse in Korea. The Owner will purchase and transport HP heaters for Unit #2 to LP1 site and hand them over to the Bidder.

4.2 Scope of work:

- Engineering: N/A;
- Supply: N/A;
- Delivery: N/A;
- Installation & Erection:
 - + Although three nos. HP heater 6-7-8 of Unit 1 are accepted, the Bidder shall check the status, alignment and report to the Owner before connecting the piping systems. Additional works (if required) shall be agreed mutually by Both parties.
 - + Bidder shall perform installation, erection, alignment, etc ..for HP heater of Unit #2 in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner;
- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

4.3 Detail requirements (N/A)

4.4 Performance Guarantee

HP Heaters data are specified in Attached document no. LP1-TKC-10LAD-M-M21-SPC-2005 and it's Heat balance Diagrams enclosed, the Parties (Owner, Contractor) shall note the performance of this component in case it affects the overall performance of the Plant to determine the responsibility of each Party respective to each Party's scope of work (supply, installation, commissioning).

4.5 Attachments:

Please see folder [4. HPH 6-7-8] in parent folder [3. P2CV S3.2.2 – Attachment] for the following

- Specification for Feed Water Heaters;
- Detail design;
- Delivery;
- OSD report;
- Detail Packing List;
- And others.

5 Deaerator

5.1 Status:

- Supplier: TKZ;
- Design: 100%; Deaerator specification shown in document no.: LP1-TKC-10LAA-M-M23-SPC-2007-0
- Procurement:
 - + Manufacturing: 100% including Two (2) deaerators with all necessary accessories for both units;
 - + Delivery: 100%;
- Installation & Erection:
 - + Deaerator for Unit #1 is put on the foundation; NCR-0098 (as attached) is not closed. NCR describes during lifting Deaerator Unit 1, found eight temporary lifting lugs has not been complied with Manual for Erection (in which two lugs were welded completely and other lugs are tack welding on the shell of Deaerator for unit 1).
 - + Deaerator for Unit #2 not installed.
- Commissioning: 0%.

5.2 Scope of work:

- Engineering: N/A;
- Supply: N/A;
- Delivery: N/A;
- Installation & Erection:

Bidder shall perform installation, erection, alignment, etc. ..for equipment in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner;

Refer: LP1-TKZ-10LAA-M-M1B-MAN-8413-C [Deaerator Manual for Erection, Commissioning, Operating, Maintenance];

- Commissioning: Refer to [Table 08 Division of Responsibility];

- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

5.3 Detail requirements (N/A)

5.4 Performance Guarantee

Deaerator data are specified in Attached document no. LP1-TKC-10LAA-M-M23-SPC-2007-0, the Parties (Owner, Contractor) shall note the performance of this component in case it affects the overall performance of the Plant to determine the responsibility of each Party respective to each Party's scope of work (supply, installation, commissioning)

5.5 Attachments:

Please see folder [5. Deaerator] in parent folder [3. P2CV S3.2.2 – Attachment] for the following:

- Specification for Deaerator;
- Detail design;
- Delivery;
- OSD report, NCR-0098;
- And others.

6 Boiler Feed Pump & Booster Pump

6.1 Status:

- Supplier: KSB;
- (1) Design 100%; the design basic and technical specifications are completed. Pumps basic design report document no.: LP1-TKC-11LAB-M-M21-CRT-0005-1 and pump specification document No.: LP1-TKC-10LAC-M-M21-SPC-2008-C.
- (2) Procurement:
- Manufacturing 100% including
 - + Main Pump (MP) type CHTD 6/7 Horizontal, radially split, barrel type pump with radial impellers, single entry, multistage, according to KSB standard design, Quantity: 6pc;
 - + Booster pump (BP), type YNK 300/670 Horizontal, radially split, double-volute casing pump with double suction, single stage, radial impeller. According to KSB standard design, Quantity: 6pc;
 - + Separate base plates for MP, GVSC, M and BP incl. fixing bolts/shims, Quantity: 6pc;
 - + Coupling between MP and GSVC w/guard Quantity: 6pc;
 - + Coupling between GVSC and M w/guard Quantity: 6pc;
 - + Coupling between M and BP w/guard Quantity: 6pc;
 - + Suction trainer for BP Quantity 6pc;

- + Internal cooling water + lubrication oil piping Quantity: 6pc;
- + Standard instrumentation for MP + BP Quantity: 6pc;
- + Multiport orifices for pump recirculation control Quantity: 6pc;
- + Noise hood for pump unit Quantity: 6pc;
- + Pressure test for MP Quantity: 6pc;
- + Pressure test for BP Quantity: 6pc;
- + Set of special tools: 1 set;
- + Set of standard documentation: 1 set;
- + Set of Spare parts for commissioning for BFP unit according to attached spare parts list: 1 set;
- + Electric motor (M) 15,200 kW, 50 Hz, 10 kV, 1,490 rpm: 6pc;
- + Geared variable speed coupling (GVSC) Voith type R18K550M (design acc. To DIN): 6pc;
- Delivery: 50%, 3 sets of completed pumps (include booster pump, main pump, coupling, electric motor, etc.) for Unit #1 are stored at site.



Electric motors of BFP under preservation in warehouse at site

- (3) Erection: 0%;
- (4) Commissioning: 0%.

Note: The Owner will purchase and transport BFPs for Unit #2 to LP1 site and hand them over to the Bidder.

6.2 Scope of work:

- Engineering: N/A;
- Supply: N/A;
- Delivery: N/A;

- Installation & Erection: Bidder shall perform installation, erection, alignment, etc.. for equipment for 2 (two) Units in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner;
- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

6.3 Detail requirements (N/A)

6.4 Performance Guarantee

Boiler Feed Pump & Booster Pump data are specified in Attached document no. LP1-TKC-10LAC-M-M21-SPC-2008-C, the Parties (Owner, Contractor) shall note the performance of this component in case it affects the overall performance of the Plant to determine the responsibility of each Party respective to each Party's scope of work (supply, installation, commissioning)

6.5 Attachments:

Please see folder [6. Boiler Feed Pump & Booster Pump] in parent folder [3. P2CV S3.2.2 – Attachment] for the following:

- Design Basic Report;
- Specification for the system/item: LP1-TKC-10LAC-M-M21-SPC-2008;
- Detailed drawing:
 - + LP1-TKC-11LAB-M-M21-CRT-0005 design report for BFP;
 - + LP1-TKC-10BR-M-M45-CAL-0093 sizing calculation for FW pipe;
 - + LP1-TKC-10LAC-M-M21-CAL-0051 sizing calculation BFP;
 - + LP1-TKC-11LAB-M-M21-P&ID-1006 P&ID feedwater system;
 - + Others;
- List of delivered equipment;
- OSD report;
- Detail Packing List (KSB Pumps).

7 Condensate Extraction Pump

7.1 Status:

- Supplier: KSB;
- (1) Design: 100% the design basic and technical specifications are completed. Condensate Extraction Pump specification shown in Attached document no. LP1-TKC-10LCB-M-M23-SPC-2003. Configuration: 03 set for per each Unit
- (2) Procurement:
 - Manufacturing: 100% including:
 - + Condensate Extraction pump (CEP) type WKTB 8/1+3 Multistage, vertical can type, ring-section pump with radial impellers. The first stage

features a double-entry suction impeller, acc. To KSB standard design: 6 pc;

- + Electric motor (M), 830 kW, 50 Hz, 3 kV, 1,480 rpm: 6 pc;
- + Coupling between CEP+M: 6 set;
- + Foundation frame CEP: 6 set;
- + Counter flange for pump suction & discharge nozzles: 6 set;
- + Set of standard instrumentation: 6 set;
- + Set of spare parts for Commissioning for CEP unit acc to attached spare parts list: 1 set;
- + Set of special tools: 1 set;
- Delivery 50%: 3 pc. Pump + motor + barrel and commissioning parts, tools for Unit #1 are stored at Site.

(3) Erection: 0%;

(4) Commissioning: 0%.

Note: The Owner will purchase and transport CEPs for Unit #2 to LP1 site and hand them over to the Bidder .

7.2 Scope of work

- Engineering: N/A;
- Supply: N/A;
- Delivery: N/A;
- Installation & Erection: Bidder shall perform installation, erection, alignment, etc.. for equipment for 2 (two) Units in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner;
- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

7.3 Detail requirements (N/A)

7.4 Performance Guarantee

Condensate Extraction Pump data are specified in Attached document no. LP1-TKC-10LCB-M-M23-SPC-2003, the Parties (Owner, Contractor) shall note the performance of this component in case it affects the overall performance of the Plant to determine the responsibility of each Party respective to each Party's scope of work (supply, installation, commissioning)

7.5 Attachments:

Please see folder [7. Condensate Extraction Pumps] in parent folder [3. P2CV S3.2.2 – Attachment] for the following:

- Design Basic Report LP1-TKC-11LCA-M-M23-CRT-0004-0; and calculation, data sheet attached
- Specification: LP1-TKC-10LCB-M-M23-SPC-2003;
- Detailed drawing:
 - + [...]DGA-0003 CEP section drawing;
 - + [...]DSE-1207-3 Power House – General Cross Section;
 - + [...]ESP-1202-4 power house - floor plan;
 - + [...]PFD-1100-0 power cycle – diagram;
 - + [...]P&ID-1005 condensate system;
 - + and others.
- List of delivered equipment.

8 Cooling Water Pump

8.1 Status

- Supplier: KSB;
- (1) Design: 100%; Status: Cooling water system specified in basic design report no.: LP1-TKC-10PAB-M-M4-CRT-0010; Cooling water pump specification shown on document no.: LP1-TKC-10PAC-M-M4-SPC-2002-1
- (2) Procurement
 - Manufacturing: 100% include four (4) nos. (2x 50% for each unit) vertical wet pit type, self-lubricated, non-pull out type. CW Pumps complete with electric motor drives together with all accessories as Specification for Circulating Water Pumps: LP1-TKC-10PAC-M-M4-SPC-2002;
 - Delivery: 50%, two (02) sets of Cooling water pump for Unit #1;
- (3) Erection: 0%;
- (4) Commissioning: 0%.

Note: The Owner will purchase and transport CWP's for Unit #2 to LP1 site and hand them over to the Bidder.

8.2 Scope of work:

- Engineering: N/A;
- Supply: N/A;
- Delivery: N/A;
- Installation & Erection: Bidder shall perform installation, erection, alignment, etc.. for equipment for 2 (two) Units in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner;
- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

8.3 Detail requirement (N/A)**8.4 Performance Guarantee**

Cooling Water Pump data are specified in Attached document no. LP1-TKC-10PAC-M-M4-SPC-2002-1, the Parties (Owner, Contractor) shall note the performance of this component in case it affects the overall performance of the Plant to determine the responsibility of each Party respective to each Party's scope of work (supply, installation, commissioning)

8.5 Attachments:

Please see folder [8. Cooling Water Pump] in parent folder [3. P2CV S3.2.2 – Attachment] for the following:

- Design Basic report;
- Specification for Circulating Water Pumps: LP1-TKC-10PAC-M-M4-SPC-2002;
- Drawing:
 - + LP1-TKC-10UPA-M-M29-DGA-1209 – CW house;
 - + LP1-KSB-11PAC-M-M4-P&ID-0023 PID – CW pump;
 - + And others;
- Equipment delivery.

9 Turbine Oil Purification System**9.1 Status:**

- Supplier: Not selected;
- Design: 0%; Turbine Oil Purification System specification stated in document no.: LP1-TKC-10QSV-M-M1B-SPC-2062
- Procurement:
 - + Manufacturing: 0%;
 - + Delivery: 0%;
- Erection: 0%;
- Commissioning: 0%.

9.2 Scope of work:**(1) Engineering:**

Bidder shall design and finalize the engineering (subjected for procurement activity) based on the Owner's documents provided in attachments.

(2) Supply:

The Bidder shall supply the following equipment:

- One (1) no. central lubricating oil purifier with drive and accessories;
- One (1x100%) clean oil pump with drives and accessories;

- One (1x100%) dirty oil pump with drives and accessories;
 - Piping, valves, fittings, hangers, supports suction strainers at the suction and discharge of dirty and clean oil pumps;
 - One (1) 400V 3-phase power supply for each of the following drives:
 - + Clean Oil Pump Motor;
 - + Dirty Oil Pump Motor;
 - + Electrical Cabinet of the Central Lubricating Oil Purifier.
 - All LV power and control cables, cable trays & accessories, cabling required for electrical connections;
 - Any other power supply system required;
 - Supply of all above ground earthing materials for earthing of equipment under this package;
 - Start-up and commissioning spare parts;
 - Special tools and tackles;
- (3) Delivery:
- Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and storage.;
- (4) Installation & Erection:
- Bidder shall perform installation, erection, alignment, etc.. for equipment in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner;
- (5) Commissioning: Refer to [Table 08 Division of Responsibility];
- (6) TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

9.3 Detail requirements

For more details, Bidder refers to Technical requirements specified in the document No: LP1-TKC-10QSV-M-M1B-SPC-2062 – SPECIFICATION FOR CENTRAL LUBRICATING OIL PURIFICATION SYSTEM.

9.4 Performance Guarantee

The Bidder shall guarantee the following data:

- Central Lubricating Oil Purification Unit (Centrifuge):
 - + Number of purifier One (1)
 - + Type of purifier: Centrifuge
 - + Capacity of purifier: 9,500 LPH.
- Dirty Oil Pump:
 - + Number of pump: One (1)

- + Type of pump: Positive Displacement
- + Capacity of pump: 10,500 LPH
- + Discharge Head of Pump: 2kg/sqcm(g)..
- Clean Oil Pump:
 - + Number of pump: One (1)
 - + Type of pump: Positive Displacement
 - + Capacity of pump: 2kg/sqcm(g).
- Maximum size of solids and maximum water content (in %) acceptable for T.G. oil system at purification plant stated in document no.: LP1-GE-11MA-M-M1B-DSD-0112-E

9.5 Attachments

Please see folder [9. Turbine Oil Purification System] in parent folder [3. P2CV S3.2.2 – Attachment] for the following:

- Specification: LP1-TKC-10QSV-M-M1B-SPC-2062.
- System and Component Cleanliness Requirements: LP1-GE-11MA-M-M1B-DSD-0112-E

10 Condensate Polishing System

Online Condensate Polishing System (CP System) is envisaged to achieve high order of availability of various power cycle equipment as well as to ensure quick start up of the unit & continue the unit operation without any restriction by maintaining desired quality of condensate water as recommended by Boiler manufacturer. The CP System should also be capable of maintaining specified condensate quality with condenser tube leakage (clarified water).

The proposed CP System will comprise of 6 X 50% Condensate Polisher Mixed Beds for 2 x 600 MW Units (i.e. 3 X 50% for each 600 MW Unit) and One (1) no. common External Regeneration System for 2 X 600 MW Units.

The Condensate Polisher Mixed Beds and associated pipe works, valves, instruments, control panels etc. will be located at ground floor of Power House.

The regeneration facilities comprising of Regeneration Vessels, Measuring Tanks and Pumps will be located in a separate place near and outside the Power House. The resins will be transferred to the Regeneration Area from the Condensate Polisher Mixed Beds and vice versa through a pipeline.

10.1 Status:

- Supplier: VA TECH WABAG;
- Engineering: 5%, Design Basic Report (DBR) was approved; the specification was issued, not approved yet. System Basic design report in document no.: LP1-TKC-10LD-M-M23-CRT-0038-0. System specification shown on document no.: LP1-TKC-10QLD-M-M23-SPC-2042-0

- Procurement:
 - + Manufacturing: 16.0%, Six (6) nos. Condensate Polisher Mixed Beds (6x50%) along with all accessories are being stored at manufacturer's warehouse.
 - + Delivery: 0.00%;
- Erection: 0.00%;
- Commissioning: 0%.

10.2 Scope of work :

(1) Engineering

Bidder shall finalize the engineering/designs/specification (subjected for procurement activity) based on the Owner's documents provided in attachments.

The ammonia content of waste water from Condensate Polisher External Regeneration system (if any) shall be treated in case higher than regulated value in QCVN 40:2025/BTNMT, or concentration of NH₃ in air higher than regulated value in QCVN 06: 2009/BTNMT

(2) Supply:

Having the specification LP1-TKC-10QLD-M-M23-SPC-2042 completed Bidder shall furnish the following equipment & accessories:

- Six (6) nos. Condensate Polisher Mixed Beds (6x50%) along with all accessories for 2 x 600 MW Units (i.e. 3 X 50% for each 600 MW Unit).
- Resin transfer lines of stainless steel construction between the Condensate Polisher Mixed Beds and the External Regeneration Vessels along with all accessories;
- External resin traps at the outlet of each of the Condensate Polisher Mixed Beds each designed for in-place manual back wash facility;
- Condensate inlet and outlet headers for Condensate Polisher Mixed Beds of each 600 MW Unit within the boundary limits;
- Resin transfer lines of stainless steel construction between the External Regeneration Vessels and the Condensate Polisher Mixed Beds;
- Rinse water outlet header from Condensate Polisher Mixed Beds of each 600 MW Unit to the boundary limit;
- All necessary valves and fittings along with the actuators necessary for operation;
- A common drain header for the Condensate Polisher Mixed Beds of each 600 MW Unit;
- All interconnecting ammonia piping, valves, fittings, pipe supports within this package;;
- All necessary drains, vents and sampling points along with isolation valves;

- Two (2 x100%) nos. blowers for each 600 MW Unit for Condensate Polisher Mixed Beds;
- Emergency bypass system between the condensate inlet and outlet headers with its automatic valve, isolation valves on both sides and controls for each of Condensate Polisher Mixed Beds for each 600 MW Unit;
- The equipment and accessories for the common external regeneration of ion-exchange resins:
 - + One (1x100%) no. Resin Separation Vessel complete with all accessories.
 - + One (1x100%) no. Anion Resin Regeneration Vessel complete with all accessories.
 - + One (1x100%) no. Cation Resin Regeneration Vessel / Mixed Resin Storage Vessel complete with all accessories.
 - + One (1x100%) no. Resin Hopper, complete with a water ejector system for resin make-up complete with all accessories.
 - + One (1x100%) no. Hose Station for Transfer of Hydrochloric Acid. The hose station shall have two (2) nos. each 80 mm NB rubber hose connections.
 - + Two (2x100%) nos. Hydrochloric Acid Unloading Pumps each complete with electrical drive motor and all other accessories as required.
 - + One (1x100%) no. Hydrochloric Acid Storage Tank complete with integral pipe works, valves and all other accessories as required.
 - + One (1x100%) no. Hydrochloric Acid Measuring Tank for regeneration of Cation Resins, complete with integral pipe works, valves and all other accessories as required.
 - + One (1x100%) no. Hose Station for Transfer of Caustic. The hose station shall have two nos. each 80 mm NB rubber hose connections.
 - + Two (2x100%) nos. Caustic Unloading Pumps, each complete with electrical drive motor and all other accessories as required.
 - + One (1x100%) no. Activated Carbon Filter for Caustic, complete with internals, integral pipe works, valves and all other accessories as required.
 - + One (1x100%) no. Caustic Storage Tank, each complete with integral pipe works, valves and all other accessories as required.
 - + One (1x100%) no. Caustic Measuring Tank for regeneration of Anion Resins, complete with integral pipe works, valves and all other accessories as required.
 - + Two (2x100%) nos. air blowers, each with electric motor drives, V-belt drive with belt guard, air filters, silencers, discharge snubbers, for supply of process air required for regeneration of the resins.
 - + Two (2x100%) nos. DM Water Regeneration / Resin Transfer Pumps each with electric drive motor, one normally operating and the other standby,

for water supply for chemical preparation / dosing and transfer of resin from Condensate Polisher Mixed Beds to Regeneration vessels and vice-versa, backwash etc.

- + One (1) no. Water Heater for regeneration of Anion Resins, complete with integral pipe works, valves and all other accessories as required.
- + One (1x100%) no. Neutralization Pit with two (2) compartments, each complete with all accessories.
- + One (1x100%) no. Acid Measuring Tank for neutralization, complete with integral pipe works, valves and all other accessories as required.
- + One (1x100%) no. Caustic Measuring Tank for neutralization, complete with integral pipe works, valves and all other accessories as required.
- + Two (2) nos. Neutralized Waste Transfer Pumps, each complete with electrical drive motor and all other accessories as required.
- + All integral and interconnected pipe works, necessary valves complete with the actuators as necessary for their remote automatic operation (These need to include all drains, vents, and sampling points with isolation valves as required) and ejectors, fittings, sumps, gates, all types of pipe supports, pipe and cable racks, pipe and cable bridges, etc. for the entire System.

The above shall include DM water piping for dilution, resin transfer, backwashing, flushing, rinsing etc. including the DM water piping along with all supports and hangers between the Regeneration Facility and the CP System.

- + Operating platforms, ladders, supports and other structural works as required to facilitate accessibility for operation and maintenance for all the Condensate Polisher Mixed Beds, Regeneration Vessels, Storage Tanks and other equipment.
- + First fill of resins for all Condensate Polisher Mixed Beds, Mixed Resin Storage Vessel and Makeup Resin Hopper for all the units complete with make-up resin for first three years of operation (Quantity of make-up resins shall be calculated on the basis of 3% and 5% attrition loss per annum for cation and anion resin respectively).
- + All integral and interconnected pipe works, valves, sumps, gates, all types of pipe supports, pipe and cable racks, pipe and cable bridges, etc. for the entire Condensate Polishing System .
- One (1) no. 400V MCC for supplying the drives and equipment of CPU system;
- All LV power, control and instrument/special cables, cable trays & accessories, cabling required for supplying loads and associated auxiliary system;
- Supply of all above ground earthing materials for earthing of equipment;
- Entire field instrumentation including within the package area complete with all accessories;

- Hardwired LCP along with Push Button, lamps, hardwired annunciation, mimic diagram etc;
 - Erection hardware, Rack, Local control panel, junction box etc;
 - Instrumentation & Control cable within the package battery limit;
 - All types of special cables including System bus, Ethernet, Earthing cable, FO Cable;
 - Cable Glands and other accessories including flexible & rigid conduits, GI slotted sub-trays, pull cable boxes, junction boxes, patch cord, pigtail, converter, inspection covers, lugs, ferrules, fittings, Rating plates, Name plates etc;
 - Calibration and maintenance tools and tackle etc, needed for complete erection and commissioning work;
 - Start-up and commissioning spare parts;
 - Special tools and tackles.
- (3) Delivery:
- Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and storage.;
- (4) Installation & Erection:
- Bidder shall perform installation, erection, alignment, etc.. for equipment for 2 (two) Units in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner;
- (5) Commissioning: Refer to [Table 08 Division of Responsibility];
- (6) TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

For more details, Bidder refers to Technical requirements specified in the document No: LP1-TKC-10QLD-M-M23-SPEC-2042

10.3 Detail requirements

Refer to Clause no. 10.00.00 **SPECIFIC REQUIREMENTS – TECHNICAL** in LP1-TKC-10QLD-M-M23-SPEC-2042- Specification for Condensate Polishing System.

10.4 Performance Guarantee

- Each pump shall be guaranteed for capacity, total dynamic head and power consumption.
- All blowers shall be guaranteed for head and power consumption.
- Condensate Polisher Mixed Beds
 - + Each Condensate Polisher Mixed Bed will have a rated continuous treated water output capacity of not less than 740 tons/hr. Each Condensate Polisher Mixed Bed Unit shall be regenerated once after every 720 hrs. of continuous service run.

- + Net output from each of Condensate Polisher Mixed Beds shall be not less than 739 tons/hr (normal conditions, net of demineralized water used for regeneration). In case water analysis is different from the design values, guaranteed quantity shall be calculated as indicated elsewhere in Specification LP1-TKC-10QLD-M-M23-SPC-2042 and guarantee shall be applicable on this calculated quantity.
- + Chemical consumption of the Condensate Polisher Mixed Bed as indicated by the Bidder shall be guaranteed against the regeneration level employed and resin volume provided without any tolerance.
- + Qualities of treated condensate water:

Contaminants	Unit	Normal Condition	Start Up Condition	Tube Leakage Condition
TDS- Total Dissolved Solids	$\mu\text{g}/\text{dm}^3$	< 25	< 50	
SiO₂ - Silicic acid content	$\mu\text{g}/\text{dm}^3$	< 5	< 50	
Total Ferric Iron	$\mu\text{g}/\text{dm}^3$	< 5	< 100	
Total Copper	$\mu\text{g}/\text{dm}^3$	< 1	< 15	
pH value (runs in H/OH mode)		6.5 ± 7.5	6.5 ± 7.5	
Electrical conductivity	$\mu\text{S}/\text{cm}$	< 0.1	< 0.2	
Cl - Chlorides	$\mu\text{g}/\text{dm}^3$	< 2	< 10	
Na - Sodium	$\mu\text{g}/\text{dm}^3$	< 2	< 5	< 20
Crud (mostly black oxide of iron)	$\mu\text{g}/\text{dm}^3$	< 5	< 100	
Specific electrical conductivity	$\mu\text{S}/\text{cm}$	< 0.1	< 0.2	
O₂ – Oxygen content before the Boiler	$\mu\text{g}/\text{dm}^3$	$50 \div 150$	-	
NH₃ - Ammonia	$\mu\text{g}/\text{dm}^3$	≤ 500	-	
N₂H₄ - Hydrazine	$\mu\text{g}/\text{dm}^3$	-	-	

TOC – Total organic carbon	$\mu\text{g}/\text{dm}^3$	≤ 100	-	
Oil product content	$\mu\text{g}/\text{dm}^3$	≤ 0.1	-	
SO₄ - Sulphates	$\mu\text{g}/\text{dm}^3$	≤ 2	-	
Total hardness	$\mu\text{g-eq}/\text{dm}^3$	≤ 0.2	-	

10.5 Attachments:

Please see folder [10. Condensate Polishing System] in parent folder [3. P2CV S3.2.2 – Attachment] for the following:

- Design Basic Report;
- Specification: LP1-TKC-10QLD-M-M23-SPC-2042;
- Detailed design:
 - + LP1-TKC-11LD-M-M23-P&ID-1014;
 - + LP1-WAB-10ULD-M-M3-CAL-0001;
 - + LP1-WAB-10ULD-M-M3-FSP-0001;
 - + LP1-WAB-10ULD-M-M3-FSP-0001;
 - + LP1-WAB-10ULD-M-M3-P&ID-0001;
 - + LP1-WAB-10ULD-M-M3-PFD-0001;
 - + LP1-WAB-10ULV-M-M3-P&ID-0001;
 - + LP1-WAB-11ULD-M-M3-DAL-0002;
 - + and others.

11 Condenser and LP Heater 1 & Drain Cooler 1 (LP1 & DC1)

11.1 Status:

- Supplier: Wood (formerly known as Amec Foster Wheeler Energia - AMFW);
- (1) Engineering: 100%; System basic design report in document no.: LP1-TKC-11LCA-M-M23-CRT-0004-B. Condenser specification shown on document no.: LP1-TKC-10MGA-M-M1C-SPC-2001-0. LP heater 1, Drain Cooler 1: specification shown on document no.: LP1-TKC-10LAD-M-M21-SPC-2005-0
- (2) Procurement
 - Manufacturing 100% including:
 - + Condenser + LP1 Heater + Drain Cooler.
 - + (2) tube bundles with titanium tubes.
 - + (2) Inlet/Outlet and (2) Return waterboxes with (2) manholes.

- + (1) sump with (3) condensate outlet connection of 24"
- + (2) Condenser discharge stainless steel pipe for LP by-pass 36".
- + (1) Condenser transition exhaust neck with rubber “dog-bone” type expansion joint.
- + (2) Carbon steel stand pipes for the Hotwell.
- + (1) Lifting beam for transport.
- + Hotwell and Neck access Door Joint (SPAIN).
- + Low Pressure Horizontal Feedwater Heater (LP-1)
- + Low Pressure Horizontal Drain Cooler (LP-DC1).
- + Rubber plugs (USA)
- + Rubber Expanding plugs
- Delivery: only 226.966 tons of Condenser #Unit 1 are at Site, including:
 - + Seven (07) Expansion joints
 - + Five (05) bundle sole plates
 - + Return (Right, Left) Waterboxs
 - + Hotwell (Left, Right) Parts
 - + Inlet/outlet (Left) Waterbox
 - + Exhaust Neck Left, Right Parts...etc.
- (3) Installation & Erection: 0%;
- (4) Commissioning: 0%.



Goods at site

TUBES BUNDLES



EXTRACTION PIPES



Goods at factory

11.2 Scope of work

- Engineering: N/A;
- Supply: N/A (The entire condenser #2 and the remaining equipment of condenser #1 will be purchased and transported to Site by the Owner.)
- Delivery: N/A;
- Installation & Erection:

The underground foundation for Condenser has been completed. Bidder shall provide installation service for 2 (two) Units to comply with Supplier's manual and erection and Bidder's ITP approved by Owner ;

- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

11.3 Detail requirements (N/A)

11.4 Performance Guarantee

Condenser's performance data are specified in Attached document no. LP1-TKC-10MGA-M-M1C-SPC-2001-0, the Parties (Owner, Contractor) shall note the performance of this component in case it affects the overall performance of the Plant to determine the responsibility of each Party respective to each Party's scope of work (supply, installation, commissioning)

11.5 Attachments:

Please see folder [11. Condenser and LP#1-DC#1] in parent folder [3. P2CV S3.2.2 – Attachment] for the following:

- Design Basic Report;
- Specification: LP1-TKC-10MAG-M-M1C-SPC-2057-2

- Drawing:
 - + LP1-AFW-10MAG-M-M1C-DAS-0001;
 - + LP1-AFW-10MAG-M-M1C-DSU-0018;
 - + LP1-AFW-10MAG-M-M1C-DSU-0019;
 - + LP1-AFW-10MAG-M-M1C-DSU-0022;
 - + LP1-AFW-10MAG-M-M1C-DSU-0031;
- List of delivered equipment;
- List of remaining parts of Condenser and LP1&DC1 - Unit #1;
- Detail Packing List;
- Erection Manual;
- and others.

12 Condenser Air Extraction Equipment

12.1 Status:

- Supplier: SIHI Sterling;
- Design: 100%;
- Procurement:
 - + Manufacturing 100%: 06 six Condenser Air Extraction Equipment for both units 1, 2;
 - + Delivery : 0%;
- Erection: 0%.
- Commissioning: 0%

Note: The equipment will be purchased and transported to LP1 site by the Owner.

12.2 Scope of work:

- Engineering: N/A;
- Supply: N/A;
- Delivery: N/A;
- Installation & Erection: Bidder shall perform installation, erection, alignment, etc ..for equipment 2 (two) Units in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner;
- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

12.3 Detail requirements (N/A)**12.4 Performance Guarantee**

Condenser Air Extraction pump data specified in Attached document no.: LP1-TKC-10MAG-M-M1C-SPC-2057-2, the Parties (Owner, Contractor) shall note the performance of this component in case it affects the overall performance of the Plant to determine the responsibility of each Party respective to each Party's scope of work (supply, installation, commissioning)

12.5 Attachments:

Please see folder [12. Condenser Air Extraction Equipment] in parent folder [3. P2CV S3.2.2 – Attachment] for the following:

- Design Basic Report;
- Specification: LP1-TKC-10MAG-M-M1C-SPC-2057-2 - Condenser air extraction equipment;
- Drawing:
 - + LP1-FLW-11MAG-M-M1B-DGA-0031 - Equipment – general arrangement;
 - + LP1-FLW-12MAG-M-M1B-DGA-0032 - Equipment – general arrangement;
 - + LP1-TKC-10UMA-G-M1B-ESP-1202- Power house – floor plan;
 - + Others.

13 Condenser Waterbox Priming Vacuum Pump

Refer to 7. P2CV S3.2.6 Balance of Plant item 10 MISCELLANEOUS HORIZONTAL PUMPS

14 Condenser Online Tube Cleaning System + Debris Filter**14.1 Condenser Online Tube Cleaning System***14.1.1 Status:*

- Supplier: Taprogge;
- Engineering: 100.0%; System specification shown in document no.: LP1-TKC-11PAH-M-M1A-SPC-2056. System configuration: There are two power generating units for the project. Condenser Online Tube Cleaning System shall be supplied for each of the two units. The system for one unit shall consist of
 - + Two (2) nos. ball separators (one on each C.W. outlet pipe). Each ball separator shall consist of Carbon Steel flanged shell, ball separator screens, ball extraction arrangement; drive units for actuation of screens, differential pressure measuring system etc.
 - + One (1) no. ball re-circulation units complete with 2X100% pumps, drive motors, ball collectors with motor operated ball catching flaps, all necessary distributors and ball injection nozzles for each half of the condenser.

- Procurement:
 - + Manufacturing: 100.0%;
 - + Delivery: 100.0% including:
 - Ball injection, Strainer,
 - Diff. Pressure measuring system,
 - Assembly parts,
 - Ball injection,
 - Counter flange,
 - Pumps/piping...
- Erection: 0%;
- Commissioning: 0%.

14.1.2 Scope of work:

- Engineering: N/A;
- Supply: N/A;
- Delivery: N/A;
- Installation & Erection:

Bidder shall perform installation, erection, alignment, etc ..for equipment for 2 (two) Units in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner;

- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

14.1.3 Detail requirements (N/A)

14.1.4 Performance Guarantee (N/A)

14.1.5 Attachments:

Please see folder [14. Condenser Online Tube Cleaning System + Debris Filter/ 1. Condenser Online Tube Cleaning System] in parent folder [3. P2CV S3.2.2

– Attachment] for the following:

- Design Basic Report;
- Specification: as above;
- Detailed drawing (TAP):
 - + LP1-TAP-10PAH-M-M4-DSU-0001;
 - + LP1-TAP-10PAH-M-M4-DSU-0002;
 - + LP1-TAP-10PAH-M-M4-DSU-0003;
 - + LP1-TAP-10PAH-M-M4-DSU-0004;

- + LP1-TAP-10PAH-M-M4-DSU-0005.

- List of delivered equipment.

14.2 Debris filter

14.2.1 Status:

- Engineering: 100%; System specification shown in document no.: LP1-TKC-11PBB-M-M1A-SPC- 2054
- Procurement:
 - + Manufacturing: 100% includes four (4) debris filters with all necessary accessories for both units;
 - + Delivery: 00%;
- Erection: 00%;
- Commissioning: 00%;

14.2.2 Scope of work

- Engineering: N/A;
- Supply: N/A (All equipment will be purchased and transported to LP1 site by the Owner.);
- Delivery: N/A;
- Installation & Erection:

Bidder shall perform installation, erection, alignment, etc ..for equipment for 2 (two) Units in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner;

- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

14.2.3 Detail requirement (N/A)

14.2.4 Performance Guarantee (N/A)

14.2.5 Attachments

Please see folder [14. Condenser Online Tube Cleaning System + Debris Filter/ 2. Debris Filter] in parent folder [3. P2CV S3.2.2 – Attachment] for the following:

- Specification for Gate, Screens & Debris Filter: Document No. LP1-TKC-11PBB-M-M1A-SPC-2054;
- Detail Packing List.

15 CHEMICAL DOSING SYSTEM

15.1 Status

(1) Design: Engineering 100%. System basic design report in document no.: LP1-TKC-10LFN-M-M30-CRT-0017-1. System specification shown on document no.: LP1-TKC-10PBQ-M-M30-SPC-2041-0.

(2) Procurement:

– Manufacturing: 100% and fully stored at Wabag's warehouse (namely VCL Watertech from Czech Republic) with:

+ Carbohydrazide Dosing System

One (1) no. skid mounted Carbohydrazide Dosing System for each 600 MW Unit [Total two (2) nos. Skids shall be provided for 2x600 MW Units].

Each Skid for Carbohydrazide Dosing System shall include:

- One (1) no. Carbohydrazide Barrel.
- One (1x100%) no. Carbohydrazide Dispensing Pump complete with metering cylinder and all other accessories.
- Two (2x100%) nos. Carbohydrazide Dosing Tanks (capacity of 550l/each made of Stainless Steel SS304), each complete with agitator as well as its drive motor and all other accessories.
- Three (3x50%) nos. Carbohydrazide Dosing Pumps (rated capacity 20l/h per each can be locally controlled or remote control by plant DCS for hydrazine dosing adjustment) each complete with drive motor and all other accessories for dosing of Carbohydrazide solution at outlet of Deaerator.
- Three (3x50%) nos. Carbohydrazide Dosing Pumps (rated capacity 20l/h per each can be locally controlled or remote control by plant DCS for hydrazine dosing adjustment) each complete with drive motor and all other accessories for dosing of Carbohydrazide solution at outlet of Condensate Polishers.
- All Piping, Valves and Instruments as addressed in 'P&I DIAGRAM FOR CHEMICAL DOSING SYSTEM [LP1-TKC-10LFN-M-M30-P&ID-1061, R-A]

+ Ammonia Dosing System

One (1) no. skid mounted Ammonia Dosing System for each 600 MW Unit [Total two (2) nos. Skids shall be provided for 2x600 MW Units].

Each Skid for Ammonia Dosing System shall include:

- One (1) no. Ammonia Barrel.
- One (1) no. Ammonia Dispensing Pump (1x100%) complete with metering cylinder and all other accessories.

- Two (2x100%) nos. Ammonia Dosing Tanks (capacity of 2100l/each made of Stainless Steel SS304), each complete with agitator as well as its drive motor and all other accessories.
- Three (3x50%) nos. Ammonia Dosing Pumps (rated capacity 120l/h per each can be locally controlled or remote control by plant DCS for Ammonia dosing adjustment) complete with agitator as well as drive motor and all other accessories for dosing of ammonia solution at outlet of Condensing Polishers.
- Three (3x50%) nos. Ammonia Dosing Pumps (rated capacity 120l/h per each can be locally controlled or remote control by plant DCS for Ammonia dosing adjustment) complete with agitator as well as drive motor and all other accessories for dosing of ammonia solution at outlet of Deaerator.
- All Piping, Valves and Instruments as addressed in 'P&I DIAGRAM FOR CHEMICAL DOSING SYSTEM [LP1-TKC-10LFN-M-M30-P&ID-1061, R-A].

+ Oxygen Dosing System

One (1) no. skid mounted Oxygen Dosing System has been envisaged for each 600 MW Unit [Total two (2) nos. Skids shall be provided for 2x600 MW Units].

The Skid for Oxygen Dosing System shall include:

- Ten (10) nos. Oxygen Cylinders (capacity of 10 liter water), each complete with isolation/check valves and all other accessories.
- Ten (10) nos. Flexible Connectors
- One (1) no. Manifold for Oxygen Cylinders.
- Isolation Valve & Auto Change Over Facility in the common manifold.
- Dosing (automatic type) valves.
- All Piping, Valves and Instruments as addressed in 'P&I DIAGRAM FOR CHEMICAL DOSING SYSTEM [LP1-TKC-10LFN-M-M30-P&ID-1061, R-A].

+ Sodium Hydroxide Dosing System

- One (1) no. skid mounted Sodium Hydroxide Dosing System has been envisaged for each 600 MW Unit [Total two (2) nos. Skids shall be provided for 2x600 MW Units].
- Sodium Hydroxide from Sodium Hydroxide Dosing Tank will be fed into CCW Make up Tank/CCW Pump Suction as required to raise the pH as addressed above.
- The Skid for Sodium Hydroxide Dosing System shall include One (1) no. Solution Preparation Cum Storage Tank (capacity of 50 liter/each made of Stainless Steel SS304), complete with agitator as well as its drive motor and all other accessories.

- All Piping, Valves and Instruments as addressed in 'P&I DIAGRAM FOR CHEMICAL DOSING SYSTEM [LP1-TKC-10LFN-M-M30-P&ID-1061,R-A].

+ The Dosing Skids are manufactured by Wabag in accordance with documents:

- LP1-WAB-11UGD-M-M3- P&ID-1301: Carbon Hydrazine Dosing for Unit 1
- LP1-WAB-11UGD-M-M3-P&ID-1302: Ammonia Dosing for Unit 1
- LP1-WAB-11UGD-M-M3-P&ID-1303: Oxygen, Sodium Hydroxide Dosing for Unit 1
- LP1-WAB-12UGD-M-M3-P&ID-1306: Oxygen Sodium Hydroxide Dosing for Unit 2
- LP1-WAB-12UGD-M-M3- P&ID-1304: Carbon Hydrazine Dosing for Unit 2
- LP1-WAB-12UGD-M-M3-P&ID-1305: Ammonia Dosing for Unit 2
- LP1-WAB-12UGD-M-M3-P&ID-1306: Oxygen Sodium Hydroxide Dosing for Unit 2
- LP1-WAB-10UGD-M-M3-FSP-0301: Technical Report for Chemical Dosing System
- LP1-WAB-10UGD-M-M3-DAS-1306: List and datasheet of Chemical Dosing System.

– Delivery: 0%.

(3) Erection: 0%;

(4) Commissioning: 0%.

15.2 Scope of work

– Engineering: N/A;

– Supply: N/A (All above-mentioned equipment will be purchased and transported to LP1 site by the Owner.)

– Delivery: N/A;

– Installation & Erection:

Bidder shall perform installation, erection, alignment, etc ..for equipment of 2 (two) Units in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner;

– Commissioning: Refer to [Table 08 Division of Responsibility];

– TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

15.3 Detail requirements (N/A)**15.4 Performance Guarantee (N/A)****15.5 Attachments**

Please see folder [15. Chemical Dosing System] in parent folder [3. P2CV S3.2.2 – Attachment] for the following:

- List of engineering documents by Wabag (VCL)
- Design Basic Report;
- Specification
- Detailed design:
 - + LP1-TKC-10XXX-M-M1-PFD-1100,
 - + LP1-TKCL11LAC-M-M23-P&ID-1006
 - + LP1-TKC-10LFN-M-M30-P&ID-1061 P&ID- Chemical Dosing System
 - + LP1-TKC-10UMA-M-M1B-DGA-1354 to 1356 Piping Layout- Power House Building;
 - + LP1-TKC-10UMY-M-G1-DGA-1365 Piping Layout- Outdoor Piping Rack- Plan
 - + Others.
- List of materials/equipment stored at Wabag's warehouse

SECTION III

SUB-SECTION

3.2 DETAILED REQUIREMENTS

ARTICLE

3.2.3 - POWER CYCLE PIPING, VALVES, SPECIALTIES AND THERMAL INSULATION

[PII.CV.SIII.SS3.2 – Article 3.2.3]

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CHAPTER V – SECTION III**SUB-SECTION 3.2****ARTICLE 3.2.3 POWER CYCLE PIPING, VALVES, SPECIALTIES AND
THERMAL INSULATION**

This section is intended to cover the design, supply, construction and commissioning of power cycle piping, valves, specialties and thermal insulation for 2x600 MW Long Phu–1 Power Plant.

The Specification documents for procurement during the previous EPC implementation stage (2014–2018) which division is summarized as follows:

No.	Description	Document Reference
A	POWER CYCLE PIPING	LP1-TKC-10BR-M-G1-SPC-2017
1	Main steam system	
2	Cold reheat system	
3	Hot reheat system	
4	Extraction Steam System	
5	Feed Water System	
6	HP/LP Bypass System	
7	Aux. Steam System and Power Cycle Piping Drains and Vents	
8	Condensate System	
9	Heater Drain & Vent	
10	Hangers and Supports	
B	VALVES, SPECIALTIES	
1	LP Valves & specialties	- LP1-TKC-10AA-M-G1-SPC-2020 - LP Valves & specialties will be excluded in this section due to LP Valves & specialties are required for whole Plant included individual BOP system and will be integrated into each respective system
2	Control Valves	LP1-TKC-10XXX-I-I1-SPC-0010
3	HP Safety Valves	LP1-TKC-10LBA-M-M1A-SPC-2058
4	HP & LP Bypass valve stations	LP1-TKC-10AA-M-G1-SPC-2060
5	HP Valve & piping specialties	LP1-TKC-10A.A-M-G1-SPC-2061
C	THERMAL INSULATION	LP1-TKC-10BU-M-G1-SPC-2021
	Not yet procurement	

1 HP Piping (Power Cycle Piping) and hanger support

1.1 Status:

- Supplier: Sung IL;
- Engineering: 0%, Specification LP1-TKC-10BR-M-G1-SPC-2017 is under development;
- Procurement:
 - + Sung IL only purchased 96% raw materials;
 - + Manufacturing: 00.0%;
 - + Delivery: 00.0%;
- Erection & Installation: 00.0%;
- Commissioning: 00.0%.

1.2 Scope of work:

(1) Engineering:

Bidder shall finalize the engineering/designs (particularly LP1-TKC-10BR-M-G1-SPC-2017 and stress analysis calculation, isometric drawings...) based on the Owner's documents provided in attachments.

(2) Supply & service:

Having completed the specification LP1-TKC-10BR-M-G1-SPC-2017, the Bidder shall supply HP Piping and hanger support for the following system of 2 (two) Units::

- Main steam system;
- Cold reheat system;
- Hot reheat system;
- Extraction system;
- Feed water system;
- HP/LP bypass system;
- Aux. steam system and Power Cycle Piping Drains and Vents;
- Condensate system;
- Heater Drain & vent, etc.

Bidder shall also furnish the following materials and tools as follows:

- Start-up, commissioning spare parts;
- Special tools and tackles.

Any additional equipment and materials or work which are not specifically mentioned, but, are required to make the installation complete in every respect, shall be under scope of Bidder:

- Preparation of fabrication isometric / spool drawings and design calculations as applicable for pipes & fittings based on general isometric drawing and stress analysis calculations;

- The supplier shall finalize the piping BOQ based on the general isometric drawing;
 - Procedure for manufacturing, welding and testing of the piping; Fabrication of pipes & fittings at shop;
 - All testing & inspection at Manufacturer's works;
 - HP piping accessories and consumables for erection, testing and commissioning along with first charge of oil, lubricants, grease, etc;
 - Cleaning and painting of pipe at shop.
- (3) **Delivery:** Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and storage.
- (4) **Erection & Installation:** Bidder shall perform installation, erection, alignment, etc...for equipment in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner.
- (5) **Commissioning:** Refer to [Table 08 Division of Responsibility].
- (6) **TA Service for erection/construction, commissioning, training service to Owner personnel:** Refer to [Table 08 Division of Responsibility].

1.3 Detail requirements

- Refer to Attachment-C (LP1-TKC-10XXX-M-M16-DAS-1100-1) of SPC-2017 for piping material specification for the project;
- Refer to Cl. No. 2.04.00 of Attachment -1 (Technical Specification for Power Cycle Piping, Valves & Specialties) of SPC-2017 for tests on HP piping;
- Refer to Volume II-D Section-I in EPC RFP Document.

1.4 Performance Guarantee (N/A)

1.5 Attachments:

Please see folder [1. HP Piping (Power cycle Piping) and hanger support] in parent folder [4. P2CV S3.2.3 - Attachment] for the following:

- Specification: LP1-TKC-10BR-M-G1-SPC-2017;
- Design change request (DCR);
- Drawings (P&ID and Isometric,...etc).

2 HP & LP Bypass Valves

2.1 Status:

- Supplier: Velan;
- Engineering: 100.0%; the design basis and specification is approved and sufficient for procurement and further activities;
- Procurement:
 - + Manufacturing: 30.0%;
 - + Delivery: 00.0%;
- Erection & Installation: 00.0%;
- Commissioning: 00.0%.

2.2 Scope of work:

(1) **Engineering:** N/A

(2) **Scope of supply**

In compliance with under specification LP1-TKC-10AA-M-G1-SPC-2060 - Specification For HP Bypass Valve Stations & LP Bypass Valve Stations, Bidder shall supply:

- 4 High Pressure (HP) Bypass valve stations for 2 units along with electro-hydraulic actuator and integral de-superheater. Each HP bypass station shall be provided with associated limit switches, electrohydraulic positioner, position transmitter etc;
- 4 Low Pressure (LP) Bypass valve stations for 2 units along with electro-hydraulic actuator and integral de-superheater. Each LP bypass station shall be provided with associated limit switches, electrohydraulic positioner, position transmitter etc;
- Four (4) nos. feed water spray control valves for two (2) units along with electrohydraulic actuator / Pneumatic actuator;
- Four (4) nos. condensate water spray control valves for two (2) units along with electrohydraulic actuator / Pneumatic actuator;
- Four (4) nos. electro-hydraulic operated water block valve for two (2) units in the feed water spray water line to provide isolation of spray water when bypass is out of service;
- Four (4) nos. motor / electro-hydraulic (optional) operated water block valve for two (2) units in the condensate spray water line to provide isolation of spray water when bypass is out of service;
- Hydraulic Units:
 - + The hydraulic units for HP & LP Bypass valves shall be separate .The HP Bypass valves of one unit may have one common hydraulic skid, as well as LP Bypass valves of one unit may have one common hydraulic skid. Each hydraulic unit shall be provided with minimum as given below: a) Open / Closed Limit switch. b) Position transmitter;
 - + Each hydraulic supply unit shall include 2 x 100% pumps, electric drive motors, associated tanks, filters, 2 x 100% accumulators, interconnecting piping, valves,

specialties like strainers, relief valve, oil control console with all accessories, instruments viz. pressure transmitter, temperature transmitter, control cabinet etc. All hydraulic control & signal piping/tubing, control signal cabling;

- + Necessary nitrogen filling device (if required) for pressuring the oil accumulator;
- + Complete hydraulic oil supply and return piping from each skid to each bypass valve and block valve, shall be provided;
- + Necessary oil testing devices & portable purifier as required;
- + Accumulator of hydraulic system shall be sized so that it can cater hydraulic power for one cycle of valve operation in case of power failure.

Bidder shall also furnish the following materials and tools as follow:

- Start-up, commissioning spare parts;
 - Special tools and tackles.
- (3) **Delivery:** Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and storage.
 - (4) **Erection & Installation:** Bidder shall perform installation, erection, alignment, etc ...for equipment in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner.
 - (5) **Commissioning:** Refer to [Table 08 Division of Responsibility].
 - (6) **TA Services for erection/construction, commissioning, training to Owner personnel:** Refer to [Table 08 Division of Responsibility].

2.3 Detail requirements

Refer to Clause 8.00.00 Special Technical Requirements in LP1-TKC-10AA-M-G1-SPC-2060 - Specification For HP Bypass Valve Stations & LP Bypass Valve Stations.

2.4 Performance Guarantee

The Bidder shall guarantee all technical requirements mentioned in datasheet

2.4.1 HP bypass Valve station

STEAM AND SPRAY WATER PARAMETERS FOR EACH HP BYPASS VALVE							
Parameter	Unit	60% BMCR	Cold Start	Warm Start	Hot Start	Very Hot	Design
Steam Parameter							
Steam Inlet flow (Q1)	Kg/hr	572,665	215,500	286,500	410,000	412,000	By Bidder
Pressure (p)	kgf/cm2 a	194.81	71.38	135	156	156	290
Temperature (t)	°C	565.5	370	430	500	520	576
Steam Outlet flow (Q2)	Kg/hr	669,865	234,876	311,695	478,776	492,281	By Bidder
Pressure (p)	kgf/cm2 a	37.75	15.96	21.24	28.12	29.11	64.1

STEAM AND SPRAY WATER PARAMETERS FOR EACH HP BYPASS VALVE							
Parameter	Unit	60% BMCR	Cold Start	Warm Start	Hot Start	Very Hot	Design
Temperature (t)	°C	325.43	230	260	265	265	576
Spray Water Parameter							
Spray Water flow (Qw)	Kg/hr	97,200	19,376	25,195	68,776	80,281	By bidder
Pressure (p)	kgf/cm2 a	243.52	150	167	217	217	422
Temperature (t)	°C	141.52	132	143	143	143	300
Note: Flow parameters shown are for each valve. Data for Cold, Warm and Hot Start-up are indicative.							

EQUIPMENT DATA : HP BYPASS VALVE STATIONS		
i)	HP Bypass Valve:	
	Name of the valve	HP Bypass Valve
	Function of the valve	Pressure Reduction
	No. of valves per unit	Two(2)
	Seat Leakage class	FC 70.2 Class V
	% opening of valve trim	80-85 at max. flow ; 30-35 at 30% flow (Bidder must specify in their offer the exact values and characteristic curves for % lift Vs Cv must be submitted along with the offer)
	Plug characteristics	By bidder
	Inlet connections	DN300; MOC: Alloy Steel, A335 P91
	Outlet connections	DN450 (tentative); Alloy Steel, A335 P91 (mixing length)
	Connection with pipe line	As per ANSI B 16.25
	Nozzle orientation	Bottom entry - side discharge
	Mode of operation	Modulating type
	Noise Level (max)	85 dBA

ii)	De-superheater:	Integral with each HP Bypass valve		
iii)	Spray Control Valve:			
	Name of the Valve	HPBP Spray Control Valve		
	Type	Hydraulic		
	Function of the valve	Steam Temperature control		
	No. of valve	One(1) per HPBP Valve		
	Seat Leakage class	FC 70.2 Class V		
	Inlet pipe	DN 150; Carbon Steel, A106 Gr. C		
	Stem Orientation	Vertical		
	Connection with pipe line	As per ANSI B 16.25		
	Noise Level (max)	85dBA		
iv)	Material of Construction:	HP Bypass Valve	HPBP Spray Block Valve	HPBP Spray Control Valve
	Design	ASME		
	Body type	Angle	Globe	Globe
	Body Material Forged	A 182 F91	WCC	WCC
	Pipe Material (Inlet)	A335P91	A106GrC	A106GrC
	Pipe Material (outlet)	A335P91	A106GrC	A106GrC (bidder shall confirm if there will be a transition piece of P91 piping at the connection point with HP steam bypass valve at 576 deg C)
Note: 1. Outlet pipe size of HPBP valve is indicative and will be finalized later.				

2.4.2 LP bypass Valve station

STEAM AND SPRAY WATER PARAMETERS FOR EACH LP BYPASS VALVE

Parameter	Unit	60% BMCR	Cold Start	Warm Start	Hot Start	Very Hot Start	Design
Steam Parameter							
Steam Inlet flow (Q1)	Kg/hr	450,935	235,000	312,000	479,000	493,000	By bidder
Pressure (p)	kgf/cm ² _a	34.73	10.19	15.29	15.29	15.29	61.29
Temperature (t)	°C	565.6	340	410	480	500	576
Steam Outlet flow (Q2)	Kg/hr	585,663	263,972	367,211	591,233	616,651	By bidder
Pressure (p)	kgf/cm ² _a	6.1	6.1	6.1	6.1	6.1	10
Temperature (t)	°C	183	183	183	183	183	576
Spray Water Parameter							
Spray Water flow (Qw)	Kg/hr	134,728	28,972	55,211	112,233	123,651	By bidder
Pressure (p)	kgf/cm ² _a	25	25	25	25	25	40
Temperature (t)	°C	40.26	41.6	41.6	41.6	41.6	160
EQUIPMENT DATA : LP BYPASS VALVE STATIONS							
i)	LP Bypass Valve:						
	Name of the valve		LP Bypass Valve				
	Function of the valve		Pressure Reduction				
	No. of valves per unit		Two(2)				
	Seat Leakage class		FC 70.2 Class V				
	% opening of valve trim		80-85 at max. flow ; 30-35 at 30% flow (Bidder must specify in their offer the exact values and characteristic curves for % lift Vs Cv must be submitted along with the offer)				
	Plug characteristics		By bidder				
	Inlet connections		DN550 (tentative); MOC: Alloy Steel, A335 P91				
	Outlet connections		DN900; Alloy Steel, A335 P91 (mixing length)				
	Connection with pipe line		As per ANSI B 16.25				
	Nozzle orientation		Side entry - side discharge				
	Mode of operation		Modulating type				
	Noise Level (max)		85 dBA				
ii)	De-superheater:		External with each LP Bypass valve				
	Steam inlet connection		DN550; MOC: Alloy Steel, A335 P91				

	Steam outlet connection	DN550; MOC: Alloy Steel, A335 P91
	Spray water connection	DN 150/ as per bidder; Carbon Steel, A106 Gr. C
iii)	Spray Control Valve:	
	Name of the Valve	LPBP Spray Control Valve
	Type	Motor operated (base offer). Hydraulic (optional)
EQUIPMENT DATA : LP BYPASS VALVE STATIONS		
i)	LP Bypass Valve:	
	Name of the valve	LP Bypass Valve
	Function of the valve	Pressure Reduction
	No. of valves per unit	Two(2)
	Seat Leakage class	FC 70.2 Class V
	% opening of valve trim	80-85 at max. flow ; 30-35 at 30% flow (Bidder must specify in their offer the exact values and characteristic curves for % lift Vs Cv must be submitted along with the offer)
	Plug characteristics	By bidder
	Inlet connections	DN550 (tentative); MOC: Alloy Steel, A335 P91
	Outlet connections	DN900; Alloy Steel, A335 P91 (mixing length)
	Connection with pipe line	As per ANSI B 16.25
	Nozzle orientation	Side entry - side discharge
	Mode of operation	Modulating type
	Noise Level (max)	85 dBA
ii)	De-superheater:	External with each LP Bypass valve
	Steam inlet connection	DN550; MOC: Alloy Steel, A335 P91
	Steam outlet connection	DN550; MOC: Alloy Steel, A335 P91
	Spray water connection	DN 150/ as per bidder; Carbon Steel, A106 Gr. C
iii)	Spray Control Valve:	
	Name of the Valve	LPBP Spray Control Valve
	Type	Motor operated (base offer). Hydraulic (optional)
	Function of the valve	Steam Temperature control
	No. of valve	One(1) per LPBP Valve
	Seat Leakage class	FC 70.2 Class V
	Inlet pipe	DN 150; Carbon Steel, A106 Gr. C
	Connection with pipe line	As per ANSI B 16.25
	Stem Orientation	Vertical
	Noise Level (max)	85dBA

iv)	Material of Construction:	LP Bypass Valve	LPBP Spray Block Valve	LPBP Spray Control Valve
	Design	ASME		
	Body type	Angle	Globe	Globe
	Body Material Forged	A217C1 2A	WCB	WCC
	Pipe Material (Inlet)	A335P91	A106GrC	A106GrC
	Pipe Material (outlet)	A335P91	A106GrC	A106GrC (bidder shall confirm if there will be a transition piece of P91 piping at the connection point with LP steam bypass valve at 576 deg C)

2.5 Attachments:

Please see folder [2. HP & LP Bypass Valve] in parent folder [4. P2CV S3.2.3 - Attachment] for the following:

- Specification LP1-TKC-10AA-M-G1-SPC-2060;
- Design Basic Report;
- Drawing.

3 Control Valves

3.1 Status:

- Supplier: Velan;
- Engineering: 100.0%, technical specification is completed and approved, **see list of valves** (Attachment 4) in LP1-TKC-10XXX-I-I1-SPC-0010;
- Procurement:
 - + Manufacturing: 30.0%;
 - + Delivery: 00.0%;
- Erection & Installation: 00.0%;
- Commissioning: 00.0%.

3.2 Scope of work:

(1) Engineering:

N/A

(2) Supply:

Scope of supply under LP1-TKC-10XXX-I-I1-SPC-0010 shall include, but not limited, to the following:

- Control Valves including accessories (**see list of valves** in LP1-TKC-10XXX-I-I1-SPC-0010);
- All necessary pipes, tubes, fittings and valves etc;
- Necessary isolated 4-20 mA DC outputs from HART compatible smart positioners at separate terminal block;
- Close and open limit switch shall be terminated at separate terminal block;
- Cables –Between Limit Switch and integral junction box, smart positioner and integral junction box with accessories like cable gland etc. to make the system complete in all respect;
- Erection Hardware;
- Rating plates with KKS tag, Nameplates and Labels;
- Drawings and Documents;

Bidder shall also furnish the following materials and tools as follow:

- Start-up, commissioning spare parts;
- Special tools and tackles.

Any additional equipment and materials which are not specifically mentioned in the specification, but, are required to make the installation complete in every respect, shall be under scope of this specification.

- (3) **Delivery:** Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and storage.
- (4) **Erection & Installation:** Bidder shall perform installation, erection, alignment, etc ...for equipment in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner.
- (5) **Commissioning:** Refer to [Table 08 Division of Responsibility].
- (6) **TA Services for erection/construction, commissioning, training works to Owner personnel:** Refer to [Table 08 Division of Responsibility].

3.3 Detail requirements

Refer to Clause 8.00.00 SPECIFIC REQUIREMENTS - TECHNICAL in LP1-TKC-10XXX-I-II-SPC-0010 Specification for control valve.

3.4 Performance Guarantee

The Bidder shall be responsible for proper design, smooth and trouble free operation of all equipment supplied by him and guarantee the performance of the control valves as stipulated elsewhere in the specification LP1-TKC-10XXX-I-II-SPC-0010.

3.5 Attachments:

Please see folder [3. Control Valve (Velan)] in parent folder [4. P2CV S3.2.3 - Attachment] for the following:

- Specification LP1-TKC-10XXX-I-II-SPC-0010;
- Detailed drawing (VEL).

4 HP Safety Valves including Silencers (Boiler Safety Valves)

4.1 Status:

- Supplier: Velan;
- Engineering: 100.0%, technical specification is completed and approved;
- Procurement:
 - + Manufacturing: 30.0%;
 - + Delivery: 00.0%;
- Erection & Installation: 00.0%;
- Commissioning: 00.0%.

4.2 Scope of work

(1) Engineering:

N/a

(2) Supply:

The following shall be provided in compliance with specification LP1-TKC-10LBA-M-M1A-SPC-2058:

- Twenty (20) nos. of Safety Valves (SV) for Main Steam Lines, ten (10) for each unit;
- Sixteen (16) nos. of SV for Cold Reheat Lines, eight (8) for each unit and;
- Twelve (12) nos. of SV for Hot Reheat Lines, six (6) for each unit;
- And silencers for each safety valve.

Bidder shall also furnish the following materials and tools as follow:

- Start-up, commissioning spare parts;
- Special tools and tackles.

Any additional equipment and materials or work which are not specifically mentioned, but, are required to make the installation complete in every respect, shall be under scope of Bidder.

(3) Delivery: Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and storage.

(4) Erection & Installation: Bidder shall perform installation, erection, alignment, etc ...for equipment in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner.

(5) Commissioning: Refer to [Table 08 Division of Responsibility].

(6) TA Services for erection/construction, commissioning, training works to Owner personnel: Refer to [Table 08 Division of Responsibility].

4.3 Detail requirements

- Each valve shall be sized by the Bidder using criteria & data established by the Owner and the valve design conditions as indicated below and in Safety valve sizing & selection LP1-TKZ-11XXX-M-M1A-CAL-9401;

- Pressure accumulation shall be not greater than 10 percent of the valve set pressure or 3 psi, whichever is greater;
- The class rating for steel valves shall be as per ANSI B16.34.

Refer to Clause 6.00.00 VALVE SIZING and 7.00.00 VALVE CONSTRUCTION in Specification LP1-TKC-10LBA-M-M1A-SPC-2058 for more detail.

4.4 Performance Guarantee

The performance figures quoted in technical particular sheets shall be guaranteed within the tolerance permitted by relevant standards.

4.5 Attachments:

Please see folder [4. HP Safety Valves including Silencers] in parent folder [4. P2CV S3.2.3 - Attachment] for the following:

- Specification LP1-TKC-10LBA-M-M1A-SPC-2058;
- Detailed drawing (VEL).

5 HP Valves & Piping specialties

5.1 Status:

- Engineering: under development.
- Procurement: HP Valves & Piping specialties are provided by two suppliers
 - + Supplier “Velan”: Manufacturing: 20.0%;
 - + Supplier “HP valves”: Manufacturing: 9.64%;
 - + Delivery: 00.0%;



HP valves at factory

- Installation: 00.0%;
- Commissioning: 00.0%.

5.2 Scope of work:

(1) **Engineering:** Engineering work should be completed in compliance with finalization of relevant P&IDs.

(2) **Supply:**

In compliance with specification LP1-TKC-10AA-M-G1-SPC-2061 which specified for Unit #1, the Bidder shall refer and proposal quantity for 2 (two) Units, the following HP Valves & Piping specialties are provided:

- Main steam system;
- Cold reheat system;
- Hot reheat system;
- Extraction system;
- Feed water system;
- HP/LP bypass system;
- Aux. steam system;
- Condensate system;
- Heater Drain & vent;
- Gland steam system;
- etc.

In LP1-TKC-10AA-M-G1-SPC-2061 above, Refer to **Appendix 1-Valve List** for quantity of valves; **Appendix 2-Piping Specialty List** for valve parameters.

Bidder shall also furnish the following materials and tools as follow:

- Start-up, commissioning spare parts;
- Special tools and tackles.

Any additional equipment and materials or work which are not specifically mentioned, but, are required to make the installation complete in every respect, shall be under scope of Bidder.

- (3) **Delivery:** Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and storage.
- (4) **Erection & Installation:** Bidder shall perform installation, erection, alignment, etc ...for equipment in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner.
- (5) **Commissioning:** Refer to [Table 08 Division of Responsibility].
- (6) **TA Services for erection/construction, commissioning, training works to Owner's personnel:** Refer to [Table 08 Division of Responsibility].

5.3 Detail requirements

Refer to Clause 7.00.00 SPECIFIC REQUIREMENTS-TECHNICAL in Specification LP1-TKC-10AA-M-G1-SPC-2061.

5.4 Performance Guarantee (N/A)

5.5 Attachments:

Please see folder [5. HP Valve & Piping Specialties] in parent folder [4. P2CV S3.2.3 - Attachment] for the following:

- Specification LP1-TKC-10AA-M-G1-SPC-2061;
- Detailed drawing (VEL, if any).

6 Thermal Insulation

6.1 Status:

- Supplier: not nominated;
- Engineering: 0.0%;
- Procurement:
 - + Manufacturing: 00.0%;
 - + Delivery: 00.0%;
- Installation: 0.00%;
- Commissioning: 0.00%.

6.2 Scope of work:

(1) Engineering:

Bidder shall finalize the engineering/designs (particularly LP1-TKC-10BU-M-G1-SPC-2021) based on the Owner's documents provided in attachments and Bidder's design for piping and equipment on Power steam cycle.

(2) Supply:

Having completed the specification LP1-TKC-10BU-M-G1-SPC-2021, the Bidder shall supply Thermal Insulation for 2 (two) Units:

- Gland Steam Condenser;
- Drain Cooler of LP Heater-1;
- LP Heater-2-3-4;
- Deaerator;
- Boiler Feed Booster Pump and Feed Pump;
- HP Heater- 6-7-8;
- Drain Tank for SCAPH;
- HP Flash Tank, LP Flash Tank, Boiler Blow down Flash Tank, Start-up Flash Tank, Atmospheric Flash Tank;
- ID Fans, Flue Gas Recirculation Fans;
- HP Pipings (power cycle piping), including the following subsystems:
 - + Main Steam, CRH (cold reheat steam) and HRH (hot reheat steam);
 - + HP/LP bypass system;
 - + Condensate System;
 - + Drains and Vents of FW Heaters;
 - + Feed Water System;
 - + Gland Steam System;
 - + Extraction Steam - Condensate Heating;

- + Extraction Steam - FW heating;
- + Aux. Steam and Power Cycle Piping Drains and Vents, etc.

Bidder shall also furnish the following materials and tools as follows:

- Start-up, commissioning spare parts;
- Special tools and tackles.

Any additional equipment and materials or work which are not specifically mentioned, but are required to make the installation complete in every respect, shall be under scope of Bidder.

- (3) **Delivery:** Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and storage.
- (4) **Erection & Installation:** Bidder shall perform installation, erection, alignment, etc ...for equipment in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner.
- (5) **Commissioning:** Refer to [Table 08 Division of Responsibility].
- (6) **TA Services for erection/construction, commissioning, training works to Owner's personnel:** Refer to [Table 08 Division of Responsibility].

6.3 Detail requirements

Refer to:

- Appendix- 2 Design Basic Report for Thermal Insulation;
- VOLUME II-D SECTION-II in EPC RFP Document.

6.4 Performance Guarantee

Ensure the surface temperature remains within safe limits $\leq 50^{\circ}\text{C}$

6.5 Attachments:

LP1-TKC-10BU-M-G1-SPC-2021 Specification for thermal insulation.

SECTION III

SUB-SECTION

3.2 DETAILED REQUIREMENTS

ARTICLE

3.2.4 – INSTRUMENTATION AND CONTROL

[PII.CV.SIII.SS3.2 – Article 3.2.4]

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CHAPTER V – SECTION III

SUB - SECTION 3.2

ARTICLE 3.2.4 INSTRUMENTATION AND CONTROL

1. General Requirements

This Specification sets forth the technical requirements for the design, supply, construction, and commissioning of the Instrumentation and Control System for 2x600 MW Long Phu 1 Power Plant.

The Bidder shall be responsible for supplying a complete instrumentation and control system, which includes all required control equipment, field instruments (for measurement and final control), engineering and design services, all necessary licenses, project standards and guidelines, full documentation, manufacturing, delivery of all equipment to the site, programming and configuration, factory acceptance testing (FAT), cables and cabling, installation works and materials, site acceptance testing (SAT), commissioning, training of the Owner's operations and maintenance personnel, repair any defects during the Defects Notification Period until the final issuance the Taking Over Certificate.

The Bidder shall construct the Plant in accordance with internationally accepted standards. Additionally, all applicable designs shall comply with the prevailing Vietnamese standards, codes, and regulations. In the event of any conflict between international and local standards, the mandatory Vietnamese codes and regulations shall take precedence.

All construction works at the Site shall be carried out in accordance with the relevant Vietnamese standards and the Owner's Technical Requirements, whichever is more stringent.

The Bidder shall ensure that the design, supply, and implementation of the Instrumentation and Control System fully comply with all requirements in this document and in **“Volume II – Technical Specifications”**.

All technical requirement documents referred to or incorporated herein shall be deemed applicable and binding as integral parts of this technical requirement.

2. Design Principles

The proposed instrumentation and control (I&C) systems shall apply to all equipment including, but not be limited to, all mounted measuring devices and related ancillaries, conditioning devices, transmitters and related circuits, microprocessor based and computer based devices (such as programmable logic controllers (PLC), and distributed

control system (DCS), control drives and actuators, control circuits, marshalling racks and panels, cabling and wiring, and the control side of all switchgear.

The design of control, interlock, and protection systems across the Power Plant shall prioritize both security and integrity, and shall comply with the applicable Grid Connection Agreement and the following design principles:

- The system design shall adopt “Fail-safe” philosophy to ensure safety of equipment in case of failure or malfunction of related instrumentation.
- The system shall be designed to ensure redundancy at controller level, I/O level, bus level and power supply level.
- The design of the DCS power supply system shall ensure that, in the event of a short circuit in one power supply unit, the second unit shall continue to provide the required power to the load without back feeding into the faulted circuit.
- No single component failure will cause the loss of the Unit protection.
- No single component failure will cause an immediate risk to the Unit trip. The Bidder shall provide, as part of design submission, details of Unit protection and tripping scheme for review by the Owner during detailed engineering stage.
- No single component failure will cause the failure of the DCS which renders the Unit inoperable from CCR.
- All important I&C equipment which affect Unit operation shall be supplied by a direct current (DC) or uninterruptible power supply (UPS) system.
- Essential transmitters and sensors, which directly or indirectly trip the Unit(s), shall be triplicated and arranged in two-out-of-three voting logic for binary signals or median selection logic for analogue signals. Details shall be submitted for Owner’s review if this principle cannot be applied in specific cases.
- Redundant signals shall be distributed across independent branches, input and output modules to provide contingency coverage in the event of failure.
- All protection, tripping or interlock instruments/circuits which affect Unit operation shall be redundant.
- The Bidder shall provide Unit protection and tripping schemes during detailed engineering stage.
- The startup, normal running and shutdown operation shall be carried out in CCR with no attendant required to attend various plant outside the CCR. The design

shall allow only one operator to operate one Unit during normal operation. Assistance from another operator is allowable during Unit start up and shut down.

- All main Plant equipment including boiler and boiler auxiliaries, turbine-generator and auxiliaries shall be controlled by the DCS. The turbine control shall interface with the DCS and shall comply with all requirements as if they are part of the DCS. As a minimum, the turbine control shall send back to the DCS all protection and control signals for the operation of the Power Plant with time tags accurate to their acquisition scanning rates in the DCS. All trip signals shall be hardwired to the DCS to give accurate time stamp. The interface shall enable the operator to control the Power Plant as if this turbine control system is part of the DCS. Trip signals, major control signals such as turbine load control and group start/stop from DCS shall be connected by hardwire. Other signal interface between DCS shall be connected by communication link (OPC or Modbus TCP/IP). And the detailed signal interface shall be designed and reviewed during contract execution stage.
- All major control and electrical switching (i.e. closing and opening of switchgear) of GCBs, station MV/LV electrical supplies and tap changing of generator step-up transformer and Unit auxiliary transformer shall be achieved by operator commands via the DCS in Central Control Room (CCR).
- A panel of minimum hardwired equipment shall be provided in CCR, for emergency shutdown in case of total failure of DCS. The panel shall be operated independent of the DCS.
- All motorized actuators shall be provided with torque switch and position switch.
- The Bidder shall provide tin-plated copper knife switch terminals for cable connections in all DCS and PLC cabinets, panels, and junction boxes.

3. General Scope of Works

The Bidder shall perform all works necessary for the completion of the Plant, including design, supply, importation and delivery to Site, installation, testing and commissioning of instrumentation and control system.

The scope of works shall include:

1. Design:

I&C Design for Boiler, Boiler auxiliary, Turbine, Turbine auxiliary and associated Auxiliary systems including but not limited to the following:

- Control system configuration;

- Typical I&C design (DCS typical logic, typical cable installation, wiring, DCS graphic specification, DCS hardware/software design specification, junction box, local cabinet, 3rd interface etc);
 - Plant protection and interlock diagram;
 - Plant Input/Output signals list;
 - DCS I/O allocation drawing;
 - Signal alarm setting, SOE alarm list;
 - Design loop wiring diagrams, cable schedules of the Turbine Package (GE supplied);
 - Instrument list;
 - Instrument hook up drawing;
 - Instrument location drawing;
 - Power Supply Distribution System for Instrumentation and Control System;
 - Electrical single line diagram, Electrical schematic drawing, Control panel layout for I&C;
 - Control philosophy and control logic for process system;
 - Cable schedule, cable interconnection drawing , cable BOQ (bill of quantity);
 - I&C equipment specification (instrument, control valve, communication etc);
 - The Bidder shall be responsible for consolidating vendor-supplied control logic and philosophies, developing control logic diagrams and control philosophy for the Boiler system, Boiler auxiliary system, Turbine and Turbine auxiliary system; establishing coordinated control logic between the Boiler and Turbine;
 - Provision of complete remote manual control from the National Dispatching Centre, along with a fully functional logic control system for both open-loop and closed-loop operations of the boilers, turbines, generators, their auxiliary systems, and all common systems;
 - Provision Overall Plant operation philosophy, start up – shut down procedure;
2. Supply:
- Distributed Control System (DCS);

- Control system for package such as Condensate Polishing System, Intake Chlorination System, Effluent Treatment System, Emergency DG Set, etc;
- Environment Monitoring system (EMS);
- Rotating Machine Condition Monitoring System (RMCMS);
- Plant Communication System, SCADA;
- CCTV monitoring system;
- Field Instruments, Control Valve and Actuator;
- Instrumentation Hardware;
- Instrumentation and Control Cable and accessories;
- Panel, Junction Box, Local Panel, Rack and accessories;
- Power Supply Distribution System for Instrumentation and Control System;
- Interface with packaged system;
- All spare parts and consumables;
- All Software licenses;
- Others.

3. Delivery:

Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and storage.

4. Installation:

Bidder shall perform installation, erection, alignment, etc ..for equipment in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner.

5. Testing and Commissioning:

- Factory Acceptance Test;
- Site Acceptance Test;
- Commissioning (Refer to "Table 08 Division of Responsibility")

6. Service:

- Technical Assistance for erection/installation, commissioning, training (Refer to "Table 08 Division of Responsibility");
- Commissioning Support;

- Training for Operation and Maintenance Staff.

For the avoidance of doubt, any items not expressly stated herein shall be clarified in *Annexure 2 - I&C Scope of Works Description*.

All other works not explicitly listed herein but required for the complete integration and functionality of the system shall be deemed included in the Bidder's Scope of Works.

4. Distributed Control System (DCS)

4.1 Status

N/A

4.2 Scope of works

The Bidder's Scope of Works shall include the design and engineering, manufacturing, procurement, importation and delivery of goods to Site, installation, testing, commissioning, and training for the Distributed Control System (DCS), as well as the supply of associated spare parts and relevant technical documentation.

The Bidder shall supply a complete and fully integrated Distributed Control System (DCS) suitable for Long Phu 1 Thermal Power Plant (2×600MW), including but not limited to the following components:

- DCS Control Hardware: Power distribution cabinets; Redundant CPU/controller units, Remote and local I/O modules (DI, DO, AI, AO); Engineering workstation (EWS); Operator stations (HMI/OWS) etc for central and local control rooms; System servers (historian, alarm management, data trending); Communication modules supporting OPC; Modbus; Profibus; Profinet; etc;
- Fully furnished with operator consoles, desks, chairs, and cabinets arranged in the CCR and the engineer's room;
- Control Panels: Complete DCS panels, marshalling panels, termination cabinets, and Remote I/O panels for the control and monitoring of subsystems such as the Coal Handling System, Water and Wastewater Treatment System, Cooling Water System, and Plant Water System (including Demineralized Water, Service Water, and Potable Water Transfer Pumps), etc;

- Interface to the Turbine Control system (Digital Electro-Hydraulic Governor hardware (EHG); Automatic Synchronisation System hardware and Automatic Excitation Regulator systems, Generator Protection System, etc);
- Complete DCS control and monitoring system for ESP and FGD packages (including Operation Workstations, Engineering Workstations, Consoles, DCS system cabinets, DCS I/O Termination cabinets, Panels, Desks, Chairs at the FGD and the ESP Local Control Room etc);
- PADO system: The system solution includes optimization of plant performance by identifying and controlling the parameters that cause efficiency deviations. The system application acts as an online decision support system that utilizes information from the plant's data acquisition system to analyze, diagnose and optimize plant performance;
- Networking Equipment: Industrial Ethernet switches and routers, firewalls, Fiber optic converters, patch panels, accessories, etc;
- Field Interface: Interposing relay panel, Signal isolators/barriers (if required), Patch cords and terminal jumpers, etc;
- Communication interface with 3rd system (supply OPC server, switch, communication module, cable and accessories);
- Master clock system with redundant time synchronization servers;
- Slave Clock System for Building and Local control room;
- Software: System software for configuration, operation, diagnostics, alarm and trend management, Programming software with full license, SCADA/HMI graphics and user interface packages, Antivirus software, firewall, network segmentation hardware/software, etc;
- Engineering Tools: One industrial-grade engineering laptop per PLC/DCS type (Intel i7 latest version, 16 GB RAM , Windows OS, with pre-installed software for programming and diagnostics);
- LED panel for displaying the main plant data parameters;
- 03 Large Screen (size minimum 98",OLED);
- Printers including SOE printer, A3/A4 color printer, A3/A4 Black/white printer;

4.3 Detailed Requirements

The Bidder shall ensure that the DCS design and supply fully comply with this document and the following Technical Requirements, in order of precedence:

- 1) All requirements set forth in this document;
- 2) Annexure-1: Package control and monitoring philosophy matrix;
- 3) LP1-TKC-10XXX-I-I1-SPC-0001-3 Specification for Distributed Control System;
- 4) Vol II E: Technical Specifications for Instrumentation and Control

Testing:

DCS shall be tested in the following three stages.

(a) Factory acceptance test (FAT), which shall be carried out during and after the completion of the manufacturing of the DCS. The Bidder shall submit the FAT procedure of DCS for review by the Owner during detailed engineering stage. The Owner shall be given the opportunity to witness the test and the DCS shall not be shipped until the Owner is satisfied that there has been a successful completion of FAT. The FAT shall include the hardware testing of assembled panels, and software testing of control algorithms.

(b) Site test, which shall form part of the installation and commissioning of the DCS, shall be witnessed by the Owner. The Site test shall be performed by the Bidder after the completion of the assembly of the whole DCS system.

(c) Availability tests, which shall be included within the overall reliability test of the Unit, shall achieve an availability of 99.9% or better.

Two (2) trips shall be arranged for Unit #1 and Unit #2, with four (4) persons per trip. All related expenses, including airfare, accommodation, meals, and allowances, shall be borne by the Bidder.

The Bidder shall provide the testing details and procedures for above tests for Owner's review.

4.4 Performance Guarantee

The Bidder shall demonstrate that the Instrumentation and Control system meets all the functional/performance requirements, specified in technical specifications.

4.5 Attachments:

- LP1-TKC-10XXX-I-I1-SPC-0001-3 Specification for Distributed Control System
- Annexure-1: Package control and monitoring philosophy matrix

5. Steam and Water Analysis System (SWAS)**5.1 Status**

The SWAS equipment was supplied by the Owner and has already been delivered to site.

5.2 Scope of Works

The Bidder's Scope of Works shall include installation, testing, commissioning, and training.

5.3 Detailed Requirements

The Bidder shall ensure that the SWAS fully complies with this document and the following Technical Requirements, in order of precedence:

- i) Detailed design
- ii) LP1-TKC-10XXX-I-I1-SPC-0002-0: Technical Specification for SWAS
- iii) Vol II E: Technical Specifications for Instrumentation and Control

5.4 Performance Guarantee

Not Applicable for this package (N/A);

5.5 Attachments

- i) LP1-TKC-10XXX-I-I1-SPC-0002-0 Technical Specification for SWAS.
- ii) Detailed Packing List of delivered equipment.
- iii) Detailed design

6. Environment Monitoring system (EMS)**6.1 Status**

The Environmental Monitoring System (EMS) of the Long Phu 1 Thermal Power Plant (TPP) consists of the following subsystems:

- Continuous Emission Monitoring System (CEMS): This equipment will be supplied by the Owner.
- Cooling Water Monitoring System (CWMS): The design for this system has not yet been developed.
- Waste Water Monitoring System (WWMS): The design for this system has not yet been developed.

6.2 Scope of Works

The Bidder shall be fully responsible for the design and engineering, manufacturing, procurement, delivery to site (including customs clearance), installation, testing, commissioning, and training related to the Environmental Monitoring System (EMS), including the supply of associated spare parts and all relevant technical documentation.

For the Continuous Emission Monitoring System (CEMS), which will be supplied by the Owner, the Bidder shall be responsible for its installation, integration with the EMS, testing, and commissioning.

The Bidder shall ensure that the design of the EMS complies with all applicable environmental regulations currently in effect. Furthermore, the Bidder shall be responsible for implementing all relevant requirements of Vietnamese environmental legislation, including any subsequent amendments or updates.

The Bidder shall carry out, but not be limited to, the following scope of work:

- Supply all necessary equipment and accessories required for the full completion and integration of the EMS system, including but not limited to: switches, computers, monitors, large screen at main gate, shelters, routers, video recorders, data loggers, cables, cameras and other related accessories;
- The Bidder shall be fully responsible for the modification and integration of the CEMS (Owner-supplied equipment) into the EMS system, ensuring successful signal transmission and obtaining formal acceptance from the Department of Natural Resources and Environment (DONRE);
- Provide a fully functional interface for the real-time transmission of EMS data to the Department of Natural Resources and Environment (DONRE) and/or the Ministry of Agriculture and Environment as required;

- Undertake all necessary works to facilitate inspection and secure acceptance by DONRE;
- Perform accuracy testing such as Relative Accuracy Test Audit (RATA) for EMS equipment in accordance with applicable Vietnamese regulations;
- Supply the cameras for the CEMS as required;
- Conduct calibration/verification/rectification for all relevant instruments and systems;
- Provide commissioning support services necessary to ensure the full operational readiness of the EMS.

6.3 Detailed Requirements

The Bidder shall ensure that the EMS design and supply fully comply with the following requirements, in order of precedence:

- All applicable laws and Vietnamese regulations;
- All requirements set forth in this document;
- VOLUME II-E: Technical Specification for Instrumentation and Control.

The Bidder shall be responsible for preparing all necessary documents and coordinating with the relevant competent authorities on behalf of the Owner to obtain approval for the Environment Monitoring system (EMS).

The EMS shall comply with all applicable Vietnamese environmental technical regulations (QCVN) and circulars issued by MONRE.

The EMS shall provide real-time data transmission to DONRE and MONRE systems via secure and compatible protocols. The system shall also maintain a historical data backup as required.

6.4 Performance Guarantee

The Bidder shall carry out the work in accordance with technical specifications, the mandatory local codes and regulations to obtain an acceptance from local authorities.

6.5 Attachments:

- VOLUME II-E: Technical Specification for Instrumentation and Control.

7. Rotating Machine Condition Monitoring System (RMCMS)

7.1 Status

N/A

7.2 Scope of works

The Bidder's Scope of Works shall include the design, engineering, manufacturing, procurement, delivery, installation, testing, commissioning, and training for the Rotating Machinery Condition Monitoring System (RMCMS), as well as the supply of associated spare parts and relevant technical documentation.

The RMCMS shall provide continuous monitoring of critical rotating and reciprocating equipment to detect mechanical anomalies and prevent equipment failures. The system shall be equipped with advanced diagnostic software capable of automatically identifying faults such as imbalance, misalignment, bearing wear, and resonance. It shall interface with the DCS to transmit real time operational data and alarm signals. By safeguarding key equipment including pumps and fans, the RMCMS shall contribute to minimizing unplanned outages and improving equipment reliability and operational lifespan.

The scope of works shall include, but not be limited, to the following:

- The Bidder shall supply a complete set of hardware and software, including but not limited to: power supplies, monitors, servers, vibration rack module controllers, I/O modules, transducers, converters, signal splitters, vibration sensors, network switches, interface modules, cables, accessories, and all other components necessary for a fully functional RCMCS system;
- The RMCMS shall be synchronized in real time with the DCS master clock;
- The vibration data archival system shall have the capability to retain data for a minimum period of three (3) years;
- The RMCMS shall be configured with redundancy in power supply, servers, communication systems, and other critical components to ensure continuous and reliable operation;
- The Bidder shall perform all testing activities for the vibration monitoring system supplied by the Owner, including but not limited to troubleshooting, repair, and replacement of any defective components

such as vibration sensors, transducers, signal converters, vibration controller (vibration rack modules), etc. The Bidder shall also be responsible for ensuring the complete and successful integration and interface of the system with the Distributed Control System (DCS).

7.3 Detailed Requirements

All major pieces of rotating and reciprocating equipment shall be provided with permanent vibration monitoring equipment and integration of electronic hardware and software, which is so called condition monitoring system.

The vibration monitoring equipment supplied shall be suited to the design and operating conditions of each individual piece of mechanical equipment. The vibration monitors shall provide indication and control signals to facilitate alarms and equipment shutdown as well as data for preventive maintenance diagnostic and operating efficiency.

A microprocessor based monitoring unit shall be permanently wired to the field sensors and signal conditioners. The monitoring unit shall be mounted in a cabinet located in the central equipment room in control building.

The monitoring unit (computer) shall collect, store and display the dynamic values from the field sensors and signal conditioners. The monitoring unit shall also provide alarm status when signal levels exceed the set value. External outputs for alarm/control functions shall be provided.

The vibration monitoring system shall be capable of trending information and facilitating the analysis of issues related to fans, pumps, coal mills, etc;

The system shall provide sufficient sensors data to the Unit control system for online operator information and alarm on excess levels of vibration.

Continuous on-line machinery protection and management shall be implemented for equipment items identified as having a large impact on production and for equipment items which constitute major investments or which may require expensive or long duration repairs in the event of catastrophic failure, such as:

- Boiler feed pumps,
- Forced draft fans,
- Induced draft fans,
- Primary air fans,

- Circulating cooling water pumps,
- Closed Cooling water pumps,
- Condensate extraction pumps,
- Coal Mills,
- Seal Air Fans,
- Flue Gas Recirculation fans,
- Air Compressors,
- Others.

The monitoring points of boiler feedwater pumps shall include but not limited to the following:

- (a) Shaft speed and phase using a keyphasor transducer
- (b) Shaft vibration and position on pump and motor bearing housing using X and Y orthogonally mounted proximity sensors for fluid film bearings (seismic for roller bearings)
- (c) Axial position within thrust bearing using two proximity sensors
- (d) Critical process parameters
 - Pump bearing metal temperature
 - Feedwater tank pressure and temperature
 - Flow rate
 - Lubricating oil pressure
 - Lubricating oil temperature
- (e) Performance process parameters
 - Discharge pressure and temperature
 - Motor power, voltage and current from MV board

The monitoring points of cooling water pumps and condensate extraction pumps shall include but not limited to the following:

- (a) Vibration on pump and motor bearing housing using X and Y orthogonally mounted accelerometers for bearings
- (b) Critical process parameters

- Pump thrust bearing metal temperature or lubricating oil temperature
- Flow rate (for condensate extraction pump)

(c) Performance process parameters

- Discharge pressure and temperature
- Motor power, voltage and current from MV board

The monitoring points of forced draft fans, induced draft fans and primary air fans shall include but not limited to the following:

(a) Shaft speed and phase using a keyphasor transducer

(b) Shaft vibration and position on fan and motor bearing housing using X and Y orthogonally mounted seismic sensors for the bearings

(c) Axial position within thrust bearing using two proximity sensors

(d) Process parameters

- Flow rates at forced draft duct and primary air duct
- Flue gas velocity at stack for induced draft fan
- Lubricating oil pressure
- Lubricating oil temperature

(e) Performance process parameters

- Discharge pressure and temperature
- Motor power, voltage and current from MV board

The Bidder shall ensure that the RMCMS design and supply fully comply with this document and the following Technical Requirements, in order of precedence:

- 1) All requirements set forth in this document;
- 2) LP1-TKC-10XXX-I-II-SPC-0011 Specification for rotating machine condition monitoring system
- 3) Vol II E: Technical specifications for Instrumentation and Control

7.4 Performance Guarantee

The Bidder shall demonstrate that the Instrumentation and Control system meets all the functional/performance requirements, specified in technical specifications.

7.5 Attachments:

- Vol II E: Technical specifications for Instrumentation and Control
- LP1-TKC-10XXX-I-I1-SPC-0011 Specification for rotating machine condition monitoring system

8. Plant Communication System, SCADA

8.1 Status

N/A

8.2 Scope of works

The Bidder's Scope of Work shall include the design and engineering, manufacturing, procurement, delivery, installation, testing, commissioning, training, supply associated spare parts for the following system:

- Plant Telephone (EPABX) and Lan System;
- Public Announcement System (PA);
- Radio Communication System (Walkie-Talkie);
- Slave Clock System for Building, Local control room (time correction of slave clock shall be automatically controlled by master clock);
- VCGM/DIM System;
- Tariff Metering Data Collection System;
- Hotline System (with A0/A2);
- Hotline Communication with 220 kV and 500 kV Switchyard;
- SCADA/EMS and Telecommunication system (including leased line connections and VCGM WAN system);

The Bidder shall be fully responsible for carrying out all necessary works and procedures to obtain all required agreements, permits, licenses, and approvals from competent authorities and related parties in compliance with the applicable laws and regulations.

The scope of services shall include the following:

- Provision of services and support for rental channel arrangements with EVN company (EVNICT);
- Provision full quality assurance for the SCADA/EMS, Telecommunication, and VCGM WAN System;

- Agreement on technical design, testing, audit and sealing for the tariff metering system and transmission of Tariff metering data system;
- Agreement on technical design, test/commissioning for SCADA and communications system;
- Agreement on Dispatch Instruction Management (DIM) system and Information Technology infrastructure for Vietnam Competitive Generation Market (VCGM) with National Power System and Market Operator Company (NSMO);
- Leased line Connection agreement with Information and Communication Technology Company of Vietnam Electricity (EVNICT);
- The Bidder shall obtain and supply all necessary licenses and permits as required by applicable regulations, including a trunk license that enables multiple simultaneous external calls via shared trunk lines to the public telecommunications network;
- Provide license, certificate and permit for using Radio equipment (License for using of Radio Frequencies and Radio Equipment, Certificate of Conformity & Declaration of Conformity for Radio Equipment);
- The Bidder shall be responsible for preparing all necessary dossiers and coordinating with the relevant competent authorities on behalf of the Owner to obtain approvals for agreements, certificates, and permits required for commissioning and operation of the Plant in accordance with applicable Vietnamese laws and regulations. These shall include, but are not limited to the Grid Connection Agreement, Power Purchase Agreement, Protection Relay Coordination Agreement, SCADA and Communication Agreement, Environmental Permit and any other approvals as may be necessary for the Plant's commercial operation;
- The Bidder shall be responsible for carrying out any modification works required by government authorities in the course of obtaining the necessary permits and licenses for the Plant's commercial operation;

8.3 Detailed Requirements

The Bidder shall supply and install the Telephone, LAN, PA, Radio systems covering the entire plant boundary.

LAN cables shall be installed alongside telephone cables to serve all telephone and PC outlets. Each telephone outlet shall be a dual socket, providing one port for a telephone connection and one for a computer connection.

In the Admin Building, the LAN cables and LAN/PC outlets shall be supplied and installed by others.

The Contractor shall design, supply, and install a termination cabinet in the 500 kV and 220 kV switchyard control buildings, serving as the interface for electrical and I&C signals between Long Phu 1 Thermal Power Plant and the Switchyard.

The detailed design of the Plant Communication System and SCADA shall be subject to review and approval by the Owner during the engineering stage.

The Bidder shall ensure that the design and supply of the Plant communication & SCADA system fully comply with this document and the following Technical Requirements, in order of precedence:

- 1) All requirements set forth in this document;
- 2) LP1-TKC-10XXX-I-I1-SPC-0009-2 Specification for Plant Communication system
- 3) VOLUME II-E: Technical Specification for Instrumentation and Control.

8.4 Performance Guarantee

The Bidder shall carry out the work in accordance with technical specifications, the mandatory local codes and regulations to obtain an acceptance from local authorities.

8.5 Attachments:

- VOLUME II-E: Technical Specification for Instrumentation and Control
- LP1-TKC-10XXX-I-I1-SPC-0009-2 Specification for Plant Communication system

9. CCTV Monitoring System

9.1 Status

N/A

9.2 Scope of works

The Bidder's Scope of Works shall include the design and engineering, manufacturing, procurement, delivery, installation, testing, commissioning,

training for the CCTV Monitoring System as well as the supply of associated spare parts and relevant technical documentation.

The CCTV system for security purposes will be installed to provide surveillance over specified areas such as access roads, entrance gates, perimeter fences, and other critical points deemed necessary to ensure site security.

Cameras shall be furnished with remote-controlled pan, tilt, and zoom (PTZ) capabilities, utilizing proven and reliable technology that allows operators to adjust viewing angles and focal length in real-time via a centralized control interface.

The CCTV system intended for operational purposes will be set up to oversee vital operational zones, including the burner section, turbine hall, coal unloading jetty, coal storage yards, coal transfer towers, the flue gas desulfurization (FGD) unit, water treatment facilities, transformers, and other essential equipment and machinery. Thermal cameras will be installed in areas containing flammable materials, such as the coal storage area. These thermal cameras will be interfaced with the fire alarm system. The specific locations and quantity of thermal cameras will be reviewed during the design phase.

To support operational monitoring, CCTV display units will be positioned in the Central Control Room (CCR) and the Coal Handling Plant control room, Guard House.

9.3 Detailed Requirements

The Bidder shall ensure that the design and supply of the CCTV system fully comply with this document and the following Technical Requirements, in order of precedence:

- 1) All requirements set forth in this document;
- 2) LP1-TKC-10XXX-I-I1-SPC-0008-0 Specification for Closed Circuit Television (CCTV) System.
- 3) Vol II E: Technical specifications for Instrumentation and Control

9.4 Performance Guarantee

N/A

9.5 Attachments:

- LP1-TKC-10XXX-I-I1-SPC-0008-0 Specification for Closed Circuit Television (CCTV) System.

10. Field Instruments, Control Valve and Actuator

10.1 Status

Under the previous EPC contract, the status of supply as below:

- Design: 20%
- Manufacturing: 0%
- Delivery: 0%.
- Installation, commissioning: 0%

10.2 Scope of works

The Bidder's Scope of Works shall include the design and engineering, manufacturing, procurement, delivery, installation, testing, commissioning, training as well as the supply of associated spare parts and relevant technical documentation.

The Bidder shall supply all field instruments, control valves and actuators required for the complete and proper functioning of the power plant control system, including: Boiler and Boiler auxiliary, Turbine auxiliary, associated auxiliary systems.

The Boiler and Boiler Auxiliary I&C equipment design will be finalized by the Owner's Contractor; based on the existing P&ID, instrument list, and instrument specifications attached, Bidder shall study carefully, estimate and propose the lump sum quote for un-procured I&C equipment and including in Bid price proposal, any extra cost caused from deviation with design of the Owner/Owner's Contractor shall be included in this proposal.

The scope of works shall include, but not be limited to, the following:

- Supply complete Field instruments and sensors, control valves and actuators, accessories for Boiler and Boiler auxiliary, Turbine auxiliary, associated auxiliary systems;
- Supply Boiler Flame Monitoring camera System, Boiler Leakage Detection system, Boiler Furnace temperature (thermo) probe, Boiler furnace pressure transmitters and pressure switches, Boiler metal temperature sensors/transmitters, etc for Boiler system (except instrument on Coal and Oil Burners shall be provided by the Owner);

- The boiler furnace for each Unit (Unit no.1 and Unit no.2) shall be provided with at least two sets of flame monitoring colour CCTV and at least two sets of bottom hopper monitoring color CCTV;
- The Bidder shall supply all required field instruments, sensors, control valves, actuators and associated accessories necessary for the complete functioning of the control system in the Owner-supplied equipment, such as: HP/LP heaters, tanks, etc (e.g., level transmitters, level switches);
- The Bidder shall perform all testing of the I&C devices supplied by the Owner and shall report the results to the Owner;
- All instruments shall be calibrated prior installation at the Site (including those installed on skids, pumps, and fans supplied by the Owner);
- Supply the necessary instruments on the process pipelines (steam, water, air etc) to interface with other common Balance of Plant systems;

The field instruments, control valves, and actuators for the following systems are not included in the Bidder's scope of supply:

- Electrostatic Precipitator system (ESP);
- Flue Gas Desulfurization system (FGD);
- Coal Handling system (CHS);
- Ash Handling system (AHS) and Mill rejection system;
- Limestone and gypsum handling system;
- Water Treatment Plant system (WTP);
- Rotary Air Preheater system (RAPH);
- Burner (instrument such as oil and coal flame scanner, ignitor, etc supplied by the Owner);
- Steam and Water Analysis System (SWAS);
- CEMS;
- Auxiliary boiler;
- Turbine and Generator supply by GE;
- Pumps, fans, and coal mills (coal pulverizers), air compressors, fuel oil pump skids which are supplied by the Owner;
- Condenser Tube Cleaning System (CTCS);

- Debris filter system (DF);
- Hydrogen generation plant;
- Fire Protection and Detection System.

10.3 Detailed Requirements

The Bidder shall ensure that the design and supply of the Field Instruments, Control Valves and Actuators fully comply with this document and the following Technical Requirements, in order of precedence:

- 1) All requirements set forth in this document;
- 2) LP1-TKC-10XXX-I-I1-SPC-0004-0 Specification for Field Instruments;
- 3) LP1-TKC-10XXX-I-I1-SPC-0010-6 Specification for Control Valves;
- 4) Vol II E: Technical specifications for Instrumentation and Control.

10.4 Performance Guarantee

N/A

10.5 Attachments:

- LP1-TKC-10XXX-I-I1-SPC-0004-0 Specification for Field Instruments
- LP1-TKC-10XXX-I-I1-SPC-0010-6 Specification for Control Valves
- Basic design of Boiler instruments

11. Instrumentation Hardware

11.1 Status

N/A

11.2 Scope of works

The Bidder's Scope of Works shall include the design and engineering, manufacturing, procurement, delivery, installation, testing, commissioning, training as well as the supply of associated spare parts and relevant technical documentation.

The scope of works shall include, but not be limited, to the following:

- Instrumentation hook up and accessories for field instruments such as valve, tubing, fitting, condensate pot, support, drain, etc;
- The Bidder shall supply all instrumentation hardware required for the complete installation of Boiler and Boiler auxiliary, Turbine and Turbine auxiliary, associated auxiliary systems;

- Supply all Instrumentation hardware for Owner-supplied equipment such as HP/LP heaters, tanks, etc (e.g., level transmitters, level switches, temperature transmitters, sensors etc);
- Provide instrument tapping points on the process piping supplied by the Bidder for Turbine package control, as required, including thermowells, root valves, impulse piping, and all necessary accessories;
- The Bidder shall inspect and replace any faulty instrumentation hardware supplied by the Owner;
- Pneumatic hook up accessories;
- Local instrument rack, cubicle, gauge board & enclosures, transmitter rack;
- Sample piping & accessories;
- Instrument air distribution piping, etc;

The instrumentation hardware for the following systems are not included in the Bidder's scope of supply:

- ESP;
- FGD;
- CHS;
- AHS and Mill rejection system;
- Limestone and gypsum handling system;
- Water Treatment Plant;
- Rotary Air Preheater system (RAPH);
- Burner (instrument such as oil and coal flame scanner, ignitor, etc supplied by the Owner);
- Steam and Water Analysis System (SWAS);
- Chemical dosing system;
- CEMS;
- Auxiliary boiler system;
- Turbine and Generator system supply by GE;
- Pumps, fans, and coal mills (coal pulverizers), air compressors, fuel oil pump skids which are supplied by the Owner;

- Condenser Tube Cleaning System (CTCS);
- Debris filter system (DF);
- Hydrogen generation plant;
- Fire Protection and Detection System.

11.3 Detailed Requirements

The Bidder shall ensure that the design and supply of the instrumentation hardware fully comply with this document and the following Technical Requirements, in order of precedence:

- 1) All requirements set forth in this document;
- 2) LP1-TKC-10XXX-I-I1-SPC-0006-0 Specification for Instrumentation Hardware – BOP;
- 3) Vol II E: Technical specifications for Instrumentation and Control.

11.4 Performance Guarantee

N/A

11.5 Attachments:

- i) LP1-TKC-10XXX-I-I1-SPC-0006-0 Specification for Instrumentation Hardware – BOP.

12. Instrumentation and Control Cable

12.1 Status

N/A

12.2 Scope of works

The Bidder shall be responsible for the design, supply, delivery to site, installation, and testing of all Instrumentation and Control (I&C) cables for the Plant, including instrument and control cables, power cables, fiber optic (FO) cables, special cables, and communication cables. In addition, the Bidder shall supply all necessary cable accessories required for termination such as conduit, cable glands, terminal lugs, cable markers, and wire markers.

The scope of supply shall cover all systems of the Plant, except for the following systems:

- Fire alarm and detection system;
- Coal handling system;
- Ash handling system;

- Limestone and gypsum handling system;
- Water Treatment Plant;
- Auxiliary boiler;
- ESP;
- FGD.

The Bidder shall also supply interface cables with common facilities such as the Coal Handling System (CHS), Ash Handling System (AHS), Limestone and gypsum handling system, Water Treatment Plant, CEMS, Fire alarm and detection system and other related auxiliary systems as required.

12.3 Detailed Requirements

The non-armoured instrumentation and control cables shall be accepted, other cable properties shall comply with the technical specification.

The Bidder shall ensure that the design and supply of the instrumentation and control cable fully comply with this document and the following Technical Requirements, in order of precedence:

- 1) All requirements set forth in this document;
- 2) LP1-TKC-10XXX-I-I1-SPC-0005-0 Specification for Instrumentation Cables
- 3) Vol II E: Technical specifications for Instrumentation and Control

12.4 Performance Guarantee

N/A

12.5 Attachments:

- LP1-TKC-10XXX-I-I1-SPC-0005-0 Specification for Instrumentation Cables

13. Panel, Junction Box, Local Panel, Rack

13.1 Status

N/A

13.2 Scope of works

The Bidder's Scope of Work shall include the design and engineering, manufacturing, procurement, delivery, and installation of panels, junction boxes, local panels, racks, instrument racks/boxes, and associated accessories.

The scope of supply shall cover all systems of the Plant, except for the following systems:

- ESP;
- FGD;
- CHS;
- AHS and Mill rejection system;
- Limestone and gypsum handling system;
- Water Treatment Plant;
- RAPH;
- Steam and Water Analysis System (SWAS);
- Chemical dosing system;
- CEMS;
- Auxiliary boiler;
- Turbine and Generator supply by GE;
- Pumps, fans, and coal mills, which are supplied by the Owner;
- CTCS/Debris filter system;
- Hydrogen generation plant;
- Fire Protection and Detection System.

The Bidder shall also supply the necessary local panels and junction boxes for interface with other common facilities such as the Coal Handling System, Ash Handling System, Water treatment system, ESP, FGD, etc if required.

13.3 Detailed Requirements

The Bidder shall ensure that the design and supply of the system fully comply with this document and the following Technical Requirements, in order of precedence:

- 1) All requirements set forth in this document;
- 2) Vol II E: Technical specifications for Instrumentation and Control

13.4 Performance Guarantee

N/A

13.5 Attachments:

- Vol II E: Technical specifications for Instrumentation and Control

14. Subsystems

14.1 Status

14.2 Scope of works

The Bidder shall be responsible for the complete design, engineering, supply, installation, testing, and commissioning of all Instrumentation and Control (I&C) equipment and systems required for the full automation, monitoring, and safe operation of the following systems, including integration with the plant-wide DCS where applicable.

List of systems:

- Ammonia unloading and storage system,
- Turbine Oil Purification System,
- Condensate Polishing System,
- Intake Chlorination System,
- Effluent Treatment System,
- Emergency Diesel Generator Set,
- HVAC.

14.3 Detailed Requirements

The Bidder shall ensure that the system design and supply fully comply with this document and the following Technical Requirements:

- 1) All requirements set forth in this document;
- 2) LP1-TKC-10RU-M-M27-SPC-2039 Specification for effluent and sewage conveyance and treatment system;

LP1-TKC-10PBN-M-M43-SPC-2040 Specification for Intake Chlorination System;

LP1-TKC-11XKA-E-E2-SPC-0012-0 Specification for Emergency DG set;

LP1-TKC-10QLD-M-M23-SPC-2042-0 Specification for Condensate Polishing Unit;

LP1-TKC-10QSV-M-M1B-SPC-2062 Specification for central lube oil;

LP1-TKC-10QCJ-M-M1A-SPC-2059 Specification for Ammonia Unloading and Storage System.

3) Vol II E: Technical specifications for Instrumentation and Control

14.4 Performance Guarantee

The Bidder shall carry out the work in accordance with the technical specifications and ensure stable operation within the tolerances permitted by relevant standards.

14.5 Attachments:

- Vol II E: Technical specifications for Instrumentation and Control;
- LP1-TKC-10RU-M-M27-SPC-2039 Specification for effluent and sewage conveyance and treatment system;
- LP1-TKC-10PBN-M-M43-SPC-2040 Specification for Intake Chlorination System;
- LP1-TKC-11XKA-E-E2-SPC-0012-0 Specification for Emergency DG set;
- LP1-TKC-10QLD-M-M23-SPC-2042-0 Specification for Condensate Polishing Unit;
- LP1-TKC-10QSV-M-M1B-SPC-2062 Specification for central lube oil;
- LP1-TKC-10QCJ-M-M1A-SPC-2059 Specification for Ammonia Unloading and Storage System.

SECTION III

SUB-SECTION

3.2 DETAILED REQUIREMENTS

ARTICLE

3.2.5 Electrical Requirement

[PII.CV.SIII.SS3.2 – Article 3.2.5]

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CHAPTER V – SECTION III

SUB-SECTION 3.2

ARTICLE 3.2.5 ELECTRICAL REQUIREMENT

The specification is intended to cover the design, supply, construction/erection (include related civil work) and commissioning of Electrical equipment and Accessories for the 2x600 MW Long Phu–1 Power Plant.

The scope of work shall also include design, manufacture, assembly, testing at manufacturer's works, supply & delivery, properly packed for transport to all equipment & materials specified hereinafter including transportation and transit insurance, complete with all auxiliaries and accessories for efficient and trouble-free operation in a manner acceptable to the Owner.

In general, three (3) types of documents are provided as follows:

- The requirements specified in this document
- The procurement specifications/engineering documents issued by PM/TKC during the previous EPC implementation stage (2014-2018)
- Original Request for Proposal (RFP) by Owner in bidding stage (2013).

To help the Contractor gain an overall understanding of the electrical materials and equipment within their scope of supply, the Owner has marked them on the single line diagram for the Contractor's reference. In the event of any ambiguity or conflict between the documents listed above, interpretation higher priority document shall prevail.

It's not intent to provide full description, status of packages and list out all documents in this updated specification. The Bidder shall be responsible for carefully reviewing, studying and finalizing engineering work, provide materials/equipment/services, construction & erection and testing, commissioning to ensure adequacy and completeness and meeting high degree of reliability and ease of operation of maintenance.

1. GENERATOR TRANSFORMERS

1.1 Status

Under the previous EPC contract, Power Machines (PM) signed a sub-contract with Power Machines - Toshiba (PMTT, Russia) for the supply of two (2) generator transformers (GT1 and GT2).

Generator transformers specification shown on document no.: LP1-TKC-11BAT-E-E1-SPC-0001

- GT1: Three nos. 252 MVA 1-phase, 23 kV/235 kV ($235\text{ kV}/\sqrt{3}$ for 1-phase), YNd11, 50Hz, 2-winding, outdoor, oil immersed, ONAN/ONAF/ODAF cooled.
- GT2: Three nos. 252 MVA 1-phase, 23 kV/525 kV ($525\text{ kV}/\sqrt{3}$ for 1-phase), YNd11, 50Hz, 2-winding, outdoor, oil immersed, ONAN/ONAF/ODAF cooled.

These generator transformers were successfully manufactured. During transportation, GT1 and two packages of GT2 (packages 5/12 and 8/12: including the manifold, CT mounting, and piping) fell into the Hau River and were damaged. Therefore, the status of the package is as follows:

- Design: 100%.
- Manufacturing: around 50% (GT2).
- Delivery: around 50%. GT2 has been delivered to the site and is currently being stored in the warehouse except (packages 5/12 and 8/12: including the manifold, CT mounting, and piping).
- Installation/Erection: 03 Main bodies of GT2 were put on its foundation.
- Commissioning: 0%

1.2 Scope of work

- **Engineering:**

The Bidder shall design new GT1 (including foundation modify (if any)) and design the two (02) damaged packages of GT2 to finalize the GT2.

- **Supply:**

Generator Transformer 1 (GT1):

The Bidder shall provide the GT1 transformer complete with all necessary accessories.

Each transformer shall be furnished complete with:

- Fittings and Accessories;
- Bushing Current Transformers;
- First filling of oil including 10% extra;

- Each transformer will be equipped with fittings and accessories complying with the requirement of EPC RFP specification, Volume-II/F1, Section IX and as per the standard fittings furnished by the bidder;
- Remote Tap Changing Control (RTCC) panel;
- Hydran type on-line gas in oil (DGA) monitor with all accessories for each transformer;
- Partial Discharge Analyzer (PDA) with all accessories for each transformer (Option);
- Marshalling Box for each transformer and Master Marshalling Box for each set of transformers for further interface with Plant DCS/remote mounted equipment and Protection System;
- Star point formation busbar, supporting post insulators and all necessary nuts, bolts, hardware & accessories as required;
- Special tools and tackle along with the equipment required for the erection, assembly, dis-assembly & maintenance of the equipment
- All the necessary start-up & commissioning spares parts, oil/lubricants/consumables;
- All anchor bolts, nuts, fasteners, embedded parts and any other likewise material required for installation of the transformers;
- All relevant drawings, data and instruction manuals;
- GT1 arrangement shall be matched with IPB (Isolate phase bus duct), GCB (Generator Circuit breaker) and existing Unit transformers of Unit #1 (Bidder to refer to drawing no.: LP1-PMTT-10BBT-E-E1-DAL-0001-C)

Generator Transformer 2 (GT2):

- For the two (02) damaged packages of GT2 transformer, the Bidder can purchase from the PMTT manufacturer (new company name is LLC Nevskiy Transformer) or some famous manufacturers or purchase directly from PMTT's subvendors (the list of subvendors is listed in document LP1-PMTT-10BAT-E-E1-LST-1002-A).

- The Bidder shall provide Partial Discharge Analyzer (PDA) with all accessories for each transformer of GT2 (Option).

• Delivery:

The Bidder shall be responsible for customs clearance, transportation (including both offshore and domestic), delivery to the Long Phu 1 site, and storage.

• Installation/Erection:

The Bidder shall perform installation, erection, alignment, and other related works for GT1, GT2 transformers in accordance with the Supplier's manual, erection procedures, and the Bidder's ITP approved by the Owner.

• Testing & commissioning:

The Bidder shall perform testing and commissioning of the equipment to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility]

- **Services**

The Bidder shall provide technical services for supervision during installation, testing, commissioning, and training of the Owner's personnel.

Refer to Table 08 [Division of Responsibility].

1.3 Detailed Requirements

For more details, the Bidder refers to Clause 8.00.00, 9.00.00, 10.00.00 and in document No. LP1-TKC-11BAT-E-E1-SPC-0001 [Specification for Generator Transformers] and Data Specification for Generator Transformers as the following table:

No.	Description	Ratings & Requirements
1	Rating (with both cooling units operating)	
	i) ONAN	50% of ODAF rating
	ii) ONAF	70% of ODAF rating
	iii) ODAF	100%
2	Number required	3 nos. of 1 phase Or 3-phase bank.
3.	Reference Standard	
	i) Power transformer	IEC 60076
	ii) Instrument transformer	IEC 61869
4	Rated Power	3 x 252 MVA (1-ph. bank) 756 MVA (3-ph bank)
5	Service	Outdoor, Step-up
6	Type	Oil immersed
7	i) Type of cooling	ONAN/ONAF/ODAF
	ii) Nos. of cooling units & each capacity	2 x 70%
	iii) Duration of remaining in operation during failure of oil pumps or fans without exceeding winding hot spot temperature of 140 deg C	10 minutes
	iv) Duration of remaining in operation during failure of oil pumps or fans associated with one (1) cooler without exceeding winding hot spot temperature of 115 deg C	20 minutes
8	Temperature rise above 40 Deg. C ambient temperature	

No.	Description	Ratings & Requirements
	a) In oil by thermometer	60 Deg. C
	b) In winding by resistance	65 Deg. C
9	Number of phases and frequency	1 ph, 50 Hz or 3 ph, 50 Hz
10	Winding per phase	2
11	Rated voltage	
	a) HV	235/ $\sqrt{3}$ kV (1-ph bank) Or 235 kV (3-ph bank)
	b) LV [Primary Voltage to match with Gen. Terminal voltage]	23 KV
12	a) Basic impulse level	
	i) HV	1050 kV Peak
	ii) HV Neutral	----
	iii) LV	125 kV peak
	b) Power frequency induced over voltage (1min.)	
	i) HV	460 kV rms
	ii) HV Neutral	38 kV rms
	iii) LV	50 kV rms
13.	Inter-phase connection considering 3 single phase units	
	a) HV	Wye with solidly grounded
	b) LV	Delta
14	Vector group reference	YNd11
15	Type of tap changing	On Load, full capacity (OLTC)
16	Taps provided on	HV winding
17	Range of taps	$\pm 10\%$ in steps of 1.25%
18	Number of taps	17
19	Method of tap change control	Local-Manual, LocalElectrical, Remote ElectricalManual and Remote Electrical-Automatic
20	Percentage impedance voltage at rated MVA (ODAF) & 75 deg.C	13.5%
21	System Grounding	
	a) HV	Solidly grounded
	b) LV	Non-effectively earthed through distribution transformer & Loading Resistor (Generator neutral side)

No.	Description	Ratings & Requirements
22	Over Voltage withstand capacity	• 110% of rated voltage for continuous operation • 125% rated voltage for a period of one minute • 140% of rated voltage for a period of five seconds.
23	Short Circuit withstand capacity	
	Transformer will be able to withstand short circuit stresses due to terminal fault on one winding with full voltage maintained on other winding for a minimum period of	2 seconds
24	System Fault level	
	HV	50 kA for 3 seconds
25	Terminal arrangement	
	a) HV	Terminal bushing suitable for overhead conductor termination
	b) LV	Suitable for connecting to isolated phase bus duct (IPB) and to form delta connection by IPB for 3 nos. of 1-ph TRF
	c) HV Neutral	Bushing
26	Neutral terminals	
	a) HV	Yes
	b) LV	None
27	Type of Bushings	
	a) HV	Oil impregnated paper condenser type.
	b) LV	Solid porcelain type suitable for IPB connection.
	c) HV neutral	Solid porcelain type.
28	Minimum clearances at HV side	
	Phase to Earth	2100 mm
29	Creepage distance	31 mm/kV

1.4 Performance Guarantee

The performance figures quoted in technical particular sheets shall be guaranteed within the tolerance permitted by relevant standards. In case of failure of the equipment to meet the guarantee, Owner shall have the right to reject the equipment.

The Bidder shall guarantee the following performance figures of the equipment:

No.	Description	Value in KW
1	Generator Transformer GT1	
a)	No-load loss	
b)	Load loss	
c)	Cooler loss	

1.5 Attachments

- 1) Specification for Generator Transformers.
- 2) Detailed design.
- 3) Detailed Packing List of delivered equipment.
- 4) Detailed Packing List of Damaged Parts of Generator Transformers GT2.
- 5) Design Change Request.

2. UNIT TRANSFORMER

2.1 Status

Under the previous EPC contract, Power Machine - Toshiba (PMTT – Russia) signed the contract with PM to supply four (4) nos. Unit Transformer 72 MVA – 23 kV/10.5 kV/10.5kV (3-phase) and technical services.

These Unit transformers were successfully manufactured. The status of the package is as follows:

- Design: 100%.
- Manufacturing: 100%
- Delivery: 100%.
- Installation, commissioning: 3/4 main bodies of Unit Transformers were put on its foundation.
- Civil work: Three out of four Unit Transformer foundations have been completed; the remaining one is still under construction.

2.2 Scope of work

- **Engineering:** N/A
- **Supply:** N/A
- **Delivery:** N/A
- **Installation/Erection:**

The Bidder shall perform installation, erection, alignment, and other related works for Unit transformers in accordance with the Supplier's manual, erection procedures, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning:**

The Bidder shall perform testing and commissioning of the equipment to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility].

- **Services**

The Bidder shall provide technical assistance services for supervision during installation, testing, commissioning, and training of the Owner's personnel.

Refer to Table 08 [Division of Responsibility].

2.3 Detailed Requirements

For more details, the Bidder refers to Technical requirements specified in document No. LP1-TKC-11BBT-E-E1-SPC-0020 [Specification for Unit Transformer] as attached..

2.4 Performance Guarantee

N/A

2.5 Attachments

- 1) Specification for Unit Transformer.
- 2) Detailed design.
- 3) Detailed Packing List of delivered equipment.

3. STATION TRANSFORMER

3.1 Status

Under the previous EPC contract, Power Machines (PM) signed a sub-contract with Hyundai Heavy Industries (HHI – Korea) to supply one (1) Station Transformer 120 MVA – 220 kV/10.5 kV/10.5 kV (3-phase) and technical services.

The Station Transformer was successfully manufactured. However, HHI has already sold this transformer as surplus/disposal. Therefore, the status of the package is as follows:

- Design: 100%.
- Manufacturing: 0%
- Delivery: 0%.
- Civil work: The foundation has been completed
- Installation, commissioning: 0%

3.2 Scope of work

- **Engineering:**

The Bidder shall design and finalize the engineering for the Station Transformer in compliance with the technical requirements.

- **Supply:**

The Bidder shall provide the station transformer complete with all necessary accessories.

The transformer shall be furnished complete with:

- Fittings and Accessories
- Bushing Current Transformers
- First filling of oil including 10% extra
- The transformer will be equipped with fittings and accessories complying with the requirement of EPC RFP specification, Volume-II/F1, Section XI and as per the standard fittings furnished by the bidder
- Remote Tap Changing Control (RTCC) panel
- Hydran type on-line gas in oil monitor with all accessories for each transformer.
- Special tools and tackle along with the equipment required for the erection, assembly, dis-assembly & maintenance of the equipment.
- All the necessary start-up & commissioning spares parts, oil/lubricants/consumables;
- All anchor bolts, nuts, fasteners, embedded parts and any other likewise material required for installation of the transformers.
- All related civil work.
- All relevant drawings, data and instruction manuals.

- **Delivery:**

The Bidder shall be responsible for customs clearance, transportation (including both offshore and domestic), delivery to the Long Phu 1 site, and storage.

- **Installation/Erection:**

The Bidder shall perform installation, erection, alignment, and other related works for the station transformer in accordance with the Supplier's manual, erection procedures, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning:**

The Bidder shall perform testing and commissioning of the equipment to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility]

- **Services**

The Bidder shall provide technical services for supervision during installation, testing, commissioning, and training of the Owner's personnel.

Refer to Table 08 [Division of Responsibility].

3.3 Detailed Requirements

For more details, the Bidder refers to Clause 8.00.00, 9.00.00, 10.00.00 in document No: LP1-TKC-10BBT-E-E1-SPC-0019 [Specification for Station Transformer] as attached and Data Specification for Station Transformers as the following table:

No.	Description	Ratings & Requirements
1	Rating (with both cooling units operating)	
	i) ONAN	50% of ONAF rating
	ii) ONAF	100%
2	Number required	1 nos
3.	Reference Standard	IEC 60076
4	Rated Power	120/60/60 MVA (ONAF) 84/42/42 MVA (ONAN)
5	Service	Outdoor, Step-down
6	Type	3-winding(with tertiary delta), Oil immersed
7	i) Type of cooling	ONAN/ONAF
	ii) Nos. of cooling units & each capacity	2 x 70%
	iii) Duration of remaining in operation during failure of oil pumps or fans without exceeding winding hot spot temperature of 140 deg C	10 minutes
	iv) Duration of remaining in operation during failure of oil pumps or fans associated with one (1) cooler without exceeding winding hot spot temperature of 115 deg C	20 minutes
8	Temperature rise above 40 Deg. C ambient temperature	
	a) In oil by thermometer	60 Deg. C
	b) In winding by resistance	65 Deg. C
9	Number of phases and frequency	3 ph, 50 Hz
10	Winding per phase	3
11	Rated voltage (line to line)	
	a) HV	220 kV
	b) LV1	10.5 kV

No.	Description	Ratings & Requirements
	c) LV2	10.5 kV
12	a) Basic impulse level	
	i) HV	1050 kV Peak
	ii) LV	75 kV Peak
	iii) HV Neutral	----
	iv) LV Neutral	75 kV Peak
	b) Power frequency induced over voltage (1min.)	
	i) HV	460 kV rms
	ii) LV	28 kV rms
	iii) HV Neutral	38 kV rms
	iv) LV Neutral	28 kV rms
13.	Inter-phase connection	
	a) HV	Wye with solidly grounded
	b) LV1/LV2	Wye with resistance grounded
14	Vector group reference	YNyn0yn0d11
15	Type of tap changing	On Load Tap Changer (OLTC)
16	Taps provided on	HV winding
17	Range of taps	± 10% in steps of 1.25%
18	Number of taps	17
19	Method of tap change control	Local-Manual, Local-Electrical, Remote Electrical-Manual and Remote Electrical-Automatic
20	Percentage impedance voltage at rated MVA (ONAF) & 75 deg.C	13.5%
	i) HV – LV1	24%
	ii) HV – LV2	24%
	iii) LV1 – LV2	44%
	iv) Positive & Negative Tolerances	±5%
21	System Grounding	
	a) HV	Solidly grounded
	b) LV	Resistance grounded
	c) LV Tertiary winding	One corner of the delta winding is solidly grounded
22	N/A	
23	Short Circuit withstand capacity	
	Transformer will be able to withstand short circuit stresses due to terminal fault on	2 seconds

No.	Description	Ratings & Requirements
	one winding with full voltage maintained on other winding for a minimum period of	
24	System Fault level	
	HV	50 kA for 3 seconds
25	Terminal arrangement	
	a) HV	Tank mounted bushing for overhead conductor connection
	b) LV	Tank mounted bushing for segregated phase bus duct (SPB) connection
	c) HV Neutral	Tank mounted bushing
	d) HV Neutral	Tank mounted bushing with detachable type cable end box.
	e) LV tertiary winding one corner grounding connection	Tank mounted bushing
26	Type of Bushings	
	a) HV	Oil impregnated paper condenser type
	b) LV	Solid porcelain type
	c) HV Neutral	Solid porcelain type
	d) HV Neutral	Solid porcelain type
	e) LV tertiary winding one corner grounding connection	Solid porcelain type
27	Minimum clearances at HV side	
	Phase to Phase	2100 mm
	Phase to Earth	2100 mm
28	Creepage distance	31 mm/kV

3.4 Performance Guarantee

The performance figures quoted in technical particular sheets shall be guaranteed within the tolerance permitted by relevant standards. In case of failure of the equipment to meet the guarantee, Owner shall have the right to reject the equipment.

The Bidder shall guarantee the following performance figures of the equipment

No.	Description	Value in KW
1	Station Transformer Losses	
a)	No-load loss	

b)	Load loss	
c)	Cooler loss	

3.5 Attachments

- 1) Specification for Station Transformer;
- 2) Detailed design document.

4. AUXILIARY TRANSFORMERS

4.1 Status

Under the previous EPC contract, Hyundai Heavy Industries (HHI – Korea) signed the contract with Power Machines to supply Auxiliary Transformers (dry and oil-immersed type) and technical service.

These Auxiliary Transformers were successfully manufactured. However, HHI has already sold these transformers as surplus/disposal. Therefore, the status of the package is as follows:

- Design: 100%.
- Manufacturing: 0%
- Delivery: 0%.
- Installation, commissioning: 0%

4.2 Scope of work

• Engineering:

The Bidder shall design and finalize the engineering for the Auxiliary Transformers in compliance with the technical requirements.

• Supply:

The transformers shall be furnished complete with:

- Fittings and Accessories
- Bushing Current Transformers
- First filling of oil including 10% extra
- Special tools and tackle along with the equipment required for the erection, assembly, dis-assembly & maintenance of the equipment.
- All the necessary start-up & commissioning spares parts, oil/lubricants/consumables;
- All anchor bolts, nuts, fasteners, embedded parts and any other likewise material required for installation of the transformers.
- All relevant drawings, data and instruction manuals.

The following 10/3.15KV Aux. Transformers shall be furnished with all accessories by the bidder:

Sl No	KKS	Rating	Type	Description	Remarks
1	11BCT12	10.5/15 MVA, 10/3.15 kV, Z-10% (with IEC tol)	ONAN/ONAF	Unit Auxiliary Transformer	
2	11BCT22	10.5/15 MVA, 10/3.15 kV, Z-10% (with IEC tol)	ONAN/ONAF	Unit Auxiliary Transformer	
3	10BCT21	8.75/12.5 MVA, 10/3.15 kV, Z-8%(with IEC tol)	ONAN/ONAF	Station Auxiliary Transformer	
4	10BCT41	8.75/12.5 MVA, 10/3.15 kV, Z-8%(with IEC tol)	ONAN/ONAF	Station Auxiliary Transformer	
5	12BCT12	10.5/15 MVA, 10/3.15 kV, Z-10% (with IEC tol)	ONAN/ONAF	Unit Auxiliary Transformer	
6	12BCT22	10.5/15 MVA, 10/3.15 kV, Z-10% (with IEC tol)	ONAN/ONAF	Unit Auxiliary Transformer	

The following 10/0.420KV and 3/0.420KV Auxiliary Transformers shall be furnished with all accessories by the bidder:

Sl No	KKS	Rating	Type	Description	Remarks
1	11BFT11	2.5 MVA, 10/0.420 kV, Z-10% (with IEC tol)	AN	Boiler Service Transformer	
2	11BFT21	2.5 MVA, 10/0.420 kV, Z-10% (with IEC tol)	AN	Boiler Service Transformer	
3	11BFT12	1.6 MVA, 10/0.420 kV, Z-6.5% (with IEC tol)	AN	Turbine Service Transformer	
4	11BFT22	1.6 MVA, 10/0.420 kV, Z-6.5% (with IEC tol)	AN	Turbine Service Transformer	
5	11BFT13	3 MVA, 10/0.420 kV, Z-10.5% (with IEC tol)	AN	ESP Auxiliary Transformer	
6	11BFT23	3 MVA, 10/0.420 kV, Z-10.5% (with IEC tol)	AN	ESP Auxiliary Transformer	
7	10BFT11	2.5 MVA, 10/0.420 kV, Z-10% (with IEC tol)	AN	Station Service Transformer	
8	10BFT31	2.5 MVA, 10/0.420 kV, Z-10% (with IEC tol)	AN	Station Service Transformer	
9	10BFT21	2.5 MVA, 10/0.420 kV, Z-10% (with IEC tol)	AN	Station Service Transformer	

Sl No	KKS	Rating	Type	Description	Remarks
10	10BFT41	2.5 MVA, 10/0.420 kV, Z-10% (with IEC tol)	AN	Station Service Transformer	
11	10BFT22	2 MVA, 10/0.420 kV, Z-7.25% (with IEC tol)	ONAN	WTP Aux. Transformer	
12	10BFT42	2 MVA, 10/0.420 kV, Z-7.25% (with IEC tol)	ONAN	WTP Aux. Transformer	
13	10BFT24	2.5 MVA, 3/0.420 kV, Z-10% (with IEC tol)	ONAN	CWPH Aux. Transformer	
14	10BFT44	2.5 MVA, 3/0.420 kV, Z-10% (with IEC tol)	ONAN	CWPH Aux. Transformer	
15	12BFT11	2.5 MVA, 10/0.420 kV, Z-10% (with IEC tol)	AN	Boiler Service Transformer	
16	12BFT21	2.5 MVA, 10/0.420 kV, Z-10% (with IEC tol)	AN	Boiler Service Transformer	
17	12BFT12	1.6 MVA, 10/0.420 kV, Z-6.5% (with IEC tol)	AN	Turbine Service Transforme	
18	12BFT22	1.6 MVA, 10/0.420 kV, Z-6.5% (with IEC tol)	AN	Turbine Service Transforme	
19	12BFT13	3 MVA, 10/0.420 kV, Z-10.5% (with IEC tol)	AN	ESP Auxiliary Transformer	
20	12BFT23	3 MVA, 10/0.420 kV, Z-10.5% (with IEC tol)	AN	ESP Auxiliary Transformer	
21	11BMT16	2 MVA, 3/0.420 kV, Z-7.25% (with IEC tol)	AN	Em. System Aux. Transformer	
22	11BMT26	2 MVA, 3/0.420 kV, Z-7.25% (with IEC tol)	AN	Em. System Aux. Transformer	
23	12BMT16	2 MVA, 3/0.420 kV, Z-7.25% (with IEC tol)	AN	Em. System Aux. Transformer	
24	12BMT26	2 MVA, 3/0.420 kV, Z-7.25% (with IEC tol)	AN	Em. System Aux. Transformer	
25	10BFT28	2.5 MVA, 10/0.420 kV, Z-10% (with IEC tol)	ONAN	Waste Water Treatment Service Transformer	
26	10BFT48	2.5 MVA, 10/0.420 kV, Z-10% (with IEC tol)	ONAN	Waste Water Treatment Service Transformer	
27	10BFT12	1 MVA, 10/0.420 kV, Z-5% (with IEC tol)	AN	Admin Bldg Aux. Transformer	

Sl No	KKS	Rating	Type	Description	Remarks
28	10BFT32	1 MVA, 10/0.420 kV, Z-5% (with IEC tol)	AN	Admin Bldg Aux. Transformer	
29	10BFT29	2 MVA, 10/0.420 kV, Z-7.25% (with IEC tol)	ONAN	WTP Aux. Transformer	
30	10BFT49	2 MVA, 10/0.420 kV, Z-7.25% (with IEC tol)	ONAN	WTP Aux. Transformer	

- **Delivery:**

The Bidder shall be responsible for customs clearance, transportation (including both offshore and domestic), delivery to the Long Phu 1 site, and storage.

- **Installation/Erection:**

The Bidder shall perform installation, erection, alignment, and other related works for the Auxiliary Transformers in accordance with the Supplier's manual, erection procedures, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning:**

The Bidder shall perform testing and commissioning of the equipment to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility]

- **Services**

The Bidder shall provide technical services for supervision during installation, testing, commissioning, and training of the Owner's personnel.

Refer to Table 08 [Division of Responsibility].

4.3 Detailed Requirements

- 10/3.15 kV Auxiliary Power Transformer will be equipped with fittings and accessories complying with the requirement of EPC RFP specification, Volume-II/F2, Section VI and as per the standard fittings furnished by the bidder.
- 10/0.420 kV and 3/0.420KV Auxiliary Power Transformer will be equipped with fittings and accessories complying with the requirement of EPC RFP specification, Volume-II/F2, Section II and as per the standard fittings furnished by the bidder.
- For more details, the Bidder refers to Clause 8.00.00, 9.00.00, 10.00.00 and APPENDIX-1A, APPENDIX-1B [Data Specification Sheet] in document No. LP1-TKC-10BCT-E-E1-SPC-0005 [Specification for Auxiliary Transformer] as attached.

4.4 Performance Guarantee

The performance figures quoted in technical particular sheets shall be guaranteed within the tolerance permitted by relevant standards. In case of failure of the equipment to meet the guarantee, Owner shall have the right to reject the equipment.

The Bidder shall guarantee the following performance figures of the equipment

No.	Description	Value in KW
1	Unit Auxiliary Transformer Losses (11BCT12)	
a)	No-load loss	
b)	Load loss	
c)	Cooler loss	
2	Unit Auxiliary Transformer Losses (11BCT22)	
a)	No-load loss	
b)	Load loss	
c)	Cooler loss	
3	Unit Aux Transformer Losses (12BCT12)	
a)	No-load loss	
b)	Load loss	
c)	Cooler loss	
4	Unit Aux Transformer Losses (12BCT22)	
a)	No-load loss	
b)	Load loss	
c)	Cooler loss	
5	Station Aux Transformer Losses (10BCT21)	
a)	No-load loss	
b)	Load loss	
c)	Cooler loss	

No.	Description	Value in KW
6	Station Aux Transformer Losses (10BCT41)	
a)	No-load loss	
b)	Load loss	
c)	Cooler loss	

4.5 Attachments

- 1) Specification for Auxiliary Transformers.
- 2) Detailed design.
- 3) Key Single Diagram (Bidder's scope)

5. 500KV, 220KV INTERCONNECTION SYSTEM

5.1 Status

Under the previous EPC contract, Fortek (FTK – Korea) signed the contract with Power Machines to supply equipment for 500 kV, 220 kV Interconnection system from Long Phu 1 Power Plant to Long Phu Switchyard 500 kV, as follows:

- Supply the 220 kV overhead transmission line for Generator step-up Transformer of unit 1 and Station Transformer;
- Supply 500 kV Overhead line for Generator step-up Transformer of unit 2. The overhead transmission line along with all necessary equipment like insulators, jumper ect for erection. Additionally, the lightning protection line is included in this scope.
- 06 (six) Lightning Arrestor (LA) 198 kV; 03 (three) LA 480 kV;
- 06 (six) Current Transformer (CT) 220 kV; 03 (three) CT 500 kV;
- 06 (six) Capacitive Voltage Transformer (CVT) 220 kV; 03 (three) CVT 500 kV;
- Conductor :
 - + 3 x AAC625 per phase for Generator Transformer Unit 1;
 - + 2 x AAC330 per phase for Station Transformer;
 - + 2 x AAC625 per phase for Generator Transformer Unit 2.
- Post insulation; Terminal Pad at equipment terminals for LA, CT, CVT, and Post insulator; Hardware like insulators, clamps, connectors, spacer.
- 08 (eight) galvanized steel structure take-off Gantries (06 for Unit 1, 02 for Unit 2) and 02 Towers for Unit 2, see detail in LP1-FTK-10XXX-E-E1-DAL-

0003. Galvanized Steel structure for LA, CVT, CT at Long Phu 1 Power Plant project.

- Tool and tackles for carrying out the stringing and interconnection job.

All equipment were successfully manufactured. FTK has already sold these equipment as surplus/disposal. Therefore, the status of the package is as follows:

- Design: 100%.
- Manufacturing: 0%
- Delivery: 0%.
- Installation, commissioning: 0%

5.2 Scope of work

- **Engineering:**

The Bidder shall design and finalize the engineering for the 500 kV and 220 kV interconnection system in compliance with the technical requirements. Currently, the transmission line from the high-voltage side of the step-up transformer Unit 2 to the gantry of the 500kV Long Phu switchyard uses 2xAAC 625mm² conductors per phase. The Bidder is requested to recalculate and consider the use of triple (3) conductors per phase to ensure the safe operation of the 500kV transmission line.

- **Supply:**

The work involves timely procurement and transportation of all hardware, materials, and miscellaneous items necessary to complete the supply and erection job as specified for the interconnection between Long Phu 1 Power Plant and the 500/220 kV switchyard. All items must be delivered to the site in a properly packed condition.

- a) Supply of 220 kV overhead line conductors up to and including take-off gantry for Generator Step-up Transformer of unit-1 and up to take off gantry at 220kV switchyard along with all necessary equipment/materials for erection.
- b) Supply of 220 kV overhead line conductors up to and including take-off gantry for Station Transformer and up to take off gantry at 220kV switchyard along with all necessary equipment/materials for erection.
- c) Supply of 500 kV overhead line conductors up to and including take-off gantry for Generator Step-up Transformer of unit-2 and up to take off gantry at 500 kV switchyard along with all necessary equipment/materials for erection.
- d) Supply of conductors for dropper connections from line to equipment (LA, CVT & CT) at Long Phu-1 power plant side, along with necessary terminals and connectors.
- e) Supply of Lightning Arrester (including supply of equipment structures) for Generator Step- up Transformers of unit-1 and unit-2 and Station Transformer at power plant side.

- f) Supply of CVT for tariff metering (including supply of equipment structures) for Generator Step-up Transformers of unit-1 and unit-2 and Station Transformer at power plant side.
- g) Supply of CT for tariff metering (including supply of equipment structures) for Generator Step-up Transformers of unit-1 and unit-2 and Station Transformer at power plant side.
- h) Supply of 220 kV and 500 kV Post insulators (PI) near Generator Transformer of Unit-1 and Unit-2
- i) Necessary terminal pads at equipment terminals for LA, CVT, CT and Post Insulator (PI) for dropper connections and line connections at Long Phu1 power plant side.
- j) All hardware like insulators, clamps, connectors, AAC conductors, spacers, sag compensators, junction boxes, equipment terminal connectors etc. as per the requirement to complete the work.
- k) Supply of lightning protection wires.
- l) Supply necessary materials and installation the following:
 - Galvanized steel structures for CT, CVT, LA for 220 kV and 500 kV system at Long Phu1 Power Plant.
 - Galvanized steel gantry structures (GT-1, GT-2, GT-3, GT-4, GT-5, GT-6, GT-7 & GT-8) as per the attached drawing
 - Galvanized steel structures for towers T2-1 and T2-2
- m) All necessary tools and tackles for carrying out the stringing and interconnection job .
- n) All the necessary start-up & commissioning spares parts, oil/lubricants/consumables
- o) Civil & Structural Work:

The scope of civil & structural work as required comprises design and construction including supply of all materials and equipment foundations, GI steel structure etc. required for this work including, but not limited to the following:

- Foundations of all equipment like LA, CT, PI and CVT at Long Phu 1 power plant side.
- Foundations of all gantry structures.
- Foundations of all towers.

- **Delivery:**

The Bidder shall be responsible for customs clearance, transportation (including both offshore and domestic), delivery to the Long Phu 1 site, and storage.

- **Installation/Erection:**

The Bidder shall perform installation, erection, alignment, and other related works for the 500 kV, 220 kV Interconnection system in accordance with the Supplier's manual, erection procedures, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning:**

The Bidder shall perform testing and commissioning of the equipment to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility]

- **Services**

The Bidder shall perform the verification and calibration of equipment samples related to metering, such as CTs, VTs, meter, etc.

The Bidder shall provide technical services for supervision during installation, testing, commissioning, and training of the Owner's personnel.

Refer to Table 08 [Division of Responsibility].

5.3 Detailed Requirements

For more details, the Bidder refers to Clause Technical requirements specified in document No. LP1-TKC-10ABZ-E-E2-SPC-0014-1: [Specification for 500 kV/220 kV System Interconnection] as attachment.

Bidders should take note to study Vietnam's current electricity market regulations in order to design and procure CTs and VTs in compliance with electricity metering requirements.

5.4 Performance Guarantee

The performance figures quoted in technical particular sheets shall be guaranteed within the tolerance permitted by relevant standards. In case of failure of the equipment to meet the guarantee, Owner shall have the right to reject the equipment.

5.5 Attachments

- 1) Specification for 500 kV/220 kV System Interconnection
- 2) Detailed design.

6. 10 KV & 3 KV SEGREGATED PHASE BUSDUCT

6.1 Status

Under the previous EPC contract, Cadivi (Vietnam) signed the contract with Power Machines to supply 10 kV & 3 kV segregated phase busduct and technical service. The status of the package is as follows:

- Design: 50%.
- Manufacturing: 0%

– Delivery: 0%.

Installation, commissioning: 0%

6.2 Scope of work

- **Engineering:**

The Bidder shall design and finalize the engineering for the 10 kV & 3 kV segregated phase busduct in compliance with the technical requirements.

- **Supply:**

10 kV & 3 kV segregated phase bus duct as per Appendix-1 in document No. LP1-TKC-10XXX-E-E2-SPC-0017 [Specification for Segregated Phase Busduct] as attachment.

Each of the required sets of 10 kV & 3 kV segregated phase bus ducts complete with all accessories and the auxiliary equipment in accordance with attachments in No. LP1-TKC-10XXX-E-E2-SPC-0017.

Hot air blowing equipment.

All supporting steel structures and hardware, which form part of the complete installation of the equipment. The offer for the equipment shall include steel foundation frame, anchor bolts, holding down bolts, buses, insulators, flexible connectors, etc., required for all mechanical and electrical items. All steel structures for supporting the bus duct shall be under the scope of this specification.

Special tools and tackle.

All the necessary start-up & commissioning spares parts, oil/lubricants/consumables.

All civil and structural work

All relevant drawings, data and instruction manuals.

- **Delivery:**

The Bidder shall be responsible for customs clearance, transportation (including both offshore and domestic), delivery to the Long Phu 1 site, and storage.

- **Installation/Erection:**

The Bidder shall perform installation, erection, alignment, and other related works for the 10 kV & 3 kV segregated phase bus ducts in accordance with the Supplier's manual, erection procedures, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning:**

The Bidder shall perform testing and commissioning of the equipment to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility]

- **Services**

The Bidder shall provide technical assistance services for supervision during installation, testing, commissioning.

Refer to Table 08 [Division of Responsibility].

6.3 Detailed Requirements

For more details, the Bidder refers to document No: LP1-TKC-10XXX-E-E2-SPC-0017 [Specification for Segregated Phase Busduct] as attachment.

6.4 Performance Guarantee

The performance figures quoted in technical particular sheets shall be guaranteed within the tolerance permitted by relevant standards. In case of failure of the equipment to meet the guarantee, Owner shall have the right to reject the equipment.

6.5 Attachments

- 1) Specification for 10 kV, 3 kV Segregated Phase Busduct
- 2) Detailed design.

7. 10 KV & 3 KV MV SWITCHGEARS

7.1 Status

LS VINA (Vietnam) signed the contract with the Owner to supply 10 kV & 3 kV Switchgear and technical services, as follows:

- No. 138 sets 10 kV Switchgear;
- No. 115 sets 3 kV Switchgear;
- Automatic bus transfer will be achieved through an intelligence relay based high speed bus transfer device mounted as part of the switchgear.

Technical services: supervision for installation, commissioning and Training for the Owner's personnel.

The status of the package is as follows:

- Design: 100%.
- Manufacturing: 100%
- Delivery: 0%.
- Installation, commissioning: 0%

For more details, the Bidder refers to Technical requirements specified in document No. LP1-TKC-10BBA-E-E2-SPC-0004 [Specification for 10 kV & 3 kV MV Switchgears] as attachment

7.2 Scope of work

- **Engineering: N/A**
- **Supply: N/A**

- **Delivery: N/A**

- **Installation/Erection:**

The Bidder shall perform installation, erection, alignment, and other related works for the 10 kV & 3 kV MV Switchgears in accordance with the Supplier's manual, erection procedures, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning:**

The Bidder shall perform testing and commissioning of the equipment to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility]

- **Services**

The Owner shall be responsible for the procurement and handover to the Bidder. The Bidder's scope of services includes installation, testing, commissioning.

Refer to Table 08 [Division of Responsibility].

7.3 Detailed Requirements

For more details, the Bidder refers to document No. LP1-TKC-10BBA-E-E2-SPC-0004 [Specification for 10 kV & 3 kV MV Switchgears] as attachment.

7.4 Performance Guarantee

The performance figures quoted in technical particular sheets shall be guaranteed within the tolerance permitted by relevant standards. In case of failure of the equipment to meet the guarantee, Owner shall have the right to reject the equipment.

7.5 Attachments

- 1) Specification for 10 kV & 3 kV MV Switchgears
- 2) Detailed design.
- 3) Key Single Line Diagram (LSEVN's scope)

8. 220 V DC SYSTEM

8.1 Status

Under the previous EPC contract, CEG (Italia) signed the contract with Power Machines to supply 05 (five) sets of 220 V DC system and technical services for Boiler-Turbine-Generator (BTG) for Unit 1, Unit 2. The status of the package is as follows:

- Design: 65.9%.
- Manufacturing: 0%
- Delivery: 0%.
- Installation, commissioning: 0%

8.2 Scope of work

- **Engineering:**

The Bidder shall design and finalize the engineering for the 220 V DC system in compliance with the technical requirements.

- **Supply:**

220 V D.C. System of BTG unit-1 shall consist of 2x100% sets of lead Acid Plante type 220 V Battery banks and 2x100% chargers (one 100% float-cum-boost charger and one 100% float charger for each battery bank).

220 V D.C. System of BTG unit-2 shall consist of 2x100% sets of Lead Acid Plante Type 220 V Battery banks and 2x100% chargers (one 100% float-cum-boost charger and one 100% float charger for each battery bank).

Type, rating and connections of the equipment listed below are as per Appendix-1 in document No. LP1-TKC-11BTA-E-E2-SPC-0021-0: [Specification for 220 V DC System].

Each set of battery and battery charger shall be supplied complete with fittings and accessories.

Base channel frame, floor channel sill, and kick plates for all floor-mounted charger panels, complete with holding down bolts and nuts.

Special tools and tackle along with the equipment required for the erection, assembly, dis-assembly & maintenance of the equipment.

All the necessary start-up & commissioning spares parts, oil/lubricants/consumables;

Any other equipment necessary for completeness of the system.

All relevant drawings, data and instruction manuals.

- **Delivery:**

The Bidder shall be responsible for customs clearance, transportation (including both offshore and domestic), delivery to the Long Phu 1 site, and storage.

- **Installation/Erection:**

The Bidder shall perform installation, erection, alignment, and other related works for the 220 V DC system in accordance with the Supplier's manual, erection procedures, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning:**

The Bidder shall perform testing and commissioning of the equipment to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility]

- **Services**

The Bidder shall provide technical assistance services for supervision during installation, testing, commissioning, and training of the Owner's personnel.

Refer to Table 08 [Division of Responsibility].

8.3 Detailed Requirements

For more details on technical requirement, the Bidder refers to document No. LP1-TKC-11BTA-E-E2-SPC-0021-0: [Specification for 220 V DC System] as attachment.

8.4 Performance Guarantee

The performance figures quoted in technical particular sheets shall be guaranteed within the tolerance permitted by relevant standards. In case of failure of the equipment to meet the guarantee, Owner shall have the right to reject the equipment.

8.5 Attachments

- 1) Specification for 220 V DC System (With lead acid battery)
- 2) Detailed design.
- 3) LP1-TKC-11BTA-E-E2-CAL-531: Sizing Calculation 220 V battery (lead acid-plante) & Battery charger (for Unit & Station excluding Coal Handling Plant (CHP) & Ash Handling Plant (ASH))
- 4) Design Change Requests (DCRs).

9. 400V PCC/MCC, ACDB & DCDB AND NON-SEGREGATED PHASE BUS DUCT

9.1 Status

Under the previous EPC contract, Cadivi (Vietnam) signed the contract with Power Machines to supply equipment/material and technical services, as follows:

- Power Control Centre (PCC); Motor Control Centre (MCC); AC Distribution Board (ACDB); DC Distribution Board (DCDB); 230V 1 Ph. Distribution Board; Local Push Button Stations (LPBS); DC Starter Panel. Technical specifications shall comply with Appendix-1“Data specification sheet for 400V PCC/MCC, ACDB & DCDB and Busduct”, as outlined in the Specification.
- 400V AC non-segregated phase busduct for interconnection between the LV side of the Transformer & PCC. The rated continuous current is mentioned in serial number F - List of busduct in Appendix 1.
- 950V AC, 5000A non-segregated phase Busduct complete with all accessories and the auxiliary equipment for interconnection between the secondary side of Excitation Transformer & Excitation Panel.
- 650V DC, 5500A non-segregated phase Busduct complete with all accessories and the auxiliary equipment for interconnection between the Excitation Panel and Generator Field.

- All above equipment shall be furnished complete with all accessories.

The status of the package is as follows:

- Design:
 - + LV Non-Segregated Phase Busduct: 40%
 - + 400V LV PCC & Motor Control Center (MCC): 100%
- Manufacturing 0%.
- Delivery: 0%.
- Installation, commissioning: 0%.

9.2 Scope of work

• Engineering:

The Bidder shall design and finalize the engineering for the 400v PCC/MCC, ACDB & DCDB And Non-Segregated Phase Bus Duct in compliance with the technical requirements.

• Supply:

400V PCC/MCC, ACDB & DCDBs and non-segregated phase busducts shall be as per Appendix-1 in document No: LP1-TKC-10BFA-E-E2-SPC-0006 [Specification 400V PCC/MCC, ACDB & DCDBs and non-segregated phase busduct] as attachment.

The following equipment shall be furnished complete with all accessories:

- Power Control Centre (PCC).
- Motor Control Centre (MCC).
- AC Distribution Board (ACDB).
- DC Distribution Board (DCDB).
- 230V 1 Ph. Distribution Board.
- Local Push Button Stations (LPBS)
- DC Starter Panel

Breaker lifting and handling trolley.

Racking in/out handle for breakers.

Each of the required sets of 400V non-segregated phase Busduct complete with all accessories and the auxiliary equipment.

950V AC, 5000A non-segregated phase Busduct complete with all accessories and the auxiliary equipment for interconnection between the secondary side of Excitation Transformer & Excitation Panel.

650V DC, 5500A non-segregated phase Busduct complete with all accessories and the auxiliary equipment for interconnection between the Excitation Panel and Generator Field.

Special tools and tackle along with the equipment required for the erection, assembly, dis-assembly & maintenance of the equipment.

All the necessary start-up & commissioning spares parts, oil/lubricants/consumables;

All relevant drawings, data and instruction manuals.

List of PCCs / MCCs/ DBs

The quantity indicated is for bidding purpose only. The actual quantity shall however be finalized during detail engineering.

➤ 400V PCC

- 400V Boiler PCC (11BFA11/21, 12BFA11/21)
- 400V Unit Turbine PCC (11BFA12/22, 12BFA12/22)
- 400V Station PCC (10BFB11/31, 10BFB21/41)
- 400V Admn Bldg. PCC (10BFB12/32)
- 400V Intake Water, CW & Fuel Oil PCC (10BFB24/44)
- 400V Water Treatment Plant PCC-1 (10BFB22/42)
- 400V Water Treatment Plant PCC-2 (10BFB29/49)
- 400V Sand Settling Basin Area PCC (10BFB28/48)

➤ 400V MCC

- Coal Mill MCC (11BFD16/26, 12BFD16/26)
- Boiler Aux MCC (11BFD11/21, 12BFD11/21)
- Turbine Aux MCC (11BFD12/22, 12BFD12/22)
- Auxiliary Boiler MCC (10BFE13/33)
- Compressor MCC (10BFE25/45)
- Fire/ Fresh Water P/H MCC (10BFE53/63)
- Clarified Water MCC (10BFE51/61)
- 400V Emergency MCC (11BMA16/26, 12BMA16/26)

➤ ACDB (3 Phase, 1 Phase)

- Station ACDB (10BFE11/31, 10BFE21/41)
- Boiler Valve DB #1 (11BFD15/12BFD15)
- Boiler Valve DB #2 (11BFD25/12BFD25)
- Boiler Damper DB (11BFD14/24)
- Turbine Valve DB #1 (11BFD19/12BFD19)
- Turbine Valve DB #2 (11BFD29/12BFD29)
- Workshop DB (10BFE28/48)
- Warehouse DB (10BFE29/49)
- Intake Water Pump House ACDB (10BFE71/81)
- Common Service Bldg. ACDB (10BFE72/82)

- Filter Water P/H ACDB (10BFE73/83)
- Fire Station ACDB (10BFE74/84)
- Water Treatment Plant ACDB (10BFE76/86)

➤ **DCDB**

- 220V Main DCDB #1 (11BUA16/26)
- 220V Main DCDB #2 (12BUA16/26)
- Intake Water P/H DCDB (10BUA04)
- FGD Building DCDB (10BUA05)

➤ **List of 400V Non-segregated Phase Bus duct**

Sl No	400V NSPBD KKS	From (LV side of Transformer)	To (PCC)	Busduct Rating (A)	Length (m)	Bend
1	11BFR11	2.5 MVA, 10/0.420 kV Boiler Service Transformer- 11BFT11	400V Boiler PCC- 11BFA11	4000	5	Horizontal - 1 Vertical - 2
2	11BFR21	2.5 MVA, 10/0.420 kV Boiler Service Transformer- 11BFT21	400V Boiler PCC- 11BFA21	4000	5	Horizontal - 1 Vertical - 2
3	11BFR12	1.6 MVA, 10/0.420 kV Turbine Service Transformer- 11BFT12	400V Unit Turbine PCC- 11BFA12	2500	5	Horizontal - 1 Vertical - 2
4	11BFR22	1.6 MVA, 10/0.420 kV Turbine Service Transformer- 11BFT22	400V Unit Turbine PCC- 11BFA22	2500	5	Horizontal - 1 Vertical - 2
5	11BFR13	2 MVA, 10/0.420 kV ESP Auxiliary Transformer- 11BFT13	400V ESP PCC- 11BFA13	3200	5	Horizontal - 1 Vertical - 2
6	11BFR23	2 MVA, 10/0.420 kV ESP Auxiliary Transformer- 11BFT23	400V ESP PCC- 11BFA23	3200	5	Horizontal - 1 Vertical - 2

Sl No	400V NSPBD KKS	From (LV side of Transformer)	To (PCC)	Busduct Rating (A)	Length (m)	Bend
7	10BFR11	2.5 MVA, 10/0.420 kV Station Service Transformer- 10BFT11	400V Station PCC- 10BFB11	4000	5	Horizontal - 1 Vertical - 2
8	10BFR31	2.5 MVA, 10/0.420 kV Station Service Transformer- 10BFT31	400V Station PCC- 10BFB31	4000	5	Horizontal - 1 Vertical - 2
9	10BFR12	1.0 MVA, 10/0.420 kV Admin Bldg Aux. Transformer- 10BFT12	400V Admin Bldg PCC- 10BFB12	1600	5	Horizontal - 1 Vertical - 2
10	10BFR32	1.0 MVA, 10/0.420 kV Admin Bldg Aux. Transformer- 10BFT32	400V Admin Bldg PCC- 10BFB32	1600	5	Horizontal - 1 Vertical - 2
11	10BFR21	2.5 MVA, 10/0.420 kV Station Service Transformer- 10BFT21	400V Station PCC- 10BFB21	4000	5	Horizontal - 1 Vertical - 2
12	10BFR41	2.5 MVA, 10/0.420 kV Station Service Transformer- 10BFT41	400V Station PCC- 10BFB41	4000	5	Horizontal - 1 Vertical - 2
13	10BFR24	2.5 MVA, 10/0.420 kV CWPH Aux. Transformer- 10BFT24	400V Intake Water, CW & Fuel Oil PCC- 10BFB24	4000	15	Horizontal - 2 Vertical - 2
14	10BFR44	2.5 MVA, 10/0.420 kV CWPH Aux. Transformer- 10BFT44	400V Intake Water, CW & Fuel Oil PCC- 10BFB44	4000	15	Horizontal - 2 Vertical - 2

SI No	400V NSPBD KKS	From (LV side of Transformer)	To (PCC)	Busduct Rating (A)	Length (m)	Bend
15	10BFR22	2.5 MVA, 10/0.420 kV WTP Aux. Transformer- 10BFT22	400V Water Treatment Plant PCC- 1 10BFB22	4000	15	Horizontal - 2 Vertical - 2
16	10BFR42	2.5 MVA, 10/0.420 kV WTP Aux. Transformer- 10BFT42	400V Water Treatment Plant PCC- 1 10BFB42	4000	15	Horizontal - 2 Vertical - 2
17	10BFR29	2.5 MVA, 10/0.420 kV WTP Aux. Transformer- 10BFT42	400V Water Treatment Plant PCC- 2 10BFB29	Define later	Define later	Define later
18	10BFR49	2.5 MVA, 10/0.420 kV WTP Aux. Transformer- 10BFT42	400V Water Treatment Plant PCC- 1 10BFB49	Define later	Define later	Define later
19	10BFR28	2.5 MVA, 10/0.420 kV Waste Water Treatment Service Transformer- 10BFT28	400V Waste Water Treatment PCC- 10BFB28	4000	15	Horizontal - 2 Vertical - 2
20	10BFR48	2.5 MVA, 10/0.420 kV Waste Water Treatment Service Transformer- 10BFT48	400V Waste Water Treatment PCC- 10BFB48	4000	15	Horizontal - 2 Vertical - 2
21	12BFR11	2.5 MVA, 10/0.420 kV Boiler Service Transformer- 12BFT11	400V Boiler PCC- 12BFA11	4000	5	Horizontal - 1 Vertical - 2
22	12BFR21	2.5 MVA, 10/0.420 kV Boiler Service Transformer- 12BFT21	400V Boiler PCC- 12BFA21	4000	5	Horizontal - 1 Vertical - 2

Sl No	400V NSPBD KKS	From (LV side of Transformer)	To (PCC)	Busduct Rating (A)	Length (m)	Bend
23	12BFR12	1.6 MVA, 10/0.420 kV Turbine Service Transformer- 12BFT12	400V Unit Turbine PCC- 12BFA12	2500	5	Horizontal - 1 Vertical - 2
24	12BFR22	1.6 MVA, 10/0.420 kV Turbine Service Transformer- 12BFT22	400V Unit Turbine PCC- 12BFA22	2500	5	Horizontal - 1 Vertical - 2
25	12BFR13	2 MVA, 10/0.420 kV ESP Auxiliary Transformer- 12BFT13	400V ESP PCC- 12BFA13	3200	5	Horizontal - 1 Vertical - 2
26	12BFR23	2 MVA, 10/0.420 kV ESP Auxiliary Transformer- 12BFT23	400V ESP PCC- 12BFA23	3200	5	Horizontal - 1 Vertical - 2
27	11BMR16	2 MVA, 3/0.420 kV Em. System Aux. Transformer- 11BMT16	400V Emergency PCC- 11BMA16	3200	5	Horizontal - 1 Vertical - 2
28	11BMR26	2 MVA, 3/0.420 kV Em. System Aux. Transformer- 11BMT26	400V Emergency PCC- 11BMA26	3200	5	Horizontal - 1 Vertical - 2
29	12BMR16	2 MVA, 3/0.420 kV Em. System Aux. Transformer- 12BMT16	400V Emergency PCC- 12BMA16	3200	5	Horizontal - 1 Vertical - 2
30	12BMR26	2 MVA, 3/0.420 kV Em. System Aux. Transformer- 12BMT26	400V Emergency PCC- 12BMA26	3200	5	Horizontal - 1 Vertical - 2

➤ **List of 950V AC & 650V DC Non-segregated Phase Busduct**

The quantity indicated is for bidding purpose only. The actual quantity shall however be finalized based on approved drawings during detail engineering.

SI No	NSPBD KKS	From	To	Busduct Rating (A)	Length (m)	Bend
1		Secondary Side of Excitation TRF – Unit#1	Generator Excitation Panel – Unit#1	5000	16	Horizontal - 1 Vertical – 2
2		Secondary Side of Excitation TRF – Unit#2	Generator Excitation Panel – Unit#2	5000	16	Horizontal - 1 Vertical – 2
3		Excitation Panel – Unit#1	Generator Field – Unit#1	5000	38	Vertical – 4
4		Excitation Panel – Unit#2	Generator Field – Unit#2	5000	38	Vertical – 4

- **Delivery:**

The Bidder shall be responsible for customs clearance, transportation (including both offshore and domestic), delivery to the Long Phu 1 site, and storage.

- **Installation/Erection:**

The Bidder shall perform installation, erection, alignment, and other related works for the 400V PCC/MCC, ACDB & DCDBs and Non-Segregated phase Busduct] in accordance with the Supplier's manual, erection procedures, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning:**

The Bidder shall perform testing and commissioning of the equipment to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility]

- **Services**

The Bidder shall provide technical assistance services for supervision during installation, testing, commissioning, and training of the Owner's personnel.

Refer to Table 08 [Division of Responsibility].

9.3 Detailed Requirements

For more details, the Bidder refers to Clause 8.00.00 document No. LP1-TKC-10BFA-E-E2-SPC-0006 [Specification 400V PCC/MCC, ACDB & DCDBs and non-segregated phase busduct] as attachment.

9.4 Performance Guarantee

The performance figures quoted in technical particular sheets shall be guaranteed within the tolerance permitted by relevant standards. In case of failure of the equipment to meet the guarantee, Owner shall have the right to reject the equipment.

9.5 Attachments

- 1) Specification 400V PCC/MCC, ACDB & DCDBs and Non-Segregated Phase Busduct
- 2) Detailed design.
- 3) Key Single Diagram.

10. EMERGENCY DIESEL GENERATOR SET

10.1 Status

Under the previous EPC contract, Cummins DKHS (Vietnam) signed the contract with Power Machines to supply 02 set DG 2000kVA, 3kV and auxiliaries and technical services.

The status of the package is as follows:

- Design: 0%
- Manufacturing: 0%.
- Delivery: 0%.

Installation, commissioning: 0%

10.2 Scope of work

- **Engineering:**

The Bidder shall design and finalize the engineering for the Emergency Diesel Generator in compliance with the technical requirements.

- **Supply:**

Two (2) nos. of Diesel Generator sets (one for each unit) having rating of 2000kVA, 3 kV, 3 ph, 50 Hz, 0.8 PF mounted in acoustic enclosure and complete with intake system, exhaust system and other accessories as required shall be provided. Diesel Generator sets shall be as per Appendix-1, Emergency Diesel Generator relay and metering scheme shall be as per Attachment-2 in the document No. LP1-TKC-11XKA-E-E2-SPC-0012-0 [Specification for Emergency DG set] as attachment.

Each DG set shall include but not limited to the following:

- a) Diesel Engine.
- b) Generator and Exciter.
- c) Local Control cum Protection Panel (AMF) with composite numerical relays for Gen. Protection, AVR etc.
- d) Complete DC system required for the start of DG set as well as to supply control power to its various auxiliary panels, as required.
- e) Auxiliary System (lube oil, cooling, exhaust, fuel, air, etc.)

- f) Generator Acoustic Enclosure
- g) Air Intake Filter
- h) Exhaust System, Silencer and Stack
- i) Fuel Oil Day Tank
- j) Engine mounting system
- k) Base Frame
- l) All anchor bolts, nuts, fasteners, embedded parts and any other likewise material required for completion of the work and shall be supplied with all fittings and accessories as per specification.

One (1) no. 400V DG Auxiliary MCC for each DG system auxiliaries.

All painting materials including primers.

Items not specifically mentioned but which are required for making the system completely reliable and efficient in operation shall be included.

One (1) set of special tools and tackles for the erection, assembly, dis-assembly & maintenance of the equipment.

All the necessary start-up & commissioning spares parts, oil/lubricants/consumables.

All relevant drawings, data and instruction manuals.

Any other equipment necessary for completeness of the system.

- **Delivery:**

The Bidder shall be responsible for customs clearance, transportation (including both offshore and domestic), delivery to the Long Phu 1 site, and storage.

- **Installation/Erection:**

The Bidder shall perform installation, erection, alignment, and other related works for the Emergency Diesel Generators in accordance with the Supplier's manual, erection procedures, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning:**

The Bidder shall perform testing and commissioning of the equipment to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility]

- **Services**

The Bidder shall provide technical assistance services for supervision during installation, testing, commissioning, and training of the Owner's personnel.

Refer to Table 08 [Division of Responsibility].

10.3 Detailed Requirements

For more details, the Bidder refers to Clause 8.00.00, 9.00.00, 10.00.00 in document No. LP1-TKC-11XKA-E-E2-SPC-0012-0 [Specification for Emergency DG set] as attachment.

10.4 Performance Guarantee

The performance figures quoted in Appendix-1 of document No. LP1-TKC-11XKA-E-E2-SPC-0012-0 [Specification for Emergency DG set] shall be guaranteed within the tolerance permitted by relevant standards. In case of failure of the equipment to meet the guarantee, Owner shall have the right to reject the equipment.

10.5 Attachments

- 1) Specification for Emergency DG set

11. GENERATOR CIRCUIT BREAKER

11.1 Status

Under the previous EPC contract, Grid Solution SAS (GS) signed contract with PM to supply 02 sets of 23 kV Generator Circuit Breakers (GCB) and technical services. GS has manufactured however GS has sold to other customer due to prolong postpone of the project . Thus, the status of the package is as follows:

- Design: 100%
- Manufacturing: 0%.
- Delivery: 0%.
- Installation, commissioning: 0%.

11.2 Scope of work

- **Engineering:**

The Bidder shall design and finalize the engineering for the 23 kV Generator Circuit Breakers in compliance with the technical requirements.

- **Supply:**

Generator Circuit Breaker 11BAC01 and 12BAC01 shall be as per Appendix-1 in document No. LP1-TKC-11BAC-E-E2-SPC-0002-3 [Specification for Generator Circuit Breaker] as attachment.

Each GCB shall be furnished complete with:

- a) Disconnecting switches
- b) Earth switches
- c) Voltage transformers
- d) Current transformers

- e) Surge arrestor, surge capacitor.
- f) Control cubicle along with all fittings, accessories and auxiliary equipment
- g) Following auxiliary equipments:
- h) One (1) set of Portable SF6 gas evacuating & filling equipment
- i) Two (2) sets of SF6 gas leakage detectors
- j) One (1) set of Circuit Breaker operation analyzer

All anchor bolts, nuts, fasteners, embedded parts and any other likewise material required for installation of the Generator Circuit Breakers.

Special tools and tackles for the erection, assembly, dis-assembly & maintenance of the equipment.

All the necessary start-up & commissioning spares parts, oil/lubricants/consumables.

All relevant drawings, data and instruction manuals.

- **Delivery:**

The Bidder shall be responsible for customs clearance, transportation (including both offshore and domestic), delivery to the Long Phu 1 site, and storage.

- **Installation/Erection:**

The Bidder shall perform installation, erection, alignment, and other related works for the Generator Circuit Breaker in accordance with the Supplier's manual, erection procedures, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning:**

The Bidder shall perform testing and commissioning of the equipment to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility]

- **Services**

The Bidder shall provide technical assistance services for supervision during installation, testing, commissioning, and training of the Owner's personnel.

Refer to Table 08 [Division of Responsibility].

11.3 Detailed Requirements

For more details, the Bidder refers to Clause 8.00.00, 9.00.00, 10.00.00 in document No. LP1-TKC-11BAC-E-E2-SPC-0002-3 [Specification for Generator Circuit Breaker] as attachment.

11.4 Performance Guarantee

The performance figures quoted in Appendix-1 of document LP1-TKC-11BAC-E-E2-SPC-0002-3 [Specification for Generator Circuit Breaker] shall be guaranteed within the tolerance permitted by relevant standards. In case of failure

of the equipment to meet the guarantee, Owner shall have the right to reject the equipment.

11.5 Attachments

- 1) Specification for Generator Circuit Breaker.
- 2) Detailed design.

12. ISOLATED PHASE BUSDUCT

12.1 Status

Under the previous EPC contract, Cadivi (Vietnam) signed contract with Power Machines to supply Isolated Phase Busduct for two (2) STG units and technical services. The status of the package is as follows:

- Design: 100%
 - Manufacturing: 0%.
 - Delivery: 0%.
- Installation, commissioning: 0%.

12.2 Scope of work

- **Engineering:**

The Bidder shall design and finalize the engineering for the Isolated Phase Busduct in compliance with the technical requirements.

- **Supply:**

Isolated Phase Busduct 11BAA and 12BAA for two (2) STG units shall be as per Appendix-1 in the document No: LP1-TKC-11BBA-E-E2-SPC-0003 [Specification for Isolated Phase Busduct] as attachment.

For each STG unit isolated phase bus duct shall be furnished complete with the following:

- a) Isolated phase bus duct between generator phase side terminals to respective Generator Circuit Breaker for each Generator Earth switches.
- b) Isolated phase bus duct between Generator Circuit Breaker and LV terminals of generator step-up transformer.
- c) Segregated-phase Terminal adapter box at generator phase side.
- d) One (1) set of isolated phase tap-off run of busduct to VT compartment.
- e) One (1) set of isolated phase tap-off run of bus duct from main run to Unit Transformers (applicable for two unit transformers).
- f) One (1) set of isolated phase bus duct tap-off from main run to excitation transformer.

- g) One (1) set of bus duct for connections from the star point of the Generator to generator neutral grounding equipment.
- h) One (1) set of disconnecting link with shorting bars located in between Generator Circuit Breaker and LV side of generator transformer for heat run/short circuit tests.
- i) One (1) set of hot air blowing equipment.
- j) One (1) set of disconnecting link at high voltage end of each Unit Transformer.
- k) Silica Gel breather for Bus Ducts.
- l) One (1) set of pressurization unit complete with all piping and accessories.

The Isolated phase bus duct, complete with all accessories and the auxiliary equipment, shall be supplied in accordance with this specification and listed attachments.

All supporting steel structures and hardware, which form part of the complete installation of the equipment. The offer for the equipment shall include steel foundation frame, anchor bolts, holding down bolts, buses, insulators, flexible connectors, etc., required for all mechanical and electrical items. All steel structures for supporting the bus duct shall be under the scope of this specification.

Special tools and tackles for the erection, assembly, dis-assembly & maintenance of the equipment.

All the necessary start-up & commissioning spares parts, oil/lubricants/consumables.

Shop painting.

All relevant drawings, data and instruction manuals.

- **Delivery:**

The Bidder shall be responsible for customs clearance, transportation (including both offshore and domestic), delivery to the Long Phu 1 site, and storage.

- **Installation/Erection:**

The Bidder shall perform installation, erection, alignment, and other related works for the Isolated Phase Busduct in accordance with the Supplier's manual, erection procedures, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning:**

The Bidder shall perform testing and commissioning of the equipment to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility]

- **Services**

The Bidder shall provide technical assistance services for supervision during installation, testing, commissioning.

Refer to Table 08 [Division of Responsibility].

12.3 Detailed Requirements

For more details, the Bidder refers to Clause 8.00.00, 9.00.00, 10.00.00 in document No. LP1-TKC-11BBA-E-E2-SPC-0003 [Specification for Isolated Phase Busduct] as attachment.

12.4 Performance Guarantee

The performance figures quoted in Appendix-1 of document LP1-TKC-11BBA-E-E2-SPC-0003 [Specification for Isolated Phase Busduct] shall be guaranteed within the tolerance permitted by relevant standards. In case of failure of the equipment to meet the guarantee, Owner shall have the right to reject the equipment.

12.5 Attachments

- 1) Specification for Isolated Phase Busduct.
- 2) Detailed Design.

13. MV POWER, LV POWER & CONTROL CABLES

13.1 Status

During the implementation of the previous EPC package, the General Designer (TKC) of Power Machines developed the relevant design and calculation documents, as attached. The Bidder may utilize these documents for further implementation. The status of the package is as follows:

- Design: 0%
- Manufacturing: 0%.
- Delivery: 0%.
- Installation, commissioning: 0%.

13.2 Scope of work

• Engineering:

The Bidder shall finalize the engineering and design works based on the Owner's documents provided in the attachments, in compliance with the technical requirements.

• Supply:

The Bidder shall supply cables including MV cables, LV cables and control cables for the entire plant, except internal cables for some systems/building (Coal handling plant; Ash Handling and Mill Reject system; ESP; FGD; Limestone &

Gypsum; Demin, Desal, River Water Pretreatment; Admin building, Canteen building, workshop and warehouse) that will be provided by other/Owner.

Cables shall be furnished in accordance with this specification and the following appendix in the document No: LP1-TKC-10XXX-E-E2-SPC-0011-0 [Specification for MV Power, LV Power & Control Cables] as attachment:

- a) M.V. Power Cables: **Appendix-1A**
- b) L. V. Power Cables: **Appendix-1B**
- c) Control Cables: **Appendix-1C**
- d) Bill of Materials: **Appendix-1D**

Spares required during erection, testing and commissioning of the equipment

All relevant drawings, data and instruction manuals.

- **Delivery:**

The Bidder shall be responsible for transportation, delivery to the Long Phu 1 site, and storage.

- **Installation/Erection:**

The Bidder shall perform installation, erection, alignment, and other related works for MV power cables, LV power cables, and control cables in accordance with the Supplier's manual, erection procedures, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning:**

The Bidder shall perform testing and commissioning of the cables to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility]

- **Services**

The Bidder shall provide technical assistance services for supervision during installation.

Refer to Table 08 [Division of Responsibility].

13.3 Detailed Requirements

For more details, the Bidder refers to Clause 8.00.00, 9.00.00, 10.00.00 in document No. LP1-TKC-10XXX-E-E2-SPC-0011-0 [Specification for MV Power, LV Power & Control Cables] as attached.

The Installation work of cable shall be carried out in accordance with document of Technical specification for Installation of cabling as describe in Volume II F2, Section IX.

13.4 Performance Guarantee

The performance figures quoted in Appendix-1A, Appendix-1B, Appendix-1C of document No. LP1-TKC-10XXX-E-E2-SPC-0011-0 [Specification for MV Power, LV Power & Control Cables] shall be guaranteed within the tolerance

permitted by relevant standards. In case of failure of the equipment to meet the guarantee, Owner shall have the right to reject the equipment.

13.5 Attachments

- 1) LP1-TKC-10XXX-E-E2-SPC-0011-0 [Specification for MV Power, LV Power & Control Cables.
- 2) Documents designed by TKC.

14. RELAY PANELS & METERING PANELS

14.1 Status

Under the previous EPC contract, Cadivi (Vietnam) signed contract with Power Machines to supply Unit Transformers Relay Panels, Metering panels for Unit Transformers, Station Transformer Relay Panels, Overhead Line Differential Protection Panel, Tariff Metering (Main and Back-up), Disturbance Fault and Event Recorder and technical services. The status of the package is as follows:

- Design: 100%
- Manufacturing: 0%.
- Delivery: 0%.
- Installation, commissioning: 0%.
- The Bidder is noted that Overhead Line Differential Protection relays at Switch-yard side were equipped with ABB relays (RED 670).

14.2 Scope of work

- **Engineering:**

The Bidder shall finalize the engineering and design works based on the Owner's documents provided in the attachments, in compliance with the technical requirements.

The Bidder shall be responsible for preparing the design documents as required for the Owner or the Owner's authorized Bidder to carry out coordination and agreement procedures with relevant specialized entities (such as the Load Dispatch Center, the Electricity Trading Company, etc.).

- **Supply:**

Relay Panels and Metering panels as per the document No. LP1-TKC-10BAY-E-E2-SPC-0010 [Specification for Relay panels and metering panels]. The equipment under this specification will include mainly the following:

SL. No.	Panel	Type	Quantity	Total Quantity
a	Unit Transformer Relay Panels with comprehensive unit transformer protection numerical relays, lock-out relays, auxiliary relays, timers, wiring, terminal blocks, TTB, provision for hook-up with DCS, etc., as described elsewhere in the Technical Specification	Simplex Vertical	Two (2) separate sets for each generating unit	Four (4) sets
b	Metering panel for Unit Transformer	Simplex Vertical	One (1) set for each Unit Transformer for each generating unit	Four (4) sets
c	Station Transformer Relay Panels with comprehensive Station transformer protection numerical relays, lock-out relays, auxiliary relays, timers, wiring, terminal blocks, TTB, provision for hook-up with DCS, etc., as described elsewhere in the Technical Specification	Simplex Vertical	One (1) set	One (1) set
d	Overhead Line Differential Protection Panel with comprehensive protection numerical relays, lock-out relays, auxiliary relays, timers, wiring, terminal blocks, TTB, provision for hook-up with DCS, etc., as described elsewhere in the Technical Specification	Simplex Vertical	One (1) set combined for Unit-1, Unit-2 and Station Transformer	One (1) set
e	Tariff Metering (Main and Back-up)	Simplex Vertical	One (1) set combined for Unit-1, Unit-2 and Station Transformer	One (1) set
f	Disturbance Fault and Event Recorder/ Phasor Measurement Unit (FR/PMU)	Simplex Vertical	One (1) set combined for Unit-1, Unit-2 and Station Transformer	One (1) set

A laptop including software for relay setting and devices for secondary current injection.

Floor channel sills, vibration damping pads and kick plates for relay panels, complete with holding down bolts and nuts.

Shop painting.

All the necessary start-up, commissioning spares parts

All relevant drawings, data and instruction manuals.

The previous EPC Contractor has completed 100% of the design in accordance with the technical requirements. However, according to Tariff Metering Agreement with Electricity Power Trading Company (EVNEPTC) No. 5093 dated 26/12/2018, the parties agreed to change the main and backup metering points, adding metering points at the high voltage side of the excitation transformer (Unit1, Unit 2) and metering points at the low voltage side of 04 unit transformers.

Based on the above mentioned status, the Bidder shall be responsible for studying and updating the above Agreement No. 5093 and carrying out other necessary works to reach agreements/certificates/licenses/approval decisions from the authorities and related parties according to current regulations such as Agreement on technical design, test/ commissioning of automatic protection relay system.

- **Delivery:**

The Bidder shall be responsible for customs clearance, transportation (including both offshore and domestic), delivery to the Long Phu 1 site, and storage.

- **Installation/Erection:**

The Bidder shall perform installation, erection, alignment, and other related works for Relay panels and Metering panels in accordance with the Supplier's manual, erection procedures, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning:**

The Bidder shall perform Relay setting calculation, setting, testing and commissioning of Relay panels and Metering panels to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility]

- **Services**

The Bidder shall inspect and assess the current condition of the counterpart relays (06 sets ABB (RED 670)) at the switchyard, and prepare an evaluation report with proposals for repair or replacement if necessary.

The Bidder shall provide technical assistance services for supervision during installation, testing, commissioning, and training of the Owner's personnel.

Refer to Table 08 [Division of Responsibility].

14.3 Detailed Requirements

For more details, the Bidder refers to Clause 8.00.00, 9.00.00, 10.00.00 in document LP1-TKC-10BAY-E-E2-SPC-0010 [Specification for Relay panels and metering panels] as attached.

14.4 Performance Guarantee

N/A

14.5 Attachments

- 1) Design Basic Report (DBR)
- 2) Tariff Metering Agreement with Electricity Power Trading Company (EVNEPTC) No. 5093 dated 26/12/2018
- 3) Specification for Relay panels and metering panels.
- 4) Detailed design.

15. UNINTERRUPTIBLE POWER SUPPLY (UPS) SYSTEM

15.1 Status

Under the previous EPC contract, CEG (Italia) signed the contract with Power Machines to supply three (03) sets of UPS for Main Plant and Water Treatment Pant (WTP), and technical services as follows:

- Two (02) sets for Main Plant UPS System. The capacity of each set is 170 kVA.
- Other auxiliary equipment.
- Technical services: Supervision during installation, and commissioning; Witness during field performance test; Training for the Owner's personnel.

The status of the package is as follows:

- Design: 32.32 %
- Manufacturing: 0%.
- Delivery: 0%.
- Installation, commissioning: 0%.

15.2 Scope of work

• Engineering:

The Bidder shall design and finalize the engineering for the UPS in compliance with the technical requirements.

• Supply:

The Bidder shall supply two Sets 170 kVA Main Plant UPS system shall be as per Appendix-1 in document No. LP1-TKC-11BRU-E-E2-SPC-0009: [Specification for Uninterruptible Power Supply System (UPS)] as attachment.

Each set of UPS System shall be furnished complete with the following components as per 230 V UPS system single line diagram:

- a) 100% Static inverter & input isolation transformer: 2
- b) 100% Static switch: 2
- c) Manual bypass switch: 1
- d) 100% UPS System battery with back up time 1 hour: 2
- e) 100% Float-cum-boost charger: 2
- f) Step-down transformer (400V three phase to 230V single phase for bypass):
1
- g) Static voltage Regulator : 1
- h) Input output isolation transformer : 2
- i) Interconnection cable between UPS equipment, battery and ACDB: 6
 - Each Main Plant Unit ACDB shall have following rating outgoing MCB feeders:
 - 200 A MCB feeders : Two (2) nos.
 - 25 A MCB feeders : Six (6) nos.
 - 50 A MCB feeders : Six (6) nos.
 - 10 A MCB feeders : Twenty (20) nos.
 - Each Water Treatment Plant ACDB shall have following rating outgoing MCB feeders:
 - 25 A MCB feeders : Four (4) nos.
 - 50 A MCB feeders : Two (2) nos.
 - 10 A MCB feeders : Fifteen (15) nos.

Bidder shall note that number and rating of outgoing MCB feeders indicated above are for tender purpose only. Final rating and number of outgoing feeders shall be informed to successful bidder at time of detail engineering.

Any other equipment necessary for completeness of the system.

Shop painting.

The Bidder shall supply one complete set of special tools and tackles along with the equipment required for the erection, assembly, dis-assembly & maintenance of the equipment

All the necessary start-up, commissioning spares parts

All relevant drawings, data and instruction manuals.

● **Delivery:**

The Bidder shall be responsible for customs clearance, transportation (including both offshore and domestic), delivery to the Long Phu 1 site, and storage.

- **Installation/Erection:**

The Bidder shall perform installation, erection, alignment, and other related works for UPS in accordance with the Supplier's manual, erection procedures, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning:**

The Bidder shall perform testing and commissioning of UPS to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility]

- **Services**

The Bidder shall provide technical assistance services for supervision during installation, testing, commissioning, and training of the Owner's personnel.

Refer to Table 08 [Division of Responsibility].

15.3 Detailed Requirements

For more details, the Bidder refers to Clause 8.00.00, 9.00.00, 10.00.00 in document No. LP1-TKC-11BRU-E-E2-SPC-0009 [Specification for Uninterruptible Power Supply System (UPS)] as attached.

15.4 Performance Guarantee

The performance figures quoted in Appendix-1 of document LP1-TKC-11BRU-E-E2-SPC-0009 [Specification for Uninterruptible Power Supply System (UPS)] shall be guaranteed within the tolerance permitted by relevant standards. In case of failure of the equipment to meet the guarantee, Owner shall have the right to reject the equipment.

15.5 Attachments

- 1) Specification for Uninterruptible Power Supply System.
- 2) Detailed design.
- 3) LP1-TKC-11BRU-E-E2-CAL-510: Sizing Calculation – 230 V UPS for main plant and WTP area.
- 4) Design Change Request: Deviation list of 220DC and UPS system.

16. NEUTRAL GROUNDING RESISTOR

16.1 Status

Under the previous EPC contract, Hankook (Korea) signed the contract with Power Machines for design, engineering, manufacturing, supply Neutral Grounding resistors (NGR). The NGRs will connect to 10kV and 3kV side neutral of Unit Transformer, Station Transformer and Auxiliary Transformers.

The neutral grounding resistors are required in the following two (2) rating:

- a) 10.5 kV, 20.20 ohms, 300 Amps for 10 seconds for:

- + Unit Transformer : 8 Nos.
- + Station Transformer : 2 Nos.
- b) 3.15 kV, 6.06 ohms, 300 Amps for 10 seconds for:
 - + Unit Transformer : 4 Nos.
 - + Station Transformer : 2 Nos.

The status of the package is as follows:

- Design 100%.
- Manufacturing 100%.
- Delivery: 100%. NGRs are stored at site in good condition.
- Installation, commissioning: 0%

16.2 Scope of work

- **Engineering:** N/A
- **Supply:** N/A
- **Delivery:** N/A
- **Installation/Erection:**

The Bidder shall perform installation, erection, alignment, and other related works for the Neutral Grounding resistors in accordance with the Supplier's manual, erection procedures, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning:**

The Bidder shall perform testing and commissioning of the equipment to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility]

- **Services**

The Bidder's scope of services includes installation.

Refer to Table 08 [Division of Responsibility].

16.3 Detailed Requirements

For more details, the Bidder refers to document No. LP1-TKC-10XXX-E-E2-SPC-0007 [Specification for Neutral Grounding Resistor] as attached.

16.4 Performance Guarantee

N/A

16.5 Attachments

- 1) Specification
- 2) Detailed drawing
- 3) List of delivered equipment

17. Grouding & Lightning System

17.1 Status

a) Grounding system status:

- **Design:** During previous EPC period, Power Machine has designed the grounding system for Power Plant as **Grounding Drawings/Document Designed attached**.
- **Purchase & Delivery:** During previous EPC period, Power Machine has procured some grounding materials (Copper conductor, steel ground rod, metal powder,...), the quantity of material has been procured **as attachment**, the Owner will hand over to Bidder
- **Installation:**
 - + **For under ground grounding system:** During previous EPC period, Power Machine has installed grounding system for 12 areas of the Power Plant (1. Earthing System for Power House Building Unit 1; 2. Earthing System for Power House Building Unit 2; 3. Earthing system for Administration Building; 4. Earthing system for Electrostatic Precipitator System for unit 1; 5. Earthing system for Common services building; 6. Earthing System for Warehouse building; 7. Earthing System for Hydrogen generation plant building; 8. Earthing system for Electrostatic Precipitator System for unit 2; 9. Earthing System for central electrical and control equipment building; 10. Earthing System for SCR foundation area for unit 1; 11. Grounding System for Boiler Unit 2; 12. Grounding System for Boiler Unit 1), quantity of grounding system has been installed as **attached document and marked drawing**.
 - + **For above ground grounding system:** 0%

b) Lightning system status:

- **Design:** During previous EPC period, Power Machine has designed the lightning system for Power Plant as **Lightning Drawings/Document Designed attached**.
- **Purchase & Delivery:** 0%
- **Installation:** 0%

17.2 Scope of work

• Engineering:

- For the underground grounding system: the Contractor shall review the completed design and make adjustments if necessary.
- For the above ground grounding system: based on the existing design documents, the Contractor shall complete the design of the above-ground grounding system, except for ***ESP, FGD, CHP, AHP, L&G systems, Water treatment, as well as equipment in the admin building, workshop, warehouse, and fire protection system***, shall be designed by other Contractors appointed by the Owner.

- For the lightning protection system: based on the existing designs, the Contractor shall review and finalize the lightning protection design for the systems/buildings/equipment within the Contractor's supply and installation scope. The lightning protection design for systems/buildings/equipment such as ESP, FGD, CHP, AHP, L&G systems, water treatment, as well as the administration building, workshop, and warehouse, Intake CW Pump House shall be provided by other Contractors appointed by the Owner.

- **Supply:**

- **For under ground grounding system**

The Bidder shall base on the existing design documentation for grounding system of the Project (LP1-TKC-10XXX-E-E2-DLB-1200-2 Notes and details grounding system; LP1-TKC-10UHA-E-E2-DAL-2000-4 Main plant area below ground grounding layout; LP1-TKC-10XXX-E-E2-DAL-8050_001-1: Overall Plant Area- Below Ground Grounding Layout 03 sheets;...) and the quantities of materials already procured by the Owner to proceed with the procurement of the remaining materials for the grounding system of the entire plant,

- **For above ground grounding system**

Base on the existing design documentation for grounding system of the Project (LP1-TKC-10XXX-E-E2-DLB-1200-2 Notes and details grounding system;...) the The Bidder shall supply Earthing cables, cadweld (if any) and all required accessories needed to connect equipment within scope of supply/erection of the Bidder to Main earthing grid and riser of Power Plant.

The materials for grounding of equipment belonging to the ESP, FGD, CHP, AHP, L&G systems, Water treatment, as well as equipment in the admin building, workshop, warehouse, and fire protection system, shall be procured by other Contractors appointed by the Owner.

- a) **Lightning system**

Based on the existing design documents for lightning system of the project (LP1-TKC-10XXX-E-E2-DLB-1300-0: Notes and details - Lightning protection system;...), the Bidder shall supply materials for the installation of the lightning protection system for buildings/equipment within the scope of the package.

Lightning protection materials for buildings/equipment under the ESP, FGD, CHP, AHP, L&G systems, Water treatment as well as the administration building, workshop, warehouse and Intake CW Pump House shall be procured by other Contractors appointed by the Owner

All relevant drawings, data and instruction manuals.

- **Delivery:**

The Bidder shall be responsible for transportation, delivery to the Long Phu 1 site, and storage.

- **Installation/Erection:**

The Bidder shall perform installation, erection, alignment, and other related works for Grounding & Lightning system (in his scope of supply) and in accordance with approved drawings, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning:**

The Bidder shall perform testing and commissioning Grounding & Lightning system to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility]

- **Services**

The Bidder shall provide technical assistance services for supervision during installation.

Refer to Table 08 [Division of Responsibility].

17.3 Detailed Requirements

For more details, the Bidder refers to Technical Specification for Installation of cabling, Earthing and Lightning Protection System as stipulated in Volume IIF2 Section IX [TECHNICAL SPECIFICATION FOR INSTALLATION OF CABLING, EARTHING AND LIGHTNING PROTECTION SYSTEMS].

17.4 Performance Guarantee

For under ground grounding system Overall ground grid resistance will be less than One (1) Ohm.

17.5 Attachments

- 1) Attached file: Grounding Drawings/Document Designed
- 2) Attached file: Lightning Drawings/Document Designed
- 3) Attached file: Quantity of material has been procured
- 4) Attached file: Quantity of grounding system has been installed

18. ILLUMINATION SYSTEM

18.1 Status

- Design: The Previous EPC contractor (TKC) has designed the illumination system for most areas and buildings of the power plant (see attached detailed designed documents)
- Manufacturing: 0%.
- Delivery: 0%.
- Installation, commissioning: 0%

18.2 Scope of work

- **Engineering:**

The Bidder shall finalize the engineering and design works based on the Owner's documents provided in the attachments, in compliance with the technical requirements. The illumination design for systems, equipment, and buildings such as **ESP area and ESP Control Building, FGD area and FGD Control Building, administration building, canteen, workshop, warehouse, car parking, Intake CW Pump House, water treatment plant (including river water pretreatment, desalination, and demineralization), coal handling plant, limestone and gypsum handling system, chimney, ash handling and mill reject system** shall be carried out by other Contractors appointed by the Owner

- **Supply:**

The Bidder shall provide interior and exterior illumination and small power distribution throughout the entire plant as stipulated in ANNEXURE-B [BROAD LIST OF AREAS TO BE ILLUMINATED], Volume IIF2 Section VII, **excluding illumination for the following locations: ESP area and ESP Control Building, FGD area and FGD Control Building, administration building, canteen, workshop, warehouse, car parking, Intake CW Pump House, water treatment plant (including river water pretreatment, desalination, and demineralization), coal handling plant, limestone and gypsum handling system, chimney, ash handling and mill reject system will be done by other Contractors appointed by the Owner.**

This scope includes various indoor and outdoor areas in the main plant and off-site areas, as well as internal and peripheral roads within the boundary wall. The illumination system in these areas will comprise the following subsystems:

- Normal A.C. Lighting
- Emergency D.C. Lighting
- Remote Emergency Lighting
- Outdoor Area/Street Lighting

The Bidder shall supply one complete set of special tools and tackles along with the equipment required for the erection, assembly, dis-assembly & maintenance of the equipment.

The Bidder shall include in Bidder's scope of supply all the necessary start-up, commissioning spares parts.

All relevant drawings, data and instruction manuals

- **Delivery:**

The Bidder shall be responsible for transportation, delivery to the Long Phu 1 site, and storage.

- **Installation/Erection:**

The Bidder shall perform installation, erection, alignment, and other related works for illumination system and in accordance with approved drawings, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning:**

The Bidder shall perform testing and commissioning illumination system to ensure safe and reliable operation.

Refer to Table 08 [Division of Responsibility]

- **Services**

The Bidder shall provide technical assistance services for supervision during installation, testing, commissioning.

Refer to Table 08 [Division of Responsibility].

18.3 Detailed Requirements

Plant illumination system shall generally comply with the requirements of various document as follow:

- Volume IIF2 Section VII [TECHNICAL SPECIFICATION FOR ILLUMINATION SYSTEM]
- Volume IIF1 Section VII [TECHNICAL SPECIFICATION FOR PCC/MCC, ACDB AND DCDB]
- Volume IIF2 Section II [TECHNICAL SPECIFICATION FOR LV AUX. TRANSFORMERS]
- Volume IIF1 Section VIII [TECHNICAL SPECIFICATION FOR MISCELLANEOUS LOCAL PANELS]
- Volume IIF1 Section VIII [TECHNICAL SPECIFICATION FOR MISCELLANEOUS LOCAL PANELS]
- Document No: LP1-TKC-10XXX-E-E2-DLB-1400 [NOTES AND DETAILS ILLUMINATION SYSTEM]

18.4 Performance Guarantee

The Bidder must ensure that the lighting system within the Bidder's scope complies with the regulations specified in the table below:

ILLUMINATION LEVEL (Lux)

1	Boiler Area / Platforms / Deaerator floors	Sodium vapour (Heat resistant type)	100
2	Power House Building - Turbine Hall	Metal Halide	250
3	Power House Building- General Indoor Area	Fluorescent / Metal Halide	200
4	Power House Building- Cable Vault	Fluorescent	70

5	Power House Building- Control Room	Fluorescent (Decorative type)	400
6	Power House Building- Switchgear / MCC / Electrical Equipment Room	Fluorescent	250
7	Power House Building- Control Room / Relay Room	Fluorescent (Decorative type)	400
8	Power House Building- Battery room	Fluorescent (Corrosion proof type)	250
9	Transformer Yard	Sodium Vapour	100
10	Cooling Water Pump House/ Plant water pump house (Extension)	Sodium Vapour	200
11	Store	Fluorescent	150
12	Laboratory	Fluorescent	500
13	Office	Compact fluorescent (Decorative type)	300
14	Corridor	Fluorescent / Compact Fluorescent	100
15	Electric Room in various plants	Fluorescent	250
16	Toilets	Fluorescent / Compact Fluorescent	70
17	Staircases	Fluorescent / Compact Fluorescent	70
18	Roadways, Vehicle Yards & Car parking	Sodium vapour	50
19	Outdoor Manned Plant Areas	Sodium vapour	50
20	Outdoor Unmanned Plant Areas	Sodium vapour	20
21	Site perimeter fencing	Sodium vapour	20
22	Ash compressor room	Fluorescent	200
23	Blower room near ash silo	Fluorescent	200
24	Ash silo	Sodium vapour	100

25	Conveyor Gallery	Fluorescent	100
26	Fuel oil pump house	Fluorescent	150
27	DM plant	Fluorescent (Acid resistance proof)	150
28	Hydrogen Plant Building	HPMV Flameproof	150

18.5 Attachments

- 1) Detailed designed document/drawings

19. CABLE ROUTING SYSTEM (DUCT BANK, CABLE TRENCH, CABLE TRAY, CONDUIT & ACCESSORIES)

19.1 Status

The Contractor (Power Machine/TKC) shall be responsible for the design of cable routing between various plant areas and within buildings, utilizing duct banks, cable trenches, cable trays, and conduits, as indicated in the design documents attached.

19.2 Scope of work

- **Engineering:**

Based on the existing previous designs and the cable routing requirements specified in Volume 2F2 Section I and in certain sections of Volume II of the Original RFP, the Contractor shall be responsible for the complete design of the cable routing system and its associated for cabling to all systems and equipment within the Bidder's supply and installation scope, as well as to Transformers/PCCs/MCCs/DBs belonging to the BOP packages executed by other contractors of the Owner (including ESP system, FGD system, administration building, canteen, workshop, warehouse, car parking, water treatment plant — including river water pretreatment, desalination, and demineralization — coal handling plant, limestone and gypsum handling system, chimney, ash handling, and mill reject system). The design of cable routing (duct banks/cable trenches/cable trays/and conduits) within the BOP equipment/systems/buildings mentioned above are not within the Bidder's scope of work.

- **Supply:**

The Bidder shall provide cable routing system (duct banks, cable trenches, cable trays, conduits and accessories such as coupler plates, ground continuity connections, nuts, bolts, washers, hangers, clamps, etc.) for the entire plant, **excluding internal cable routing for the following systems and buildings: ESP area and ESP Control Building, FGD area and Control Building, administration building, canteen, workshop, warehouse, car parking, water**

treatment plant (including river water pretreatment, desalination, and demineralization), coal handling plant, limestone and gypsum handling system, chimney, ash handling, and mill reject system. These excluded scopes will be carried out by other contractors appointed by the Owner.

Any additional materials which are not specifically mentioned in the specification, but, are required to make the installation complete in every respect, shall be under scope of this specification.

As the project is being executed concurrently by multiple Contractors, the Owner has provisionally defined the interface for the supply and implementation of the cable routing system between the Bidder and other Contractors engaged by the Owner, as illustrated in the marked-up drawing LP1-TKC-10UMY-E-E2-DAL-8000_001. The exact scope of supply to be undertaken by the Contractor shall be finalized at a later stage".

All relevant drawings, data and instruction manuals

- **Delivery:**

The Bidder shall be responsible for transportation, delivery to the Long Phu 1 site, and storage.

- **Installation/Erection:**

The Bidder shall perform construction, installation, erection, alignment, and other related works for Cable routing system and in accordance with approved drawings, and the Bidder's ITP approved by the Owner.

- **Testing & commissioning: N/A**

Refer to Table 08 [Division of Responsibility]

- **Services**

The Bidder shall provide technical assistance services for supervision during installation.

Refer to Table 08 [Division of Responsibility].

19.3 Detailed Requirements

For more details, the Bidder refers to Clause 8.00.00, 9.00.00, 10.00.00 in document No: LP1-TKC-10XXX-E-E2-SPC-0018-1 [Specification for Cable trays and accessories] and Volume 2F2 Section I and in certain sections of Volume II of the Original RFP as attachment.

19.4 Performance Guarantee: N/A

19.5 Attachments

- 1) Documents and drawings designed
- 2) Marked-up drawing LP1-TKC-10UMY-E-E2-DAL-8000_001.
- 3) Specification for Cable trays and accessories

SECTION III

SUB-SECTION

3.2 DETAILED REQUIREMENTS

ARTICLE

3.2.6 BALANCE OF PLANT

[PII.CV.SIII.SS3.2 – Article 3.2.6]

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CHAPTER V – SECTION
SUB-SECTION 3.2
ARTICLE 3.2.6 BALANCE OF PLANT

1 Waste water treatment System

1.1 Status

- Former EPC Contractor signed a contract with Hyorim (Korea) to supply Effluent and Sewage Conveyance and Treatment System for the Long Phu 1 Project (previous scope of work does not include: Wastewater from RO Desalination Reject, Wastewater from Neutralization pit for desal RO & DM RO System, and water from FGD system with a Chloride concentration of 20,000 ppm). The status of this package (under contract between Former EPC Contractor and Hyorim) is as follows:
 - + Engineering: about 89%.
 - + Manufacturing: 00%
 - + Delivery: 00%
 - + Erection: 00%
 - + Commissioning: 00%.

1.2 Scope of Work

- The scope shall include design, engineering, manufacture, inspection and testing at manufacturer's works, packing and shipment, Custom clearance, transportation (including offshore and domestic), transit insurance and delivery at site. In addition, the scope shall also include all necessary civil/ structural/architectural works, erection/installation including unloading storage and handling at site, site testing, commissioning, trial run, performance and guarantee tests and other services including supply co-ordination, engineering and project management related to the Wastewater water treatment.
- Bidder shall design and finalize the engineering based on Bidder's experience.
- Bidder shall furnish the equipment & accessories based on the design/specification developed by Bidder with Owner approval.
- Delivery: Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and the subsequent storage and preservation of all materials and equipment.
- Erection/installation: The Bidder shall perform all erection, installation, and alignment of the equipment in full compliance with the supplier's instructions, erection procedures, and the Inspection and Test Plan (ITP) approved by the Owner.
- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

1.3 Detail Requirements

- The waste streams (effluent & sewage) from different sources of the proposed 2x600 MW Long Phu 1 Power plant will be collected, treated, recycled, and reused to the extent feasible, and rest of unused but treated effluent will be disposed of meeting the

environmental standards specified by the Ministry of Natural Resources & Environment, Government of Vietnam.

- Wastewater (Effluent) shall include but not limited the following main streams:

No	Waste Source	Remark
1.	DMF and ACF backwash	
2.	Boiler & ESP area drains (Non Oily)	
3.	Coal Mill Reject drains	
4.	APH & ESP wash water (For Start-up and Shut down only)	
5.	Fly Ash Silo area wastewater	
6.	Water Treatment Plant Sludge	
7.	Fuel oil storage area oily wastewater	
8.	Boiler & Coal Mill area oily wastewater	
9.	TG building Power House area) oily wastewater	
10.	DG building oily wastewater	
11.	Transformer yard unit #1&2 oily wastewater	
12.	FGD & Limestone/Gypsum Elec. Bldg. Aux. Transformer oily wastewater	
13.	AHP Area Aux Transformer oily wastewater	
14.	CHP Substation Bldg. Aux Transformer oily wastewater.	
15.	Sand Settling Basin Area Aux. Transformer oily wastewater	
16.	WTP Aux. Transformer oily wastewater	
17.	CWPH Aux. Transformer oily wastewater	
18.	AHP Equipment Bldg. Aux transformer oily wastewater	
19.	Bulldozer Shed oily wastewater	
20.	CHP dust suppression effluent & Coal pile area rainfall run off	
21.	Condenser wastewater	
22.	FGD area wastewater	
23.	Treated water from sewage treatment plant	
24.	Desal RO reject	
25.	Neutralised wastewater from Desal RO & DM RO systems	
26.	Neutralised CPU Regeneration wastewater	
27.	Neutralised wastewater from Ammonia unloading area (from SCR system).	
28.	And others	

- Sewage water will be generated from the following buildings:

Sl No	Name of building	No. of Users	Water Consumption (LPD)
1	Power House including control building (with Ladies Toilet)	30	2,850
2	Ware House	25	2,375
3	Workshop	25	2,375
4	Security Gate House & Time Keeping Office	8	760
5	Administration building (with Ladies Toilet)	271	25,745
6	Fire Station Building	15	1,425
7	ESP Control Building	9	855
8	Coal Handling Control Building for Plant	10	950
9	Filtered Water Pump House	2	190
10	Chemical House	8	760
11	Common Service building	16	1,520
12	FGD Control Building	2	190
13	Water Treatment Plant Control Building	2	190
14	Sludge Pump House	2	190
15	Desalination & Demineralization Building	2	190
16	Waste Water Treatment Plant Control Building	2	190
17	Ash Handling and Control Building	2	190
18	External Workshop	5	475
19	Sub Gate House	3	285
20	Intake Chlorination Building	2	190
21	Return Water Pump Station	2	190
22	Fuel Oil Pump House	2	190
23	CHP Pump House	2	190
24	CHP Office	10	950
25	Ash Slurry Pump House	2	190
26	Fire Station	5	475
27	And others		

- All the wastewater generated at various facilities will be segregated at the source of generation according to their types. Effort shall be made for collection of similar type of wastewater at one point before treatment and then treated to meet the requirements for disposal or reuse.
- The scope of this specification will comprise dedicated Wastewater treatment plant along with its collection and conveyance and final disposal as specified wastewater at one point before treatment and then treated to meet the requirements for disposal or reuse.
- Former EPC Contractor has built Design Basis Report for Waste Water Treatment System (Document No: LP1-TKC-10XXX-M-M3-CRT-0019) and Specification for

Effluent and Sewage Conveyance and Treatment (Document No: LP1-TKC-10RU-M-M27-SPC-2039) is not a detailed description of the entire package.

- The Bidder is responsible for researching, designing, supply and delivery to the Site, erection, construction and Commissioning for Waste water treatment system.
- The contractor's scope of work will include building wastewater collection pits at waste source locations, then pumping them to a centralized wastewater treatment site. Details of the location of this sump will be clarified during the detailed design phase.
- Data specification on collection location, number of collection pits, transport pumps, pipelines... preliminary design of wastewater treatment system is described in detail in the document: Design Basis Report for Waste Water Treatment System (Document No: LP1-TKC-10XXX-M-M3-CRT-0019) and Specification for Effluent and Sewage Conveyance and Treatment (Document No: LP1-TKC-10RU-M-M27-SPC-2039. For wastewater from RO Desalination Reject, Neutralization pit, FGD system: The contractor needs to complete the design of wastewater collection from the locations Wastewater from RO Desalination Reject, Neutralization pit for desal RO & DM RO System, wastewater from FGD to conduct quality treatment before discharging into the environment.

1.4 Performance guarantee

- The effluent from the domestic Wastewater Treatment Plant must comply with QCVN 14:2025/BTNMT (Column A) prior to entering the centralized Waste water treatment System.
- Treated effluent from the centralized wastewater treatment system shall be discharged into the environment only in accordance with QCVN 40:2025/BTNMT (Column A) – National technical regulation on industrial effluent.

1.5 Attachments

- Specification for Effluent and Sewage Conveyance and Treatment System No.LP1-TKC-10RU-M-M27-SPC-2039.
- Design basis report for waste water treatment system No.LP1-TKC-10XXX-M-M3-CRT-0019.
- Design Raw Water Analysis.
- Data wastewater: Wastewater from Water Treatment and Wastewater for FGD system.
- Vietnam Regulations: QCVN 40:2025/BTNMT and QCVN 14:2025/BTNMT.

2 COMPRESSED AIR EQUIPMENT

2.1 Status

- Former EPC Contractor signed a contract with Atlascopco for the design, manufacturing, and supply of a compressed air equipment.
- Equipment includes:
 - + Four (4) air compressor skids for service air system, each consisting of the following:

- One (1) 100% capacity oil-free rotary screw air compressor with electric motor drive and other accessories as required.
 - One (1) inlet air filter/silencer and water-cooled inter-cooler and after-cooler; One (1) acoustic enclosure built around the compressor and drive unit to limit sound level <85 at a distance of 1m from equipment.
 - All piping, fittings and valves within the skid.
 - All necessary instruments and control hardware for interlocks, controls and all automatic load control equipment, instruments and accessories as required.
 - All necessary instruments and control hardware for interlocks, controls and all automatic load control equipment, instruments and accessories as required.
- + Four (4) air receivers for service air supply system, complete with safety valves, pressure gauges and automatic condensate drain.
- + Four (4) air compressor skids for instrument air supply system, each consisting of the following:
- One (1) 100% capacity oil-free rotary screw air compressor with electric motor drive and other accessories as required.
 - One (1) inlet air filter / silencer and water-cooled inter-cooler and after-cooler.
 - One (1) acoustic enclosure built around the compressor and drive unit if required to limit sound level <85 at a distance of 1m from equipment.
 - All piping, fittings and valves within the skid.
 - All necessary instruments and control hardware for interlocks, controls and all automatic load control equipment, instruments and accessories as required.
- + Six (6) air receivers, for instrument air supply system of which Four (4) are station air receivers and two (2) are unit air receivers, complete with safety valves, pressure gauges and automatic condensate drain.
- + Four (4) nos. air drying plants, one (1) for each IA compressor. Each air drying plant shall be complete with the following accessories:
- Air inlet strainer.
 - Air to air heat exchanger (pre-cooler).
 - Air to refrigerant heat exchanger (evaporator).
 - One (1) moisture separator with auto drain trap.
 - Refrigerant condensing unit complete with one (1) hermetically sealed compressor, one (1) compressor drive motor, one (1) water cooled condenser, refrigerant circuit access connection, refrigerant distributor, high and low pressure cut-out switches, interconnecting pipes, valves, fittings as required, liquid and suction line, one (1) filter dryer, one (1) sight glass with moisture indicator, safety valves or any other pressure relief devices;
 - One (1) automatic expansion valve in refrigerant line.
 - All inter-connecting/integral piping, valves trap stations with by-pass valves at drains, fittings, flanges, gaskets, etc.
 - Instrument and controls.
 - Instrument and controls.

- One (1) dew point indicator; One (1) control panel for control hardware and auto / manual operation of ADP, using a PLC.
 - Supporting structures, base plates, support plates, foundation/ anchor bolts, nuts, sleeves, inserts, lifting lugs, eye bolts, etc. as needed for efficient installation and handling of equipment.
- + Instrumentation & Control system:
- Microprocessor /Programmable Logic Controller based control panel (Skid mounted) for each compressor having facility to interface with a common redundant PLC.
 - One (1) no. redundant PLC based common control system will be provided for operation, control and monitoring of all related auxiliaries such as Air Dryers, Service Air Pneumatic isolation valves etc. PLC shall have an interface with Purchaser's DCS (SCMS) at CCR for remote operation (start / stop) and monitoring through fiber optic link.
 - Operator cum Engineering workstation for PLC based common control system with 24" color LCD monitor, membrane KB, mouse, color laser printer with associated desk & furniture d) Entire field instrumentation within the package area including pressure gages & switches, transmitters, thermocouples /RTDs etc. complete with all accessories shall be included in the scope as a minimum in line with the attached P&I Diagram for Compressed Air System .
 - Master clock interface card, OPC gateway along with server, Ethernet switch etc.
 - All associated original, licensed software platforms and application software for logs, mimic display, logs & reports etc.
 - Instrumentation & Control cable within the package battery limit.
 - Any special cables, if required, include System bus, Ethernet, Earthing cable, FO Cable.
 - Calibration and maintenance tools and tackle system-programming units etc, needed for complete erection and commissioning work.
- Technical requirements comply with Specification for Compressed Air System No. LP1-TKC-10QEA-M-M6-SPC-2014.
- Status:
- + Engineering: 100% for Compressors and Air receivers. Central Control is not finished.
 - + Manufacturing & Delivery:

All Compressors and air dryers were manufactured and delivered to Site. The equipment is in good condition and has been maintained by the Owner according to the manufacturer's instructions (see list good at site for compressor air system).

Air receivers and Central control system are not manufactured.
 - + Erection: 00%.
 - + Commissioning: 00%.

2.2 Scope of work

- The Bidder shall finalize the engineering/designs and furnish the remaining equipment (Air receivers and Central control system) based on the specification Compressed Air System No. LP1-TKC-10QEA-M-M6-SPC-2014.
- Delivery: Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and the subsequent storage and preservation of all materials and equipment.
- Erection/installation: The Bidder shall perform all installation, erection, and alignment activities for the equipment. Such works must be executed in strict accordance with the applicable supplier's installation manuals, erection procedures, and the Bidder's Inspection and Test Plan (ITP) as approved by the Owner. This scope shall apply to both equipment furnished by the Owner and equipment procured by the Bidder.
- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

2.3 Detail Requirements

- Technical requirements comply with Specification for Compressed Air Equipment No. LP1-TKC-10QEA-M-M6-SPC-2014.

2.4 Performance guarantee (N/A)

2.5 Attachments:

- Specification for compressed air system, document No.LP1-TKC-10QEA-M-M6-SPC-2014.
- Detail design (Atlas Copco).
- List good at site for compressor air system.

3 HYDROGEN GENERATING PLANT AND CO₂ CYLINDERS

- Supply Two (02) Hydrogen Generation Plant with all accessories and spare parts are provided under LP1-TKC-10QJG-M-M34-SPC-2033 and 140 Nos. CO₂ Cylinders.

3.1 Status:

- Former EPC Contractor signed a contract with Teledyne (US) to supply Two (02) Hydrogen Generation Plant and 140 Nos CO₂ Cylinders.
- Equipment includes:
 - + 140 Carbon dioxide Cylinders.
 - + Two (2) nos. (1 no. per stream) of Electrolyzer unit of sealed and compact design each consisting of requisite number of cells to generate rated quantity of hydrogen, complete with all accessories and safety features.
 - + One (1) Lye (Sodium Hydroxide) Tank. Silicon Controlled Rectifier (SCR) sets complete with all accessories, rectifier, transformer, panels etc. for each electrolyzer unit.
 - + Two (2) Gas Washing Tanks, one per stream

- + Two (2) nos. (1 no. per stream) of Hydrogen Gas Coolers as applicable.
- + Two (2) nos. (1 no. per stream) Hydrogen Gas Purifier Unit with all accessories.
- + Two (2) nos. (1 no. per stream) Hydrogen Gas Dual Tower Dryer unit with associated reactivation equipment and devices.
- + Two (2) nos. (1 no. per stream) Dual Type After-Filters to prevent entrainment of desiccant particles with the effluent gas from the dryer unit.
- + Two (2) Nos. (1 no. per stream) Buffer Vessels for storage of low-pressure hydrogen.
- + Two (2) sets of (each set having gas handling capacity of one "stream") multistage Hydrogen Gas Compressors, each set complete with drive unit, intercoolers and other accessories and instrumentation for each stream. Total four (4) compressors for two streams.
- + On line Hydrogen purity & dew point analyzers & detectors.
- + Two (2) Portable Hydrogen Gas Purity Meters. These meters shall be battery operated.
- + Deoxo - Drier for Oxygen removal.
- + Two (2) nos. Bottle Filling Stations, each with manifolds and isolation valves for both evacuating and simultaneous filling of twelve (12) hydrogen cylinders shall be provided per stream with hydrogen at a maximum filling pressure of 150 Kg/Sq.cm (gauge). Each manifold shall be provided with a vacuum pump for evacuation of air from hydrogen cylinder prior to filling.
- + Three (3) nos. Hydrogen Cylinder Hold Racks, each capable of holding six (6) cylinders shall be provided. Racks shall be provided with wheels with rubber tyres, turn tables for easy handling and appropriate braking mechanism.
- + Two (2) nos. DM Water Tanks each of minimum 5cu.m capacity shall be of SS construction.
- + Air cooled chiller in order to reduce hydrogen losses in the regeneration process of the Deoxo- dryer and to maintain dew point of Hydrogen gas to – 12°C (Atmospheric) upstream of the Deoxo-Drier.
- + All piping, valves, fittings, specialties, hangers, supports, insulation and cladding etc., as required to make the system complete.
- + One (1) no. Electrolyte Solution Preparation Tank of SS / MSRL construction.
- + Two (2) nos. (one working and one standby) Electrolyte Transfer Pumps with drive motors complete with all accessories.
- + Two (2) nos. (one working and one standby) Duplex Filters for Electrolyte Transfer Pumps.
- + HTO (Hydrogen transmitter in oxygen) at the Downstream of the Electrolyzer.

- + Hydrogen purity (indirect measurement method) rest of Oxygen in Hydrogen at the Downstream of the Deoxo/drier HTA Hydrogen detector in Air (inside of the enclosure)
- + Hydrogen gas-electrolyte separator, Hydrogen gases cooler, hydrogen demister, and drier for moisture removal.
- + Visualization software installed on the Visualization PC with following features, but not limited:
 - i) Graphical overview of the process
 - ii) Data acquisition.
- Status:
 - + Engineering: 100%
 - + Manufacturing & Delivery: 100%
 - + Erection/Installation: 00%
 - + Commissioning: 00%

3.2 Scope of work

- Engineering: N/A
- Manufacturing & Delivery: N/A
- Erection/Installation: Bidder will inspect the status of the equipment stored on the Site after being handed over by the Owner and carry out erection, installation. Bidder shall perform installation, erection, alignment, etc. for equipment in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner (Including both equipment delivered by the Owner and equipment newly purchased by the Bidder).
- Commissioning: Refer to [Table 08 Division of Responsibility].
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

3.3 Detail Requirements

- Bidder shall perform installation, erection, alignment, etc. for equipment in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner

3.4 Performance guarantee (N/A)

3.5 Attachments:

- Specification for Hydrogen Generation Plant: LP1-TKC-10QJG-M-M34-SPC-2033.
- List of delivered equipment.
- Detail Design from TELEDYNE.
- Drawings:
 - + Design Basis report for Hydrogen generation plant: LP1-TKC-10QJG-M-M34-CRT-0031.

- + Process Flow Diagram Hydrogen Generation plant: LP1-TKC-10QJG-M-M34-PFD-1098.
- + P&ID Diagram Hydrogen & carbon dioxide supply & Distribution system: LP1-TKC-11QJF-M-M54-P&ID-1022.

4 N₂ GAS CYLINDERS

4.1 Status

- Former EPC Contractor signed a contract with Teledyne (US) to supply: 150 Nos. N₂ Gas Cylinders; 8-cylinder racks; Gas Distribute Panel and interconnecting piping.
- Status:
 - + Engineering: 100%
 - + Manufacturing: 100%
 - + Delivery: 0%. Nitrogen Cylinder is stored in Teledyne's warehouse.
 - + Erection: 0%
 - + Commissioning: 0%

4.2 Scope of work:

- The Bidder supplies equipment according to Specification for Gas distribution system (N₂): LP1-TKC-11H-M-M1A-SPC-2055.

Equipment includes:

- + Nitrogen cylinders of 50 lit. capacity: 60 nos.
- + Three (3) nos. Nitrogen Cylinder Hold Racks, each capable of holding twenty (20) cylinders shall be provided.
- + Nitrogen Pressure reducing station consisting of Pressure reducing valve, upstream and downstream isolation valves, bypass valves, safety valves, Pressure Indicators and Switches, and associated piping.
- + All interconnected piping between the cylinder racks and Pressure reducing station.
- + All anchor bolts, nuts, sleeves etc. as required for the equipment foundation / installation
- Delivery: Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and the subsequent storage and preservation of all materials and equipment.
- Erection/installation: The Bidder shall perform all erection, installation, and alignment of the equipment in full compliance with the supplier's instructions, erection procedures, and the Inspection and Test Plan (ITP) approved by the Owner.
- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

4.3 Detail Requirements

- The Detail requirements comply with Specification for Gas distribution system (N₂): LP1-TKC-11H-M-M1A-SPC-2055.

4.4 Performance guarantee (N/A)

4.5 Attachments:

- Specification for Gas distribution system (N₂): LP1-TKC-11H-M-M1A-SPC-2055.
- P&ID Nitrogen Supply & Distribution system: LP1-TKC-10QJD-M-M54-P&ID-1021.
- N₂ system general arrangement: LP1-TES-10QJD-G-M16-DGA-0001.
- Long Phu Nitrogen supply P&ID: LP1-TES-10QJD-M-M16-P&ID-0001.
- Calculation for estimation of gas cylinders: LP1-TKC-10QJ-M-M54-CAL-0102.

5 HEATING, VENTILATION AND AIR CONDITION (HVAC)

5.1 Status

- Former contractor signed a contract with LG Electronics (Korea) to supply equipment and technical services for HVAC systems for buildings and working rooms in the Project.
- Air Conditioning and Ventilation systems shall be provided for the plant and non-plant buildings of the project which shall include but not be limited to as follows:
 - + 1. Power House Building
 - + 2. Central Electrical & Control Equipment Building
 - + 3. Common Service Building (Canteen)
 - + 4. ESP Control Building
 - + 5. AHP Equipment Building
 - + 6. River Water Pre-Treatment Plant
 - + 7. Desalination & Demineralization Building
 - + 8. Intake Chlorination Plant Building
 - + 9. External Regeneration System for Condensate Polishing
 - + 10. Hydrogen Generation Plant
 - + 11. Fire Station Building
 - + 12. Fuel Oil Pump House
 - + 13. Intake CW Pump House
 - + 14. Waste Water Treatment Building
 - + 15. FGD Plant
 - + 16. Ware House
 - + 17. Workshop

- + 18. Compressor Building
- + 19. Emergency DG Building
- + 20. Ash Recovery Water Pump House
- + 21. Ash Slurry Pump house
- + 22. Ash Silo Utility Building
- + 23. Coal Handling Plant
- + 24. Limestone & Gypsum Handling Building
- + 25. Fresh Water & Fire Water Pump house
- + 26. Sand settling Basin and Raw Water Forwarding Pump house
- + 27. FGD Electrical Building
- + 28. Gravity Filter house
- + 29. Remote I/O rooms, wherever applicable
- + 30. Local Control rooms, wherever applicable
- + 31. Battery rooms
- + 32. Cable spreader rooms
- + 33. Switchgear rooms
- Technical Specifications shall comply to Specifications for Heating, ventilation and air conditioning system No. LP-TKC-10SA-M-M15-SPC-2035.
- Status:
 - + Engineering: about 88%.
 - + Manufacturing and Delivery: Only 48 sets of Roof Extraction Fans for Power House Building have been manufactured and have not yet been delivered to the site.
 - + Erection: 00%.
 - + Commissioning: 00%.

5.2 Scope of work

- Engineering: Bidder shall finalize the engineering/designs based on the Specifications for Heating, ventilation and air conditioning system No. LP-TKC-10SA-M-M15-SPC-2035.
- Scope of Supply: Air Conditioning and Ventilation systems shall be provided for the plant and non-plant buildings of the project which shall include but not be limited to as follows:
 - + 1. Power House Building
 - + 2. Central Electrical & Control Equipment Building
 - + 3. Intake Chlorination Plant Building

- + 4. External Regeneration System for Condensate Polishing
- + 5. Hydrogen Generation Plant
- + 6. Fire Station Building
- + 7. Fuel Oil Pump House
- + 8. Wastewater Treatment Building
- + 9. Compressor Building
- + 10. Emergency DG Building
- + 11. Remote I/O rooms, wherever applicable
- + 12. Local Control rooms, wherever applicable
- + 13. Battery rooms,
- + 14. Cable spreader rooms,
- + 15. Switchgear rooms,
- The scope of service includes the following:
 - + Complete remaining design and engineering works, including submission drawing, calculations, test reports/ certificates, data, instruction (Operation and Maintenance) manuals, and performance curves as required by the Consultant/Client
 - + Shop painting, shop testing and supply of paints and primers for final painting
- Delivery: Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and the subsequent storage and preservation of all materials and equipment.
- Erection/installation: The Bidder shall perform all erection, installation, and alignment of the equipment in full compliance with the supplier's instructions, erection procedures, and the Inspection and Test Plan (ITP) approved by the Owner.
- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

5.3 Detail Requirements

- The Detail requirements comply with Specification for HVAC system No.LP1-TKC-10SA-M-M15-SPC-2035.

5.4 Performance guarantees

- Refer to item 5.00.00 Guaranteed Performance in Specification for HVAC system No.LP1-TKC-10SA-M-M15-SPC-2035.

Parameters	Values	Remark
Power consumption for HVAC for Power House Building at 100% load shall not exceed 445 kW, with application of the following coefficients:	$\leq 445\text{kW}$ Value is calculated as Nameplate capacity x Duty	

• Duty Factor = 0.50 • Utilization Factor = 0.76 • Efficiency Factor = 0.84	Factor x Utilization Factor x Efficiency Factor	

5.5 Attachments

- Specification for HVAC system No.LP1-TKC-10SA-M-M15-SPC-2035.
- Detail Design from LG Electronics.

6 MAIN CW PIPING AND AUXILIARY CW PIPING.

6.1 Status

- Former EPC contractor signed a contract with AGRIMECO (Vietnam) to supply Main CW piping and Auxiliary CW piping. The scope of work only includes the supply of Main CW piping and Auxiliary CW piping. The valves, expansion joints, and associated accessories shall be described and provided in accordance with Item 9. LP Valves and Specialties.
- Main CW Piping and Auxiliary CW Piping are depicted in P&I Diagram Cooling Water (LP1-TKC-10PA-M-M4-P&ID-1008) and P&I Diagram Auxiliary Cooling Water System (LP1-TKC-10PC-M-M4-P&ID-1009).
- Sizing calculation for circulation water pipe thickness is described in document No. LP1-TKC-10PAB-M-M4-CAL-0062, and Sizing calculation for circulation water pipe thickness in front PH building to avoid concrete encasement & pipe is described in document No. LP1-TKC-10PAB-M-M4-CAL-0063.
- General Arrangement for CW piping and ACW piping is described in document No. LP1-TKC-10PG-M-M24-DGA-1369 and LP1-TKC-11PAB-M-M4-DGA-1350.
- Status:
 - + Engineering: nearly 100%.
 - + Manufacturing and Delivery:
 - Main CW Piping: Manufacturing nearly 100%, and delivered to the Site.
 - ACW piping: Not manufactured.
 - + Erection: The main CW pipeline has been installed; however, the main cooling water pipes connecting to the main cooling water pump and to the condenser have not yet been installed and are currently stored at the site.



+ Commissioning: 0%.

6.2 Scope of work

- The Bidder shall conduct a survey and re-evaluate the materials and equipment delivered to the construction site (including the installed part and the uninstalled part stored on the construction site) and shall report to the Owner on the condition of such materials and equipment.
- The Bidder shall drain the water from the pipeline, clean it, inspect the current condition, and submit a report assessing the overall level of pipeline corrosion at the Bidder's own expense. If necessary, the Bidder shall propose an anti-corrosion solution.
- In the event that the Bidder proposes an additional anti-corrosion solution for the pipeline, Bidder is requested to submit the cost for the supply, installation, testing, and operational training of the anti-corrosion system, as per the Bidder's assessment report, in the optional price quotation for the Owner's consideration. The Owner may assign the Bidder to carry out the work if the proposed anti-corrosion system is deemed necessary.
- Engineering: Bidder shall finalize the engineering/designs based on the Owner's documents provided in attachments. Based on the existing design provided by the

Owner, the Bidder shall recalculate the corrosion rate of the main cooling pipeline and report to the Owner.

- Supply: The Bidder shall supply the remaining Main CW piping and ACW piping.
- Delivery: Bidder shall be responsible for customs clearance, Domestic transportation to Long Phu 1 site, and the subsequent storage and preservation of all materials and equipment.
- Erection/installation: Bidder shall perform installation, erection, alignment, etc. for equipment in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner.
- Erection/installation: The Bidder shall perform all installation, erection, and alignment activities for the equipment. Such work must be executed in strict accordance with the applicable supplier's installation manuals, erection procedures, and the Bidder's Inspection and Test Plan (ITP) as approved by the Owner. This scope shall apply to both equipment furnished by the Owner and equipment procured by the Bidder. According to the Owner's estimate, the remaining tonnage requiring installation is approximately 1,212 tones, inclusive of the unfabricated ACW piping.
- Commissioning: Refer to [Table 08 Division of Responsibility].
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

6.3 Detail Requirements

- Comply with the documents:
 - + Specification for CW & ACW Piping: Document No.LP1-TKC-10PAB-M-M4-SPC-2018.
 - + Sizing calculation for circulation water pipe thickness: LP1-TKC-10PAB-M-M4-CAL-0062 and Sizing calculation for circulation water pipe thickness in front PH building to avoid concrete encasement & pipe: LP1-TKC-10PAB-M-M4-CAL-0063. Flow
 - + P&I Diagram Cooling Water: LP1-TKC-10PA-M-M4-P&ID-1008.
 - + P&I Diagram Auxiliary Cooling Water System: LP1-TKC-10PC-M-M4-P&ID-1009.
 - + Piping Layout – CW & ACW System LP1-TKC-10PG-M-M24-DGA-1369.
 - + G.A Around Condenser & CW, ACW piping: LP1-TKC-11PAB-M-M4-DGA-1350.

6.4 Performance guarantees (N/A)

6.5 Attachments

- Specification for CW & ACW Piping No.LP1-TKC-10PAB-M-M4-SPC-2018.
- P&I Diagram Cooling Water: LP1-TKC-10PA-M-M4-P&ID-1008.
- P&I Diagram Auxiliary Cooling Water System: LP1-TKC-10PC-M-M4-P&ID-1009.

- Sizing calculation for circulation water pipe thickness: LP1-TKC-10PAB-M-M4-CAL-0062 and Sizing calculation for circulation water pipe thickness in front PH building to avoid concrete encasement & pipe: LP1-TKC-10PAB-M-M4-CAL-0063.
- Piping Layout – CW & ACW System LP1-TKC-10PG-M-M24-DGA-1369.
- G.A Around Condenser & CW, ACW piping: LP1-TKC-11PAB-M-M4-DGA-1350.
- List good at site.

7 INTAKE CHLORINATION SYSTEM

7.1 Status

- Former EPC contractor signed a contract with DENORA WATER TECHNOLOGIES ITALY (Italy) to supply Intake Chlorination System.
- Intake Chlorination System include: The equipment and accessories to be furnished and put into operation and all other required services are detailed below. The items though not specifically mentioned but needed to make the system complete in all respects and reliable for safe and smooth operation and guaranteed performance shall also be treated as though included, and the same shall be furnished, unless otherwise specifically excluded elsewhere.

Major Equipment and Accessories for Intake Chlorination System are as follows:

- + Major Equipment and Accessories for Intake Chlorination system are as follows:
- + Forty (40) nos. Chlorine Ton Containers, each provided with isolation valves, educator tubes, two (2) nos. Roller Supports and all other accessories.
- + Four (4) nos. Chlorine Manifolds, each with all accessories.
- + Four (4) nos. electrically heated water bath type Chlorine Evaporators, each with all accessories.
- + Eight (8) nos. Strainers in chlorine gas line, two (2) nos. for each of the four (4) nos. chlorination streams.
- + Pressure regulation and shut-off valves for each of the chlorine gas line from the outlet of each Chlorine Evaporator.
- + Four (4) nos. Chlorinators each vacuum-operated aqueous solution feed type complete with all accessories

Each Chlorinator should have the items as follows:

Remote Vacuum Regulator.

The monitoring and control as below will be done through Operating Station

- + Chlorine Gas Flow meter.
- + Differential Pressure Regulator.
- + Manual Flow Control Valve

Fixed throat type, Remote Ejector

- + Four (4) nos. Water Supply Booster Pumps, each complete with electrical drive motor and all other accessories to supply water to the Evaporators and Chlorinators.
- + Four (4) nos. 100% capacity Basket strainers with all accessories
- + Adequate nos. of Chlorinated Water Diffusers.
- + Necessary nos. of safety and supervisory instruments as described in Annexure – II and elsewhere of this Specification.
- + Two (2) nos. electrically operated monorail hoists of 3.0 Ton capacity complete with lifting bar, load indicator and all accessories.
- + Two (2) nos. Platform Dial Type Weighing Scale, of 3.0 Ton capacity complete with all accessories.

Electrical Equipment.

Services for Intake Chlorination System.

For more details, the Bidder refers to the Specification for Intake Chlorination System (Document No: LP1-TKC-10PBN-M-M43-SPC-2040).

- Status:
 - + Engineering: About 82.87%.
 - + Manufacturing & Delivery: 00%.
 - + Erection: 00%.
 - + Commissioning: 00%

7.2 Scope of work

- Engineering: Bidder shall finalize the engineering/designs based on the Owner's documents provided in attachments.
- Supply: Bidder shall furnish the equipment & accessories based on the design/specification (Document No: LP1-TKC-10PBN-M-M43-SPC-2040) developed by Bidder with Owner approval.
- Delivery: Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and the subsequent storage and preservation of all materials and equipment.
- Erection/installation: The Bidder shall perform all erection, installation, and alignment of the equipment in full compliance with the supplier's instructions, erection procedures, and the Inspection and Test Plan (ITP) approved by the Owner.
- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

7.3 Detail Requirements

- The Detail requirements comply with Specification for Intake Chlorination System: LP1-TKC-10PBN-M-M43-SPC-2040.

7.4 Performance guarantee

- Refer to item 6.00.00 Guaranteed Performance in Specification for Intake Chlorination System No.LP1-TKC-10PBN-M-M43-SPC-2040.

7.5 Attachments

- Specification for Intake Chlorination System: LP1-TKC-10PBN-M-M43-SPC-2040.
- P&ID for Intake Chlorination System P&ID: LP1-DNR-10PBN-M-M16-P&ID-0001.
- General Layout for Intake Chlorination System: LP1-DNR-10PBN-M-M16-DGA-0001.

8 MISCELLANEOUS CRANES & HOIST

8.1 Status

- Former EPC Contractor signed a contract with VIETNAM STEEL STRUCTURES AND LIFTING EQUIPMENT JOINT STOCK COMPANY (VietNam) supply Miscellaneous Cranes & Hoists for Long Phu 1 Project.

Supply cranes for: Intake CW Pump House; Fresh Water & Fire Water Pumps House; Filter Water Pump House; Diesel Generator Building (DG Bldg.); Workshop; Settling Basins Pumps House; Coal Mill; Motor Driven Boiler Feed Pump; Warehouse; Compressor House; External Workshop; CW Pump Screen & Gate handling. Each Crane shall be complete with the following, wherever applicable:

- + End carriages complete with wheels, bearings, etc. for the crane bridge.
- + One (1) no. motorized trolley complete with trolley frame, wheels, drive, brakes and controls.
- + One (1) no. motor-operated main hoist complete with gear train, load hook, wire rope, winding drum for wire rope, electrical and mechanical brakes, upper and lower limit switches, festooned conductor system, overload limiting device, etc.
- + One (1) no. motor-operated auxiliary hoist complete with gear train, load hook, wire rope, winding drum for wire rope, electrical and mechanical brakes, upper and lower limit switches, festooned conductor system, overload limiting device, etc.
- + One (1) no. open-pulpit type cabin complete with light, fan, seat, foot-operated warning gong, protective panel, controllers, main isolating switch, emergency stop push button, communication equipment, portable fire extinguishers etc. for CW pump house EOT crane.
- + Pendant control station with all accessories.
- + Runway rails for entire runway length along with rail clamps, all inserts, insert plates, anchor bolts, nuts, buffers & stops, limit switches etc. as required.
- + Runway conductors (DSL) for the entire runway length complete with all insulators, supports, support brackets, fixing clamps, bolts, nuts etc. as specified and as required to complete the installation.
- + Power supply cabling including isolating switch complete with electrical items, attachments and accessories as required feed power to the runway conductor.

- + Bridge and trolley current collectors and bridge cross conductors along with all wirings etc. for the crane as required to complete the scope of work.
- + Crane components shall be provided with lifting lugs, eye bolts, etc. for handling, assembling, lifting and placing into position.
- + All facilities, accessories and attachments for single and tandem operation of the crane.
- + Illumination, as specified and as necessary.
- + Water filled bags, as required for full load and overload testing at site.
- + All equipment and material for complete Electrical Works including main disconnect switch, cabling, all controls & interlocks with necessary wiring, grounding, illumination, protective panels with all protective devices, anti-collision limit switches etc. As required for the EOT cranes & Hoists.
- + Spares, tools & tackle, lubricants/oil/consumables.
- + All necessary power and control cables to make a complete system.
- + Handrails, toe boards and platforms as required.
- + All relevant drawings, data and O&M manuals.

Supply hoist for: Condenser vacuum pump; CW pipe butterfly valve to/from Condenser; A/C plant equipment room; Fuel Oil pump house; HT Switchgear Room; LT Switchgear Room; Control Equipment Room; Desalination & Demineralization Building; Fuel oil Drain Oil tank Pit; Chemical house for Clarifier; Boiler elevator M/C room; TG Hall elevator M/C room; Administration Building elevator M/C room; Central electrical and control equipment building elevator M/C room; Sand Settling Basin Pump House (Screen Handling); ACW Pump & Motor; Bulldozer shed; 1T and 2T capacity loose chain pulley block; Vane Wheel of PA fan/FD fan; Motor of PA fan/FD fan; Vane Wheel of ID fan; Motor of ID fan; Air heater; Flue gas recirculation fan rotor; Flue gas recirculation fan motor; Seal air fan. Each Hoist shall be complete with the following, wherever applicable:

- + Trolley, suspension rods, nuts, bolts, washers and specialties as required with appropriate capacities.
- + Drive motor, gear train, lifting hook block, wire rope, winding drum for wire rope, brakes, upper and lower limit switches, festooned conductor system, overload limiting device, etc.
- + Trailing cable with supports, support brackets, fixing clamps, bolts, nuts etc. as specified and as required to complete the installation.
- + Pendant control station with all accessories.
- + Lifting lugs, eye bolts, etc. for handling, assembling, lifting and placing different hoist parts into position.

- + Spares, tools & tackle, lubricants/oil/consumables.
- + All relevant drawings, data and O&M manuals

Supply Services for Miscellaneous Cranes & Hoists.

Technical Specifications comply with the Specifications for Miscellaneous Cranes & Hoist No. LP1-TKC-10SM-M-M32-SPC-2024.

- Status:

- + Engineering: about 89.5%.
- + Manufacturing & Delivery: 89.5%. (Delivery: 336.104 tons)

A total of 27 cranes have been manufactured and delivered to the Site: 01 No. Intake CW Pump Crane; 01 No. Fresh Water & Fire Water Pump House Crane; 01 No. Filter Water Pump House Crane; 01 No. Workshop Crane; 01 No. Settling Basins Pump House Crane; 18 No. Coal Mill Cranes; 02 No. Motor Driven Boiler Feed Pump Crane; 01 Nos. Warehouse Crane; 01 No. Compressor Building Crane.

- + Erection: about 8.9 % (Erection: about 29.916 tons)
- + Commissioning: 00%.
- The Owner will procure and erect the handling crane for the CW Pump Screens and Gates under a separate bidding package.

8.2 Scope of work

- Engineering: Bidder shall finalize the engineering/designs based on the Owner's documents provided in attachments.
- Supply 01 remain Cranes: 01 No. Diesel Generator Building.
- Supply Miscellaneous Hoists:

Sl. No.	Application	Tag No.	Type	Qty	Capacity	Lift (m)	Travel (m)	Service
1	Condenser vacuum pump	Later	Electric	2	2 x 10 T	5	10	Indoor
2	CW pipe butterfly valve to/from Condenser	Later	Electric	2	25T	16	20	Indoor
3	Fuel Oil pump house	Later	Manual	1	2T	5.6	25	Indoor
4	Boiler elevator M/C room	Later	Electric	4	4 x 8T	6	10	Indoor
5	TG Hall elevator M/C room	Later	Manual	2	2 x 3T	5	10	Indoor
6	ACW Pump & Motor	Later	Electric	2	7T	4	13	Indoor
7	1T and 2T capacity loose chain pulley blocks	Later	Later	Later	1T & 2T	Later	Later	Indoor
8	Vane Wheel of PA fan/FD fan	Later	Electric	4	4 x 8T	10	60	Outdoor
9	Motor of PA fan/FD fan	Later	Electric	4	4 x 15T	8	60	Outdoor
10	Vane Wheel of ID fan	Later	Electric	4	4 x 20T	12	55	Outdoor
11	Motor of ID fan	Later	Electric	4	4 x 25T	9	55	Outdoor

12	Air heater	Later	Electric	4	4 x 5T	8	20	Outdoor
13	Flue gas recirculation fan rotor	Later	Electric	4	4 x 5T	8	20	Outdoor
14	Flue gas recirculation fan motor	Later	Electric	4	4 x 10T	10	20	Outdoor
15	Seal air fan	Later	Manual	4	4 x 2T	5	15	Outdoor

- Delivery: Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and the subsequent storage and preservation of all materials and equipment.
- Erection/installation: The Bidder shall perform all installation, erection, and alignment activities for the equipment. Such work must be executed in strict accordance with the applicable supplier's installation manuals, erection procedures, and the Bidder's Inspection and Test Plan (ITP) as approved by the Owner. This scope shall apply to both equipment furnished by the Owner and equipment procured by the Bidder.

For Cranes:

No.	DESCRIPTION	Type	Quantity	Capacity (T)	Supply	Erection	Remark
1	Intake CW Pump House	Double Girder	1	55/10	Owner	Owner	
2	Fresh Water & Fire Water Pump House	Single Girder	1	5	Owner	Owner	
3	Filter Water Pump House	Single Girder	1	5	Owner	Owner	
4	DG Bldg.	Single Girder	1	10	Bidder	Bidder	
5	Workshop	Single Girder	1	20	Owner	Bidder	
6	Settling Basins Pump House	Single Girder	1	5	Owner	Owner	
7	Coal Mill	Single Girder	18	25	Owner	Bidder	
8	Motor Driven Boiler Feed Pump	Double Girder	2	50/10	Owner	Bidder	
9	Ware-house	Single Girder	1	10	Owner	Bidder	
10	Comp. Bldg.	Single Girder	1	10	Owner	Bidder	

11	CW Pump Screen & Gate handling	Semi Gantry	1	16***	Owner	Owner	

For Hoists:

Sl. No.	Application	Tag No.	Type	Qty	Capacity	Supply	Erection	Remark
1	Condenser vacuum pump	Later	Electric	2	2 x 10 T	Bidder	Bidder	
2	CW pipe butterfly valve to/from Condenser	Later	Electric	2	25T	Bidder	Bidder	
3	Fuel Oil pump house	Later	Manual	1	2T	Bidder	Bidder	
4	Boiler elevator M/C room	Later	Electric	4	4 x 8T	Bidder	Bidder	
5	TG Hall elevator M/C room	Later	Manual	2	2 x 3T	Bidder	Bidder	
6	ACW Pump & Motor	Later	Electric	2	7T	Bidder	Bidder	
7	1T and 2T capacity loose chain pulley blocks	Later	Later	Later	1T & 2T	Bidder	Bidder	
8	Vane Wheel of PA fan/FD fan	Later	Electric	4	4 x 8T	Bidder	Bidder	
9	Motor of PA fan/FD fan	Later	Electric	4	4 x 15T	Bidder	Bidder	
10	Vane Wheel of ID fan	Later	Electric	4	4 x 20T	Bidder	Bidder	
11	Motor of ID fan	Later	Electric	4	4 x 25T	Bidder	Bidder	
12	Air heater	Later	Electric	4	4 x 5T	Bidder	Bidder	
13	Flue gas recirculation fan rotor	Later	Electric	4	4 x 5T	Bidder	Bidder	
14	Flue gas recirculation fan motor	Later	Electric	4	4 x 10T	Bidder	Bidder	
15	Seal air fan	Later	Manual	4	4 x 2T	Bidder	Bidder	

- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

8.3 Detail Requirements

Technical Specifications comply with the Specifications for Miscellaneous Cranes & Hoists No.LP1-TKC-10SM-M-M32-SPC-2024.

In addition to this, the Bidder must adhere to the codes and standards specified in Attachment- B and also to the following Vietnamese codes and standards:

- + QTKD: 01- 2014/BLDTBXH: Procedure for technical inspection of lifting equipment.
- + TCVN 4244:2005 Lifting equipment - Design, manufacture and technical examination.

- + TCVN 5206:1990 Lifting equipment - Safety requirements for counterweights and stabilizing weights.
- + TCVN 5207:1990 Lifting equipment- General safety requirements.
- + TCVN 5209:1990 Lifting equipment - Safety requirements for electrical part.
- + TCVN 5179:1990 Lifting equipment - Hydraulic test requirements.
- + TCVN 9358:2012 Installation of grounding systems for industrial works- General requirements
- + QCVN 7: 2012/BLBTBXH National regulation on lifting equipment with respect to safety at work.

8.4 Performance guarantees

- Refer to Item 5.00.00 Guaranteed performance guarantees in the Specification for Miscellaneous Cranes & Hoists (Document No.LP1-TKC-10SM-M-M32-SPC-2024).

8.5 Attachments

- Specification for Miscellaneous Cranes & Hoists (Document No.LP1-TKC-10SM-M-M32-SPC-2024).
- List goods received.

9 LP VALVES AND SPECIALTIES

9.1 Status

- Former EPC contractor signed a contract with VELAN (Germany) to supply LP Valves and Specialties. Supply LP valves & specialties for:
 - + Plant water System
 - + Cooling water system
 - + Auxiliary Cooling water system
 - + Closed Cycle Cooling water system
 - + Service water distribution system
 - + Potable water system
 - + Instrument air distribution system
 - + Service air distribution system
 - + Fuel oil unloading-Storage and handling system
 - + Auxiliary Steam System
 - + Central lube Oil System
 - + Steam turbine and power cycle piping, drain and vents.
(Valve, Rubber Expansion Joints, orifice plate, Strainer, coupling...)
- Supply Services.

For more details, the contractor refers to Specification for LP Valves & Specialties (Document No. LP1-TKC-10AA-M-G1-SPC-2020).

- Status:
 - + Engineering: 00%.
 - + Manufactured: 00%.
 - + Delivery: 00%.
 - + Erection and commissioning: 00%
- LP Valve and Specialties in piping from Raw Water Intake Pump in Intake pump house to River water pre-treatment have been separated in another package and will be excluded in this package.

9.2 Scope of work

- Engineering: Bidder shall finalize the engineering/designs based on the Specification for LP Valves & Specialties (Document No. LP1-TKC-10AA-M-G1-SPC-2020).

Supply: Bidder shall furnish the LP Valve & Specialties based on the design/specification developed by Bidder with Owner approval (Exclude LP Valve and Specialties in piping from Raw Water Intake Pump in Intake pump house to River water pre-treatment. Refer to P&ID LP1-TKC-10G-M-M3-P&ID-1050 in attachment. Exclude the expansion joint on the storm water pump discharge as shown on drawing LP1-TKC-10GUA-M-M3-P&ID-1103).
- Delivery: Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and the subsequent storage and preservation of all materials and equipment.
- Erection/installation: The Bidder shall perform all erection, installation, and alignment of the equipment in full compliance with the supplier's instructions, erection procedures, and the Inspection and Test Plan (ITP) approved by the Owner.
- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

9.3 Detail Requirements

- Technical Specifications comply with the Specifications LP Valves & Specialties (Document No. LP1-TKC-10AA-M-G1-SPC-2020) and Volume II-I Section-VI: Technical Specification for Low pressure piping, valves and specialties.

9.4 Performance guarantees (N/A)

9.5 Attachments

- Specification LP Valves & Specialties (Document No. LP1-TKC-10AA-M-G1-SPC-2020).
- Exclude LP Valve and Specialties from Intake pump house to River water pre-treatment (P&ID LP1-TKC-10G-M-M3-P&ID-1050).
- Drawing LP1-TKC-10GUA-M-M3-P&ID-1103.

- Volume II-I Section-VI: Technical Specification for Low pressure piping, valves and specialties.

10 MISCELLANEOUS HORIZONTAL PUMPS

10.1 Status:

- Supply pumps:
 - + Two (2) nos. horizontal centrifugal type Fresh Water Transfer Pumps complete with electric motor drives and all other accessories.
 - + Two (2) nos. horizontal centrifugal type Potable Water Pumps complete with electric motor drives and all other accessories.
 - + Four (4) nos. horizontal centrifugal type ACW Booster Pumps complete with electric motor drives and all other accessories.
 - + Four (4) nos. horizontal centrifugal type Closed Cycle Cooling Water (CCCW) Pumps complete with electric motor drives and all other accessories.
 - + Two (2) nos. horizontal centrifugal type Demineralized (DM) Water Transfer Pumps complete with electric motor drives and all other accessories.
 - + Four (4)nos. horizontal centrifugal type Condensate Transfer Pumps complete with electric motor drives and all other accessories.
 - + Two (2) sets of Condenser Water box Priming Vacuum Pump Skids complete with Vacuum Control Tank, Cooler, Separator, Inter connecting Piping, electric motor drives, associated Controls and all other accessories.
 - + Four (4) nos. horizontal centrifugal type SCAPH Drain Pumps complete with electric motor drives and all other accessories.
 - + Four (4) nos. horizontal centrifugal type Cycle Make Up Pumps complete with electric motor drives and all other accessories.
 - + Each pump shall be provided with the following accessories/auxiliaries, as a minimum:
 - Heavy-duty flexible couplings of approved design to connect the pump shaft directly with the motor shaft.
 - Sets of base plate, support plate, grounding pad, thrust block, lifting lugs, eye bolts, anchor bolts, nuts etc. for each pump and motor set.
 - Slip-on type drilled steel flanges of proper rating for discharge connections of each pump set. All the counter flanges shall be complete with requisite number of bolts, nuts, gaskets etc.
 - All internal/integral piping with valves, fittings, and pressure gauges for lubrication, cooling and sealing, wherever applicable, shall be tapped directly from respective pump discharge.
 - Finish painting at shop and supply of touch-up paint for application at site.
 - Drain/vent connection with valves.

- All steel inserts, plates, bolts, nuts and sleeves etc. as required to grout in the Purchaser's concrete work and to hold/support the equipment being supplied under this specification.
- Mandatory and Recommended Spare Parts.
- Start-up & commissioning spares.
- All accessories, consumables and lubricants are required for erection, testing and commissioning.
- All special tools and tackles as required for the erection and maintenance of the equipment offered.
- Drawings and documents
- + Electrical scope shall include supply of electrical drive motors as required for the pumps within the scope of the Contractor
- + Instrumentation and Control
- + Technical specifications comply with Specification for Miscellaneous Horizontal Pumps No.LP1-TKC-10AP-M-G1-SPC-2009.
- Supply Services:
 - + Bidder shall take responsibility for all the testing and inspection of the manufacturer's works to be conducted in a manner as specified.
 - + Transportation of all equipment after being packed for transportation from the Manufacturer's works to the Site, inclusive of all intermediate Handling.
 - + Cleaning, Painting, & Protective coating.
 - + Complete services for supervision of erection, testing, and commissioning of the system at the purchaser's option.
 - + Furnishing of documents, data, drawings, manuals, test certificates, manufacturer's Certificate of Compliance, etc.
 - + Supply and compilation of different manufacturers' operating and instruction manuals comprehensively, proposed for use by operating and/or maintenance Personnel.
- Status:

Former EPC contractor signed a contract with Apollo Gobnit GmbH (Germany) to supply 12 pumps according to the Specification for miscellaneous Horizontal Pumps (02 Fresh Water Transfer Pumps, 02 Potable water pumps, 04 ACW Booster Pumps, 02 Condenser water box priming vacuum pump skids). And EPC contractor signed a contract with RUHRPUMPEN for the supply Remain Horizontal Pumps (02 DM Water transfer pumps, 04 Condensate transfer pumps).

 - + APOLLO's PUMPS
 - Engineering: 100% (For supply equipment).
 - Manufacturing: 100%.

- Delivery: 00%.
 - Erection and commissioning: 00%
- + RUHRPUMPEN's PUMPS
- Engineering: N/A%.
 - Manufacturing: 00%.
 - Delivery: 00%.
 - Erection and commissioning: 00%

The owner will purchase all these pumps from **APOLLO** (10 pumps: 02 pumps DM Water Transfer Pumps; 02 pumps Portable Transfer Pumps; 02 pumps Condenser Waterbox Priming Vacuum Pump Skids; 04 pumps ACW Booster Pumps) and hand over to Bidder to erected.

10.2 Scope of work:

- Engineering: Bidder shall finalize the engineering/designs based on the Owner's documents provided in attachments.
- Supply: Bidder will purchase all remain horizontal Pumps (04 Condensate transfer pumps, 04 Closed Cycle Cooling Water pumps, 04 SCAPH drain transfer pumps, 04 Cycle make up pumps, etc..).
- Delivery: Bidder shall be responsible for customs clearance, Domestic transportation to Long Phu 1 site, and the subsequent storage and preservation of all materials and equipment.
- Erection: The Bidder shall perform all erection, installation, and alignment of the equipment in full compliance with the supplier's instructions, erection procedures, and the Inspection and Test Plan (ITP) approved by the Owner.

No.	Description	Quantity	Supply	Erection	Remark
1	Fesh Water Transfer Pumps	2	Owner	Owner	
2	Potable Water Pumps	2	Owner	Bidder	
3	ACW Booster Pumps	4	Owner	Bidder	
4	CCCW Pumps	4	Bidder	Bidder	
5	DM Water Transfer Pumps	2	Owner	Bidder	
6	Condensate Transfer Pump	4	Bidder	Bidder	

7	Condenser water box priming Vacuum Pump Skids	2	Owner	Bidder	
8	SCAPH Drain Transfer Pumps	2	Bidder	Bidder	
9	Cycle make up pumps	4	Bidder	Bidder	

- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

10.3 Detail Requirements

- Technical Specification to comply with the Specification for Miscellaneous Horizontal Pumps (Document no. LP1-TKC-10AP-M-G1-SPC-2009).
- The number of pumps, according to the Specification, may change. The contractor will have to update according to the general design of the plant.

10.4 Performance guarantee

- Refer to Item 5.00.00 Guaranteed Performance in the Specification for Miscellaneous Horizontal Pumps (Document no. LP1-TKC-10AP-M-G1-SPC-2009).

10.5 Attachments:

- Specification for miscellaneous horizontal pumps No. LP1-TKC-10AP-M-G1-SPC-2009.

11 MISCELLANEOUS VERTICAL PUMPS & SUMP PUMPS

11.1 Status

- Former EPC Contractor signed a contract with RUHRPUMPEN for the supply Miscellaneous Horizontal Pumps. Supply pumps:
 - + Twelve Numbers (12) nos. vertical wet pit type pumps, complete with electric motor drives together with all accessories for each pump set as specified below.
 - Couplings of approved design to connect pump shaft directly with the motor shaft.
 - Sets of base plates, support plates, grounding pads, lifting lugs, eye bolts, foundation bolts, nuts etc for each pump and motor set.
 - Slip-on type drilled steel flanges of proper rating for discharge connections of each pump set. All the counter flanges shall be complete with a requisite number of bolts, nuts, gaskets etc.
 - Vent connection, column breather, air release cocks and drain plugs for each pump set.
 - Discharge line pressure gauge completes with isolating cocks for each pump set.

- Automatic Pre-lubrication system including all necessary accessories, if applicable.
 - All internal piping with valves, fittings, and pressure gauges for lubrication, cooling and sealing, wherever applicable, shall be tapped directly from respective pump discharge.
 - Spares, tools & tackle, lubricants/oil/consumables
 - All accessories, consumables and lubricants are required for erection, testing and commissioning.
 - All relevant drawings, data and O&M manuals.
 - Painting at shop and touch up paint at site
- + Two (2) nos. diesel engine driven trolley mounted horizontal centrifugal sump pumps along with following accessories for each pump set
- One (1) no. 7.5 meters long hose for the pump suction and one (1) no. 30 meters long hose for the pump discharge. Both the hoses shall be provided with flanged ends, complete with counter flanges, bolts, nuts and gaskets.
 - One (1) no. 500 mm long spool piece, with both ends flanged, one end matching with the pump suction nozzle and the other end matching with the flanged end of the suction hose.
 - One (1) no foot valve (of Bidder's recommended size) with suction strainer, of suitable size and end type to match with the flanged end of the suction hose.
 - Diesel engine and flexible coupling, complete with integral diesel tank, engine cooling system, lube oil system, suction air filter, exhaust silencer, flywheel, necessary instrumentation, engine panel and other engine accessories.
 - One (1) no each of pump suction and discharge pressure gauges for local indication.
 - Common base frame for pump and diesel engines, coupled through a flexible coupling, mounted on a 4-wheeled trolley for easy transportation of the equipment within the plant. The trolley shall have suitable front wheel steering arrangements for maneuvering.
- + Fourteen (14) numbers permanently installed vertical sump pumps, complete with motor, common base plate and following accessories for each pump set
- Flexible couplings of approved design between motor and pump shaft.
 - Common base plate for supporting each pump motor set and the discharge pipe up to terminal point.
 - Three (3) nos. level switches (L, H and HH) for each pair of sump pumps (1W+1S).
 - Self-standing type local starter panel for each pair of sump pumps (1W+1S), complete with start/stop push buttons, switches, indicating lamps, level controller and hooking up facility with the plant DCS.

- Power and control cable, of 15 m length each, for connecting the pump motor set/level switches with the local starter panel.
 - Necessary lifting lugs, eye bolts, anchor bolts, nuts etc. for each pump and motor set.
 - Slip-on type drilled steel counter flanges matching with the terminal point discharge flange of each pump set, complete with bolts, nuts and gaskets.
 - One (1) pressure gauge with isolating cock to be installed at the discharge side for each pump.
 - All internal piping with valves, fittings, and pressure gauges for lubrication, cooling and sealing, wherever applicable, shall be tapped directly from respective pump discharge.
 - Spares, tools & tackle, lubricants/oil/consumables.
 - All accessories, consumables and lubricants are required for erection, testing and commissioning.
 - All relevant drawings, data and O&M manuals.
 - Painting at shop and touch up paint at site.
- + Ten (10) nos. submersible type motor driven dewatering sump pumps complete with hermetically sealed motor with integral starter and cabling, along with following accessories for each pump set.
- One (1) no. 30 meters long hose for the pump discharge. The hose shall be provided with flanged end, matching with the pump discharge flange, complete with counter flanges, bolts, nuts and gaskets.
 - One (1) no. 25 meters long steel wire rope for connecting to the pump unit during hoisting.
 - Integral suction strainer and support legs.
 - Suitable lugs/eye bolts on the pump set, for hoisting and lowering it into the dewatering area.
- + Two (2) nos. submersible type motor driven silt removing sump pumps complete with hermetically sealed motor with integral starter and cabling, along with necessary accessories for each pump set.
- + Electrical scope shall include supply of electrical drive motors as required for the pumps within the scope of the Bidder.
- + Supply Instrumentation and control.
- Supply service:
- + Complete cleaning, protection and painting.
 - + Packing, long term preservation material, forwarding and transportation to site.
 - + Shop testing of all equipment / component under the scope of supply.

- + Supervision of leveling, grouting, erection, final checkup, testing and commissioning of all equipment and accessories of the complete system (optional scope).
- + Furnishing of document, data, drawings, manuals, test certificates, manufacturer's certificate of compliance etc.
- + All structural steel members, e.g., plates, channels, etc. for supporting the sump pumps, lifting lugs, eyebolts, anchor bolts, nuts, sleeves, inserts, etc.
- + Interchangeability –Components of all kind of pumps shall be having similar design parameters and shall be interchangeable with one another.

Technical specifications comply with the Specification for Miscellaneous Vertical Pumps & Sump Pumps (Document no. LP1-TKC-10AP-M-G1-SPC-2010).

- Status:
 - + Engineering: 100%
 - + Manufacturing and delivery: 00%
 - + Erection: 00%
 - + Commissioning: 00%.

11.2 Scope of work

- Engineering: Bidder shall finalize the engineering/designs based on the Owner's documents provided in attachments.

Supply pumps (exclude 08 pumps (02 Screen Wash Pumps; 04 Raw water intake pumps, and 04 Raw Water forwarding pumps):

- + Two Numbers (2) nos. vertical wet pit type pumps (Filtered water transfer pumps), complete with electric motor drives together with all accessories for each pump set
- + Two (2) nos. diesel engine driven trolley mounted horizontal centrifugal sump pumps along with following accessories for each pump set.
- + Fourteen (14) numbers permanently installed vertical sump pumps, complete with motor, common base plate and following accessories for each pump set.
- + Ten (10) nos. submersible type motor driven dewatering sump pumps complete with hermetically sealed motor with integral starter and cabling, along with following accessories for each pump set.
- + Two (2) nos. submersible type motor driven silt removing sump pumps complete with hermetically sealed motor with integral starter and cabling, along with necessary accessories for each pump set.

Technical specifications comply with the Specification for Miscellaneous Vertical Pumps & Sump Pumps (Document no. LP1-TKC-10AP-M-G1-SPC-2010).

- Delivery: Bidder shall be responsible for customs clearance, Domestic transportation to Long Phu 1 site, and the subsequent storage and preservation of all materials and equipment.

- Erection/installation: The Bidder shall perform all erection, installation, and alignment of the equipment in full compliance with the supplier's instructions, erection procedures, and the Inspection and Test Plan (ITP) approved by the Owner.

No.	Description	Quantity	Supply	Erection	Remark
1	Screen Wash Pumps	2	Owner	Owner	
2	Raw Water Intake Pumps	4	Owner	Owner	
3	Raw Water Forwarding Pumps	4	Owner	Owner	
4	Filtered Water Transfer Pumps	2	Bidder	Bidder	
5	Diesel engine driven trolley mounted horizontal centrifugal pumps	2	Bidder	Bidder	
6	CW Pit Pumps	8	Bidder	Bidder	
7	Drain Oil Pit Sump Pump	2	Bidder	Bidder	
8	Portable Sump Pumps	10	Bidder	Bidder	
9	Portable Silt Removal Pumps	2	Bidder	Bidder	

- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

11.3 Detail Requirements:

- Technical specifications comply with the Specification for Miscellaneous Vertical Pumps & Sump Pumps (Document no. LP1-TKC-10AP-M-G1-SPC-2010).

11.4 Performance guarantees

- Refer to item 5.00.00 Guaranteed Performance in Specification for Miscellaneous Vertical Pumps & Sump Pumps (Document no. LP1-TKC-10AP-M-G1-SPC-2010).

11.5 Attachments

- Specification for Miscellaneous Vertical Pumps & Sump Pumps No. LP1-TKC-10AP-M-G1-SPC-2010.

12 FIELD FABRICATED TANKS

12.1 Status

- Former EPC Contractor signed a contract with DAI DUNG (Vietnam) for the supply Shop fabricated tanks. Supply tanks:
 - + One (1), 1,000 m³ net capacity, CS tank to store potable water.
 - + Two (2), 2,500 m³ net capacity each, DM tank to store DM Water.
 - + Two (2), 1,000 m³ net capacity each, CS tank to store diesel oil.
 - + Two (2), 500 m³ net capacity each, CS tank to store condensate.
- For the above storage tanks maintenance and safe storage, following items/ systems shall be provided:
 - + Access Manholes.
 - + Internal ladder.
 - + Counter flanges of nozzles.
 - + Staircases and platforms going from bottom to roof.
 - + Handrails around perimeter of tank roof.
 - + Provision for interface with purchaser's Lightning Protection.
 - + Nozzles and Provisions for interface with purchaser's Fire Protection (for diesel oil storage tanks)
 - + Drain & Vent connections.
 - + Inlet, outlet and recirculation connections.
 - + Overflow connections.
 - + Spare nozzles.
 - + Float Level indicators.
 - + Connections for all instruments and for sampling.
 - + Flame Arrestor for diesel oil storage tanks.
 - + Supports for vertical foam and water lines and support pads & structural steel supports for shell cooling rings/piping (for diesel oil storage tanks).
 - + CO₂ absorber and seal pot for overflow/vent connections of DM and Condensate storage tanks.
- Supply Services:
 - + Bidder shall take responsibility for all the testing and inspection in the field (as per API 650)
 - + Transportation of all equipment/material to the project site store, inclusive of all intermediate handling.

- + Furnishing of documents, data, drawings, manuals, test certificates, manufacturer's certificate of compliance, etc.
- + Fabrication and Erection at site.
- + Internal and external painting.
- + Power, fuels, lubricants, construction equipment & consumables required for the execution of the job.
- + Name plate indicating tag nos. & tank designation
- + Provision for earthing lugs at 4 places.
- + Start-up spare parts, consumables & wear items required during testing & pre-commissioning, acceptance testing, and up to preliminary acceptance.
- + Cranes & handling facility required during execution.
- + Site barricading around tanks during tank erection.
- + Supply of Water for hydro test and disposal shall be included in bidder's scope. All other necessary arrangements for hydro testing shall also be included in the scope of bidder.
- + Welding procedures shall be as per BS 499 Part 1, Appendices A-G. Weld procedure qualification tests shall be carried out in accordance with BS 4870.
- + NDT shall be as per applicable international standards & customer specification.
- Technical Specification shall comply with the specified for Field Fabricated Tanks No.LP1-TKC-10BB-M-G1-SPC-2012.
- Status:
 - + Engineering: 00%.
 - + Manufacturing and Delivery: 00%
 - + Erection: 00%
 - + Commissioning: 00%.
- The Owner has separated DM tanks and Potable tank into another package and these tanks will be excluded in this scope of work.

12.2 Scope of work

- Engineering: Bidder shall finalize the engineering/designs based on the Owner's documents provided in attachments.
- Supply tanks:
 - + Two (2), 1,000 m³ net capacity each, CS tank to store diesel oil.
 - + Two (2), 500 m³ net capacity each, CS tank to store condensate.
- Supply accessories and services etc (Including all relevant equipment inspections and tests).

Technical Specification shall comply with the specified for Field Fabricated Tanks No.LP1-TKC-10BB-M-G1-SPC-2012.

- Delivery: Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and the subsequent storage and preservation of all materials and equipment.
- Erection/installation: The Bidder shall perform all erection, installation, and alignment of the equipment in full compliance with the supplier's instructions, erection procedures, and the Inspection and Test Plan (ITP) approved by the Owner.
- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

12.3 Detail Requirements:

- Technical Specification will comply with the specified for Field Fabricated Tanks No.LP1-TKC-10BB-M-G1-SPC-2012.

12.4 Performance Guarantees (N/A)

- N/A.

12.5 Attachments

- Specification for Field Fabricated Tanks (Document No.LP1-TKC-10BB-M-G1-SPC-2012).

13 SHOP FABRICATED TANKS

13.1 Status

- Former EPC Contractor signed a contract with DAI DUNG (Vietnam) for the supply Shop Fabricated tanks.
- Scope of supply tank includes:
 - + Two (2), 5 m³ net capacity, CS tank to store DMCCCW water.
 - + Two (2), 48 m³ net capacity each, HP flash tanks.
 - + Two (2), 76 m³ net capacity each, LP flash tanks.
 - + Two (2), 48 m³ net capacity each, boiler flash tanks.
 - + Two (2), 16 m³ net capacity each, startup flash tanks.
 - + One (1), 5 m³ net capacity, hydro pneumatic tank to store service water.
 - + One (1), 5 m³ net capacity, hydro pneumatic tank to store potable water.
 - + One (1), 20 m³ net capacity, drain oil tank to store drain oil.
 - + One (1), 72 m³ net capacity, clean oil storage tank (Turbin lube oil).
 - + One (1), 72 m³ net capacity, dirty oil storage tank (Turbin lube oil).
 - + Two (2), 7 m³ net capacity each, SCAPH drain tanks.
 - + Two (2), 14 m³ net capacity each, Atmospheric Flash tanks.

- + Two (2), 13.3 m³ net capacity each, Drain Flash Tanks.

For the above storage tanks, following fittings are required:

- + Access Manholes.
 - + Counter flanges of nozzles.
 - + Drain & Vent connections.
 - + Inlet, outlet, overflow and recirculation connections.
 - + Spare nozzles.
 - + Float Level indicators.
 - + Connections for all instruments and for sampling.
 - + Flame Arrestor for drain oil tank, clean oil storage tank and dirty oil storage tank.
 - + CO₂ absorber and seal pot for overflow/vent connections of DMCCCW tanks.
 - + Internal & external ladder for drain oil tank, clean oil storage tank and dirty oil storage tank.
 - + Provision of insulation cleats for installation of thermal insulation for HP flash tanks, LP flash tanks, boiler flash tanks, start-up flash tanks, atmospheric flash tank and SCAPH drain tank.
 - + Provision for Float and board type level indicator: Bidder shall provide three nos. 150# ,20 mm flanges with 150 mm collar for drain oil tank. Minimum four numbers of M.S angle scale support shall be provided. Base plate shall be welded to the bottom of the tank to connect the level instrument guide wire.
 - + Provision for installation of Ultrasonic type level switch: Bidder shall provide 100 mm, 150#, flange.
- Scope of services includes manufacturing, transportation, customs clearance, installation and pre-commissioning of all tanks.
 - Technical specification with comply to the specification for Shop fabricated tanks No.LP1-TKC-10BB-M-G1-SPC-2013.
 - Status:
 - + Engineering: 00%
 - + Manufacturing and Delivery: 00%
 - + Erection: 00%
 - + Commissioning: 00%.

13.2 Scope of work

- Engineering: Bidder shall finalize the engineering/designs based on the Owner's documents provided in attachments.
- Scope of supply tanks:
 - + Two (2), 5 m³ net capacity, CS tank to store DMCCCW water.

- + Two (2), 48 m³ net capacity each, HP flash tanks.
- + Two (2), 76 m³ net capacity each, LP flash tanks.
- + Two (2), 48 m³ net capacity each, boiler flash tanks.
- + Two (2), 16 m³ net capacity each, startup flash tanks.
- + One (1), 5 m³ net capacity, hydro pneumatic tank to store service water.
- + One (1), 5 m³ net capacity, hydro pneumatic tank to store potable water.
- + One (1), 20 m³ net capacity, drain oil tank to store drain oil.
- + One (1), 72 m³ net capacity, clean oil storage tank (Turbin lube oil).
- + One (1), 72 m³ net capacity, dirty oil storage tank (Turbin lube oil).
- + Two (2), 7 m³ net capacity each, SCAPH drain tanks.
- + Two (2), 14 m³ net capacity each, Atmospheric Flash tanks.
- + Two (2), 13.3 m³ net capacity each, Drain Flash Tanks.
- Delivery: Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and the subsequent storage and preservation of all materials and equipment.
- Erection/installation: The Bidder shall perform all erection, installation, and alignment of the equipment in full compliance with the supplier's instructions, erection procedures, and the Inspection and Test Plan (ITP) approved by the Owner.
- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

13.3 Detail Requirements:

- Technical specification with comply to the specification for Shop fabricated tanks No.LP1-TKC-10BB-M-G1-SPC-2013 including ASME stamping work.

13.4 Performance guarantees

- N/A

13.5 Attachments:

- Specification for Shop fabricated tanks: LP1-TKC-10BB-M-G1-SPC-2013.

14 LOW PRESSURE PIPING AND SPECIALTIES

14.1 Status

- Under the previous EPC contract, Power Machines (PM) has built the scope of Low-Pressure Piping supply for the whole factory according to Document No. LP1-TKC-10BR-M-G1-SPC-2019. Currently, PM signed a contract with DAI DUNG (Vietnam) to supply LP Piping.
- Supply LP Piping for:
 - + 1. Compressed air system

- + 2. Instrument air system
- + 3. Service air system
- + 4. Service water system
- + 5. Potable water system
- + 6. DMCCCW System
- + 7. Raw water system
- + 8. Filtered water system
- + 9. Fresh water system
- + 10. DM water system
- + 11. Condensate transfer system
- + 12. Fuel oil system
- + 13. Generator seal oil system
- + 14. Turbin Lube oil system
- + 15. Central Lube oil system
- + 16. Turbine Hydraulic Oil System
- + 17. Nitrogen Supply and distribution system
- + 18. Hydrogen and carbon dioxide supply and distribution system
- + 19. Storm water drainage system
- + 20. Ammonia supply & distribution System
- + 21. Auxiliary cooling water system
- + 22. Cooling water system
- + 23. Stator winding cooling water system
- + 24. Deaerator standpipe.
- Supply services include the following:
 - + Fabrication of pipes & fittings at shop.
 - + All testing & inspection at Manufacturer's works as indicated in this specification.
 - + Preparation of fabrication isometric / spool drawings and design calculations as applicable for pipes & fittings based on general isometric drawings to be provided to the supplier after placement of order.
 - + The supplier shall finalize the piping BOQ based on the general isometric drawings to be furnished to him after placement of order.
 - + Procedure for manufacturing, welding and testing of the piping.
 - + LP piping accessories and consumables as required for erection, testing and commissioning along with first charge of oil, lubricants, grease, etc.

- + Cleaning and painting of pipe at shop.
- + Any additional equipment and materials or work which are not specifically mentioned but are required to make the installation complete in every respect, shall be under scope of this specification.
- + Supervision of erection and of piping cleaning at site.

Technical specification complying with Specification for LP Piping No. LP1-TKC-10BR-M-G1-SPC-2019.

- Status:
 - + Engineering: N/A
 - + Manufacturing and Delivery: 00%
 - + Erection: 00%
 - + Commissioning: 00%.

14.2 Scope of work

- Engineering: Bidder shall finalize the engineering/designs based on the Owner's documents provided in attachments.
- Supply LP Piping to comply with Specification for LP Piping No. LP1-TKC-10BR-M-G1-SPC-2019 (scope of supply exclude raw water piping from raw intake pump to two (02) Demin tank due to the Owner has divided a part of Raw water piping into separate package and this scope will be excluded in this package, see attached drawings. Exclude the Piping on the storm water pump discharge as shown on drawing LP1-TKC-10GUA-M-M3-P&ID-1103).
- Delivery: Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and the subsequent storage and preservation of all materials and equipment.
- Erection/installation: The Bidder shall perform all erection, installation, and alignment of the equipment in full compliance with the supplier's instructions, erection procedures, and the Inspection and Test Plan (ITP) approved by the Owner.
- Commissioning: Refer to [Table 08 Division of Responsibility].
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

14.3 Detail Requirements:

- LP Piping to comply with Specification for LP Piping No. LP1-TKC-10BR-M-G1-SPC-2019 and Volume II-I Section-VI: Technical Specification for Low pressure piping, valves and specialties.
- N/A.

14.4 Attachments

- Specification for LP Piping (Document No. LP1-TKC-10BR-M-G1-SPC-2019).
- Volume II-I Section-VI: Technical Specification for Low pressure piping, valves and specialties

- Exclude Raw water piping LP1-TKC-10G-M-M3-P&ID-1050.
- Drawing LP1-TKC-10GUA-M-M3-P&ID-1103.

15 ELEVATORS FOR BOILER, PH BUILDING AND CECB

15.1 Status

- Former EPC Contractor signed a contract with ALIMAK HEK AB for the supply Elevators for Boiler, PH Building and CECB.
- Supply elevators:
 - + Four (4) goods cum passenger elevator complete with all accessories shall be furnished, two (2) for each boiler.
 - + Two (2) goods cum passenger elevator complete with all accessories shall be furnished in Power House Building.
 - + One (1) passenger elevator complete with all accessories to be furnished for Central Electrical & Control building.
 - + Equipment Accessories, Each Elevator set shall be supplied with the following accessories:
 - One (1) no. car platform. Elevator car completes with door, door hangers and tracks, speed governors, push button station, operating panel, car position indicators, illumination fittings in elevator car, well and machine room, fan fittings and other required accessories. Lighting point and plug point shall be provided over the elevator car roof for the purpose of maintenance work. Emergency hooter for sounding emergency alarm from the inside of the car.
 - One (1) no. enclosed car frame with all specified car fixtures and operating devices.
 - One (1) no. car gate complete with automatic door drives.
 - One (1) set of car and counterweight guides and fastenings suitable for lubricating and cleaning during servicing of elevator equipment.
 - One (1) set of car safety and governing devices.
 - One (1) counter-weight with accessories.
 - One (1) set of suspension ropes, sheaves with accessories, drums, ropes, hoist rope compensation and guide rail lubrication device.
 - One (1) set of terminal buffers.
 - One (1) set of terminal and ultimate limit switches complete with electro-mechanical locks.
 - One (1) set of driving equipment and controllers. Complete drive machinery and accessories e.g., electric motor, gear box etc., electrical and control equipment including supply & installation/laying of cables & isolating switch starting from Owner's power supply point including Power & Lighting distribution boards. Scope will also include grounding of all electrical equipment body including

those located on lift car as per IE Rules, up to the nearest earth mat at ground floor.

- One (1) set of hoist way equipment and controllers each landing.
 - One (1) set of brakes, switches, mechanical indicators as required. Necessary brakes and limit switches, safety locks for car and landing door & all other protective devices including switch, fuse, starters etc. All rigid flexible conduit, ferrules, lugs, glands, terminal blocks, cable clamps, general purpose flexible/ Trailing cables, automatic leveling device and other miscellaneous items as required.
 - Electric wiring, power and control complete from elevator control cabinet to its drives and all control points in the cabin and on each landing.
- Supply services, etc.

Technical Specifications comply with the Specification for elevators for Boiler, PH Building & CECB No.LP1-TKC-10SN-M-M33-SPC-2025.

- Status:
- + Engineering: 100%
 - + Manufacturing and delivery: 100%
 - + Erection: 00%
 - + Commissioning: 00%

15.2 Scope of Work

- The Bidder shall take over seven (07) Elevators (04 boiler elevators, 02 PHB elevators and 01 CECB elevators) from the Owner.
- Erection/installation: Bidder will inspect the status of the equipment stored on the Site after being handed over by the Owner and carry out erection, installation. Bidder shall perform installation, erection, alignment, etc... for equipment in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner.
- Commissioning: Refer to [Table 08 Division of Responsibility].
- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

15.3 Detail Requirements

- Following to Alimak's design

15.4 Performance guarantee

- (N/A)

15.5 Attachments

- Specification for Elevators for Boiler, PH Building & CECB (Document No.LP1-TKC-10SN-M-M33-SPC-2025).
- Detail Design from Alimak.
- List good at the Site.

16 TG HALL EOT CRANE

16.1 Status

- Former EPC Contractor signed a contract with VINALIFT (Vietnam) to supply TG Hall EOT Crane.
- Supply equipment:
 - + Two (2) nos. top running, double girder EOT Cranes having duty and service conditions as specified herein, along with all accessories. The cranes should be designed to operate in tandem and also for independent operation. The Scope of work for such tandem work also covers supply of lifting beam and facility for tandem operation. Each crane shall be complete with the following:
 - + End carriages complete with wheels, bearings, etc. for the crane bridge.
 - + One (1) no. motorized trolley complete with trolley frame, wheels, drive, brakes and controls.
 - + One (1) no. motor-operated main hoist complete with gear train, load hook, wire rope, winding drum for wire rope, electrical and mechanical brakes, upper and lower limit switches, festooned conductor system, overload limiting device, etc.
 - + One (1) no. motor-operated auxiliary hoist complete with gear train, load hook, wire rope, winding drum for wire rope, electrical and mechanical brakes, upper and lower limit switches, festooned conductor system, overload limiting device, etc.
 - + One (1) no. open-pulpit type cabin complete with light, fan, seat, foot-operated warning gong, protective panel, controllers, main isolating switch, emergency stop push button, communication equipment, portable fire extinguishers, air conditioning etc.
 - + Portable transmitter with operation knobs, antenna and receiver at the bridge with a relay panel for signal conversion and amplification, for operation of all motions of the crane by a radio control station.
 - + Runway rails for entire runway length along with rail clamps, all inserts, insert plates, anchor bolts, nuts, buffers & stops, limit switches etc. as required.
 - + Runway conductors (DSL) for the entire runway length complete with all insulators, supports, support brackets, fixing clamps, bolts, nuts etc. as specified and as required to complete the installation.
 - + Power supply cabling including isolating switch complete with electrical items, attachments and accessories as required feed power to the runway conductor.
 - + Bridge and trolley current collectors and bridge cross conductors along with all wirings etc. for the crane as required to complete the scope of work.
 - + Crane components shall be provided with lifting lugs, eye bolts, etc. for handling, assembling, lifting and placing into position.
 - + All facilities, accessories and attachments for single and tandem operation of the crane.

- + Illumination, as specified and as necessary.
- + Water filled bags, as required for full load and overload testing at site.
- + All equipment and material for complete Electrical Works including main disconnect switch, cabling, all controls & interlocks with necessary wiring, grounding, illumination, protective panels with all protective devices, anti-collision limit switches etc. as required for the EOT cranes.
- + Spares, tools & tackle, lubricants/oil/consumables as indicated in Appendix-2.
- + All the necessary power and control cables to make a complete system.
- + Handrails, toe boards and platforms as required.
- + All relevant drawings, data and O&M manuals.
- Supply Services:
 - + The bidder shall take responsibility for all the testing & inspection at Manufacturer's works to be conducted in a manner as indicated in this specification.
 - + Equipment accessories and consumables as required for erection, testing and commissioning along with the first charge of oil, lubricants, grease, etc.
 - + Painting at shop and touch up paint at site.
 - + Any additional equipment and materials or work which are not specifically mentioned, but, are required to make the installation complete in every respect, shall be under scope of this specification.
 - + Supervision of complete erection, shop/ site testing and commissioning of the cranes at the option of the purchaser.

Technical requirements are specified in the document No: LP1-TKC-10SMA-M-M31-SPC-2023 [Specification for TG Hall EOT Crane].

- Status:
 - + Engineering: 100%.
 - + Manufacturing and Delivery: 100%.
 - + Erected: about 79.22 % (Erection 183.879/232.118 tons)
 - + Commissioning: 0%

16.2 Scope of work:

- The Bidder shall inspect the current condition of the equipment and then install the remaining equipment in accordance with the manufacturer's instructions.
- Erection/installation: Bidder shall perform installation, erection, alignment, etc ..for equipment in accordance with Supplier's manual and erection and Bidder's ITP approved by Owner.
- Commissioning: Refer to [Table 08 Division of Responsibility].

- TA Service for erection/construction, commissioning, training service to Owner's personnel: Refer to [Table 08 Division of Responsibility].

16.3 Detail Requirements

- Technical requirements are specified in the document No: LP1-TKC-10SMA-M-M31-SPC-2023 [Specification for TG Hall EOT Crane].

16.4 Performance guarantee

- Crane equipment needs to be inspected and certified for safety according to technical inspection process of tower crane safety in construction No. QTKĐ: 01-2016/BXD.

16.5 Attachments:

- Specification for TG Hall EOT Crane No.LP1-TKC-10SMA-M-M31-SPC-2023.
- Detail design.
- Detail Packing List of delivered equipment.

17 CCCW HEAT EXCHANGER

17.1 Status

- Former EPC Contractor signed a contract with FUNKE to supply CCCW Heat Exchanger.
- Supply equipment:
 - + Four (4) Nos. of Plate Heat Exchangers, two (2) for each unit, each complete with the following accessories:
 - Suitable cleaning system completes with all equipment and accessories (viz. pumps, piping, valves etc.) for inside cleaning of the PHEs.
 - Suitable drain and vent connections for both CCW and ACW streams complete with isolation valves.
 - Sampling connection with isolation valve on the outlet nozzle of CCW Relief valves on both streams, if required.
 - All structural steel members e.g. plates, channels etc. for supporting the heat exchanger, support wheels, lifting lugs, eye bolts, anchor bolts, nuts, sleeves, inserts, etc.
 - Matching flanges with necessary bolts, nuts, gaskets etc. for all flanged connections.
 - Application of protective coating, final/finish painting for the equipment supplied. Supply of paint in sealed container for touch-up painting of equipment after installation at site.
 - Cathodic Protection system (sacrificial anode type) for the heat exchangers.
 - One new set of special tools and tackle as required for the regular operation,
 - maintenance and erection of the equipment supplied. Adequate means shall be provided for lifting and handling the PHEs.

- Various drawings, data, test reports, test certificates, erection, commissioning, operation and maintenance manuals as specified in Attachment-1 ‘Technical Specification for Cooling Water Heat Exchangers.
- Supply services:
 - + The scope of services includes the following:
 - + Provide transportation, customs clearance, installation, and pre-commissioning of all equipment.
 - + Provide training and supply of training materials for Owner’s personnel.

For detail design refer to Specification for Closed cycle cooling water heat exchangers No.LP1-TKC-10NAD-M-M24-SPC-2011.

- Status:
 - + Engineering: N/A
 - + Manufacturing : 00%
 - + Delivery: 00%
 - + Erection: 00%
 - + Commissioning: 00%

17.2 Scope of work:

- Engineering: Bidder shall finalize the engineering/designs based on the Owner’s documents provided in attachments.
- Supply: Four (4) Nos. of Plate Heat Exchangers, two (2) for each unit. Bidder shall furnish the equipment & accessories based on the design/specification developed by Bidder with Owner approval.
- Delivery: Bidder shall be responsible for customs clearance, transportation (including offshore and domestic) to Long Phu 1 site, and the subsequent storage and preservation of all materials and equipment.
- Erection/installation: The Bidder shall perform all erection, installation, and alignment of the equipment in full compliance with the supplier's instructions, erection procedures, and the Inspection and Test Plan (ITP) approved by the Owner.
- Commissioning: Refer to [Table 08 Division of Responsibility];
- TA Service for erection/construction, commissioning, training service to Owner’s personnel: Refer to [Table 08 Division of Responsibility].

17.3 Detail Requirements

- Technical requirements comply with Specification for Closed cycle cooling water heat exchangers No.LP1-TKC-10NAD-M-M24-SPC-2011.

17.4 Performance guarantees

- Refer to item 5.00.00 Guaranteed Performance in Specification for Closed cycle cooling water heat exchangers No.LP1-TKC-10NAD-M-M24-SPC-2011.

17.5 Attachments:

- Specification for Closed cycle cooling water heat exchangers No. LP1-TKC-10NAD-M-M24-SPC-2011.
- Sizing calculation for Closed cycle cooling water system: LP1-TKC-10PGC-M-M24-CAL-0065.

PART II
TECHNICAL REQUIREMENTS and SPECIFICATIONS

CHAPTER V
TECHNICAL REQUIREMENTS and SPECIFICATIONS

SECTION-IV
PERFORMANCE GUARANTEES

[PII.CV.SIV - PERFORMANCE GUARANTEES]

SECTION-IV PERFORMANCE GUARANTEES

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SECTION-IV PERFORMANCE GUARANTEES

4.1. GUARANTEE CONDITIONS

4.1.1 Site data

Nos.	Reference conditions for Performance Guarantees	Unit	Specified Values					
			Average/ Design		Max.		Min.	
1	<u>Site Reference Conditions:</u>							
	- Atmospheric pressure	mbar	1,009		1,020		1,002	
	- Ambient air temperature (dry bulb)	°C	26.7		37.2		13.1	
	- Relative humidity	%	84		100		N/A	
	- Cooling water temperature	°C	30.0		32.4		25	
2	<u>Power Grid Operating Conditions:</u>							
	1) Grid Frequency							
	- Rated Frequency	Hz	50					
	- Normal Operation mode	Hz			50.2		49.8	
	- Single fault operation mode							
	Permissible Frequency Band.	Hz			51		49	
	Restoration time in order to put the frequency to the range of 49.5Hz ÷ 50.5Hz	Min.			02			
	Restoration time in order to put the frequency to the range of 49.8Hz ÷ 50.2Hz.	Min.			05			
	- Multi-fault, serious fault operation and extreme emergency mode							
	Permissible Frequency Band	Hz			52(*)		47.5(*)	
	Restoration time in order to put the frequency to the range of 49Hz ÷ 51Hz	Sec.			10			
	Restoration time in order to put the frequency to the range of 49.5Hz ÷ 50.5Hz	Min.			05			
	Restoration time in order to put the frequency to the range of 49.8Hz ÷ 50.2Hz.	Min.			10			
	2) Grid Voltage		Unit 1	Unit 2	Unit 1	Unit 2	Unit 1	Unit 2

	- Rated voltage	kV	220	500				
	- Normal Operation mode	kV			242	525	209	475
	- Single fault operation mode	kV			242	550	198	450
	- Multi-fault, serious fault operation and extreme emergency mode	kV			264(*)	600(*)	176(*)	400(*)
	3) Cosphi (Power Factor)							
	- Lagging Power Factor			0.85				
	- Leading Power Factor			0.90				
	(*) Value in case of Grid disturbances of multiple elements defined in VN Grid code, refer to Circular No. 25/2016/TT-BCT dated 30/11/2016, Circular No. 30/2019/TT- BCT dated 18/11/2019, Circular No. 39/2022/TT-BCT dated 30/12/2022, Circular No. 40/2014/TT-BCT dated 05/11/2014 and Decide No. 106/QĐ-ĐTĐL dated 14/12/2018.							

4.1.2. Analysis of Coal and Ash

Parameters	Unit (By Weight)	Range (Design Coal)	Design Value on “As Received” (Wet) Basis) (Performance Coal)
Proximate Analysis			
Inherent Moisture	adb %	1 - 18	18.00
Total Moisture	ar %	Max 28	26.00
Fixed Carbon	adb %	35 - 60	35.646
Volatile Matter	adb %	26 - 45	34.29
Ash	adb%	Max. 15	4.06
Total Sulphur	adb%	Max. 1	0.89
HHV	adb, kcal/kg	5,500 – 6,500	4,963

Grindability	HGI	35 - 60	47
Ultimate Analysis			
Carbon	%	51 - 75	52.08
Hydrogen	%	4.0 – 7.5	3.10
Oxygen	%	By difference	12.87
Nitrogen	%	1.1 – 1.8	1.05
Sulfur	%	0.53 – 0.86 *	0.89
Chlorine		< 0.05	0.007
Ash	%	Max. 15	
Moisture	%	1 - 18	
Ash Component			
SiO ₂	adb, %	24-62	24.67
Al ₂ O ₃	adb, %	12-35	14.26
Fe ₂ O ₃	adb, %	5-22	11.89
CaO	adb, %	Max. 18	13.59
MgO	adb, %	0.5-8.6	4.89
Na ₂ O	adb, %	0.1-7.2	7.20
K ₂ O	adb, %	0.2-1.76	1.76
SO ₃	adb, %	0.3-20.34	20.34
P ₂ O ₅	adb, %	0.1-1.1	0.52
TiO ₂	adb, %	0.5-3	0.72
Mn ₃ O ₄	adb, %	0.04-0.2	0.16
Other	adb, %		0.00

Initial Deformation temperature	⁰ C*	Min. 1,050	≥ 1,050
Sphere Temperature	⁰ C*		
Hemisphere Temperature	⁰ C*	Min. 1,100	≥ 1,125
Flow Temperature	⁰ C		≥ 1,150

4.1.3 Predict auxiliary power consumption approved:

The approved Guaranteed Total Plant Auxiliary Power Consumption 128.383 MW with detail consumption load of each system/equipment designed as attachment Table 12. During performance test, the power consumption of each system/equipment will be recorded, this will be the basis for allocating responsibility between the Parties if the system/equipment supplied by one Party consumes more power than the value in Table 12, causing the total Plant consumption to exceed the guaranteed value, and the Party shall be responsible accordingly.

4.2. PLANT PERFORMANCE GUARANTEES VALUES IN PREVIOUS EPC CONTRACT

	Items	Unit	Parameter for Performance Guarantee	Remarks
1	Guaranteed Gross Unit Rated Output	MW	600	Continuous output (MW) of 100% TMCR at Generator terminals under rated steam conditions at Turbine inlet and CW temperature of 30 Deg. C with 0% make-up with excitation power deducted.
2	Guaranteed Gross Unit Heat Rate	kcal/kWh	2 037	Unit Gross Heat Rate in Kcal/Kwh at 100% TMCR for constant pressure operation under rated steam conditions and condenser vacuum of 57 mm Hg(A) with zero make up and all heaters in service.
3	Guaranteed Total Plant Auxiliary Power Consumption	MW	128.383 (no BF)	100 % of TMCR HB Case C for EPC package;
4	Guaranteed Maximum Overload Capacity	MW	630	Continuous Output (MW) of 105% of TMCR at Generator terminals corresponding to VWO flow under rated steam conditions at Turbine Inlet and 0% make-up.

	Items	Unit	Parameter for Performance Guarantee	Remarks
5	Guaranteed Minimum Load Without Fuel Oil Support (BMCR)	%	40%	Firing performance coal; The Steam Generator load is decreased slowly (not above 6%/min)
6	Guaranteed Maximum Unburnt Carbon in Ash (Fly/Bottom)	%	5/8	Firing the design coal and range; Feed water quality meets the requirement; The measurement method is according to ASME PTC 4
7	Guaranteed Steam Generator Efficiency (HHV)	%	87.36	Measured at TMCR load, HB Case C; Steam Generator Fuel Efficiency is calculated according to the heat loss method of ASME PTC 4.0; Ambient air temperature 26.7°C; Ambient air relative humidity; 84% Barometric pressure 0.101325 MPa; Firing performance coal
8	Guaranteed Main Steam Capacity	t/hr	1,908.887	Measured at BMCR load, HB Case A; Firing the design coal and range
9	Air heater air-in-leakage after 3000 hrs	%	10	Steam Generator operates stably at BMCR load; firing performance coal; excess air remains at design value pulverizing system parameters meet the requirements of the Steam Generator.
10	Various part load operations		30% TMCR~ BMCR	firing the design coal and range; feed water quality meets the requirement

	Items	Unit	Parameter for Performance Guarantee	Remarks
11	Guaranteed Main Steam Temperature	°C	568.4	firing the design coal and range excess air remains at design value, Superheater outlet temperature , TMCR HBD Case C Short-term control range of $\pm 5.5^{\circ}\text{C}$ permitted.
12	Guaranteed RH Steam Temperature	°C	566.5	firing the design coal and range excess air remains at design value; Reheater outlet temperature, TMCR HBD Case C Short-term control range of $\pm 5.5^{\circ}\text{C}$ permitted.
13	Guaranteed Maximum Water-Steam Pressure Drop	bar	64.0	firing the design coal and range main steam, reheat steam and feed water parameters keep at rated value; feed water quality meets the requirement; measured at the outlet of the final FW heater to the inlet of the MS Stop Valve, TMCR HB Case C
14	Guaranteed Maximum Steam Pressure Drop	bar	4.27	firing the design coal and range main steam, reheat steam and feed water parameters keep at rated value; feed water quality meets the requirement; measured at the HP ST exhaust to the RH turbine intercept valve, TMCR HB Case C
15	Furnace Exit Gas Temperature	°C	1,210	The Furnace Exit Gas Temperature (FEGT) at the specified location does not exceed the specified maximum temperature at all loads up to and including BMCR; firing the design coal and range main steam, reheat steam and feed water parameters remain at rated value; excess air remains at design value

	Items	Unit	Parameter for Performance Guarantee	Remarks
16	Flue Gas Temperature	°C	135	firing the design coal and range main steam, reheat steam and feed water parameters remain at rated value; excess air remains at design value
17	Steam Temperature Imbalance at SH two side outlets	°C	10	firing the design coal and range; excess air remains at design value
18	Steam Temperature Imbalance at RH two side outlets	°C	10	firing the design coal and range; excess air remains at design value
19	Max superheater spray water flow	t/h	133.6	The Steam Generator operates stable at BMCR load; firing the design coal and range; excess air remains at design value
20	Reheater spray water flow	t/h	0	Steam Generator load is within 60%~100%BMCR; Steam Generator operates stably; firing the design coal and range; excess air remains at design value.
21	Circulation Pump flow	%	30% BMCR main steam flow	The Steam Generator operation is according to the instructions supplied by contractor

	Items	Unit	Parameter for Performance Guarantee	Remarks
22	Maximum ramp/sudden load change withstand capability		6% / per minute	
23	Mill Capacity		BMCR load and design coal - 53.3 t/h (t=27oC and RH-84%). Max mill capacity – 53.3*1.1=58.7 t/h.	BMCR load can be achieved with one mill out of service, 6 mills (5 mills in operation).
24	Guaranteed Turbine Exhaust Pressure	mm HG abs.	57	Measured at the LP STG exhaust hood interface with the condenser; Assuming 30 °C CW.
25	NOx Emission	mg/Nm ³	Max. 450	Equivalent NO ₂ at stack inlet at 6% excess oxygen
26	SOx Emission	mg/Nm ³	Max. 300	Equivalent SO ₂ at stack inlet at 6% excess oxygen
27	Outlet dust concentration	mg/Nm ³	Max. 50	Equivalent SO ₂ at stack inlet at 6% excess oxygen

	Items	Unit	Parameter for Performance Guarantee	Remarks
28	Operating frequency range	Hz	See document Volume II Technical proposal, _DCS and Electrical part, article 2.1	

4.3. PLANT PERFORMANCE GUARANTEES VALUES INTENDED TO REMAIN BY THE OWNER

4.3.1. The Owner intends to remain the following performance guarantees as bellows:

Project shall be guaranteed under approved FEED (Front-End Engineering Design). The main parameters of the plant are committed by the Owner to ensure to the competent authorities as follows:

	Items	Unit	Parameter for Performance Guarantee	Remarks
1	Guaranteed Gross Unit Rated Output	MW	600	Continuous output (MW) of 100% TMCR at Generator terminals under rated steam conditions at Turbine inlet and CW temperature of 30 Deg. C with 0% make-up with excitation power deducted.
2	Guaranteed Gross Unit Heat Rate	kcal/kWh	2 037	Unit Gross Heat Rate in Kcal/Kwh at 100% TMCR for constant pressure operation under rated steam conditions and condenser vacuum of 57 mm Hg(A) with zero make up and all heaters in service.
3	Guaranteed Total Plant Auxiliary Power Consumption	MW	128.383 (no BF)	BF = Booster Fan
4	Guaranteed Steam Generator Efficiency (HHV)	%	87.36	Measured at TMCR load, HB Case C; Steam Generator Fuel Efficiency is calculated according to the heat loss method of ASME PTC 4.0; Ambient air temperature 26.7°C; Ambient air relative humidity; 84% Barometric pressure 0.101325 MPa; Firing performance coal

	Items	Unit	Parameter for Performance Guarantee	Remarks
5	~~Guaranteed Turbine Exhaust Pressure~~	~~mm HG abs.~~	~~57~~	~~Measured at the LP-STG exhaust hood interface with the condenser; Assuming 30 °C CW.~~
6	NOx Emission	mg/Nm ³	Max. 450	Equivalent NO ₂ at stack inlet at 6% excess oxygen. From 31/12/2031, the new outlet should be Max. 250 mg/Nm³ in compliant with QCVN 19:2024 National Technical Regulation on Industrial Emission
7	SOx Emission	mg/Nm ³	Max. 300	Equivalent SO ₂ at stack inlet at 6% excess oxygen . From 31/12/2031, the new outlet should be Max. 250 mg/Nm³ in compliant with QCVN 19:2024 National Technical Regulation on Industrial Emission
8	Outlet dust concentration	mg/Nm ³	Max. 50	Equivalent SO ₂ at stack inlet at 6% excess oxygen From 31/12/2031, the new outlet should be Max. 35 mg/Nm³ in compliant with QCVN 19:2024 National Technical Regulation on Industrial Emission

4.3.2. Performance Guarantees and Tests

Based on the Owner's guaranteed parameters for the entire plant, which is specified on FEED and the existing detail design, detailed calculations will be performed for the performance parameters of the constituent equipment/ systems to identify factors impacting the plant's overall guaranteed parameters, and responsibilities will be allocated between the Owner and Contractor according to their respective supply scopes.

The Bidder shall propose the methodology of engineering that meet the performance criteria, any deviation stated by Bidder with reasonable demonstration will be considered by the Owner.

The performance/acceptance tests for various equipment and systems shall be carried out as specified under the respective equipment specifications and those specified below shall be specifically applicable. All the guarantees shall be tested together as far as practicable.

The Performance guarantee tests shall be conducted for both the units

The performance tests shall be carried out with the unit operating at the guaranteed point conditions corresponding to 100%, 85%, 60%, 50% TMCR

4.3.2.1. Reliability Run and Performance Tests of whole Power Plant should be performed by Commissioning Contractor in separate Subcontract with the Owner.

4.3.2.2. Performance/Acceptance Tests Procedures

	Items	Performance/Acceptance Tests Procedures	Remarks
1	Overall Plant Performance	Latest ASME PTC 46 Performance Test Code on Overall Plant Performance	
2	Steam Generator	The performance tests shall be conducted in accordance with the latest version of ANSI PTC 4.0	
3	Turbine Generator	The performance test for the turbine generator set will be conducted in accordance with the latest edition of ASME-PTC-6	
4	Condenser	Performance test for the condenser shall be conducted in accordance with the latest edition of ASME PTC-12.2	
5	Feed Water Heaters and Drain Cooler	Performance test for feed water heaters shall be conducted in accordance with the latest edition of ASME PTC-12.1	
6	Deaerator	Performance test for deaerator shall be conducted in accordance with the latest edition of ASME PTC-12.3	

4.4. CONTRACTOR'S PERFORMANCE GUARANTEES

4.4.1. Contractor is responsible for following values:

4.4.2. Auxiliary Power Consumption

Contractor to fill the APC value for all equipment, which are supplied within Contractor's scope of supply

	Items	Unit	Parameter for Performance Guarantee	Remarks
1	Total Auxiliary Power Consumption	kW	--	
	In Details:			
1	Ammonia unloading and storage system	kW	--	
2	Turbine Oil Purification System	kW	--	
3	Condensate Polishing System	kW	--	
4	Miscellaneous cranes & hoist (additional crane)	kW	--	Not delivered portion.
5	Main CW piping and Aux. CW Piping	kW	N/a	
6	CCCW Heat Exchanger	kW	N/a	
7	Effluent Treatment System	kW	--	
8	Vertical Pumps & Horizontal Centrifugal Pumps	kW	--	
9	Generator Transformers Unit 1	kW	--	

	Items	Unit	Parameter for Performance Guarantee	Remarks
10	Station Transformer	kW	--	
11	Auxiliary Transformers	kW	N/a	
12	500kV/220kV System Interconnection	kW	N/a	
13	Distributed Control System (DCS)	kW	N/a	
14	Intake Chlorination System	kW	--	
15	HVAC System (except Admin building, Workshop, Warehouse, Canteen and separate BOPs packages)	kW	--	
17	HP & LP Bypass Valves	kW	N/a	
18	Control Valve	kW	N/a	
19	HP Safety Valves including Silencers	kW	N/a	
20	HP Valves & Piping specialties	kW	N/a	
21	LP valves & specialties	kW	N/a	
22	HP Piping (Power Cycle Piping) and HP Piping Hanger and Supports	kW	N/a	
23	Generator Circuit Breaker	kW	N/a	
24	Gas distribution system N2	kW	N/a	
25	10kV & 3kV Segregated phase busduct	kW	N/a	
26	400V PCC/MCC, ACDB & DCDB	kW	N/a	
27	Non-segregated Phase Busduct	kW	N/a	
28	Isolated phase busduct	kW	N/a	
29	Relay Panels & Metering Panel	kW	N/a	
30	220 DC System (with Lead Acid Battery)	kW	N/a	
31	UPS	kW	N/a	
32	Emergency DG Set	kW	N/a	
33	Under ground grounding system	kW	N/a	
34	Earthing (above ground) & Lightning System	kW	N/a	
35	Rotating Machine Condition Monitoring System (RMCMS)	kW	N/a	
36	Shop fabricated tanks	kW	N/a	
37	Field fabricated tanks	kW	N/a	
38	06 instrument air receiver and 04 Service air receiver	kW	N/a	
39	PC/Flue Gas/Air Duct and Specialties (Expansion joints, supporting steel structure, maintenance platform, air/gas mixture, hanger support,...)	kW	N/a	
40	Pipe Rack	kW	N/a	

	Items	Unit	Parameter for Performance Guarantee	Remarks
41	LP Piping and Specialties and Hanger & Support	kW	N/a	
42	Illumination System	kW	--	
43	CCTV Monitoring System	kW	N/a	
44	Online Environmental Monitoring System	kW	N/a	
45	- Plant communication System Technology - SCADA - VCGM/DIM	kW	N/a	
46	Boiler and BOP Field instruments	kW	N/a	
47	Thermal Insulation	kW	N/a	
48	Boiler Lagging and Insulation	kW	N/a	
49	Instrumentation Hardware-BOP	kW	N/a	
50	MV Power, LV Power & Control Cables	kW	N/a	
51	Cable routing (Cable trench, Cable Tray, duct bank & Accessories)	kW	N/a	
52	Instrumentation Cables	kW	N/a	
53	And all not-mentioned materials & equipment but need to be purchased by the Contractor in order to complete this package	kW	N/a	

4.4.3. Effluent and Sewage Discharge

The Bidder shall guarantee discharge of industrial and domestic wastewater as bellows:

	Items	Requirements	Remarks
1	Discharged industrial wastewater	Comply with QCVN 40:2025/BTNMT National Technical Regulation on Industrial Wastewater and Regulations of the Local Government	Apply in column A of table 1 (F>2000 m2/day) and & column A of table 2.
2	Discharged domestic waste water	Comply with QCVN 14:2025/BTNMT National Technical Regulation on Domestic Wastewater.	Apply in column A, table 2.

4.4.4. Qualities of treated condensate water (Condensate Polishing Plant)

The Bidder shall guarantee treated condensate water as below:

Contaminants	Unit	Normal Condition	Start Up Condition	Tube Leakage Condition
TDS- Total Dissolved Solids	µg/dm ³	< 25	< 50	

SiO ₂ - Silicic acid content	µg/dm ³	< 5	< 50	
Total Ferric Iron	µg/dm ³	< 5	< 100	
Total Copper	µg/dm ³	< 1	< 15	
pH value (runs in H/OH mode)		6.5 ± 7.5	6.5 ± 7.5	
Electrical conductivity	µS/cm	< 0,1	< 0,2	
Cl - Chlorides	µg/dm ³	< 2	< 10	
Na - Sodium	µg/dm ³	< 2	< 5	< 20
Crud (mostly black oxide of iron)	µg/dm ³	< 5	< 100	
Specific electrical conductivity	µS/cm	< 0,1	< 0,2	
O ₂ – Oxygen content before the Boiler	µg/dm ³	50÷150		
NH ₃ - Ammonia	µg/dm ³	≤ 500		
N ₂ H ₄ - Hydrazine	µg/dm ³			
TOC – Total organic carbon	µg/dm ³	≤ 100		
Oil product content	µg/dm ³	≤ 0.1		
SO ₄ - Sulphates	µg/dm ³	≤ 2		
Total hardness	µg-eq/dm ³	≤ 0.2		

Above guarantee are based on the following crude condensate analyses:

Contaminants	Unit	Normal Condition	Start Up Condition	Tube leakage
Ammonia	ppb	100	-	-
Total Dissolved Solids (TDS, ammonia and Silica excluded)	ppb	100	650	Normal +2,000
Copper	ppb	5	-	-
Total Ferric Iron	ppb	50	1,000	-
pH value (polisher runs at 25 ⁰ C with H / OH mode)	ppb	-	-	-
Chloride (as Cl)	ppb	20	100	-
Na - Sodium	ppb	10	20	-
Silica (as SiO ₂)	ppb	30	500	-
Crud (mostly black oxide of iron)	ppb	50	1,000	-

Conductivity (at 25⁰C)	$\mu\text{S/cm}$	0.3	2	-
Temperature	⁰ C	50	50	-

4.4.5. Noise emissions

	Items	Unit	Parameter for Performance Guarantee	Remarks
1	Noise level at boundary (on land side) at any load	dB(A)	≤ 70 from 06.00 to 21.00 hrs ≤ 55 from 21.00 to 06.00 hrs	QCVN 26:2010/BTNMT
2	Noise level at 1 m from equipment	dB(A)	≤ 85	
3	Noise level at working place, Center control room and Administration Office with ventilation/ Air cond.	dB(A)	≤ 65	

Regarding the performance guarantee for *Waste water discharges, Treated condensate water after CPU and Noise emissions*, Bidder is responsible for ensuring the parameters as committed. In case of test failure, the contractor must be responsible for checking, repairing, correcting and re-checking until the committed parameters are achieved.

4.5 START-UP, INITIAL OPERATION, RELIABILITY RUN AND PERFORMANCE TESTS

4.5.1 General

Start-Up, Initial Operation, Reliability Run and Performance Tests shall be performed by the Commissioning Contractor for Bidder's information to coordinate.

The following field inspections and tests shall be carried out in the sequence detailed below, and the successful performance and completion of all the tests taken together shall constitute the Owner acceptance tests. The Bidder shall provide supervisory services during field inspection and tests

Commissioning Contractor	Bidder / Contractor
	After completion of erection and/or installation, and before being put into operation, each unit and all its appurtenances shall be thoroughly cleaned and then inspected, for correctness and completeness of installation and acceptability for placing in operation. All piping system shall be flushed, chemically cleaned, steam blown, air blown as required and cleanliness demonstrated using acceptable industry standards. Procedures to accomplish this work shall be subject to Owner's approval
	The check outs during the pre-commissioning period should be programmed to follow the construction completion schedule. Each system, as it is completed by construction and turned over to the commissioning (start-up) engineer(s), should be checked out and cleaned. The checking and inspection of individual systems should then follow a prescribed schedule.
Provide commissioning & start-up supervisory engineering staff specially identified for the period commencing with start-up and extending from initial operation to all performance tests	
Furnish the calibration devices, special test instruments, etc. required to prepare for and conduct the performance tests	
Commissioning, & start-up supervisory engineering personnel shall conduct training for the Owner's personnel prior to and during this period and shall train them so that they will be able to operate and maintain the new equipment satisfactorily after acceptance by the Owner	
On completion of inspection, checking and after the pre-commissioning tests are satisfactorily over, the complete equipment shall be placed on Initial Operation during which period the complete equipment shall be operated integral with sub-systems and supporting equipment as a complete plant.	- Fixing the defectives, re-calibration instruments within scope installation of Bidder during Start-Up, Initial Operation, Reliability Run and Performance Tests. - In case the defectives occur with the Owner's equipment not from installation mistakes, Bidder shall propose fixing solutions and perform fixing with defective materials/ equipment provided by the Owner.

When the equipment is operating properly, its characteristics shall be recorded on the start-up report sheets. Copies of typical start-up report shall be given to the Owner. Start-up reports for all equipment shall be completed before the start of the Reliability Run	

4.5.2 Initial Operation, Reliability Run

The plant shall be on Reliability Run during which period all necessary adjustments shall be made while operating over the full load range enabling the plant to be made ready for performance and guarantee tests.

The duration of Reliability Run of the complete plant & equipment for each unit in the automatic mode of control shall be thirty (30) days out of which at least seventy two (72) hours shall be in continuous operation on full load or any other duration as may be agreed to between the Owner and the Contractor. The Reliability Run shall be considered successful, provided such item of the equipment can be operated, continuously at the specified operating characteristics for the period of Reliability Run.

For the period of Reliability Run, the time of operation with load range from 60% load to 100% load depend on dispatching by National Electricity System and Market Operation Company Limited (NSMO), minor interruptions not exceeding one (1) to Two (2) hours at a time caused during the continuous operation shall not affect the total duration of Reliability Run. Maximum number of such interruption during the reliability run shall be four (4). However, if in the opinion of the Owner, the interruption is long, the Reliability Run shall be prolonged for the period equivalent to the duration of interruption.

A Reliability Run report comprising observations and recordings of various parameters to be measured, in respect of the above run shall be prepared by the the Commissioning Contractor for each unit and witness signature by Contractor. This report besides recording the details of the various observations during operation shall also include the dates of start and finish of the Reliability Run and shall be signed by the representatives of the Parties. The report shall have sheets, recording and print out of all the details of interruption occurred, adjustments made, any minor repairs done during the Reliability Run. Based on the observations, necessary modifications/repairs to the plant shall be carried out to the full satisfaction of the Owner to enable the later to accord permission to carry out Performance and Guarantee Tests on the plant. However, minor defects which do not endanger the safe operation of the equipment shall not be considered as reasons for withholding the aforesaid permission.

Should any major failure or interruption occur in any portion of the plant due to or arising from faulty design, materials, workmanship or omissions or incorrect erection, sufficient to prevent safe and full commercial use of the plant, the reliability run shall be considered void and the reliability test period of 30 days shall recommence for that unit after the Parties has remedied the cause of defects respectively to scope of supply and scope of erection by Parties

Major Failure

Major failure means failure or interruption in any portion of the plant due to or arising from faulty design, material or workmanship, omission or incorrect erection to prevent safe and full use of the plant equipment during the Reliability Run period of 30 days.

Reliability Run would be considered a failure for any one of the following:

- (i) Failure to operate in accordance with normal operating procedures with all plant

systems under automatic control.

- (ii) Plant tripping or reduction in plant output.
- (iii) Failure to meet Guaranteed Maximum Emission Rate at any time.
- (iv) The Contractor/ Owner performs significant repairs or overhauls respectively to scope of supply and scope of erection by Parties.
- (v) Unauthorized adjustment during Reliability Run. Unauthorized adjustment means that adjustment made without a Permit To Work. However, in emergency situations, immediate adjustment may be necessary. In this case, the adjustment made should be recorded and the effect of such adjustment on the validity of the Reliability Run will be discussed and decided by the commissioning committee (created for this purpose before the start of the Reliability Run) between Owner, Commissioning Contractor and the Contractor.
- (vi) Failure to start-up/shut-down as and when required according to normal procedure.
- (vii) Major defects to warrant plant shut-down or interruption for repair which would otherwise affect safety of personnel and/or plant and equipment.
- (viii) Failure to respond correctly during the run back or emergency trip.

In the event of failure, the reliability run test period of 30 days shall recommence after the Parties has remedied the cause of the defect.

4.5.3 Performance and Guarantee Test

- a) The final tests as to the performance and guarantees shall be conducted at site, after the reliability run, by the Commissioning Contractor with full involvement of the Owner and witness by the Contractor. The necessary operating inputs shall be provided by the Owner. The engineering staff for commissioning and start-up of the Commissioning Contractor shall ensure that the equipment are ready for such tests. The Owner shall associate his necessary supporting staff with the Commissioning Contractor, Contractor to carry out the various activities related to PG tests. The necessary labour/supporting staff etc. shall be provided by the Commissioning Contractor and coordinate by the Contractor. Such tests will be conducted within a period of three (3) months after the successful completion of Reliability Run. Any extension of time beyond the above three (3) months shall be mutually agreed upon.
- b) These tests shall be binding on all the Parties of the each Contract to determine compliance of the equipment with the performance criteria.

The Commissioning Contractor shall submit the test procedure for Owner's approval within twelve (12) months from the date of letter of award of the contract. The test shall be carried out by the test grade instruments as stipulated in the applicable test code. These instruments shall be calibrated by the Commissioning Contractor in a laboratory duly approved by Owner. Batch calibration will not be acceptable. The available instrumentation and control equipment in the plant if found suitable could also be used with the prior approval of the Owner after calibrations in the plant/outside laboratory. The tests will be conducted at the specified load points, and as near the specified cycle conditions as practicable. Proper corrections in calculations to take into account the conditions which do not correspond to the specified conditions will be applied in the test report as brought out under the respective sections of the specification.

The Commissioning Contractor in coordinate with the Contractor shall submit for Owner's approval the detailed Performance Test procedure containing the following:

- (i) Object of the test
 - (ii) Scope
 - (iii) Various guaranteed parameters & tests as per contract
 - (iv) Method of conductance of test and test code
 - (v) Duration of test, frequency of readings & number of test runs.
 - (vi) Method of calculation
 - (vii) Correction curves
 - (viii) Instrument list consisting of range, accuracy, least count and location of instruments.
 - (ix) Scheme showing measurement points
 - (x) Sample calculation
 - (xi) Acceptance criteria
 - (xii) Any other information required for conducting the test.
- c) All special test grade instruments, including flow nozzles etc., equipment, tools and tackles, required for the successful completion of the Performance and Guarantee Tests shall be brought for the purpose of test, free of cost by the Commissioning Contractor.
- d) The guaranteed performance figures of the equipment shall be proved by the Parties during these Performance and Guarantee Tests. The Commissioning Contractor shall submit a detailed test report in the manner, already agreed to within one (1) month time of completion of the test, for Owner's approval. Should the Owner's assessment of these tests show any deterioration from the guaranteed values the Contractor/ Owner shall modify the equipment as required to enable it to meet the guarantees according to respective Parties scope of supply. In such case Performance and Guarantee Tests shall be repeated after one (1) month, from the date the equipment is ready for retest and all costs for modifications including labour, materials and the cost of additional testing to prove that the equipment meets the guarantees, shall be borne respectively with the Parties scope of supply.
- e) The specific tests to be conducted on equipment have been brought out in the technical specifications. The procedure to be submitted by the Commissioning Contractor should include the detailed methodology to conduct these tests/verify the guarantees offered by the Contractor notwithstanding whether these attract liquidated damages or not.
- f) Instrument accuracies shall be in accordance with the relevant test codes. All instrument in-accuracies if applicable shall be computed as per the code and values will be corrected to the advantage of the Owner. No negative tolerance will be allowed. For example, if the inaccuracy of instrumentation has been worked out to be 1%, the measured values will be assessed to be 1% inferior.
- g) The Bidder and the Commissioning Contractor shall coordinate to establish the following modes of operation to the satisfaction of the Owner before acceptance test:

- (i) Operation of each system by remote manual control.
 - (ii) Operation of the entire system in integrated manner on auto control.
 - (iii) Operation of the entire plant with auto-control loops fully implemented including different modes of load control with the help of control system.
- h) Ten (10) copies of the test reports are to be furnished by the Commissioning Contractor with coordinate by the Contractor to the Owner backed up with jointly signed data sheets.

Wherever it is not practicable to conduct the performance guarantee test at site, and an accurate test to prove the guaranteed parameter has already been conducted in the shop test, such a test may not be repeated, if so agreed by the Owner. However, in such cases, should there be any short fall in the performance during shop tests, the liquidated damages will be calculated on that basis.

4.5.4 Final completion test

On the completion of the Completion Tests of both Units and after the Parties confirm that the Facility is deemed ready for the carrying out of the Final Completion Test.

Without prejudice to the more detailed requirements as given elsewhere in the Contract, the Bidder must demonstrate that while the Facility is operating in accordance with normal operating procedures (except as necessarily modified for testing purposes) and within the limits of output specified, either continuously or intermittently as may be more convenient for the Owner and in compliance with all applicable laws and all statutory approvals:

- (i) The Facility must be available for not less than 168 consecutive hours. During this time, the Facility must operate continuously at full load for at least 72 hours, and for the rest of the period at any load as required by the Owner;
- (ii) Air emissions and noise levels of the Facility must be in compliance with guaranteed requirements; and
- (iii) Effluent discharge from the Facility must be in compliance with guaranteed requirements.

If any failure or interruption occurs in the Facility or any portion of the Facility due to, or arising from, defects in design, materials or workmanship which is sufficient to prevent the agreed usage of the equipment, the Final Completion Tests must be repeated after the Parties has remedied the causes of failure respectively to scope of supply of Parties and scope of erection by Parties.

The Final Completion Tests procedure must be agreed between the Owner and the Bidder prior to the Final Completion Tests being commenced.

SOCIALIST REPUBLIC OF VIETNAM
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CONTRACT

No.: /HD-LP1PP-....

**FOR THE PACKAGE T08 “SUPPLY OF EQUIPMENT,
CONSTRUCTION, INSTALLATION, AND SUPERVISION OF
ACCEPTANCE TEST RUN OF MAIN PLANT”**

OF

LONG PHU 1 (2X600MW) THERMAL POWER PLANT PROJECT

BETWEEN

**PETROVIETNAM LONG PHU 1 POWER PROJECT MANAGEMENT
BOARD (LP1PP)**

AND

CONTRACTOR

PETROVIETNAM
LONG PHU 1 THERMAL POWER PLANT PROJECT
CONTRACT

WITNESSTH

- Law on Construction No. 50/2014/QH13 dated June 18, 2014, and the Law amending and supplementing certain articles of the Law on Construction No. 62/2020/QH14 dated June 17, 2020, of the National Assembly of the Socialist Republic of Vietnam;
- Law on Bidding No. 22/2023/QH15 dated June 23, 2023, of the National Assembly of the Socialist Republic of Vietnam;
- Law No. 57/2024/QH15 dated November 29, 2024, of the National Assembly on amending and supplementing certain articles of the Law on Planning, the Law on Investment, the Law on Investment in the form of Public-Private Partnership, and the Law on Bidding;
- Decree No. 17/2025/ND-CP dated February 6, 2025, amending and supplementing certain articles of the decrees detailing certain articles and measures for implementing the Law on Bidding;
- Decree No. 175/2024/ND-CP dated December 30, 2024, of the Government detailing certain articles and measures for implementing the Law on Construction regarding construction activity management;
- Decision No. 342/QĐ-DKVN dated February 11, 2009, of the Board of Directors of Vietnam Oil and Gas Group (now Vietnam Oil and Gas Industry and Energy Group) (the Group) on establishing the Long Phu - Song Hau Power Project Management Board;
- Decision No. 2501/QĐ-DKVN dated November 17, 2014, of the General Director of Vietnam Oil and Gas Group on renaming the Long Phu - Song Hau Power Project Management Board to Long Phu 1 Power Project Management Board;
- Decision No. 2679/QĐ-DKVN dated December 5, 2014, of the General Director of Vietnam Oil and Gas Group on approving and issuing the organizational and operational regulations of the Long Phu 1 Power Project Management Board;
- Decision No. 5843/QĐ-DKVN dated July 02nd, 2010, of the Members' Council of Vietnam Oil and Gas Group on approval of the Long Phu 1 (2x600MW) Thermal Power Plant Project at Soc Trang Province;
- Decision No. 479/QĐ-DKVN dated January 17, 2025, of the Members' Council of Vietnam Oil and Gas Group on approving the adjustment of the investment project for Long Phu 1 Thermal Power Plant;
- Decision No. 2068/QĐ-DKVN dated March 20, 2025, of the General Director of Vietnam Oil and Gas Group on authorizing the Head of the Long Phu 1 Power Project Management Board;
- Decision No. 3271/QĐ-CNNL dated April 24, 2025, of the General Director of Vietnam National Industry and Energy Group on approving the contractor selection plan under the adjusted and supplemented contractor selection plan for Long Phu 1 Thermal Power Plant Project;
- Applicable laws of Vietnam.
- And other relevant legal documents.

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The Owner and the Contractor shall be hereinafter referred to individually as “Party” or collectively as “Parties”.

WHEREAS the Owner issued Bidding Documents for package T08 “Supply of Equipment, Construction, Installation, and Supervision of Acceptance Test Run of Main Plant” of the Long Phu 1 Thermal Power Plant Project.

WHEREAS the Contractor submitted to the Owner a bid to perform the Works.

PART 1 - CONTRACT AGREEMENT (CA)

THIS CONTRACT AGREEMENT is made at LP1PP Site Office, Thanh Duc Hamlet, Dai Ngai Commune, Can Tho City, Vietnam on th xxx, 2025.

BETWEEN:

1. OWNER: **VIETNAM NATIONAL INDUSTRY - ENERGY GROUP**
(abbreviated name: **PETROVIETNAM**)

REPRESENTATIVE: PETROVIETNAM LONG PHU 1 POWER PROJECT
MANAGEMENT BOARD (LP1PP)
(Under POA No. xxxth, 2025.)

- Mr : Hà Đình Niên
- Position : General Director
- Address : Thanh Duc hamlet, Dai Ngai commune, Can Tho City, S.R. Viet Nam
- Telephone : +84-299 3713333
- Fax : +84-299 3713 444
- Email : longphu1@lp1pp.pvn.vn
- Bank account : 0111370888889
- At : Joint Stock Commercial Bank for Foreign Trade of Vietnam, Can Tho Branch
- Tax code : 0100681592-024

(Hereinafter referred to as one Party),

AND

2. CONTRACTOR:

- Company :
- Representative :
- Position :
- Address :
- Telephone :
- Fax :
- Account No. :
- At :
- Address :
- SWIFT :

The Owner/Representative and the Contractor shall be hereinafter referred individually to as a “Party” or collectively as “Parties”.

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NOW IT IS HEREBY AGREED as follows:

The Owner and the Contractor agree as follows:

ARTICLE 1 DEFINITION

In this Contract Agreement, words and expressions shall have the same meanings as respectively assigned to them in the Conditions of Contract hereinafter referred to.

ARTICLE 2 CONTRACT DOCUMENTS

The following documents shall be deemed to form and be read and construed as an integral part of the Contract between the Owner and the Contractor. For the purpose of interpretation, the priority of the documents shall be in the sequence provided below:

1. Contract Agreement
2. Conditions of Contract
3. Forms
 - 3.1 Form of Performance Bond, Advance Payment Bond, Warranty Bond
 - 3.2 Form of Taking over Certificate
 - 3.3 Form of Performance Certificate
 - 3.4 Form of Completion of Training
4. List of Subcontractors and Manufactures
5. Appendices
 - 5.1 Appendix 1: Scope of work
 - 5.2 Appendix 2: Project Schedule
 - 5.3 Appendix 3: Price Schedules and Terms & Procedures of Payment
 - Appendix 5.3.1: Price list of for group 1 [*Materials, Equipment, and services paid Paid in on Lump sum Basis*]
 - Appendix 5.3.2: Terms & Procedures of Payment
 - 5.4 Appendix 4: Permits and Licenses
 - 5.5 Appendix 5: Not Applicable
 - 5.6 Appendix 6: Not Applicable
 - 5.7 Appendix 7: Schedule of Engineering Documents and Submission Dates.
6. Plant Performance Guarantee:
7. Contract Discussion Agreement – The provisions in this document shall take precedence over the corresponding clauses in the Contractor's Proposal
8. Decision on Approval of the Result of Bidding
9. Letter of Acceptance and Notification of Award

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10. Bid and other Clarification Documents

11. Bidding Documents and other supplement Documents

In the event of any ambiguity or conflict between the documents listed above, the provisions of the document with higher priority shall prevail.

Notwithstanding this provision of priority of the Contract Documents, if any deviations are found elsewhere which are not declared in the Contractor's Bid or new issues/proposals not agreed/approved by the Owner, they will not be accepted and the Contractor shall fully conform to the Bidding Documents. In any circumstance, the Contractor is obligated to construct and hand over the Power Plant with quality and schedule as regulated in the Contract.

ARTICLE 3 CONTRACT PRICE, ADVANCE PAYMENT AND PRIMARY COVENANTS

3.1 Contract Price and Payment Condition

3.1.1 Total value of the Contract Price is xxxx USD and VND.

(In words:)

The Price includes the CIT, PIT, import tax, VAT and other taxes, fees and expenses inside and outside of Vietnam to be declared and paid the Contractor. In the case of any withholding tax applicable to foreign contractors, the Owner shall, on behalf of the Contractor, withholding the corresponding amount of tax from progress payments and pay directly to the tax authority in Vietnam and provide the Contractor with the withholding tax certificate within thirty (30) days of the payment.

3.1.2 Condition and payment method

Details of the condition and payment method shall be stipulated in Clause 14 [Contract Price and Payment] of the Conditions of Contract.

3.1.3 Form of Contract

The Contract shall be in the form of a fixed lump sum, applicable to the entire Scope of Work specified in the contract.

3.2 Payment for the Works and Goods will be made on the basis of Clause 14 [*Contract Price and Payment*] and Appendix 1 [*Terms and Procedures of Payment*], subject to any adjustments in accordance with the Contract.

3.3 Terms and Procedures of Payment, Schedule of Payment, Payment documents will be made in accordance with Appendix 1 [*Terms and Procedures of Payment*].

ARTICLE 4 TIME FOR COMPLETION

The period of performance under this Contract shall be seven hundred ninety-one (791) days, starting from the Commence Date.

ARTICLE 5 PERFORMANCE GUARANTEES

The Contractor shall comply with the guaranteed parameters/technical specifications as detailed in Appendix 6 of Condition of Contract within the scope of the package, and shall coordinate with other contractors to achieve the guaranteed parameter values

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of the Plant

ARTICLE 6 DEFECT NOTIFICATION PERIOD

The Defect Notification Period shall be twenty four (24) months for notifying defects in a Unit under Sub-Clause 11.1 [*Completion of Outstanding Work and Remedying Defects*] (subject to any extensions under Sub-Clause 11.3 [*Extension of Defects Notification Period*]), calculated from the date on which each Unit is completed as certified under Sub-Clause 10.1 [*Taking Over of the Works and Units*]. In all cases, the Defects Notification Period shall not exceed forty-eight (48) months from the date of issuance of the Taking-over Certificate for the respective Unit.

ARTICLE 7 COMMUNICATIONS

Any notice forwarded to the Owner shall be written in full address and sent to:

Owner's Name : Petrovietnam Long Phu 1 Power Project Management Board
(abbreviated LP1PP)

Address : Thanh Duc Hamlet, Dai Ngai Commune, Can Tho City Vietnam

Telephone : +84 2993 713 333

Fax : +84 2993 713 444

And any notice forwarded to the Contractor shall be written in full address and sent to:

Contractor's Name :

Address :

Telephone :

Fax :

Communication addresses of the Owner and the Contractor may be updated as necessary for the purpose of facilitating information exchange during the Project execution period.

ARTICLE 8 EFFECTIVE DATE

The Contract shall become effective upon fulfillment of all the following conditions:

- a) The Contract has been duly signed by the authorized representatives of both the Owner and the Contractor;
- b) The Owner has received valid and effective Performance Bonds from Contractor in accordance with the terms of the Contract .
- c) The Owner has issued a written notice to the Contractor confirming the Contract Effective Date. In any event, the Contract Effective Date shall be the date specified in such notification.

ARTICLE 9 COMMENCEMENT DATE

The Commencement Date shall be the date the Owner has made the transfer of fifteen percent (15%) of the Contract Price as Advance Payment, and the Contractor has been

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notified of such transfer through bank notice, in accordance with Clause 14 [*Contract Price and Payment*] of the Conditions of Contract.

**ARTICLE 10 BASIC PRINCIPLES FOR SUCCESSFUL
IMPLEMENTATION**

- 10.1** The Owner and Contractor agree that they will perform their respective obligations under the Contract and relevant documents in full cooperation with one another, pursuant to the terms thereof, with the aim of ensuring the successful implementation of the Project;
- 10.2** The Parties agree to engage in joint discussions to resolve any material issues or disputes arising from the Contract, with the ultimate objective of ensuring the successful implementation of the Project;
- 10.3** The Parties hereby confirm that they shall cooperate in good faith and make their best efforts to prevent or minimize any delay or failure in the performance of their obligations under the Contract;
- 10.4** The Contractor shall be responsible for optimizing the design and construction methods, controlling costs, ensuring quality and timely progress, minimizing expenses for Owner and enhancing the overall efficiency of the Project.

This Contract Agreement, together with the Conditions of Contract, its Appendices, and all other attached documents forming part of the Contract, has been mutually agreed upon by the Parties. It is based on the Bidding Documents, the Contractor's Proposal and the Contract negotiation results, in accordance with the Project's requirements as approved by LP1PP.

This Contract is made in ten (10) originals of the same validity. The Owner keeps six (06) originals and Contractor keeps four (04) originals.

IN WITNESS WHEREOF, the Owner and the Contractor have caused this Contract Agreement to be duly executed by their duly authorized representatives on the day and year first written above.

FOR AND ON BEHALF OF THE OWNER

FOR AND ON BEHALF OF CONTRACTOR



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PART 2 – CONDITIONS OF CONTRACT

.....2025

Conditions of Contract (COC)

Long Phu 1 Thermal Power Plant Project

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1.

GENERAL PROVISIONS

1.1 Definitions

In the Conditions of Contract (“these Conditions”), the following words and expressions shall have the meanings stated. Words indicating persons or parties include corporations and other legal entities, except where the context requires otherwise.

1.1.1 The Contract

- 1.1.1.1 “**Contract**” means the Contract Agreement, the forms of bonds and certificates, and the further documents (if any) which are listed in the Contract Agreement.
- 1.1.1.2 “**Contract Agreement**” means the contract agreement dated xxxxx recording the terms of the Contract between the Owner and the Contractor, including any annexed memoranda.
- 1.1.1.3 Not used.
- 1.1.1.4 “**Technical Requirement and Specification**” or “**Technical Requirements**” or “**Technical Specifications**” means all the documents as included in Chapter V Part 2 of the Bidding Document and entitled technical requirements including the contract discussion agreements (“CDA”), the project information, general technical requirements, particular technical requirements, Technical Schedules and Drawing and documents incorporating CDA as included in the Contract, and any additions and modifications to such document in accordance with the Contract. Such document specifies the purpose, scope, and/or design and/or other technical criteria, for the Works.
- 1.1.1.5 “**Contractor’s Bid**” means the Contractor's signed offer for the Works and all other documents which the Contractor submitted therewith (other than these Conditions and the Technical Requirements and Specifications, if so submitted), as included in the Contract.
- 1.1.1.6 “**Plant Performance Guarantees**” means the performance guarantees as included in Appendix No.6 [Plant Performance Guarantees] of this Contract.

1.1.2 Parties and Persons

- 1.1.2.1 “**Party**” means each of the Owner or the Contractor, as the context requires.
Parties means both the Owner and the Contractor.
- 1.1.2.2 “**Owner**” means the person and/or party named as Owner in the Contract Agreement and the legal successors in title to this person.
- 1.1.2.3 “**Contractor**” means the xxxx named as contractor in the Contract Agreement.
- 1.1.2.4 “**Owner’s Representative**” means the person named by the Owner in the Contract or appointed from time to time by the Owner under Sub-Clause 3.1 [*The Owner’s Representative*], who acts on behalf of the Owner.
- 1.1.2.5 “**Contractor’s Representative**” means the person named by the Contractor in the Contract or appointed from time to time by the Contractor under Sub-Clause 4.3 [*Contractor’s Representative*], who acts on behalf of the Contractor.

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- 1.1.2.6 **“Owner's Personnel”** means the Owner's Representative, the assistants referred to in Sub-Clause 3.2 [*Other Owner's Personnel*] and all other staff, labour and other employees of the Owner and of the Owner's Representative; and any other personnel notified to the Contractor, by the Owner or the Owner's Representative, as Owner's Personnel.
- 1.1.2.7 **“Contractor's Personnel”** means the Contractor's Representative and all personnel whom the Contractor utilises on Site, who may include the staff, labour and other employees of the Contractor and of each Subcontractor; and any other personnel assisting the Contractor in the execution of the Works.
- 1.1.2.8 **“Subcontractor”** means any person entitled as subcontractor and/or appointed as a subcontractor of the Contractor to perform part(s) of the Works; and the legal successors in title to each of these persons.
- 1.1.2.9 **“List of Subcontractors and Manufacturers”** means the list of Subcontractors/Manufactures attached to in the Contract
- 1.1.2.10 **“Associated Works Contractors”** means any of the third parties, contractors, consultants or service providers engaged by or on behalf of the Owner or a Public Sector Entity to carry out Associated Works.
- 1.1.2.11 **“EVN”** means Electricity of Vietnam, and their legal successors or assignees or novatees.
- 1.1.2.12 **“Public Sector Entity”** means any national, federal, regional, state, municipal or local government, and any division, ministry, department, agency or other emanation of any of the same, including any court, commission, board, branch or similar authority of such government and anybody empowered to grant, withdraw or determine the terms and conditions of any licence”.
- 1.1.2.13 **Commissioning Contract** means the Contractor shall be responsible for managing the commissioning activities, preparing commissioning/testing procedures, carrying out testing and commissioning for each system and equipment, as well as the overall plant commissioning.

1.1.3 **Dates, Tests, Periods, Completion and Certificates**

- (a) **“Effective Date”** means the date the Contract becomes effective as stated in the Article 8 [*Effective Date*] of the Contract Agreement.
- (b) **“Commencement Date”** is defined in the Article 9 [*Commencement Date*] of the Contract Agreement.
- 1.1.3.1 **“Time for Completion”** means , for a Unit, the date which Taking Over of the Unit is to be attained as set out below (in each case as may be adjusted under Sub-Clause 8.4):
 - (a) **Unit 1:** the date falling, starting from the Commencement Date (as such date may be extended in accordance with the Contract); and
 - (b) **Unit 2:** the date falling, starting from the Commencement Date (as such date may be extended in accordance with the Contract).

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- 1.1.3.2 **“Tests on Completion”** means the tests which are specified in the Contract or agreed by both Parties or instructed as a Variation, and which are carried out under Clause 9 [*Tests on Completion*], Plant Performance Guarantee and Technical Requirements and Specifications, before the Works or a Unit (as the case may be) are taken over by the Owner.
- 1.1.3.3 **“Reliability Run”** means the “trial operation” referred to under Clause 9 [*Tests on Completion*] and Plant Performance Guarantee. The term “Reliability Run” shall be used in this connection during execution of the Contract.
- 1.1.3.4 **“Taking-Over Certificate”** means the certificate issued under Clause 10 [*Owner’s Taking Over*].
- 1.1.3.5 **“Performance Certificate”** means the certificate issued under Sub-Clause 11.9 [*Performance Certificate*].
- 1.1.3.6 **Not used.**
- 1.1.3.7 **“Defects Notification Period”** means the twenty four (24) month period for notifying defects in a Unit under Sub-Clause 11.1 [*Completion of Outstanding Work and Remedying Defects*] (with any extension under Sub-Clause 11.3 [*Extension of Defects Notification Period*]), calculated from the date on which each Unit is completed as certified under Sub-Clause 10.1 [*Taking Over of the Works and Units*] but in all case the Defects Notification Period shall not exceed forty eight (48) months from the issuing date of the Taking-over Certificate for such Unit.
- 1.1.3.8 **“Day”** or “day” means a calendar day and **“year”** means 365 days.
- 1.1.3.9 **“Working Day”** or “Working day” means any day other than Saturday, Sunday or any other day which is a public holiday in the Country.
- 1.1.4 **Money and Payments**
 - 1.1.4.1 **“Contract Price”** means the agreed amount of money stated in the Contract Agreement for the design, execution and completion of the Works and the remedying of any defects, and includes adjustments (if any) in accordance with the Contract
 - 1.1.4.2 **“Price Schedules”** means the completed Price Schedules, or any part or individual schedule thereof, submitted and agreed between parties based on the submission by the Contractor with his Proposal, and forming a part of the Contract Documents. The detailed price break down of the Contract Price is specified in Appendix 3 [*Price Schedule and Payment Schedule*] of the Contract.
 - 1.1.4.3 **“Cost”** means all expenditure reasonably incurred (or to be incurred) by the Contractor, whether on or off the Site, including overhead and similar charges.
 - 1.1.4.4 **Not used.**
 - 1.1.4.5 **“Foreign Currency”** means a currency in which part (or all) of the Contract Price is payable, but not the Local Currency.
 - 1.1.4.6 **“Local Currency”** means Vietnamese Dong.
 - 1.1.4.7
 - 1.1.4.8 **“Contract Sum”** means the agreed sum paid by the Owner to the Contractor

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1.1.5 Works and Goods

- 1.1.5.1 “**Contractor's Equipment**” means all Special Tools and Test Equipment, apparatus, machinery, vehicles and other things required for the execution and completion of the Works and the remedying of any defects. However, Contractor's Equipment excludes Temporary Works, Plant, Materials and any other things intended to form or forming part of the Permanent Works.
- 1.1.5.2 “**Goods**” means Contractor's Equipment, Materials, Plant and Temporary Works, or any of them as appropriate.
- 1.1.5.3 “**Materials**” means things of all kinds (other than Plant) intended to form or forming part of the Permanent Works, including the supply-only materials (if any) to be supplied by the Contractor under the Contract.
- 1.1.5.4 “**Permanent Works**” means the permanent works to be designed and executed by the Contractor under the Contract.
- 1.1.5.5 “**Plant**” means the apparatus, machinery and vehicles intended to form or forming part of the Permanent Works.
- 1.1.5.6 “**Special Tools and Test Equipment**” means all special erection tools, machinery, testing devices, expendable supplies, as necessary to properly erect, commission and test the Works and Units.
- 1.1.5.7 “**Temporary Works**” means all temporary works of every kind (other than Contractor's Equipment) required on Site for the execution and completion of the Permanent Works and the remedying of any defects.
- 1.1.5.8 “**Works**” mean the Permanent Works and the Temporary Works, or either of them as appropriate.
- 1.1.5.9 “**Associated Works**” means any works being or to be carried out at or connecting with the Site by the Owner or any Public Sector Entity or any Associated Works Contractors.
- 1.1.5.10 “**Power Plant**” means the coal fired power plant consisting of two (2) Units each 600 MW (gross) and Common facilities, as more particularly described in the Technical Requirements, to be designed and executed by the Contractor under the Contract.
- 1.1.5.11 “**Unit**” means either Unit 1 or Unit 2 (as the case may be) and Units means both Units 1 and 2.
- 1.1.5.12 “**Unit 1**” means coal fired power unit of 600 MW (gross) entitled “Unit 1”.
- 1.1.5.13 “**Unit 2**” means the coal fired power unit of 600 MW (gross) entitled “Unit 2”.
- 1.1.5.14 “**Common facilities**” means all facilities required for the proper operation of the plant and the logistic of coal, limestone and ash.
- 1.1.5.15 Not used.
- 1.1.5.16 Not used.
- 1.1.5.17 Not used.

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- 1.1.5.18 **“Equipment”** means the apparatus, machinery and/or vehicles intended to form or forming part of the Permanent Works.
- 1.1.5.19 **“Scope of Works”** includes but not limited to Works, Goods and services as described in the Contract.
- 1.1.5.20 **“Origin”** means the place where the Goods, Materials and Equipment or any parts thereof are mined, grown, produced or manufactured, and from which the services are provided. Goods, Materials and Equipment components are produced when, through manufacturing, processing, or substantial or major assembling of components, a commercially recognized product results that is substantially in its basis characteristics or in purpose or utility from its components.
- 1.1.6 **Other Definitions**
- 1.1.6.1 **“Contractor's Documents”** means the calculations, computer programs and other software, drawings, manuals, models and other documents of a technical nature supplied by the Contractor under the Contract as described in Sub-Clause 5.2 [*Contractor's Documents*].
- 1.1.6.2 **“Country”** means the country in which the Site is located, where the Permanent Works are to be executed.
- 1.1.6.3 **“Force Majeure”** is defined in Clause 19 [*Force Majeure*].
- 1.1.6.4 **“Laws”** means all national legislation, statutes, ordinances and other laws, and regulations and by-laws of any legally constituted public authority.
- 1.1.6.5 Not used
- 1.1.6.6 Not used
- 1.1.6.7 **“Site”** means the place or places, provided or made available by the Owner where work is to be done by the Contractor or to which the Power Plant is to be delivered, located at Thanh Duc hamlet, Dai Ngai commune, Can Tho city, Viet Nam together with so much of the area surrounding the same as the Contractor shall with the consent of the Owner use in connection with the Works otherwise than merely for the purposes of access.
- 1.1.6.8 **“Variation”** means any change to the Technical Requirements or the Works, which is instructed or approved as a variation under Clause 13 [*Variations and Adjustments*].
- 1.1.6.9 **“Guarantees”** is defined is defined in Technical Requirements and Specification referred to Documents 6 [Plant Performance Guarantees] of the Contract.
- 1.1.6.10 **“Delay Liquidated Damages”** means the Liquidated Damages described in Sub-Clause 8.7 [*Delay Damages*].
- 1.1.6.11 **“Design Values” or “design value”** means the values as defined in the Technical Specification.
- 1.1.6.12 **“Cure Period”** for each Unit means a period for the Contractor to remedy any defect of the Unit to attain Guaranteed Performance Levels as indicated in Sub-Clause 9.3 [*Retesting*].

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- 1.1.6.13 **“Good Engineering Practice”** means engineering practices and other practices, methods, equipment and procedures usually employed in engineering, design, construction, operation and maintenance by power industries throughout the world, the degree of skill, diligence, prudence and foresight which would reasonably be expected to be observed by a skilled and experienced turnkey contractor engaged in carrying out activities the same as or similar to the Works under the same or similar circumstances for the lawful, safe, reliable, efficient, design, engineering, construction, operation and maintenance of electrical power generation and transmission equipment.
- 1.1.6.14 **“Guaranteed Gross Unit Rated Output”** is defined in Plant Performance Guarantee in the Contract
- 1.1.6.15 **“Guaranteed Gross Unit Heat Rate”** is defined in Plant Performance Guarantee in the Contract.
- 1.1.6.16 **“Guaranteed Unit Auxiliary Power Consumption”** is defined in Plant Performance Guarantee in the Contract.
- 1.1.6.17 **“Guaranteed Steam Generator Efficiency”** is defined in Plant Performance Guarantee in the Contract.
- 1.1.6.18 **“Guaranteed Maximum Overload Capacity”** is defined in Plant Performance Guarantee in the Contract.
- 1.1.6.19 **“Guaranteed Minimum Load without Fuel Oil Support”** is defined in Plant Performance Guarantee in the Contract.
- 1.1.6.20 **“Guaranteed Maximum Carbon in Ash”** is defined in Plant Performance Guarantee in the Contract.
- 1.1.6.21 **“Guaranteed Performance Levels”** means the Guarantees as stipulated in Section , Chapter V of the Bidding Documents.
- 1.1.6.22 **“Lien”** means any mortgage, lien, pledge, claim, charge, lease, easement, security interest or encumbrance of any kind.
- 1.1.6.23 **“Liquidated Damages”** means the Delay Liquidated Damages and/or Performance Liquidated Damages.
- 1.1.6.24 **“Minimum Performance Levels”** means levels as described in Sub-clause 9.6 [*Minimum Performance levels*]
- 1.1.6.25 **“Performance Liquidated Damages”** means the Liquidated Damages described in Sub-Clause 9.4 [*Failure to Pass Tests on Completion*].
- 1.1.6.26 **“Performance Tests”** means the performance tests to be carried out as part of the Tests on Completion to determine whether the Guaranteed Performance Levels have been attained, as more particularly described in the Contract.
- 1.1.6.27 **“Punch List”** means a schedule of items of an administrative or less important nature which have not been completed but which do not affect the safe and reliable start-up, testing and commercial operation of any Plant and Materials or the Power Plant and which are to be completed, corrected, fixed or repaired by the Contractor at its own expense as a condition to obtaining the Performance Certificate. The

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Punch List shall also include a timetable for the completion of such Punch List items.

- 1.1.6.28 **“Bond”** means the bond or bonds, if any as stipulated in the Sub-Clause 4.2 [*Bond*] or refund bond as the case maybe.

1.2 Interpretation

In the Contract, except where the context requires otherwise:

- (a) words indicating one gender include all genders;
- (b) words indicating the singular also include the plural and words indicating the plural also include the singular;
- (c) provisions including the word "agree", "agreed" or "agreement" require the agreement to be recorded in writing,
- (d) "written" or "in writing" means hand-written, type-written, printed or electronically made, and resulting in a permanent record.
- (e) unless otherwise stated, or the context otherwise requires, references to Clauses, Sub-Clauses and Schedules are to the clauses and sub-clauses of and schedules to this Contract;
- (f) any reference to this Contract or any other document or agreement shall include any appendices, schedules, Appendixes or other annexed memoranda thereto and shall refer to the ‘agreement’ or ‘contract’ as in force for the time being and as from time to time amended, restated, supplemented or renewed;

The marginal words and other headings shall not be taken into consideration in the interpretation of these Conditions.

1.3 Communications

Wherever these Conditions provide for the giving or issuing of approvals, certificates, consents, determinations, notices and requests, these communications shall be:

- (a) in writing and delivered by hand (against receipt), sent by mail or courier, or transmitted using any of the agreed systems of electronic transmission as stated in the Technical Specification; and
- (b) delivered, sent or transmitted to the address for the recipient's communications as stated in the Contract Agreement. However:
 - (i) if the recipient gives notice of another address, communications shall thereafter be delivered accordingly; and
 - (ii) if the recipient has not stated otherwise when requesting an approval or consent, it may be sent to the address from which the request was issued.

Approvals, certificates, consents and determinations shall not be unreasonably withheld or delayed.

1.4 Law and Language

The Contract shall be governed by the law of the Socialist Republic of Vietnam.

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All documents integrated into Contract Documents must be initialled by authorised persons of the Parties. The official language for communications, including communications in dispute resolution shall be English. If there are versions of any part of the Contract which are written in more than one language, the English version shall prevail. Unless otherwise stated in the Contract, documents forming the Contract including technical/technological documents prepared and submitted by the Contractor and or foreign subcontractors/suppliers shall be in English.

1.5 Priority of Documents

Priority of Documents is stipulated as Article 2 [Document of Contract] of Contract Agreement.

1.6 Contract Effectiveness

The Contract shall come into full force and effect on the Effective Date stated in the Contract Agreement.

1.7 Assignment

Neither Party shall assign the whole or any part of the Contract or any benefit or interest in or under the Contract. However, either Party:

- (a) may assign the whole or any part with the prior agreement of the other Party at the sole discretion of such other Party, and
- (b) may, as security in favour of a bank or financial institution, assign its right to any moneys due, or to become due, under the Contract.

1.8 Care and Supply of Documents

Each of the Contractor's Documents shall be in the custody and care of the Contractor, unless and until taken over by the Owner. Unless otherwise stated in the Contract, the Contractor shall supply to the Owner six (06) copies of each of the Contractor's Documents.

The Contractor shall keep, on the Site, a copy of the Contract, publications named in the Technical Specification and Requirements, the Contractor's Documents, and Variations and other communications given under the Contract. The Owner's Personnel shall have the right of access to all these documents at all reasonable times.

If a Party becomes aware of an error or defect of a technical nature in a document which was prepared for use in executing the Works, the Party shall promptly give notice to the other Party of such error or defect.

1.9 Confidentiality

1.9.1 Subject to Clauses 1.9.2 and 1.9.3 hereunder, both Parties shall treat the details of the Contract as private and confidential, except to the extent necessary to carry out obligations under it or to comply with applicable Laws. The Contractor shall not publish, permit to be published, or disclose any particulars of the Works in any trade or technical paper or elsewhere without the previous agreement of the Owner.

1.9.2 Either Party shall be entitled to disclose the terms and conditions of the Contract and any documents and other information acquired by it under or pursuant to the Contract without the prior written consent of the other Party if such disclosure is made in good faith:

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- (a) to the extent required by applicable Laws;
- (b) to the extent required by the rules of a relevant and recognised stock exchange;
- (c) to any insurer or its affiliates/or its partners in holdings or groups under a policy of insurance issued pursuant to the Contract;
- (d) to any of its affiliates;
- (e) to its directors, employees and officers;
- (f) to any Sub-Contractor, for the furtherance of the performance of that Party's obligations under the Contract;
- (g) to outside auditors, consultants or advisors engaged by or on behalf of the disclosing Party and acting in that capacity in connection with the Project (including insurance, tax and legal advisors);
- (h) to the lender (if any) or any prospective lender and to any affiliate, agent, trustee or representative of the lender or any prospective lender;
- (i) to the power purchaser;
- (j) to Associated Works Contractors, to the extent necessary for them to co-operate and co-ordinate Associated Works with the Works; or
- (k) to those contractor(s) which the Owner proposes to retain to operate and maintain the Power Plant (and any affiliates of such contractor(s));
- (l) to those contractor(s) which the Owner retains to complete the Works in accordance with Clause 15.2 [*Termination by Owner*] of the Contract,

provided that in the case of the persons mentioned in paragraph (c) to (k) the disclosing Party shall have first obtained the person's agreement in writing to be bound by the same obligations of confidence, mutatis mutandis, as are created by the terms of this Clause 1.9.

1.9.3 The obligations of a Party under this Sub-Clause 1.9 shall not apply to information and documents which:

- (a) now or hereafter have entered the public domain through no fault of that Party; or
- (b) otherwise lawfully became available to that Party from a third party under no obligation of confidentiality.

1.10 **Owner's Use of Contractor's Documents**

As between the Parties, the Contractor shall retain the copyright and other intellectual property rights in the Contractor's Documents and other design documents made by (or on behalf of) the Contractor for the purpose of the Contract.

The Contractor shall be deemed (by signing the Contract) to give to the Owner a non-terminable transferable non-exclusive royalty-free license to copy, use and communicate the Contractor's Documents, including making and using modifications of them solely for the purposes of execution, operation, maintenance and/or warranty of the Power Plant. This license shall:

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- (a) apply throughout the actual or intended working life (whichever is longer) of the relevant parts of the Works,
- (b) entitle any person appointed by the Owner in proper possession of the relevant part of the Works to copy, use and communicate the Contractors Documents for the purposes of design, construction, completion, operation, modification, revamp, improvement, repairing, maintenance and demolishing the Power Plant, or replacement all or any of part of the Power Plant, and
- (c) in the case of Contractor's Documents which are in the form of computer programs and other software, permit their use on any computer on the Site and other places as envisaged by the Contract, including replacements of any computers supplied by the Contractor.

The Contractor's Documents and other design documents made by (or on behalf of) the Contractor shall not, without the Contractor's consent, be used, copied or communicated to a third party by (or on behalf of) the Owner for purposes other than those permitted under this Sub-Clause.

1.11 Contractor's Use of Owner's Documents

As between the Parties, the Owner shall retain the copyright and other intellectual property rights in the Bidding Documents and other documents made by (or on behalf of) the Owner. The Contractor may, at his cost, copy, use, and obtain communication of these documents for the purposes of the Contract.

They shall not, without the Owner's consent, be copied, used or communicated to a third party by the Contractor, except as necessary, for the purposes of the Contract.

1.12 Not Used

1.13 Compliance with Laws

The Parties shall, in performing the Contract, comply with applicable Laws. Unless otherwise stated in the Contract:

- (a) the Owner shall have obtained (or shall obtain) the planning, zoning or similar permission for the Permanent Works, and the Owner shall indemnify and hold the Contractor harmless against and from the consequences of any failure to do so;
- (b) the Contractor shall give all notices, pay all taxes, duties and fees, and obtain all permits, licenses and approvals, as required by the Laws in relation to the design, execution and completion of the Works and the remedying of any defects in accordance with Contract and its conditions; and the Contractor shall indemnify and hold the Owner harmless against and from the consequences of any failure to do so.

1.14 Joint and Several Liability

If the Contractor constitutes (under applicable Laws) a joint venture, consortium or other unincorporated grouping of two or more persons:

- (a) these persons shall be deemed to be jointly and severally liable to the Owner for the performance of the Contract;

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- (b) these persons shall notify the Owner of their leader who shall have authority to bind the Contractor and each of these persons; and
- (c) the Contractor shall not alter its composition or legal status without the prior consent of the Owner.

1.15 Early Work

Where the Contractor has effected any design, services or works in furtherance of the Works prior to the Commencement Date or the date of the Contract, the Contractor warrants to the Owner that such activities have been carried out in accordance with the requirements of the Contract and confirms that the warranties and undertakings set out in this Contract applied to such activities (without prejudice to the generality of such warranties and undertakings).

END OF CLAUSE 1

2. **THE OWNER**

2.1 **Right of Access to the Site**

The Owner shall (where he is in a position to do so) give the Contractor right of access to, and possession of, all parts of the Site within the time (or times) stated in the Contract. The right and possession may not be exclusive to the Contractor. If, under the Contract, the Owner is required to give (to the Contractor) possession of any foundation, structure, plant or means of access, the Owner shall do so in the time and manner stated in the Technical Requirements.

If no such time is stated in the Contract, the Owner shall give the Contractor right of access to, and possession of, the Site with effect from the Contract signing date. Notwithstanding the foregoing, within two (02) months after the signing of the Contract, the Contractor shall submit the general arrangement drawing (plot plan for the entire plant), including but not limited to the Power Plant, auxiliary system (ash handling system including pond, CW intake and outtake areas, raw water intake area, coal handling conveyor route). The Owner shall, within one (01) months after receipt of such drawing from the Contractor, hand over the corresponding areas of the Site.

If the Contractor suffers delay and/or incurs Cost as a result of a failure by the Owner to give any such right or possession within such time, the Contractor shall give notice to the Owner and shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any reasonable Cost, which shall be added to the Contract Price.

After receiving this notice, the Owner shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters.

However, if and to the extent that the Owner's failure was caused by any error or delay by the Contractor, including an error in, or delay in the submission of, any of the Contractor's Documents, the Contractor shall not be entitled to such extension of time or cost.

2.2 **Permits, Licences or Approvals**

The Owner shall (where he is in a position to do so) provide reasonable assistance to the Contractor at the request of the Contractor:

- (a) by obtaining copies of the Laws of the Country which are relevant to the Contract but are not readily available, and
- (b) for the Contractor's applications for any permits, licenses or approvals required by the Laws of the Country:
 - (i) which the Contractor is required to obtain under Sub-Clause 1.13 [*Compliance with Laws*],
 - (ii) for the delivery of Goods, including clearance through customs, and
 - (iii) for the export of Contractor's Equipment when it is removed from the Site.
 - (iv) for the registration of vehicles and equipment required by Laws of the Country except the vehicles and mobile equipment to be supplied by the Owner.

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- (c) The fee for maintaining permits and licences required for operation after Taking Over shall be at the cost of the Owner.

The Contractor shall be responsible for the cost for obtaining any permit and licenses required by the law as stated in Appendix 4. The Owner and the Contractor shall sit together to find a reasonable solution with goodwill regarding and as for the permits and licenses not listed in Appendix 4, if any.

2.3 Owner's Personnel

The Owner shall be responsible for ensuring that the Owner's Personnel and the Owner's other contractors on the Site:

- (a) co-operate with the Contractor's efforts under Sub-Clause 4.6 [*Co-operation*], and
- (b) take actions similar to those which the Contractor is required to take under sub-paragraphs (a), (b) and (c) of Sub-Clause 4.8 [*Safety Procedures*] and under Sub-Clause 4.18 [*Protection of the Environment*].

2.4 Financing Arrangement

Not used.

2.5 Owner's Claims

If the Owner considers himself to be entitled to any reasonable payment under any Clause of these Conditions or otherwise in connection with the Contract, and/or to any extension of the Defects Notification Period, he shall give notice and particulars specify the reason for claims and calculation of the claim's amount (if any) to the Contractor responsible for the respective Scope of Works.

The notice shall be given as soon as practicable after the Owner became aware of the event or circumstances giving rise to the claim. A notice relating to any extension of the Defects Notification Period shall be given before the expiry of such period.

The particulars shall specify the Clause or other basis of the claim, and shall include substantiation of the amount and/or extension to which the Owner is entitled in connection with the Contract. The Owner shall then proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) the amount (if any) which the Owner is entitled to be paid by the Contractor, and/or (ii) the extension (if any) of the Defects Notification Period in accordance with Sub-Clause 11.3 [Extension of Defects Notification Period]. The Contractor shall pay such amount due to the Owner as mentioned above within twenty eight (28) days or provide reasonable objection with respect to the Owner's claim.

In case the Contractor fails to pay such amount within twenty nine (29) days, the Owner shall deduct this amount from any moneys due, or to become due, to the Contractor. The Owner shall only be entitled to set off against or make any deduction from an amount due to the Contractor, or to otherwise claim against the Contractor, in accordance with this Sub-Clause or with sub-paragraph (i) and/or (ii) of Sub-Clause 14.7 [*Payments*].

END OF CLAUSE 2

3. THE OWNER'S ADMINISTRATION

3.1 The Owner's Representative

The Owner may appoint an Owner's Representative to act on his behalf under the Contract. In this event, he shall give notice to the Contractor of the name, address, duties and authority of the Owner's Representative.

The Owner's Representative shall carry out the duties assigned to him, and shall exercise the authority delegated to him, by the Owner. Unless and until the Owner notifies the Contractor otherwise, the Owner's Representative shall be deemed to have the full authority of the Owner under the Contract, except in respect of Clause 15 [*Termination by Owner*].

If the Owner wishes to replace any person appointed as Owner's Representative, the Owner shall give the Contractor not less than fourteen (14) days' notice of the replacement's name, address, duties and authority, and of the date of appointment.

3.2 Other Owner's Personnel

The Owner or the Owner's Representative may from time to time assign duties and delegate authority to assistants, and may also revoke such assignment or delegation. These assistants may include a resident engineer, and/or independent inspectors appointed to inspect and/or test items of Plant and/or Materials. The assignment, delegation or revocation shall not take effect until a copy of it has been received by the Contractor.

Assistants shall be suitably qualified persons, who are competent to carry out these duties and exercise this authority, and who are fluent in the language for communications defined in Sub-Clause 1.4 [*Law and Language*].

3.3 Delegated Persons

All these persons, including the Owner's Representative and assistants, to whom duties have been assigned or authority has been delegated, shall only be authorised to issue instructions to the Contractor to the extent defined by the delegation. Any approval, check, certificate, consent, examination, inspection, instruction, notice, proposal, request, test, or similar act by a delegated person, the Owner's Representative or assistant, in accordance with the assignment or delegation, shall have the same effect as though the act had been an act of the Owner. However:

- (a) unless otherwise stated in the delegated person's communication relating to such act, it shall not relieve the Contractor from any responsibility he has under the Contract, including responsibility for errors, omissions, discrepancies and non-compliances;
- (b) any failure to disapprove any work, Plant or Materials shall not constitute approval, and shall therefore not prejudice the right of the Owner to reject the work, Plant or Materials; and
- (c) if the Contractor questions any determination or instruction of a delegated person, the Contractor may refer the matter to the Owner, who shall promptly confirm, reverse or vary the determination or instruction.

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3.4 Instructions

The Owner may issue to the Contractor instructions, including instructions to request the Contractor to perform obligations concerning Common Facilities sharing between the Project and others, which may be necessary for the Contractor to perform his obligations under the Contract. Each instruction when issued shall be given in writing and shall state the obligations to which it relates and the Sub-Clause (or other term of the Contract) in which the obligations are specified. If any such instruction constitutes a Variation, Clause 13 [*Variations and Adjustments*] shall be applied.

The Contractor shall take instructions from the Owner, or from the Owner's Representative or an assistant to whom the appropriate authority has been delegated under this Clause.

3.5 Determinations

Whenever these Conditions provide that the Owner shall proceed in accordance with this Sub-Clause 3.5 to agree or determine any matter, the Owner shall consult with the Contractor in an endeavour to reach agreement. If agreement is not achieved, the Owner shall make a fair determination in accordance with the Contract, taking due regard of all relevant circumstances.

The Owner shall give notice to the Contractor of each agreement or determination, with supporting particulars. Each Party shall give effect to each agreement or determination, unless the Contractor gives notice, to the Owner, of his dissatisfaction with a determination within fourteen (14) days of receiving it. Either Party may then refer the dispute for resolution in accordance with Clause 20 [*Claims, Disputes and Arbitration*].

Notwithstanding that the Contractor may dispute any determination made by the Owner in accordance with this Contract and refer such dispute for resolution in accordance with Clause 20 [*Claims, Disputes and Arbitration*], both Parties shall continue to execute the work in accordance with the Contract and the Contractor shall proceed with such work in accordance with the Owner's determination pending any resolution agreed between the Parties or any determination by an arbitral tribunal in accordance with Clause 20 [*Claims, Disputes and Arbitration*].

END OF CLAUSE 3

4. THE CONTRACTOR

4.1 Contractor's General Obligations

The Contractor shall design, execute and complete the Works in accordance with the Contract, and shall remedy any defects in the Works. When completed, the Works shall be fit for the purposes for which the Works are intended as defined in the Contract.

The Contractor warrants to the Owner that the Works:

- (a) shall be carried out with all the skill and care to be expected of qualified and experienced turnkey contractors, designers and engineers engaged in carrying out works of a similar scale, nature and complexity to the Works;
- (b) (N/A)
- (c) shall be carried out so as not to contravene any applicable Laws and Licences and shall upon Taking Over of each Unit be in compliance with all applicable Laws and Licences;
- (d) shall consist of providing all necessary work for the design, engineering, manufacture, supply, shipment, construction, erection, testing, commissioning, and warranty services after Taking Over of the Power Plant as specified in the Contract.
- (e) shall have been and shall be designed, engineered, procured, commissioned and tested in accordance with Good Engineering Practice;
- (f) shall have been and shall be erected based on planning, supervision and quality control in accordance with Good Engineering Practice
- (g) shall incorporate only new, good quality Plant and Materials which are suitable for use as part of the works;
- (h) shall incorporate system design, major plant components and Materials which utilise proven technology, being a design and technology that has operated commercially at other power plants;
- (i) shall comply with EVN's technical requirements with respect to the coordination of the power plant with the operation of the EVN power network, as well as fully comply with the Authorities Requirements.
- (j) shall operate safely and economically.

The Contractor shall provide the Plant and Contractor's Documents specified in the Contract, and all Contractor's Personnel, Goods, consumables and other things and services, whether of a temporary or permanent nature, required in and for this design, execution, completion and remedying of defects.

The Works shall include any work which is necessary to satisfy the Technical Requirements, or is implied by the Contract, and all works which (although not mentioned in the Contract) are necessary for stability or for the completion, or safe and proper operation, of the Works.

The Contractor shall be responsible for the adequacy, stability and safety of all Site operations, of all methods of construction and of all the Works.

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The Contractor shall, whenever required by the Owner, submit details of the arrangements and methods which the Contractor proposes to adopt for the execution of the Works. No significant alteration to these arrangements and methods shall be made without this having previously been notified to the Owner.

4.2 Bonds

4.2.1. General Requirements:

Unless otherwise stated under this Contract or agreed by Parties, the Contractor shall open Bonds at the Bank which meets the following condition:

- (i) Vietnamese bank accepted by the Owner; or
- (ii) Foreign bank that has a branch in Vietnam ; or
- (iii) Foreign bank that has transactions with nominated Vietnamese banks.

In the event the Bonds are separately provided by each member of the Contractor Consortium, the Consortium shall ensure that the Owner retains the right to enforce any and all such Bonds regardless of the individual liabilities of the Consortium members under the Joint and Several Liability provision or any other relevant provisions of the Consortium Agreement or the Contract.

All expenses incurred in connection with the opening, extending the validity and/or supplementing the value and/or revising the Bonds under the Contract shall be borne by the Contractor.

4.2.2. Performance Bond

Within seven (07) Working days from the Contract signing date, the Contractor shall submit the Irrevocable Performance Bond according to the form as provided in the Forms of Contract and through the bank accepted by the Owner. In any situation, the Performance Bond shall be effective prior to the Contract Effective Date. The value of Performance Bond shall be equivalent to ten percent (10%) of the Contract Price at relevant determined currency stated in the Contract.

The Contractor has to guarantee that the Performance Bond shall be valid and effective until the Works is executed and completed by the Contractor and remedied any defect. When the Performance Bond states its expiry date but on that day the Contractor has not yet received the Taking Over certificate then in twenty eight (28) days prior to that day, the Contractor has to extend the Performance Bond's effectiveness until the Works is completed and omissions are remedied.

Unless otherwise stated in the Contract, the Owner shall be entitled to withdraw this Performance Bond to recover any direct loss and damage incurred by the Owner and any extra direct cost of completing the Works when:

- (a) the Contractor fails to perform its responsibility and obligation under this Contract; or
- (b) the Contract is terminated by the Owner as specified under sub-clause 15.2 [*Termination by the Owner*]; or

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- (c) breach of Contract by the Contractor; and/or
- (d) the Contractor has not reimbursed, within forty two (42) days from the agreement of reimbursement, the due payment to the Owner as agreed by the Parties or as stipulated at the Sub-Clause 2.5 [*Owner's Claim*] or Clause 20 [*Claims, Disputes and Arbitration*]; and/or
- (e) the Contractor has not yet extend Performance Bond effective period as above mentioned. In such case the Owner reserves the right to withdraw the whole value of the Performance Bond.

The Owner will hold and keep harmless the Contractor from losses, damages and costs including expenses and legal costs that the Contractor bears whenever the Owner call for payment from Performance Bond when the Owner is not in the position to do so.

The Owner shall return Performance Bond to the Contractor within twenty one (21) days right after receiving of one copy of Taking Over Certificate of the Works.

4.2.3. **Advance Payment Bond**

The Contractor shall submit the Irrevocable Advance Payment Bond according to the form as provided in the Form of Contract and through the bank accepted by the Owner within seven (07) Working days after the Contract Effective Date. The value of Advance Payment Bond shall be equivalent to the value of Advance Payment. Value of Advance Payment Bond shall be reduced in equivalent to the deduction of value of Advance Payment per each payment until the total value of Advance Payment has been totally recovered by the Owner. Advance Payment Bond shall be null and void and shall be returned to the Contractor when the full amount of Advance Payment has been recovered by the Owner and upon the progress payment up to 80% of the Contract Price. In any circumstance, the Advance Payment Bond must be submitted to the Owner prior to the Owner's making Advance Payment to the Contractor.

Advance Payment Bond shall be valid from the date of its issuing and effective from the date the Contractor receives full amount of Advance Payment until thirty (30) days from the issuing of Taking Over Certificate for the Unit 1 or the Owner have recovered all the value of Advance Payment in accordance with the Conditions of Contract, whichever is earlier. In case the condition of Advance Payment Bond stipulates its expiry date but the Owner have not yet recovered full amount of Advance Payment on the expiry date then the Contractor has to extend the effective date of the Advance Payment Bond in twenty eight (28) days prior to the expiry date stated until the Owner has totally recovered the Advance Payment amount.

Unless otherwise stated in the Contract, the Owner shall be entitled to withdraw this Advance Payment Bond's remaining value when:

- (a) the Contractor materially fails to perform its responsibility and obligation under this Contract; or
- (b) the Contract is terminated by the Owner as specified under sub-clause 15.2 [*Termination by the Owner*]; or
- (c) Material breach of Contract by the Contractor; or

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- (d) the Contractor has not reimbursed, within forty-two (42) days from the agreement of reimbursement, the due payment to the Owner as agreed by the Parties or as stipulated at the Sub-Clause 2.5 [Owner's Claim] or Clause 20 [Claims, Disputes and Arbitration]; and/or
- (e) the Contractor has not yet extended Advance Payment Bond effective period as above mentioned.
- (f) The amount of advance payment that has not been fully recovered when the payment progress reaches 80% of the Contract Price.

4.2.4. **Warranty Bond**

The Contractor shall submit the Irrevocable Warranty Bond according to the form as provided in Forms of Contract through the bank accepted by the Owner within fourteen (14) Working days before the issuance of Taking Over Certificate. Warranty Bond shall be valid and fully enforceable until thirty (30) days after the end of the Defect Notification Period of respective Unit. The value of Warranty Bond shall be equivalent to five percent (5%) of the Contract Price at relevant determined currency stated in the Contract.

If the Contractor fails to remedy any defect or damage within the technically reasonable time and this remedial work will be executed by the Owner or any other third party with written consent of the Contractor at the cost which shall be recovered by such Warranty Bond.

However, if Defect Liability Period has been extended on any part of the Works, the Contractor shall accordingly extend the expiry date of Warranty Bond or issue an Irrevocable Warranty Bond for the value equivalent to the proportionate of Contract Price of that part.

All Warranty Bonds shall be returned to the Contractor within twenty one (21) days after its expiration.

4.3 **Contractor's Representative**

The Contractor shall appoint the Contractor's Representative and shall give him all authority necessary to act on the Contractor's behalf under the Contract. For the avoidance of doubt, the Contractor's Representative has authority to act on behalf of all of the persons forming the Contractor.

Unless the Contractor's Representative is named in the Contract, the Contractor shall, prior to the Commencement Date, submit to the Owner for consent the name and particulars of the person the Contractor proposes to appoint as Contractor's Representative. If consent is withheld or subsequently revoked, or if the appointed person fails to act as Contractor's Representative, the Contractor shall similarly submit the name and particulars of another suitable person for such appointment.

The Contractor shall not, without the prior consent of the Owner, revoke the appointment of the Contractor's Representative or appoint a replacement.

The Contractor's Representative shall, on behalf of the Contractor, receive instructions under Sub-Clause 3.4 [*Instructions*].

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The Contractor's Representative may delegate any powers, functions and authority to any competent person, and may at any time revoke the delegation. Any delegation or revocation shall not take effect until the Owner has received prior notice signed by the Contractor's Representative, naming the person and specifying the powers, functions and authority being delegated or revoked.

The Contractor's Representative and all these persons shall be fluent in the language for communications defined in Sub-Clause 1.4 [*Law and Language*].

The Contractor's Representative shall be stationed at the Site for the entire duration of the execution of the Works. If the Contractor's Representative is to be temporarily absent from the Site during this period, a suitable replacement shall be temporarily appointed, subject to the Owner's prior consent.

4.4 Subcontractors

4.4.1 The Contractor shall not subcontract the whole of the Works.

4.4.2 Subcontractors and Manufacturers must be selected from the Subcontractors/Manufacturers set forth in Document No. 4 [List of Subcontractors and Manufacturers] of this Contract. This list of Subcontractors and Manufacturers shall be modified from time to time, subject to the approval of the Owner, which shall be officially granted after the Contractor has first evaluated and confirmed the qualifications and experience of the proposed subcontractors or suppliers and thereupon submitted the relevant supporting documents to the Owner for review.

- (i) The Contractor shall employ only such Subcontractors in the List of Approved Subcontractors and Manufacturers of this Contract as are acceptable to the Owner. During the execution of the Works, if the Owner notifies the Contractor in writing with justifiable reasons and particulars that any Subcontractor has become unacceptable and if the Contractor should thereafter continue to utilize such Subcontractor's services for the Works, then the value of such work or labour furnished by the unacceptable Subcontractor shall be deducted from the Contract Price.
- (ii) In case of replacement of any approved subcontractor indicated in the List of Approved Subcontractors and Manufacturers of this Contract, the Contractor shall submit full information in order to ensure the Technical Requirements and propose commercial variations (if any) for the Owner's review and approval. The Contractor shall sign such subcontract only based on approval of the Owner.
- (iii) To ensure the Technical Requirement and/or Technical Specification as well as quality and project schedule, the Owner/Owner's Consultant shall have the right to participate in the technical negotiation, selection and approval of subcontractors (excluding pricing and commerce negotiations) involved in the supply of Critical Plant, equipment, services and materials, if the Owner determines that such elements may impact the quality of the Works.
- (iv) For the purpose of Project execution and monitoring of the Project Schedule, the Owner reserves the right to require any local Subcontractor selected by the Contractor (applicable only where the Contractor is a local entity) to open a bank account with a Vietnamese bank approved by the Owner. Such

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account shall be used for receiving payment as stipulated in the Sub-clause 14.1 [The Contract Price] made directly from the Owner. However, the Contractor has to hold and keep the Owner harmless against the local subcontractor's claim with particulars. If the justified claim with particulars is certified, the Owner reserves the right to make direct payment to such mentioned local subcontractor with the prior written acceptance of the Contractor.

Subcontractors who provide Materials and Equipment

- (i)** The list of Manufacturers and the origins of materials and equipment are specified in Document No. 4, and this list is fixed. The Contractor shall not change any supplier or origin of materials and equipment without prior written approval from the Owner.
- (ii)** Should the Contractor propose any changes to the listed Manufacturers or the origin of materials and equipment during the contract execution implementation for any reason, the Contractor must conduct an evaluation and submit all necessary supporting documents, including any commercial impact to the Owner. This submission must be made within a reasonable timeframe to ensure that the project schedule is not adversely affected. The Owner shall review and decide whether to approve the proposed change.
- (iii)** If the proposed alternative supplier or origin of equipment is of equal or higher quality and specification compared to the original contractual requirements, the equipment value for that portion of the equipment shall remain unchanged. However, if the proposed change results in lower quality or specifications, the equipment value for that portion of the equipment will be adjusted downward in line with the prevailing market price at the time of change. The Contractor shall assess and provide market price comparison documents for the equipment as a basis for determining the corresponding price reduction. The Owner shall review the Contractor's proposal to make a decision. In case the Owner does not agree with the Contractor's proposal, the Contractor shall comply with the provisions of the signed Contract.
- (iv)** Approval from the Owner for any such change shall not release the Contractor of any of its responsibilities under the Contract.

Other Subcontractors

- (i)** The Contractor shall engage only those subcontractors specified in the Bidding Documents for any works requiring subcontracted services. If the Contractor wishes to engage subcontractors not listed in the Bidding Documents, a capacity profile for each such subcontractor must be submitted to the Owner for review and approval.
- (ii)** In all instances, the Owner reserves the right to approve or reject any proposed changes to subcontractors or suppliers not listed in Form No. 9. The Owner will provide written notification to the Contractor stating reasonable justification for any disapproval.

Contracts with Subcontractors or Manufacturers.

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- (i) Each agreement between the Contractor and a subcontractor or supplier must include provisions allowing for the assignment of the contract's subject matter to the Owner, should the Owner terminate the contract due to the Contractor's default.
- (ii) Should the obligations of a subcontractor or supplier extend beyond the expiration of the Defects Notification Period, and the Owner's representative instructs the Contractor to transfer the benefit of those obligations, the Contractor shall comply with such instruction.

4.4.3 Not used.

4.4.4 Not used

4.4.5 Not used.

4.4.6 Not used.

4.4.7 The Contractor shall be responsible for the acts or defaults of any Sub-contractor, his agents or employees, as if they were the acts or defaults of the Contractor. Where requested by the Owner, the Contractor shall give the Owner not less than twenty eight (28) days' notice of:

- (a) the intended appointment of the Subcontractor, with detailed particulars which shall include his relevant experience,
- (b) the intended commencement of the Subcontractor's work, and
- (c) the intended commencement of the Subcontractor's work on the Site.

4.4.8 The Contractor shall give priority to subcontractors utilizing services of the Owner's subsidiaries or otherwise related companies, subject to the price, quality and schedule management capability.

4.4.9 The Contractor shall provide the Owner one un-priced copy of subcontract which includes only commercial part of such sub-contractors of components indicated in the List of Subcontractors and Manufacturers of this Contract within fifteen (15) days after signing each such subcontract.

4.5 **Not used.**

4.6 **Co-operation**

4.6.1 The Contractor shall, as specified in the Contract or as instructed by the Owner, allow appropriate opportunities for carrying out work to:

- (a) the Owner's Personnel,
- (b) such Associated Works Contractors related to the Project,
- (c) the personnel of any legally constituted public authorities,

who may be employed in the execution on or near the Site of any work not included in the Contract.

4.6.2 The Owner shall notify the Contractor of any other Associated Works Contractors to be engaged by the Owner to work on the Site. The Contractor shall, in accordance with the Owner's instructions, afford such other contractors engaged by the Owner and persons

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lawfully upon the Site all reasonable opportunities for carrying out their work provided that the same shall not materially obstruct or disturb the progress of the Works as ascertained by the Owner. The Contractor shall also afford such opportunities to the employees of the Owner.

- 4.6.3 Services for these personnel and other contractors may include the use of Contractor's Equipment, Temporary Works or access arrangements which are at the Contractor's responsibilities. Any such instruction shall constitute a Variation if and to the extent that it causes the Contractor to incur Cost in an amount which was not reasonably foreseeable by an experienced contractor by the date for submission of the Proposal.
- 4.6.4 The Contractor shall be responsible for his construction activities on the Site, and shall co-ordinate his own activities with those of other contractors to the extent (if any) specified in the Contract.
- 4.6.5 If the Owner is required to give to the Contractor possession of any foundation, structure, plant or means of access in accordance with the Contract, the Contractor shall submit such documents to the Owner in the time and **Manner of Execution** stated in the Contract.

4.7 **Setting Out**

The Contractor shall set out the Works in relation to original points, lines and levels of reference specified in the Contract. The Contractor shall be responsible for the correct positioning of all parts of the Works by its costs and expenses, and shall rectify any error in the positions, levels, dimensions or alignment of the Works.

The Contractor shall be deemed to have been satisfied original point, lines and levels of reference specified in the Contract. The Owner shall have no responsibility for accuracy, sufficiency or completeness of such data.

4.8 **Safety Procedures**

The Contractor shall:

- (a) comply with all applicable safety regulations,
- (b) take care for the safety of all persons entitled to be on the Site,
- (c) use reasonable efforts to keep the Site and Works clear of unnecessary obstruction so as to avoid danger to these persons,
- (d) provide fencing, lighting, guarding and watching of the Works until completion and taking over under Clause 10 [Owner's Taking Over], and
- (e) provide any Temporary Works (including roadways, footways, guards and fences) which may be necessary, because of the execution of the Works, for the use and protection of the public and of owners and occupiers of adjacent land.

4.9 **Quality Assurance**

The Contractor shall institute a quality assurance system to demonstrate compliance with the requirements of the Contract. The system shall be in accordance with the details stated in the Contract. The Owner shall be entitled to audit any aspect of the system.

Details of all procedures and compliance documents shall be submitted to the Owner for information before each design and execution stage is commenced. When any document

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of a technical nature is issued to the Owner, evidence of the prior approval by the Contractor himself shall be apparent on the document itself.

Compliance with the quality assurance system shall not relieve the Contractor of any of his duties, obligations or responsibilities under the Contract.

4.10 Site Data

The Owner shall have made available to the Contractor for his information, prior to the Effective Date, all relevant data in the Owner's possession on subsurface and hydrological conditions at the Site, including environmental aspects. The Owner shall similarly make available to the Contractor all such data which come into the Owner's possession after the Effective Date.

The Contractor shall be responsible for verifying and interpreting all such data. The Owner shall have no responsibility for the accuracy, sufficiency or completeness of such data, except as stated in Sub-Clause 5.1 [*General Design Obligations*].

4.11 Sufficiency of the Contract Price

The Contractor shall be deemed to have satisfied himself as to the correctness and sufficiency of the Contract Price. The Contract price is set-up on the input data, interpretation, necessary information, inspection, audition and acceptance of all corresponding issues as described in the Sub-Clause 4.10 [*Site Data*]

Unless otherwise stated in the Contract, the Contract Price is accepted by the Contractor to spend on all the Contractor's obligations under the Contract, covers all the Contractor's obligations under the Contract and all things necessary for the proper design, execution and completion of the Works and the remedying of any defects.

4.12 Unforeseeable Difficulties

4.12.1. Except as otherwise stated in the Contract:

- (a) the Contractor shall be deemed to have obtained all necessary information as to risks, contingencies and other circumstances which may influence or affect the Works;
- (b) by signing the Contract, the Contractor accepts total responsibility for having foreseen all difficulties and costs of successfully completing the Works; and
- (c) the Contract Price shall not be adjusted to take account of any unforeseen difficulties or costs.

4.13 Rights of Way and Facilities

The Contractor shall bear all costs and charges for special and/or temporary rights-of-way which he may require, including those for access to the Site. The Contractor shall also obtain, at his risk and cost, any additional facilities outside the Site which he may require for the purposes of the Works.

4.14 Avoidance of Interference

The Contractor shall not interfere unnecessarily or improperly with:

- (a) the convenience of the public, or

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- (b) the access to and use and occupation of all roads and footpaths, irrespective of whether they are public or in the possession of the Owner or of others.

The Contractor shall indemnify and hold the Owner harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from any such unnecessary or improper interference.

4.15 Access Route

The Contractor shall be deemed to have been satisfied as to the suitability and availability of access routes to the Site. The Contractor shall use reasonable efforts to prevent any road or bridge from being damaged by the Contractor's traffic or by the Contractor's Personnel. These efforts shall include the proper use of appropriate vehicles and routes.

Except as otherwise stated in the Contract:

- (a) the Contractor shall (as between the Parties) be responsible for any maintenance which may be required for his use of access routes;
- (b) the Contractor shall provide all necessary signs or directions along access routes, and shall obtain any permission which may be required from the relevant authorities for his use of routes, signs and directions;
- (c) the Owner shall not be responsible for any claims which may arise from the use or otherwise of any access route,
- (d) the Owner does not guarantee the suitability or availability of particular access routes, and
- (e) Costs due to non-suitability or non-availability, for the use required by the Contractor, of access routes shall be borne by the Contractor.

4.16 Transport of Goods

Unless otherwise stated in the Contract:

- (a) the Contractor shall give the Owner not less than twenty-one (21) days' notice of the date on which any Plant or a major item of other Goods will be delivered to the Site;
- (b) the Contractor shall be responsible for packing, loading, transporting, receiving, unloading, storing and protecting all Goods and other things required for the Works; and
- (c) the Contractor shall indemnify and hold the Owner harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from the transport of Goods, and shall negotiate and pay all claims arising from their transport.

4.17 Contractor's Equipment

The Contractor shall be responsible for all Contractor's Equipment. When brought on to the Site, Contractor's Equipment shall be deemed to be exclusively intended for the execution of the Works. The Contractor shall maintain at the Site, all Contractor's Equipment, Special Tools and Test Equipment as necessary to satisfactorily execute the Works in a safe, efficient and workmanlike manner at the rate of progress specified in his working plan and approved by the Owner. All the Contractor's Equipment, Special Tools

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and Test Equipment shall be maintained in top working condition and provisions shall be made for immediate repairs or replacement of damaged or inefficient Special Tools and Test Equipment.

4.18 Protection of the Environment

The Contractor shall take all reasonable steps to protect the environment (both on and off the Site) and to limit damage and nuisance to people and property resulting from pollution, noise and other results of his operations.

The Contractor shall ensure that emissions, surface discharges and effluent from the Contractor's activities shall not exceed the values indicated in the Technical Requirements, and shall not exceed the values prescribed by applicable Laws.

4.19 Coal, Diesel oil, Limestone, Electricity, Water and Other Consumables

The Contractor shall, at his risk and cost, be responsible for the procurement, installation, operation, maintenance and provision of all power (except backed feed power), water, telecommunication, consumable and services, except the Diesel oil, coal and limestone to be provided by the Owner for the execution of the Works and Plant Performance Guarantee in the Contract. The Contractor may be required for construction, installation, testing and commissioning until issuance of the Taking Over Certificate as well as remedy of defect during Defect Notification Period. Unless otherwise stated in the Contract, all the 220 KV backed electricity consumption receiving from the 500/220KV Station of the Long Phu Electricity Centre during the Contract execution shall be supplied and paid by the Owner strictly following the contract signed by and between the Owner and EVN

Construction Electricity

The Owner shall hand over the construction power system for construction to the Contractor. The Contractor shall be responsible for entering into a power purchase contract with the power supplier (Soc Trang Power Department) at the supplier's rate. Power will be supplied via a 22kV line with a capacity of 15x1000kVA and 5 transformers (5x1000kVA).

Construction water

The Owner shall hand over the construction water system for construction to the Contractor, which includes:

- A water plant with capacity of 1200 m³/day (450 m³/day for the daily living use and 750 m³/day for construction use)
- A water pipe to the Site with a capacity of 1200 m³/day. The Contractor shall be responsible for entering into a water supply contract with the water supplier at the specified supplier's rate.

The Contractor shall be responsible for procuring the required chemicals, performing operating and maintenance work for the water treatment system to ensure a continuous water supply for construction in Bidder's scope as well as self-agreements to share/sell the water for construction to the other contractors of another packages at the Site in ensuring of mutual benefit of Parties.

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The Contractor is responsible to make a contract with Owner to provide the electricity and water for LP1PP's administration building with the price of supplier.

The Contractor shall, subject to the Owner's approval, be entitled to use, for the purposes of the Works, such supplies of electricity, water, fuel and other services as may be made available at the Site by the Owner. The Contractor shall, at his own risk and cost, provide all necessary apparatus for utilizing these services and for measuring the quantities consumed, including periodic maintenance and any necessary repairs, until such utility systems and related facilities are returned to the Owner."

Backed feed power, Coal, Diesel oil, Limestone

The Contractor shall submit Commissioning Schedule of the whole Power Plant until attain Taking Over Certificate of the each Unit to the Owner as stipulated in Sub-Clause 9.1 [*Contractor's obligation*] and estimated backed feed power, Coal, Diesel oil, limestone to be consumed for the Owner's review. The official quantity of backed feed power, Coal, Diesel oil, Limestone and Commissioning Schedule shall be submitted by the Contractor to the Owner for approval in six (06) months prior to the actual Tests on Completion (Pre-commissioning, Commissioning, Reliability Run, Performance Test) of the Power Plant. For avoidance of doubt, the official quantity of backed feed power, Coal, Diesel oil, Limestone and the Commissioning Schedule cannot exceed the quantity and period of time accordingly as stated in the submitted Proposal. Unless otherwise stated in the Contract, the backed feed power, Coal, Diesel oil, Limestone shall be provided by the Owner for Tests on Completion (including Reliability Run) up to the limit quantity and not exceed the amount of backed feed power, Coal, Diesel oil, Limestone as quantified in the approved Commissioning Schedule, whenever:

- (i) The actual backed feed power, Coal, Diesel oil, Limestone to be consumed by the Contractor exceeds those estimated consumption as stipulated in Commissioning Schedule approved by the Owner, the Contractor shall bear the costs for exceeding portion due to its failure, and/or;
- (ii) The actual Commissioning Schedule exceeds the Approved Commissioning Schedule, the Contractor shall bear the cost for exceeding time if the reason is attributable to the Contractor, even that the actual Fuel does not exceed the estimated fuel consumption.

The Contractor shall bear the costs for exceeding portion if the reason is attributable to the Contractor and costs of backed feed power, Coal, Diesel oil, Limestone as stated in (i) and (ii) thereupon which is earlier or floating Schedule in compare with the approved Commissioning Schedule. However the Owner shall pay to the Contractor fifty percent (50%) of the value of electricity sales (if received) in order to recover the fuel costs for such exceeding portion which the Contractor has consumed during the commissioning period under the Contract and/or during the Cure Period. Despite any condition of the Contract, the Contractor shall have to pay all the 220 KV backed electricity consumption receiving from the 500/220 KV Station of the Long Phu Electricity Centre during the Cure Period.

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4.20 **Not Used**

4.21 **Progress Reports**

Unless otherwise stated in the Contract, monthly progress reports shall be prepared by the Contractor and submitted to the Owner in six copies. The first report shall cover the period up to the end of the first calendar month following the Commencement Date. Reports shall be submitted monthly thereafter, each within seven (07) days after the last day of the period to which it relates.

Reporting shall continue until the Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works.

Each report shall include:

- (a) charts and detailed descriptions of progress, including each stage of design Contractor's Documents, procurement, manufacture, delivery to Site, construction, erection, testing, Tests on Completion;
- (b) photographs showing the status of manufacture and of progress on the Site;
- (c) for the manufacture of each main item of Plant and Materials, the name of the manufacturer, manufacture location, percentage progress, and the actual or expected dates of:
 - (i) commencement of manufacture,
 - (ii) Contractor's inspections,
 - (iii) tests, and
 - (iv) shipment and arrival at the Site;
- (d) the details described in Sub-Clause 6.10 [*Records of Contractor's Personnel and Equipment*];
- (e) copies of quality assurance documents, test results and certificates of Materials;
- (f) list of Variations, notices given under Sub-Clause 2.5 [*Owner's Claims*] and notices given under Sub-Clause 20.1 [*Contractor's Claims*];
- (g) safety statistics, including details of any hazardous incidents and activities relating to environmental aspects and public relations; and
- (h) comparisons of actual and planned progress, with details of any events or circumstances which may jeopardize the completion in accordance with the Contract, and the measures being (or to be) adopted to overcome delays.
- (i) physical progress for the month and estimated progress of the following month;
- (j) major activities for the month and major activities planned for the following month;
- (k) revised programme;
- (l) a tabulation of Site employees showing the supervisory staff and the number of the several classes of labour employed by the Contractor during the month.
- (m) a listing of the Contractor's Equipment, Special Tools and Test Equipment utilized for the execution of the Works during the month.
- (n) a listing of Plant and Materials on Site indicating their status, i.e., used, erected, etc.

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- (o) Payment records during the month.
- (p) Climatic conditions, etc.

In addition, the Contractor shall submit construction report covering Site activities weekly.

4.22 Interface with Other Contractors and Security of the Site

Interface refers to the points of contact, connection, or dependency between different contract packages or between parties involved in a project. Interfaces may include: i) Work areas shared between two or more contractors (e.g., mechanical – electrical connections, civil – mechanical interfaces, etc.); ii) Items requiring coordination in terms of technical aspects, construction schedule, or site access/space; iii) Responsibilities for providing information, documents, materials, services, or shared infrastructure.

The Contractor shall be responsible for carrying out connections, managing interfaces, and coordinating with other contractors/parties involved to complete the Project in accordance with the Contractor's scope of work under the Contract.

Unless otherwise stated in the Contract:

- (a) the Contractor shall be responsible for preventing unauthorised persons from entering the Site, and
- (b) authorised persons shall be limited to the Contractor's Personnel, the Owner's Personnel, and any other personnel authorised by the Owner's other contractors on the Site.

However, the Contractor shall be responsible for the protection of the Works, equipment and materials, etc. until the issuance of the Taking-Over Certificate.

4.23 Contractor's Operations on Site

The Contractor shall confine his operations to the Site, and to any additional areas which may be obtained by the Contractor and agreed by the Owner as working areas. The Contractor shall take all necessary precautions to keep Contractor's Equipment and Contractor's Personnel within the Site and these additional areas, and to keep them off adjacent land.

During the execution of the Works, the Contractor shall keep the Site free from all unnecessary obstruction, and shall store or dispose of any Contractor's Equipment or surplus materials. The Contractor shall clear away and remove from the Site any wreckage, rubbish and Temporary Works which are no longer required.

Upon the issue of the Taking-Over Certificate for the Works or Unit in accordance with Sub-Clause 10.1, the Contractor shall clear away and remove all Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works. The Contractor shall leave the Site and the Works in a clean and safe condition. However, the Contractor may retain on Site, during the Defects Notification Period, such Goods as are required for the Contractor to fulfil obligations under the Contract.

4.24 Fossils and Explosive

All fossils, coins, articles of value or antiquity, and structures and other remains or items of geological or archaeological interest found on the Site shall be placed under the care

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and authority of the Owner. The Contractor shall take reasonable precautions to prevent Contractor's Personnel or other persons from removing or damaging any of these findings.

The Contractor shall, upon discovery of any such finding, promptly give notice to the Owner, who shall issue instructions for dealing with it. If the Contractor suffers delay and/or incurs Cost from complying with the instructions, the Contractor shall give a further notice to the Owner and shall be entitled, subject to and in accordance with Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay under Sub Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any reasonable cost.

After receiving this further notice, the Owner shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters.

Whenever explosives are detected, works have to be stopped immediately and authorized organizations to be informed.

4.25 **Contractor's Specific Warranties**

In addition to those general warranties set forth in Sub-Clause 4.1, Contractor makes the following specific warranties relating to the completed Power Plant (said general and specific warranties being sometimes collectively referred to as the Contractor Warranties)

4.25.1 Mechanical Warranty

The Contractor warrants that:

- a) All Plant and Materials are specified and supplied, including without limitation, those designated by the Owner for the operation and maintenance of the Power Plant, as per the requirements of the Contract;
- b) The Power Plant shall operate properly and safely;
- c) The Power Plant shall be free from any defects and/or deficiencies; and
- d) All Plant and Materials shall be brand new, unused, and of first-class quality.

4.25.2 Environmental Warranty

The Contractor warrants that the Power Plant shall meet or be of better quality than the environmental criteria set forth in the Guarantees;

4.25.3 Production Warranties

The Contractor warrants that the Works shall achieve the Guaranteed Performance Levels during the Tests on Completion.

4.26 **Coordination Meetings**

Coordination meetings between the Owner and the Contractor shall be conducted for purposes of clarifying problems that may arise during the design/manufacturing/erection / installation/ testing/ pre-commissioning/ commissioning/Performance Tests/ Reliability Run/warranty stage of the Works. The Contractor shall clarify all questions of the Owner to the extent required by the Owner. The venue of such meetings shall be at the Owner's

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head office or at the Site except meetings regarding the design works to be mutually agreed upon by both parties.

Weekly meetings shall be held at Site to discuss progress and safety issues and may be called by the Owner at any other time to discuss relevant issues.

A Minutes of Meeting shall be prepared and signed by the Owner and the Contractor evidencing agreements and required actions.

4.27 **Tropical Serviceability**

Unless otherwise specified, all supplies, Plant and Materials under this Contract shall be suitable for, and where necessary specially treated and processed for, delivery, storage, and service under tropical conditions, particularly high temperature, high humidity, heavy rainfall, a mildew and fungus-conducive environment. Tropicalizing Materials and processes shall be in accordance with the best commercial and industrial practices and shall be subject to approval of the Owner.

4.28 **Old Materials**

Old materials of value found by the Contractor upon the Site, shall be carefully piled together where designated by the Owner within the Site, and the Contractor shall be responsible for the same until it is disposed of by the Owner but not later than the issuance of the Taking-Over Certificate for the Works.

END OF CLAUSE 4

5. **DESIGN**

5.1 **General Design Obligations**

The Contractor shall be deemed to have scrutinized, prior to the Effective Date, the Technical Requirements (including design criteria and calculations, if any). The Contractor shall be responsible for the design of the Works and for the accuracy of such Technical Requirements (including design criteria and calculations), except as stated below.

The Owner shall not be responsible for any error, inaccuracy or omission of any kind in the Technical Requirements as originally included in the Contract. Any data or information received by the Contractor, from the Owner or otherwise, shall not relieve the Contractor from his responsibility for the design and execution of the Works.

However, the Owner shall be responsible for the correctness of the following portions of the Technical Requirements and of the following data and information provided by (or on behalf of) the Owner:

- (a) portions, data and information which are stated in the Contract as being immutable or the responsibility of the Owner,
- (b) Not used

5.2 **Contractor's Documents**

5.2.1 The Contractor's Documents shall comprise the technical documents specified in the Technical Requirements, the Schedule of Engineering Documents and Submission Dates, documents required to satisfy all regulatory approvals, and the documents described in Sub-Clause 5.6 [*As-Built Documents*] and Sub-Clause 5.7 [*Operation and Maintenance Manuals*]. The Contractor's Documents shall be written in the language for communications defined in Sub-Clause 1.4 [*Law and Language*].

5.2.2 The Contractor shall be responsible for submitting all engineering documentation in accordance with the Schedule of Engineering Documents and Submission Dates set forth in Appendix 7 of Contract.

5.2.3 The Contractor shall prepare all Contractor's Documents, and shall also prepare any other documents necessary to instruct the Contractor's Personnel.

5.2.4 If Technical Requirements describe the Contractor's Documents which are to be submitted to the Owner for review, they shall be submitted accordingly, together with a notice as described below. In the following provisions of this Sub-Clause, (i) "review period" means the period required by the Owner for review, and (ii) "Contractor's Documents" exclude any documents which are not specified as being required to be submitted for review.

Unless otherwise stated in Technical Requirements and Appendix 7 of the Contract, each review and/or approval period shall not exceed fifteen (15) days, calculated from the date on which the Owner receives a Contractor's Document and the Contractor's notice. This notice shall state that the Contractor's Document is considered ready, both for review in accordance with this Sub-Clause and for use. The notice shall also state that the Contractor's Document complies with the Contract, or the extent to which it does not comply.

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The Owner may, within the review period, give notice to the Contractor that a Contractor's Document fails (to the extent stated) to comply with the Contract. If a Contractor's Document so fails to comply, it shall be rectified, resubmitted and reviewed in accordance with this Sub-Clause, at the Contractor's cost.

- 5.2.5 For each part of the Works, and except to the extent that the Parties otherwise agree:
- (a) execution of such part of the Works shall not commence prior to the expiry of the review periods for all the Contractor's Documents which are relevant to its design and execution;
 - (b) execution of such part of the Works shall be in accordance with these Contractor's Documents, as submitted for review; and
 - (c) if the Contractor wishes to modify any design or document which has previously been submitted for review, the Contractor shall immediately give notice to the Owner. Thereafter, the Contractor shall submit revised documents to the Owner in accordance with the above procedure.

Any such agreement (under the preceding paragraph) or any review (under this Sub-Clause or otherwise) shall not relieve the Contractor from any obligation or responsibility.

- 5.2.6 Anything mentioned elsewhere in the Technical Requirements and not shown on the Drawings, or shown on the Drawings but not mentioned elsewhere in the Technical Requirements, shall be of like effect as if shown or mentioned in both. In case of differences between the Drawings and the other Technical Requirements, the other Technical Requirements shall govern, except as otherwise directed by the Owner, before the start of the work affected by such differences. Should any conflict arise between the Technical Requirements and the detailed design drawings of the Contractor, the Technical Requirements shall govern, except as, and only to the extent, determined or agreed to and timely advised otherwise by the Owner.

- 5.2.7 The Drawings are considered as illustrative to show the general layout and requirements of the Power Plant, except where limiting or mandatory dimensions and elevations are indicated.

The Works shall be executed in accordance with the detailed design drawings prepared by the Contractor and approved by the Owner.

5.3 Contractor's Undertaking

The Contractor undertakes that the design, the Contractor's Documents, the execution and the completed Works will be in accordance with:

- (a) the Laws in the Country, and
- (b) the documents forming the Contract, as altered or modified by Variations.

5.4 Technical Standards and Regulations

The design, the Contractor's Documents, the execution and the completed Works shall comply with the Country's technical standards, building, construction and environmental Laws, Laws applicable to the product being produced from the Works, and other

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standards specified in the Technical Requirements, applicable to the Works, or defined by the applicable Laws.

All these Laws shall, in respect of the Works and each Unit, be those prevailing when the Works or Unit are taken over by the Owner under Clause 10 [*Owner's Taking Over*]. References in the Contract to published standards shall be understood to be references to the edition applicable on the Effective Date, unless stated otherwise.

If changed or new applicable standards come into force in the Country after the Effective Date, the Contractor shall give notice to the Owner and (if appropriate) submit proposals for compliance. In the event that:

- (a) the Owner determines that compliance is required, and
- (b) the proposals for compliance constitute a variation,

then the Owner shall initiate a Variation in accordance with Clause 13 [*Variations and Adjustments*].

5.5 Training

The Contractor shall, at its own cost as included in the Contract Price, be responsible for providing training to the Owner and the Owner's personnel in relation to the operation and maintenance of the Plant. This shall include on-job training during the commissioning period. The Contractor shall ensure that the Owner's designated operation and maintenance trainees (hereinafter referred to as the "Trainees") are provided with comprehensive knowledge, techniques, and skills necessary to effectively carry out the operation and maintenance of the Plant.

The Trainees shall be adequately qualified, based on the Contractor's recommendations, to perform their assigned tasks. Completion of this training shall be a condition precedent to the Taking Over of the Works under Sub-Clause 10.1 [*Taking Over of the Works and Units*].

The detail content and requirements of the training work including the program and number of Trainees are provided in Technical Requirements.

5.6 As-Built Documents

The Contractor shall prepare, and keep up-to-date, a complete set of "as-built" records of the execution of the Works, showing the exact as-built locations, sizes and details of the work as executed. These records shall be made within the approved drawings by hand writing, shall be kept on the Site and shall be used exclusively for the purposes of this Sub-Clause. Two (02) copies shall be supplied to the Owner prior to the commencement of the Tests on Completion. The final printed as-built document has to be copied from above mentioned records and has to be handed over to the Owner four weeks after the test of completion.

In addition, the Contractor shall supply to the Owner as-built drawings of the Works, showing all Works as executed, and submit them to the Owner for review under Sub-Clause 5.2 [*Contractor's Documents*]. The Contractor shall obtain the consent of the Owner as to their size, the referencing system, and other relevant details.

Prior to the issue of any Taking-Over Certificate, the Contractor shall supply to the Owner the specified numbers and types of copies of the relevant as-built drawings, in

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accordance with Technical Requirements, The Works shall not be considered to be completed for the purposes of taking-over under Sub-Clause 10.1 [*Taking Over of the Works and Unit*] until the Owner has received these documents.

5.7 Operation and Maintenance Manuals

Prior to commencement of the Tests on Completion, the Contractor shall supply to the Owner provisional operation and maintenance manuals in sufficient detail for the Owner to operate, maintain, dismantle, reassemble, adjust and repair the Power Plant.

The Works shall not be considered to be completed for the purposes of taking-over under Sub-Clause 10.1 [*Taking Over of the Works and Units*] until the Owner has received final operation and maintenance manuals in such detail, and any other manuals specified in Technical Requirements.

5.8 Design Error

Unless otherwise approved by the Owner's competent, if errors, omissions, ambiguities, inconsistencies, inadequacies or other defects are found in the Contractor's Documents, they and the Works shall be corrected at the Contractor's cost which shall not be added to the Contract Price, notwithstanding any consent or approval under this Clause.

5.9 Warranties Unaffected

The Contractor acknowledges and agrees -

- (a) that the warranties in Sub-Clause 5.3 [*Contractor's Undertaking*], the Contractor's design obligations and the Contractor's other guarantees, warranties, obligations and liabilities under the Contract remain unaffected; and
- (b) that the Contractor will bear and continue to bear full liability and responsibility in accordance with the Contract for the performance of the Works under the Contract,

notwithstanding any one or more of the following -

- (c) any design work carried out by the Owner, the Contractor before the Commencement date and included in the Contract, unless otherwise stated in the Contract; subject to the exceptions referred to in Sub-Clause 5.1 (a), (b).
- (d) the involvement of Subcontractors in the execution of any of the Works;
- (e) any receipt or review of, or comment on, or rejection of, or approval of, or permission to use or deemed permission to use, or expression of satisfaction or dissatisfaction with:
 - (i) any of the Contractor's Documents;
 - (ii) any other document or information provided by the Contractor;
 - (iii) any submission, proposal or recommendation by the Contractor; or
 - (iv) any of the Contractor's work methods or procedures;by (or on behalf of) the Owner (whether under any provision of the Contract or otherwise);

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- (f) any supervision, superintendence or review of, or comment on, or rejection of, or approval of, or expression of satisfaction or dissatisfaction with -
 - (i) any of the Contractor's subcontractor selections;
 - (ii) any of the Contractor's Materials, Plant or equipment selections;
 - (iii) the execution of any of the Works;
 - (iv) any work, Plant, Materials or equipmentby (or on behalf of) the Owner (whether under any provision of the Contract or otherwise);
- (g) the making available to or the provision to the Contractor by or on behalf of the Owner of any Site information;
- (h) any variation directed under Sub-Clause 13.1 [*Right to Vary*];
- (i) any failure by the Owner to do any of the things referred to in subparagraphs (c), (e), (f), or (g) of this Sub-Clause; or
- (j) any failure by the Owner to direct a variation under Sub-Clause 13.1 [*Right to Vary*].

5.10 No Duty of Care or Liability Imposed on the Owner

No review, comment, approval, consent, rejection, permission to use, deemed permission to use, permission to proceed, expression of satisfaction or dissatisfaction, supervision or superintendence by (or on behalf of) the Owner concerning:

- (a) any Contractor's Document or any other document or information provided by the Contractor; or
 - (b) any work, Plant, equipment, Materials or any other aspect of the Works;
- nor any failure by the Owner to take any such actions, shall:
- (a) limit or exclude any obligation or liability of the Contractor;
 - (b) prejudice any of the Owner's rights against the Contractor;
 - (c) be construed as the Owner assuming any responsibility or liability for the adequacy, quality, compliance or fitness of the Works or of any Contractor's Document or any other document provided by the Contractor, or for any errors in or omissions from any Contractor's Document or any other document or the Works; or
 - (d) constitute an admission that the Owner or the Owner's Personnel or their agents have checked any Contractor's Document, any other document or work for accuracy, completeness or compliance with the requirements of the Contract.

END OF CLAUSE 5

6. STAFF AND LABOUR

6.1 Engagement of Staff and Labour

The Contractor shall make arrangements for the engagement of all staff and labour, local or otherwise, and for their payment, housing, feeding and transport.

6.2 Rates of Wages and Conditions of Labour

The Contractor shall pay rates of wages, and observe conditions of labour, which are not lower than those established for the trade or industry where the work is carried out. If no established rates or conditions are applicable, the Contractor shall pay rates of wages and observe conditions which are not lower than the general level of wages and conditions observed locally by Owners whose trade or industry is similar to that of the Contractor.

6.3 Persons in the Service of Others

The Contractor shall not recruit, or attempt to recruit, staff and labour from amongst the Owner's Personnel and vice versa.

6.4 Labour Laws

The Contractor shall comply with all the relevant labour Laws applicable to the Contractor's Personnel, including Laws relating to their employment, health, safety, welfare, immigration and emigration, and shall allow them all their legal rights.

The Contractor shall require his employees to obey all applicable Laws, including those concerning safety at work.

6.5 Working Hours

No work shall be carried out on the Site on locally recognised days of rest, or outside normal working hours, unless:

- (a) otherwise stated in the Contract,
- (b) the Owner gives consent, or
- (c) the work is unavoidable, or necessary for the protection of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the Owner.
- (d) In case the Project Schedule is urgent, or delayed by the reasons attributable to the Contractor, the Contractor shall be responsible for shift working and overtime, in holidays if the Contractor receives such requirement from the Owner which cannot be unreasonably withheld and at the Contractor's expenses.

6.6 Facilities for Staff and Labour

The Contractor shall provide and maintain all necessary accommodation and welfare facilities for the Contractor's Personnel.

The Contractor shall not permit any of the Contractor's Personnel to maintain any temporary or permanent living quarters within the structures forming part of the Permanent Works.

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6.7 Health and Safety

The Contractor shall at all times take all reasonable precautions to maintain the health and safety of the Contractor's Personnel. In collaboration with local health authorities, the Contractor shall ensure that medical staff, first aid facilities, sick bay and ambulance service are available at all times at the Site and at any accommodation for Contractor's and Owner's Personnel, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics.

The Contractor shall appoint an accident prevention officer at the Site, be responsible for maintaining safety and protection against accidents. This person shall be qualified for this responsibility, and shall have the authority to issue instructions and take protective measures to prevent accidents. Throughout the execution of the Works, the Contractor shall provide whatever is required by this person to exercise this responsibility and authority.

The Contractor shall send, to the Owner, details of any accident as soon as practicable after its occurrence. The Contractor shall maintain records and make reports concerning health, safety and welfare of persons, and damage to property, as the Owner may reasonably require.

6.8 Contractor's Superintendence

Throughout the design and execution of the Works, and as long thereafter as is necessary to fulfil the Contractor's obligations, the Contractor shall provide all necessary superintendence to plan, arrange, direct, manage, inspect and test the work.

Superintendence shall be given by a sufficient number of persons having adequate knowledge of the language for communications (defined in Sub-Clause 1.4 [*Law and Language*]) and of the operations to be carried out (including the methods and techniques required, the hazards likely to be encountered and methods of preventing accidents), for the satisfactory and safe execution of the Works.

6.9 Contractor's Personnel

The Contractor's Personnel shall be appropriately qualified, skilled and experienced in their respective trades or occupations. The Owner may require the Contractor to remove (or cause to be removed) any person employed on the Site or Works, including the Contractor's Representative if applicable, who:

- (a) persists in any misconduct or lack of care,
- (b) carries out duties incompetently as regulated by applicable Law or negligently,
- (c) fails to conform with any provisions of the Contract, or
- (d) persists in any conduct which is prejudicial to safety, health, or the protection of the environment.

If appropriate, the Contractor shall then appoint (or cause to be appointed) a suitable replacement person.

6.10 Records of Contractor's Personnel and Equipment

The Contractor shall submit, to the Owner, details showing the number of each class of Contractor's Personnel and of each type of Contractor's Equipment on the Site. Details



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shall be submitted each calendar month, in a form approved by the Owner, until the Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works.

6.11 **Disorderly Conduct**

The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst the Contractor's Personnel, and to preserve peace and protection of persons and property on and near the Site.

END OF CLAUSE 6

7. PLANT, MATERIALS AND WORKMANSHIP

7.1 Manner of Execution

The Contractor shall carry out the manufacture of Plant, the production and manufacture of Materials, and all other execution of the Works:

- (a) in the manner (if any) specified in the Contract,
- (b) in a proper workmanlike and careful manner, in accordance with recognised good practice, and
- (c) with properly equipped facilities and non-hazardous Materials, except as otherwise specified in the Contract.

7.2 Samples

The Contractor shall submit samples to the Owner, for review in accordance with the procedures for Contractor's Documents described in Sub-Clause 5.2 [*Contractor's Documents*], as specified in the Contract and at the Contractor's cost. Each sample shall be labelled as to origin and intended use in the Works.

7.3 Inspection

The Owner's Personnel shall at all reasonable times:

- (a) have full access to all parts of the Site and to all places from which natural Materials are being obtained, and
- (b) during production, manufacture and construction (at the Site and, to the extent specified in the Contract, elsewhere), be entitled to examine inspect, measure and test the materials and workmanship, and to check the progress of manufacture of Plant and production and manufacture of Materials

The Contractor shall give the Owner's Personnel full opportunity to carry out these activities, including providing access, facilities, permissions and safety equipment. No such activity shall relieve the Contractor from any obligation or responsibility.

In respect of the work which Owner's Personnel are entitled to examine, inspect, measure and/or test, the Contractor shall give notice to the Owner whenever any such work is ready and before it is covered up, put out of sight, or packaged for storage or transport. The Owner shall then either carry out the examination inspection, measurement or testing without unreasonable delay, or promptly give notice to the Contractor that the Owner does not require to do so. If the Contractor fails to give the notice, he shall, if and when required by the Owner, uncover the work and thereafter reinstate and make good, all at the Contractor's cost.

The Owner and Owner's representative shall have the right, whenever he shall deem necessary, to inspect, examine and test the fabrication and the assembly of Plant and Materials in the Contractor's workshops and at the Site, and witness the tests of Plant and Materials. The Contractor shall provide all necessary assistance to these visits, inspections and checks and give all the information requested.

The Contractor shall provide the Owner with a list of the workshops in which the different parts of the supply are manufactured and shall furnish all information that may be useful for the checking of the manufacturing, such as material orders, etc. In cases where parts

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of the machinery are manufactured in the workshops of a subcontractor, the Contractor shall arrange that the Owner may freely and without hindrance inspect and examine Plant and Materials and witness the tests, just as if these were in the Contractor's workshop.

The Contractor shall be obligated, moreover, to supply for his account adequate means required for all inspections in project Site which by law are to be made by any Public Sector Entity.

All expenses relating to the Owner's foreign inspection visits shall be at the expense of the Owner.

7.4 **Testing**

This Sub-Clause shall apply to all tests specified in the Contract, other than the tests after completion (if any).

Except as otherwise provided in Sub-Clause 4.19, the Contractor shall provide all apparatus, assistance, documents, information, electricity, equipment, fuel, consumables, instruments, labour, materials, and suitably qualified and experienced personnel as necessary to carry out the specified tests efficiently. The Contractor shall coordinate with the Owner to agree upon the time and location for the testing of any Plant, Materials and other parts of the Works as required under the Contract.

The Owner may, under Clause 13 [*Variations and Adjustments*], vary the location or details of specified tests, or instruct the Contractor to carry out additional tests. If these varied or additional tests show that the tested Plant, Materials or workmanship is not in accordance with the Contract, the cost of carrying out this Variation shall be borne by the Contractor, notwithstanding other provisions of the Contract.

The Owner shall give the Contractor not less than twenty four (24) hours' notice of the Owner's intention to attend the tests. If the Owner does not attend at the time and place agreed, the Contractor may proceed with the tests, unless otherwise instructed by the Owner, and the tests shall then be deemed to have been made in the Owner's presence.

If the Contractor suffers delay and/or incurs Cost from complying with these instructions or as a result of a delay for which the Owner is responsible, the Contractor shall give notice to the Owner and shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any reasonable Cost, which shall be added to the Contract Price.

After receiving this notice, the Owner shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters.

The Contractor shall promptly forward to the Owner duly certified reports of the tests. When the specified tests have been passed, the Owner shall endorse the Contractor's test certificate, or issue a certificate to him, to that effect. If the Owner has not attended the tests, he shall be deemed to have accepted the readings as accurate.

7.5 Rejection

If, as a result of an examination, inspection, measurement or testing, any Plant, Materials, design or workmanship is found to be defective or otherwise not in accordance with the Contract, the Owner may reject the Plant, Materials, design or workmanship by giving notice to the Contractor, with reasons. The Contractor shall then promptly make good the defect and ensure that the replacement item complies with the Contract. Attribution of costs of any such replacement shall be settled under consideration of cause of defect in design, workmanship or other cause.

If the Owner requires this Plant, Materials, design or workmanship to be retested, the tests shall be repeated under the same terms and conditions. If the rejection and retesting cause the Owner to incur additional costs, the Contractor shall subject to Sub-Clause 2.5 [*Owner's Claims*] pay these costs to the Owner.

7.6 Remedial Work

Notwithstanding any previous test or certification, the Owner may, to the reasonable extent, instruct the Contractor to:

- (a) remove from the Site and replace any Plant or Materials which is not in accordance with the Contract,
- (b) remove and re-execute any other work which is not in accordance with the Contract, and
- (c) execute any work which is urgently required for the safety of the Works, whether because of an accident, unforeseeable event or otherwise.

If the Contractor fails to comply with any such instruction, which complies with Sub-Clause 3.4 [*Instructions*], the Owner shall be entitled to employ and pay other persons to carry out the work. Except to the extent that the Contractor would have been entitled to payment for the work, the Contractor shall subject to Sub-Clause 2.5 [*Owner's Claims*] pay to the Owner all costs arising from this failure

7.7 Ownership of Plant and Materials

Each item of Plant and Materials shall, to the extent consistent with the Laws of the Country, become the property of the Owner at whichever is the earlier of the following times, free from liens and other encumbrances:

- (a) when it is delivered to the Site;
- (b) when the Contractor is entitled to payment of the value of the Plant and Materials under Sub-Clause 8.10 [*Payment for Plant and Materials in Event of Suspension*].

The Works except which belong to the Contractor (including Temporary Works) including packaging materials in respect of which all progress payment has been made shall thereupon become the property of the Owner. This provision shall not be construed as relieving the Contractor from the sole responsibility for all Works upon which payment has been made or the restoration of any damaged Work or as a waiver on the right of the Owner to require the fulfilment of all the terms of the Contract.

7.8 Royalties

The Contractor shall pay all royalties, rents and other payments for:

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- (a) natural Materials obtained from outside the Site, and
- (b) the disposal of material from demolitions and excavations and of other surplus material (whether natural or man-made), except to the extent that disposal areas within the Site are specified in the Contract.

7.9 Liens

7.9.1 The Contractor shall not file, claim or register any Lien and shall use its best efforts to prevent any Lien from being filed, claimed or registered by any Subcontractor or by any employee, servant or agent of the Contractor or Subcontractor against the property of the Owner or the Contractor for any Works done or any services rendered or any Plant or Materials supplied under the Contract.

7.9.2 In the event that any Lien should be filed, claimed or registered by any such person against any Plant, Materials or Contractor's Equipment or against any monies due or to become due to the Contractor from the Owner, the Contractor shall immediately notify the Owner and shall promptly discharge, by bond or otherwise, such Lien or attachment, and exonerate, indemnify and protect the Owner against any loss, damage or reasonable expense in connection therewith, including legal fees.

7.9.3 Until any Lien contemplated by Sub-Clause 7.9.2 is fully discharged, the Owner shall have the right to withhold one hundred percent (100%) of the full amount thereof of any payments to be made to the Contractor, and such withholding of payment shall not affect the other rights and obligations of the Parties under the Contract. Alternatively, upon prior written notice to and consent from the Contractor, the Owner may discharge the Lien by paying the appropriate amount directly to the relevant person and deduct such amount from further payments to be made to the Contractor pursuant to the Contract.

7.9.4 If at any time the Contractor shall allow indebtedness to accrue for labour, Contractor's Equipment, Plant or Materials supplied under the Contract for which the Owner may become liable for payment or which may become a Lien on the Works or any part thereof or supplies therefore or on the Owner's property or possessions, the Owner may withhold payment in an amount equal to such indebtedness until the Contractor has delivered satisfactory evidence that the said indebtedness has been fully discharged.

7.9.5 On its application of any Taking Over Certificate and the Final Payment (for each Unit), pursuant to Clause 10 [*Owner's Taking Over*] and 14.10 [*Payment withheld and Retention*] respectively, the Contractor shall certify to the Owner, by way of a certificate (the "Release of Liens and Claims Certificate") that it has no knowledge of any outstanding Liens or claims which may result in Liens affecting the Works or the Site.

7.9.6 With respect to any Lien or claim outstanding at the date of issue of the Taking Over Certificate or termination of the Contractor's engagement under the Contract, the Contractor shall promptly pay or reimburse to the Owner all costs actually incurred or likely to be incurred by the Owner in extinguishing such Liens or claims, including any costs for filing and legal fees.

7.10 Spare Parts Prior to Taking Over

The Contractor shall provide the mandatory spare parts list to ensure the installation works as well as two year operation including the unit price of each price.

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During the Defects Notification Period, the Contractor shall be responsible to supply the spare parts necessary to repair the equipment defects in accordance with Clause 11 [*Defects Liability*] of the Conditions of the Contract, free of charge to the Owner.

The Contractor and the Owner will complete the list during the project execution within eighteen (18) months from the Commencement Date and in such detail as delineated in the Appendix 3 [*Price Schedule and Payment Schedule*] of the Contract. The spare part list shall be a part of the Contract and can be modified upon mutual agreement during the performance of the Works.

7.11 Spare Parts After Taking Over

The Contractor shall use its reasonable endeavours to make available for purchase by the Owner, for a period of ten (10) years following the Taking Over in relation to such Unit, instrumentation and control spare parts and special tools.

The Contractor shall use its reasonable endeavours to cause its Subcontractors to make available for purchase by the Owner, at any time after any Taking Over, the recommended spare parts and special tools identified in the Technical Requirements.

If the Contractor or a Subcontractor ceases, or notifies the Contractor that it will cease, to manufacture any of the spare parts or special tools referred to in this Sub-Clause 7.11, or the Contractor otherwise becomes aware of the same, then:

- (a) the Contractor shall promptly notify the Owner of the same, in order that the Owner can consider whether it wishes to purchase such spare parts or special tools at that time;
- (b) if such Subcontractor continues to trade or remain solvent, the Contractor shall use its reasonable endeavours to cause such Subcontractor to procure alternative spare parts or special tools of equal or better quality; and
- (c) if such Subcontractor does not continue to trade or has become insolvent, the Contractor shall:
 - (i) if so instructed by the Owner, use its reasonable endeavors to obtain manufacturing drawings, patterns, specifications and other associated documents for the necessary spare parts or special tools (as applicable); and
 - (ii) use its reasonable endeavors to provide a list of and assist the Owner in securing the services of an alternative manufacturer or supplier of the necessary spare parts or special tools the same or better quality or that will manufacture such spare parts or special tools on the basis of drawings obtained by the Contractor.

END OF CLAUSE 7

8. COMMENCEMENT, DELAYS AND SUSPENSION

8.1 Commencement of Works

The Commencement Date shall be the date the Owner has made the Advance Payment and the Contractor has been notified such payment through the corresponding bank notice, in accordance with Clause 14 [*Contract Price and Payment*] of the Contract.

The Contractor shall commence the design and execution of the Works as soon as reasonably practicable after the Commencement Date, and shall then proceed with the Works with due expedition and without delay.

8.2 Date for Completion

The Contractor shall complete the whole of the Works, and each Unit (if any) within the Time for Completion for the Works or Unit (as the case may be) including:

- (a) achieving the passing of the Tests on Completion, and
- (b) completing all work which is stated in the Contract as being required for the Works or Unit to be considered to be completed for the purposes of taking-over under Sub-Clause 10.1 [*Taking Over of the Works and Units*].

8.3 Programme

The Contractor shall submit a time programme to the Owner in accordance with the Technical Requirement. The Contractor shall also submit a revised programme whenever the previous programme is inconsistent with actual progress or with the Contractor's obligations. Unless otherwise stated in the Contract, each programme shall include:

- (a) the order in which the Contractor intends to carry out the Works, including the anticipated timing of each major stage of the Works and estimated time of subcontractor selection, if any,
- (b) the periods for reviews under Sub-Clause 5.2 [*Contractor's Documents*],
- (c) the sequence and timing of inspections and tests specified in the Contract, and
- (d) a supporting report which includes:
 - (i) a general description of the methods which the Contractor intends to adopt for the execution of each major stage of the Works, and
 - (ii) the approximate number of each class of Contractor's Personnel and of each type of Contractor's Equipment for each major stage.
 - (iii) Plan and time of subcontractor selection, if any.

Within twenty one (21) days after receiving a programme, the Owner gives notice to the Contractor stating the extent to which it does not comply with the Contract. The Contractor shall only proceed in accordance with the approved programme, subject to his other obligations under the Contract. The Owner's Personnel shall be entitled to rely upon the programme when planning their activities.

The Contractor shall promptly give notice to the Owner of specific probable future events or circumstances which may adversely affect or delay the execution of the Works. In this event, or if the Owner gives notice to the Contractor that a programme fails (to the extent stated) to comply with the Contract or to be consistent with actual progress and the

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Contractor's stated intentions, the Contractor shall submit a revised programme to the Owner in accordance with this Sub-Clause.

8.4 Extension of Time for Completion

The Contractor shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to an extension of the Time for Completion if and to the extent that completion for the purposes of Sub-Clause 10.1 [*Taking Over of the Works and Units*] is or will be delayed by any of the following causes:

- (a) a Variation (unless an adjustment to the Time for Completion has been agreed under Sub-Clause 13.3 [*Variation Procedure*]),
- (b) a cause of delay giving an entitlement to extension of time under a Sub-Clause of these Conditions, or
- (c) any delay including delay in any payments, impediment or prevention caused by or attributable to the Owner, the Owner's Personnel, obstacles in land clearance on Site due to the obstruction from the local resident are determined not to be of the Contractor's failure or the Owner's other contractors on the Site.

8.5 Delays caused by Authorities

If the following conditions apply, namely:

- (a) the Contractor has diligently followed the procedures laid down by the relevant legally constituted public authorities in the Country,
- (b) these authorities delay or disrupt the Contractor's work, and
- (c) the delay or disruption was not reasonably foreseeable by an experienced contractor by the Effective Date,

then this delay or disruption shall be considered as a cause of delay under subparagraph (b) of Sub-Clause 8.4 [*Extension of Time for Completion*] except the default is attributable to the Contractor.

8.6 Rate of Progress

If, at any time:

- (a) the actual progress is too slow to complete within the Time for Completion basing on the Critical Path Method, and/or
- (b) the progress has fallen (or will fall) behind the current programme under Sub-Clause 8.3 [*Programme*],

other than as a result of a cause listed in Sub-Clause 8.4 [*Extension of Time for Completion*], then the Owner may instruct the Contractor to submit, under Sub-Clause 8.3 [*Programme*], a revised programme and supporting report describing the revised methods which the Contractor proposes to adopt in order to expedite progress and complete within the Time for Completion.

Unless the Owner notifies otherwise, the Contractor shall adopt these revised methods, which may require increases in the working hours and/or in the numbers of Contractor's Personnel and/or Goods, at the risk and cost of the Contractor and shall not cause the Owner to incur additional costs. If these revised methods result in the Owner incurring

additional costs, the Owner shall be entitled, subject to Sub-Clause 2.5 [Owner's Claims], to recover such costs from the Contractor, in addition to any applicable delay damages.

8.7 Delay Damages

If the Contractor fails to comply with Sub-Clause 8.2 [*Date for Completion*] but except the condition as stated in the sub-paragraph (j) of Sub-Clause 10.1 [*Taking Over of the Works and Unit*] for such Unit then the Contractor shall, subject to and in accordance with Sub-Clause 2.5 [*Owner's Claims*], pay delay liquidated damages ("Delay Liquidated Damages") to the Owner for this default. These Delay Liquidated Damages shall be the sum stated below, which shall, subject to Sub-Clause 9.4 [*Failure to Pass Tests on Completion*] accrue for every day which shall elapse between the Time for Completion for relevant Unit and the date when the Contractor comply with Sub-Clause 8.2 [*Date for Completion*] or such Unit is deemed to have been taken over in accordance with the Contract. However, the total amount due under this Sub-Clause shall not exceed ten percent (10%) of the Contract Price for such Unit.

If Taking Over of either or both Units has not been attained on or prior to the Time for Completion as specified in the Sub-clause 8.2 [*Date for Completion*] for relevant Unit for the Unit(s), the Owner shall be entitled, at any time thereafter, to issue a notice of non-completion in writing to the Contractor to that effect.

Delay Liquidated Damages shall be equal to 0,03% of the Contract Price for the relevant Unit for each day of delay.

Delay Liquidated Damages shall be the only damages due from the Contractor for such default, other than in the event of termination under Sub-Clause 15.2 [*Termination by Owner*] prior to completion of the Works. These damages shall not relieve the Contractor from his obligation to complete the Works, or from any other duties, obligations or responsibilities which he may have under the Contract.

8.8 Suspension of Work

The Owner may, upon reasonable prior written notice to the Contractor, instruct the Contractor to suspend progress of part or all of the Works. During such suspension, the Contractor shall protect, store and secure such part or the Works against any deterioration, loss or damage.

The Owner may also notify the cause for the suspension. If and to the extent that the cause is notified and is the responsibility of the Contractor, the following Sub-Clauses Sub-Clause 8.9 [Consequences of Suspension], Sub-Clause 8.10 [Payment for Plant and Materials in Event of Suspension] and Sub-Clause 8.11 [Prolonged Suspension] shall not apply.

Upon receiving the suspension notice from Owner, Contractor shall, unless the notice requires otherwise:

- (a) Immediately discontinue the Works or part of Works suspended on the date and to extent specified in the notice;
- (b) Place no further orders to Subcontractors for materials, services, or facilities with respect to suspended Works other than to the extent stated in the notice;

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- (c) Promptly make every reasonable effort to provide suspension status upon terms satisfactory to the Owner of all orders, sub -contractors, and rental agreement to the extent they relate to performance of suspended Works; and
- (d) Take any other reasonable steps to minimise costs associated with such suspension and to protect the life, property or safety of the Works or parts of the Works.

8.9 Consequences of Suspension

If the Contractor suffers delay and/or incurs Cost from complying with the Owner's instructions under Sub-Clause 8.8 [*Suspension of Work*] and/or from resuming the work, the Contractor shall give notice to the Owner and shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any such Cost, which shall be added to the Contract Price.

After receiving this notice, the Owner shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters.

The Contractor shall not be entitled to an extension of time for, or to payment of the Cost incurred in, making good the consequences of the Contractor's faulty design, workmanship or materials, or of the Contractor's failure to protect, store or secure in accordance with Sub-Clause 8.8 [*Suspension of Work*].

8.10 Payment for Plant and Materials in Event of Suspension

The Contractor shall be entitled to payment of the value (as of the date of suspension) of any Plant and/or Materials which have not been delivered to Site, if:

- (a) the work on Plant or the delivery of the Plant and/or Materials has been suspended for more than twenty eight (28) days, and
- (b) the Contractor has marked the Plant and/or Materials as the Owner's property in accordance with the Owner's instructions, and
- (c) the Contractor has handed over all relevant shipping documents to the Owner.

8.11 Prolonged Suspension

If the suspension under Sub-Clause 8.8 [*Suspension of Work*] has continued for more than eighty four (84) days, the Contractor may request the Owner's permission to proceed. If the Owner does not give permission within twenty eight (28) days after being requested to do so, the Contractor may, by giving notice to the Owner, treat the suspension as an omission under Clause 13 [*Variations and Adjustments*] of the affected part of the Works. If the suspension affects the whole of the Works, the Contractor may give notice of termination under Sub-Clause 16.2 [*Termination by Contractor*].

8.12 Resumption of Work

After the permission or instruction to proceed is given, the Parties shall jointly examine the Works and the Plant and Materials affected by the suspension. The Contractor shall



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make good any deterioration or defect in or loss of the Works or Plant or Materials, which has occurred during the suspension.

END OF CLAUSE 8

9. TESTS ON COMPLETION

9.1 Contractor's Obligations

The Commissioning Contractor shall carry out the Tests on Completion in accordance with this Clause and the Technical Requirements and Specifications in compliance with all applicable Laws and, in respect of the relevant Unit (or the Works):

- (a) the Unit has been subjected to any other testing, inspection and commissioning which may be stated in the Technical Requirements and Specifications by the Contractor to be a pre-condition to the carrying out any of the Tests on Completion; and
- (b) the Contractor in coordination with Commissioning Contractor has provided any training which is required in the Technical Requirements for the Owner's (or its contractors') personnel who will participate in commissioning and/or the Tests on Completion for such part of the Works (save for any training which the Technical Requirements and Specifications state may be provided after the commencement of such Tests on Completion).

The Owner, the Contractor, Commissioning Contractor shall be entitled to order the cessation of any Test on Completion if damage to the Works or personal injury is likely to result from continuation.

The Commissioning Contractor shall submit to the Owner for approval the detailed procedures with review signature of the Contractor (including, where relevant, estimated fuel consumption and the programme of load variations) for those tests required to attain Taking Over of each Unit in accordance with the Technical Requirement,

All test procedures submitted shall comply with applicable Laws, Contract requirements (if any) and Good Engineering Practice. If the Owner reasonably requests modifications to the submitted procedures, the Contractor in coordination with Commissioning Contractor shall promptly incorporate such changes and resubmit its modified procedures within fifteen (15) days of a request so to do. The process shall be repeated until such detailed test procedures have been agreed by the Parties. If the parties have not agreed upon the procedures one (1) month prior to the anticipated start of a relevant test, the Owner shall make a decision in accordance with Clause 3.5 [*Determinations*]. The Owner shall notify the Contractor (Contractor, Commissioning Contractor) of any such determination at least twenty one (21) days prior to the anticipated start of the relevant test which shall include any instruction that may be necessary in order to enable the Commissioning Contractor to carry out such test.

The Commissioning Contractor in coordinate with the Contractor shall give to the Owner not less than twenty one (21) days' notice of the date after which the Contractor will be ready to carry out each of the Tests on Completion including any necessary instruction in carrying out these Tests. Unless otherwise agreed, Tests on Completion shall be carried out within fourteen (14) days after this date, on such day or days as the Owner shall instruct.

The Tests on Completion shall be carried out independently on each Unit, except that both Units shall be operated simultaneously for purposes of determining whether the common facilities are capable of supporting the operation of both Unit 1 and Unit 2, while

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both Units are operating simultaneously at Guaranteed Gross Electrical Unit Output and in the following sequence (except for the Performance Tests and Reliability Run which may be carried out in any sequence or concurrently) and in accordance with the procedures in Technical Requirements

- (a) pre-commissioning tests, which be performed by the Contractor with witness by the Commissioning Contractor and the Owner shall include the appropriate inspections and ("dry" or "cold") functional tests to demonstrate that each item of Plant can safely under-take the next stage;
- (b) commissioning tests, which be performed by the Commissioning Contractor in coordinate with the Contractor and witness by the Owner shall include the specified operational tests to demonstrate that the Works or Unit can be operated safely and as specified, under all available operating conditions;
- (c) Reliability Run, which be performed by the Commissioning Contractor in coordinate with the Contractor and witness by the Owner shall demonstrate that the Works or Unit perform reliably and in accordance with the Technical Requirements, and
- (d) Performance Tests which be performed by the Commissioning Contractor in coordinate with the Contractor and witness by the Owner in accordance with the Technical Requirements.

During the Reliability Run, when the Works are operating under stable conditions, the Commissioning Contractor in coordinate with the Contractor shall give notice to the Owner that the Works are ready for any other Tests on Completion, including performance tests to demonstrate whether the Works conform with criteria specified in the Technical Requirements and Specifications and with the Performance Guarantees.

In considering the results of the Tests on Completion, appropriate allowances shall be made for the effect of any use of the Works by the Owner on the performance or other characteristics of the Works. As soon as the Works, or a Unit, have passed each of the Tests on Completion described in sub-paragraph (a), (b), (c) or (d), the Commissioning Contractor shall submit a certified report of the results of these Tests with review signature of the Contractor to the Owner.

The results of the Tests on Completion shall be compiled and evaluated jointly by the Parties (Owner and the Contractor, Commissioning Contractor) in the manner detailed the Technical Requirements and Specifications. Any necessary adjustments to the results to take account of the measuring tolerances and any differences between the operating conditions under which the Tests on Completion were conducted and the specified guarantee conditions shall be made in accordance with the provisions of Technical Requirements and Specifications.

If the Owner and the Contractor disagree on the interpretation of the Test results, each shall give a statement of his views to the other within fourteen (14) days after such disagreement arises. The statement shall be accompanied by all relevant evidence.

When the Tests on Completion have been conducted and before applying for Taking Over Certificate, Contractor shall submit to the Owner the final As-built drawings (red-line markings shall be allowed) and operation and maintenance manuals for operation the

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Power Plant (some minor corrections may be made afterwards which will not affect the safe operation and maintenance of the Power Plant). Three (03) months after Taking Over all clean As-Built documents and drawings shall be submitted to the Owner.

9.2 **Delayed Tests**

If the Tests on Completion are being unduly delayed by the Owner or Commissioning Contractor, Sub-Clause 7.4 [*Testing*] and/or Sub-Clause 10.3 [*Interference with Tests on Completion*] shall be applicable.

If the Tests on Completion are being unduly delayed by the Contractor, the Owner may by notice require the Contractor to carry out the Tests within twenty one (21) days after receiving the notice in accordance with Sub-Clause 3.4 [*Instruction*]. The Contractor shall carry out the Tests on such day or days within that period as the Contractor may fix and of which he shall give notice to the Owner.

9.3 **Retesting**

If the Works, or a Unit, fail to pass the Tests on Completion, Sub-Clause 7.5 [*Rejection*] shall apply base on respective Division of Responsibility of each which state in Technical requirement, and the Owner or the Contractor may require the failed Tests, and Tests on Completion on any related work, to be repeated under the same terms and conditions within the Cure Period. The Cure Period for each Unit is one hundred eighty (180) days commencing on the Time for Completion of each Unit (may be extended in accordance with the Contract).

9.4 **Failure to Pass Tests on Completion.**

Based on Plant performance guarantee criteria committed by the Owner or any deviation proposal by the Contractor with reasonable demonstration which Parties agreed in this Contract, The Parties warrants that, on carrying out of the Performance Tests, each Unit shall attain the Guaranteed Performance Levels subject to and upon the conditions set out in this Contract.

If either Unit fails to achieve the Guaranteed Gross Unit Rated Output, and/or the Guaranteed Gross Unit Heat Rate, and/or the Guaranteed Unit Auxiliary Power Consumption, but has attained the Minimum Performance Levels which is identified the root cause from performance of equipment supplied by the Contractor or from installation mistakes as required in technical requirements in accordance with Document No.6 [Plant Performance Guarantee], the Contractor shall, either of:

- (a) pay the following liquidated and ascertained damages to the Owner (“Performance Liquidated Damages”) subject to the Contractor’s right to first carry out any necessary remedial works and retest the Unit as set out below:
 - (i) US\$2,000 for each kW that the actual Gross Unit Output is less than the Guaranteed Gross Unit Rated Output,
 - (ii) US\$175,000 for each kJ/kWh in which the actual Gross Unit Heat Rate is more than the Guaranteed Gross Unit Heat Rate,
 - (iii) US\$3,000 for each kW in which the actual Unit Auxiliary Power Consumption is higher than the Guaranteed Unit Auxiliary Power Consumption.

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- (b) carry out any necessary remedial works and retest the Unit within the Cure Period, provided that the Contractor shall pay Delay Liquidated Damages in accordance with Sub-Clause 8.7, which shall be accrue for every day commencing on the date of the Contractor's execution of this option (b) and ending the earlier of:
- (i) the date when the relevant Unit attains the Guaranteed Gross Unit Rated Output and the Guaranteed Gross Unit Heat Rate and Guaranteed Unit Auxiliary Power Consumption.
 - (ii) such Unit is deemed to have been taken over.

In case of option (b) above, during the Cure Period, the Contractor may at any time request to take over the relevant Unit by paying to the Owner the sum of Delay Liquidated Damages imposed under sub-Clause 8.7 [*Delay damages*] and/or this sub-Clause 9.4 (b) as applicable and Performance Liquidated Damages for calculation of which criteria in the last Test on Completion shall be used.

If any Unit fails to attain the Minimum Performance Levels at the expiry of the Cure Period, the Owner may select either (but not more than one) of:

- (a) require the Contractor to carry out further remedial works and/or tests to attain the Minimum Performance Levels at the Contractor's cost, and/or require the Contractor pay to the Owner the Delay Damages and the Performance Damages; or
- (b) terminate the Contract in accordance with Sub-Clause 15.2 (g) (Termination by Owner).

In the event of sub-paragraph (b), the Contractor shall proceed in accordance with all other obligations under the Contract.

9.5 **Guaranteed Performance Levels**

The Contractor warrants that, on carrying out of the Performance Tests, each Unit shall attain the Guaranteed Performance Levels referred to Document No.6 shall be achieved.

9.6 **Minimum Performance Levels**

In the event that it is certified in the Performance Tests that the demonstrated Guaranteed Gross Unit Rated Output, and/or the Guaranteed Gross Unit Heat Rate and/or the Guaranteed Unit Auxiliary Power Consumption and/or Guaranteed Boiler Efficiency and/or Guaranteed Boiler Capacity, and/or Guaranteed Steam Generator Maximum Overload Capacity and/or Guaranteed Minimum Load without Oil Support and/or Guaranteed Maximum Unburned Carbon in Ash does not meet the following values, then the Minimum Performance Level for the Works is not met and the Owner may exercise any of his rights under Sub-Clause 9.4 [*Failure to Pass Tests on Completion*].

Item	Value
Guaranteed Gross Unit Rated Output	Guaranteed Value - 5%
Guaranteed Gross Unit Heat Rate	Guaranteed Value + 5.0%

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Guaranteed Maximum Overload Capacity	Guaranteed Value - 2.5%
Guaranteed Minimum Load without Fuel Oil Support	Guaranteed Value + 5.0%
Guaranteed Total Auxiliary Power Consumption	Guaranteed Value + 5.0%
Guaranteed Maximum Carbon in Ash	Guaranteed Value + 5.0%
Guaranteed Boiler Efficiency	Guaranteed Value - 5.0%
Guaranteed Boiler Capacity	Guaranteed Value - 5.0%

If the Works or any Unit fail to achieve any of the Absolute Guarantee values referred to in the Technical Requirements, the Owner may exercise any of his rights under Sub-Clause 9.4 [*Failure to Pass Tests on Completion*]. The Contractor shall not be entitled to any tolerance in achieving the Absolute Guarantee values.

In case the Minimum Performance Levels are not met, the Contractor shall not be entitled to pay liquidated damages in satisfaction of its obligations under the Contract and the Owner shall have the right to other remedies according to Sub-Clause 9.4 [*Failure to Pass Tests on Completion*].

9.7 **Exceeding the Limits of Other Plant Performance**

Should any performance criterion or performance standard of any Materials, design or workmanship stipulated in the Technical Requirements, other than those indicated Sub-Clause 9.4 [*Failure to Pass Tests on Completion*], not be met, the Sub-Clause 7.5 [*Rejection*] shall be applied.

9.8 **Creation of Punch List**

9.8.1 As soon as the Contractor reasonably believes the state of a Unit or Works warrants such action, but in any event before Taking Over of any relevant Unit, the Contractor shall provide written notice to the Owner that the Contractor is prepared to conduct a joint inspection of the Power Plant or a Unit to produce a proposed Punch List. The Owner and the Contractor shall cooperate with each other in scheduling and conducting a joint inspection of the Works or Unit as soon as reasonably possible after the Owners receipt of such written notice but, in any event, within fourteen (14) days of its receipt. At the Owners option, the Punch List may be prepared and joint inspections performed on a component-by-component or system-by-system basis.

9.8.2 Within eight (8) days of completion of any such joint inspection, the Contractor shall prepare and deliver to the Owner a written description of all proposed items for the Punch List and the appropriate dates for completion of such items which the Contractor, in its best good faith judgment, believes have not been completed or require revision or correction to cause them to conform with the requirements of this Contract. Items of additional work disclosed by testing or operation of a Unit or of the Works through the successful completion of the Performance Tests shall be added to the proposed Punch List.

9.8.3 If the Owner accepts such proposed list as a complete Punch List, then it shall sign a copy of such list marked “accepted” and return such copy to the Contractor within ten (10)

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days. If the Owner does not so accept such proposed list, then the Owner shall within ten (10) days, state its objections to such proposed list and all if its proposed changes therein and additions thereto by written notice to the Contractor.

The Owner shall be entitled to withhold US Dollars one million (US\$ 1,000,000) from payment due at Taking Over Certificate to account for the items remaining on the punch list. The amount retained shall be paid to the Contractor upon completion of all Punch List items and preparation of Contractor's request for payment. For the purposes of clarity, Performance Certificate according to Clause 11.9 [*Performance Certificate*] shall not be issued if any punch list items are still outstanding.

- 9.8.4 Promptly after the giving of such notice, the Owner and the Contractor shall cause their respective representatives to meet and cooperate and negotiate in good faith to arrive at an agreed list of items for the Punch List and appropriate dates for completion of such items. The Owner shall have the right to have the Owner's Representative, the Lenders and/or the Lender's Representative present during any such negotiations. If the Parties fail to so agree within five (05) Working Days, the Contractor may declare an impasse on the specific items in dispute by delivery of a written notice to the Owner to such effect, and the disputed items shall be resolved in accordance with Sub-Clause 20 [*Claim, Disputes and Arbitration*].
- 9.8.5 Promptly following the Owner's acceptance of the Punch List, the Contractor shall commence and thereafter diligently pursue the completion of the items on the Punch List, as well as any portion of the Works which the Contractor, in its best good faith judgment, believes has not been completed or require revision or correction, to cause it to conform with the requirements of this Contract. The Owner's acceptance of, or agreement on, a Punch List shall not alter or diminish either the Contractor's obligations to complete all of the Works, or the Owner's right to require the Contractor's completion of each Unit and of the Works, in accordance with the Contract.

END OF CLAUSE 9

10. **OWNER'S TAKING OVER**

10.1 **Taking Over of the Works and Unit**

Taking Over in respect of a Unit means the time when all the events below shall have occurred:

- (a) the Contractor has completed the Works comprised in such Unit (except for the items on the Punch List) in accordance with all Contract requirements and the Unit complies with applicable Laws;
- (b) the Unit has passed all relevant Tests on Completion or the Unit has passed the Tests on Completion other than the Performance Tests but has attained the Minimum Performance Levels in respect of such Unit and the Contractor has either paid Performance Liquidated Damages or has delivered the 'refund bond' in accordance with Sub-Clause 9.4 [*Failure to Pass Tests on Completion*];
- (c) the Punch List of minor outstanding work and defects which do not affect the safe and reliable operation of the Plant has been mutually agreed in accordance with Sub-Clause 9.8 [*Creation of Punch List*];
- (d) the Contractor has completed its training obligations to be effected prior to Taking Over of the Unit for the Owner's personnel and other nominees of the Owner;
- (e) the Contractor has supplied final and completed Operation and Maintenance Manuals, except the final as-built drawings and minor pages that do not affect the operation;
- (f) All permits, licenses and certificates in accordance with Appendix 4 [*Permits and Licenses*] are complete and available as required by any relevant Public Sector Entity;
- (g) All control and instrumentation systems operate satisfactory in the automatic mode in accordance with Technical Requirement;
- (h) the Contractor has supplied the spare parts and special tools required to be delivered prior to Taking Over of the Unit in accordance with the Technical Requirements and replaced any spare parts used or consumed during the carrying out of Tests on Completion which are required to be replaced;
- (i) the Contractor has supplied the stockpile of consumables required prior to the relevant Taking Over pursuant to the Technical Requirements and Specifications;
- (j) the Contractor has paid the agreed Delay Liquidated Damages in accordance with Sub-Clause 8.7 [*Delay Damages*], and/or the Contractor has delivered a 'refund bond' in the form agreed by both Parties in the amount shall be equal to the amount calculated by the Owner in the same formula as stipulated in the Sub-Clause 8.7 [*Delay Damages*] based on the actual delay minus the amount of the agreed Delay Liquidated Damages in accordance with Sub-Clause 8.7 [*Delay Damages*] if applicable. The Owner will return such refund bond to the Contractor upon date when any disputes between the Owner and the Contractor are solved in accordance with the Contract; and
- (k) the Contractor has provided a Release of Liens and Claims Certificate pursuant to Sub-Clause 7.9 [*Liens*].

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Except as stated in Sub-Clause 9.4 [*Failure to Pass Tests on Completion*], the Works shall be taken over by the Owner when (i) the Works have been completed in accordance with the Contract, including the matters described in Sub-Clause 8.2 [*Date for Completion*] and except as allowed in sub-paragraph (a) below, and (ii) a Taking-Over Certificate for the Works has been issued, or is deemed to have been issued in accordance with this Sub-Clause.

In case the Parties fail to reach an agreement on the penalties for delay specified at point (j) above, while the conditions from (a) to (i) and (k) above are fulfilled, the Taking Over Certificate shall still be issued, and the amount of the penalties for delay shall be mutually agreed upon by the Parties during the contract settlement.

The Contractor may apply by notice to the Owner for a Taking-Over Certificate for each Unit not earlier than fourteen (14) days before the Unit will, in the Contractor's opinion, be complete and ready for taking over satisfying the requirements of this Sub-Clause

The whole Power Plant shall be regarded as the Power Plant completion and be taken over upon (i) the successful completion of all the Tests on Completion for all Units (including the common facilities) and (ii) being ready for the commercial operation as the whole Power Plant.

The Owner shall, within twenty eight (28) days after receiving the Contractor's application:

- (a) issue the Taking-Over Certificate to the Contractor, stating the date on which the conditions for Taking Over of the Unit were completed in accordance with the Contract, except for any minor outstanding work and defects which will not substantially affect the use of the Works or Unit for their intended purpose (either until or whilst this work is completed and these defects are remedied); or
- (b) reject the application, giving reasons and specifying the work required to be done by the Contractor to enable the Taking-Over Certificate to be issued. The Contractor shall then complete this work before issuing a further notice under this Sub-Clause 10.1.

If the Owner fails either to issue the Taking-Over Certificate or to reject the Contractor's application within the period of twenty eight (28) days, and if the Works are substantially completed in accordance with the Contract, the Taking-Over Certificate shall be deemed to have been issued on the last day of that period.

10.2 Taking Over of Parts of the Works

Parts of the Works (other than Units) shall not be taken over or used by the Owner, except as may be stated in the Contract or as may be agreed by both Parties.

10.3 Interference with Test on Completion

If the Contractor is prevented, for more than fourteen (14) days, from carrying out the Tests on Completion by a cause for which the Owner is responsible, the Contractor shall carry out the Tests on Completion as soon as practicable.

If the Contractor suffers delay and/or incurs Cost as a result of this delay in carrying out the Tests on Completion, the Contractor shall give notice to the Owner and shall be entitled subject to and in accordance with Sub-Clause 20.1 [*Contractor's Claims*] to:

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- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any reasonable Cost, which shall be added to the Contract Price.

After receiving this notice, the Owner shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters.

10.4 Clearance of Site upon Taking-over

The Contractor shall at all times during the execution of the Works, keep the Site clean and free from all hazards, accumulations of waste materials and rubbish and debris, radioactive and other toxic substance as may be occasioned during contract execution caused by his employees or the Works and shall also keep all residential camps and the Site of the Works in a sanitary condition as directed by the Owner. If the Contractor fails to maintain or leave the Site in a clean, tidy, and sanitary condition within a reasonable time after receiving written notice from the Owner, the Owner may remedy this default or cause the same to be remedied, at the Contractor's expense. (Note: Radioactive material is allowed to be used for weld testing by applying the relevant security standards.)

Special attention shall be given to keeping the structures and surrounding grounds clean. The Contractor shall employ sufficient personnel to thoroughly clean and keep sanitary his work areas continuously each working day. Materials and supplies shall be stored in locations which will not block access ways and arranged to permit easy cleaning of the area.

Any material that is deposited elsewhere than in places designated or approved by the Owner will not be paid for, and the Contractor may be required to remove such material and deposit it where directed.

Upon the issue of the Taking Over Certificate for the Works, the Contractor shall clear away and remove all Construction Equipment, surplus material, wreckage, rubbish and Temporary Works. The Contractor shall leave the Site and the Works in a clean and safe condition. However, the Contractor may retain on Site, during the Defects Notification Period, such materials as are required for the Contractor to fulfil obligations under the Contract, subject to the Owner's approval.

The Contractor shall not, without written permission of the Owner which shall be given within ten (10) days of Contractor's request, remove any of the foregoing from the Site, nor sell, let or transfer any goods, Plant or other property, designated for this Project.

END OF CLAUSE 10

11. DEFECTS LIABILITY

11.1 Completion of Outstanding Work and Remedying Defects

In order that the Works and Contractor's Documents, and each Unit, shall be in the condition required by the Contract (fair wear and tear excepted) by the expiry date of the relevant Defects Notification Period or as soon as practicable thereafter, the Contractor shall:

- (a) complete any work which is outstanding on the date stated in a Taking-Over Certificate, within such reasonable time as is instructed by the Owner, and
- (b) execute all work required to remedy defects or damage, as may be notified by the Owner on or before the expiry date of the Defects Notification Period for the Unit.

If a defect appears or damage occurs, the Owner shall notify the Contractor within reasonable time.

The Contractor shall not be responsible for the cost of the repair, replacement or making good of any defects or damages due to the improper operation or maintenance of the Power Plant.

The warranties and remedies set forth in this Clause 11 or otherwise are exclusive and are in lieu of all other warranties whether statutory, express or implied (including all warranties of merchantability and fitness for a particular purpose). The remedies included in this Clause 11 shall be the Contractor's sole liability and the Owner's exclusive remedies in respect of defects during the relevant Defects Notification Period, whether claims of the Owner are based in contract, in tort (including negligence and strict liability) or otherwise

11.2 Cost of Remedying Defects

All work referred to in sub-paragraph (b) of Sub-Clause 11.1 [*Completion of Outstanding Work and Remedying Defects*] shall be executed at the risk and cost of the Contractor, if and to the extent that the work is attributable to:

- (a) the design of the Works.
- (b) Plant, Materials or workmanship not being in accordance with the Contract,
- (c) improper operation or maintenance which was attributable to matters for which the Contractor is responsible (under Sub-Clauses 5.5 to 5.7 or otherwise), or
- (d) failure by the Contractor to comply with any other obligation.

If and to the extent that such work is attributable to any other cause, the Owner shall give notice to the Contractor accordingly, and Sub-Clause 13.3 [*Variation Procedure*] shall apply

11.3 Extension of Defects Notification Period

The Owner shall be entitled subject to Sub-Clause 2.5 [*Owner's Claims*] to an extension of the Defects Notification Period for a Unit if and to the extent that the Unit or a major item of Power Plant (as the case may be, and after taking over) cannot be used for the purposes for which they are intended by reason of a defect or damage attributable to the Contractor.

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If delivery and/or erection of Plant and/or Materials was suspended under Sub-Clause 8.8 [*Suspension of Work*] or Sub-Clause 16.1 [*Contractor's Entitlement to Suspend Work*], the Contractor's obligations under this Clause shall not apply to any defects or damage occurring more than two years after the Defects Notification Period for the Plant and/or Materials would otherwise have expired.

In relation to any remedial work carried out in relation to a defect appearing or occurring during a Defects Notification Period, the relevant Defects Notification Period shall, in relation to such remedial works, be extended for a further twenty four (24) months from the date such remedial works are completed.

In no case shall the Defects Notification Period of a Unit be extended beyond four (4) years from the respective date of Taking Over of such Unit.

11.4 Failure to Remedy Defects

If the Contractor fails to remedy any defect or damage within a reasonable time, a date may be fixed by (or on behalf of) the Owner, on or by which the defect or damage is to be remedied. The Contractor shall be given reasonable notice of this date.

If the Contractor fails to remedy the defect or damage by this notified date and this remedial work was to be executed at the cost of the Contractor under Sub-Clause 11.2 [*Cost of Remedying Defects*], the Owner may select either (but not more than one) of :

- (a) require the Contractor to carry out further remedial works at the Contractor's cost; or
- (b) if it becomes obvious that the defect cannot be remedied by the Contractor, the Owner is entitled to have its remedied by another specialized company at the cost of the Contractor.
- (c) if the defect or damage deprives the Owner of substantially the whole benefit of a Unit, terminate the Contract in accordance with Sub-Clause 15.2 (j) [*Termination by Owner*] in respect of such Unit which cannot be put to the intended use.

11.5 Removal of Defective Work

If the defect or damage cannot be remedied expeditiously on the Site and the Owner gives consent, the Contractor may remove from the Site for the purposes of repair such items of Power Plant as are defective or damaged. This consent may require the Contractor to increase the amount of the Warranty Bond or submit refund bond by the full replacement cost of these items.

11.6 Further Tests

If the work of remedying of any defect or damage may affect the performance of the Works, the Owner may require the repetition of any of the tests described in the Contract, including Tests on Completion and/or Tests after Completion. The requirement shall be made by notice within twenty eight (28) days after the defect or damage is remedied.

These tests shall be carried out in accordance with the terms applicable to the previous tests, except that they shall be carried out at the risk and cost of the Party liable, under Sub-Clause 11.2 [*Cost of Remedying Defects*], for the cost of the remedial work.

11.7 Right of Access

Until the Performance Certificate has been issued, the Contractor shall have the right of access to all parts of the Works and to records of the operation and performance of the Works, except as may be inconsistent with the Owner's reasonable security restrictions.

11.8 Contractor to Search

The Contractor shall, if required by the Owner, search for the cause of any defect, under the direction of the Owner. Unless the defect is to be remedied at the cost of the Contractor under Sub-Clause 11.2 [*Cost of Remedying Defects*], the Cost of the search shall be agreed or determined in accordance with Sub-Clause 3.5 [*Determinations*] and shall be added to the Contract Price.

11.9 Performance Certificate

Performance of the Contractor's obligations shall not be considered to have been completed until the Owner has issued the Performance Certificate to the Contractor, stating the date on which the Contractor completed his obligations under the Contract.

The Owner shall issue the Performance Certificate within twenty eight (28) days after the latest of the expiry dates of the Defects Notification Periods, or as soon thereafter as the Contractor has supplied all the Contractor's Documents and completed and tested all the Works, including remedying any defects. If the Owner fails to issue the Performance Certificate accordingly:

- (a) the Performance Certificate shall be deemed to have been issued on the date twenty eight (28) days after the date on which it should have been issued, as required by this Sub-Clause, and
- (b) Sub-Clause 11.11 [*Clearance of Site*] shall be inapplicable.

Only the Performance Certificate shall be deemed to constitute acceptance of the Works.

11.10 Unfulfilled Obligations

After the Performance Certificate has been issued, each Party shall remain liable for the fulfilment of any obligation which remains unperformed at that time under the Contract. For the purposes of determining the nature and extent of unperformed obligations, the Contract shall be deemed to remain in force.

11.11 Clearance of Site

Upon receiving the Performance Certificate, the Contractor shall remove, store, or dispose and restore the original status (if any) as may be directed by the Owner, any remaining Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works from the Site.

If all these items have not been removed within sixty (60) days after the Owner issues the Performance Certificate, the Owner may sell or otherwise dispose of any remaining items. The Owner shall be entitled to be paid the costs incurred in connection with, or attributable to, such sale or disposal and restoring the Site.

The Contractor shall not, without written permission of the Owner which shall be given within three (03) days of Contractor's request, remove any of the foregoing from the Site, nor sell, let or transfer any Goods, Plant or other property, designated for this Project.



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Without written permission of Owner within said three (03) days, Contractor's request for removal are deemed accepted.

END OF CLAUSE 11



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12. **PROCEDURE FOR TESTS AFTER COMPLETION**
Not used.

13. **VARIATIONS AND ADJUSTMENTS**

13.1 **Right to Vary**

Variations may be initiated by the Owner in respect of a Unit at any time prior to issuing the Taking-Over Certificate for such Unit, either by an instruction or by a request for the Contractor to submit a proposal. A Variation shall not comprise the omission of any work which is to be carried out by others.

The Contractor shall execute and be bound by each Variation, unless the Contractor promptly gives notice to the Owner stating (with supporting particulars) that (i) the Contractor cannot readily obtain the Goods required for the Variation, (ii) it will reduce the safety or suitability of the Works or cause a negative impact to environment regulated by the applicable Law, or (iii) it will have an adverse impact on the achievement of the Performance Guarantees. Upon receiving this notice, the Owner shall cancel, confirm or vary the instruction.

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13.2 **Contractor's Right to Submit Proposal**

The Contractor may, at any time, submit to the Owner a written proposal which (in the Contractor's opinion) will, if adopted, (i) accelerate completion, (ii) reduce the cost to the Owner of executing, maintaining or operating the Works, (iii) improve the efficiency or value to the Owner of the completed Works, or (iv) otherwise be of benefit to the Owner.

The proposal shall be prepared at the cost of the Contractor and shall include the items listed in Sub-Clause 13.3 [*Variation Procedure*].

13.3 **Variation Procedure**

If the Owner requests a proposal, prior to instructing a Variation, the Contractor shall respond in writing as soon as practicable, either by giving reasons why he cannot comply (if this is the case) or by submitting:

- (a) a description of the proposed design and/or work to be performed and a programme for its execution,
- (b) the Contractor's proposal for any necessary modifications to the programme according to Sub-Clause 8.3 [*Programme*] and to the Time for Completion, and
- (c) the Contractor's proposal for adjustment to the Contract Sum.

The Owner shall, as soon as practicable after receiving such proposal (under Sub-Clause 13.2 [*Contractor's Right to Submit Proposal*] or otherwise), respond with approval, disapproval or comments. The Contractor shall not delay any work whilst awaiting a response.

Each instruction to execute a Variation, with any requirements for the recording of Costs and time execution, shall be issued by the Owner to the Contractor, who shall acknowledge receipt.

Upon instructing or approving a Variation, the Owner shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine adjustments to the Contract Sum and the Terms and Procedures of Payment. These adjustments shall take account of the

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Contractor's submissions under this Sub-Clause 13.2 [*Contractor's Right to Submit Proposal*] if applicable.

13.4 **Payment in Applicable Currencies**

If the Contract provides for payment of the Contract Price in more than one currency, then whenever an adjustment is agreed, approved or determined as stated above, the amount payable in each of the applicable currencies shall be specified. For this purpose, reference shall be made to the actual or expected currency proportions of the Cost of the varied work, and to the proportions of various currencies specified for payment of the Contract Price.

13.5 **Not used.**

13.6 **Not Used**

13.7 **Adjustments for Changes in Legislation**

The Contract Price shall be adjusted taking account of any increase or decrease in Cost resulting from a change in the Laws of the Country (including the introduction of new Laws and, the repeal or modification of existing Laws) or in the judicial or official governmental interpretation of such Laws, made after the Effective Date, which affect the Contractor in the performance of obligations under the Contract.

If the Contractor suffers (or will suffer) delay and/or incurs (or will incur) additional Cost as a result of these changes in the Laws or in such interpretations, made after the Effective Date, the Contractor shall give notice to the Owner and shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any such Cost, which shall be added to the Contract Price.

After receiving this notice, the Owner shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters.

13.8 **Not used.**

13.9 **Valuation of Variation**

Valuation of Variation shall be determined mutually by the Parties in accordance with prevailing regulations.

13.10 **Disagreement on Adjustment of the Contract Price**

Upon instructing or approving a Variation under Clause 13 hereto, the Owner shall consult with the Contractor in an endeavour to reach an mutually agreement. If agreement is not achieved, the Owner shall make a decision in accordance with the Contract. The decision of the Owner shall be final unless the matter is referred to Clause 20 [*Claims, Disputes and Arbitration*].

13.11 **Variation Work may be awarded to the others**

In case any Variation Work shall be required in the proper performance of the Work contemplated under this Contract, it is understood that if the Contractor and the Owner fail to arrive at any agreement as to the price of such Variation Work, the Owner reserves



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the right to have such Variation Work done by other persons, firm, or corporation other than the Contractor, or to perform the same under the charge and supervision of the Owner; in such cases no Claim of any sort may be made to the Owner by the Contractor on account thereof.

END OF CLAUSE 13

14. **CONTRACT PRICE AND PAYMENT**

14.1 **The Contract Price**

Unless otherwise stated in the Contract, the Contract Price is a lump-sum amount and shall include the following:

- (a) The Contract Price includes all costs required to complete the Works in accordance with the provisions of the Contract. These costs include, but are not limited to:
 - (i) All associated costs, taxes, fees, and charges necessary for the implementation of the Contract in compliance with applicable laws;
 - (ii) Profit margins;
 - (iii) Copyright-related expenses;
 - (iv) Contingency allowances for potential risks during Contract execution.
 - (v) The Contract Price does not include exempted import taxes and the corresponding value-added tax (VAT) on those exempted imports, as prescribed by law.
- (b) the Contractor shall pay all taxes, duties and fees required to be paid by him under the Contract, and the Contract Price shall not be adjusted for any of these costs, except as stated in Sub-Clause 13.7 [*Adjustments for Changes in Legislation*] and Sub-Clause 13.8 [*Adjustment for Changes in Costs*].

14.2 **Not Used**

14.3 **Advance Payment**

The Owner shall make an advance payment as equivalent to fifteen percent (15%) of the Contract Price to the Contractor in accordance with the Appendix 1 [*Terms and Procedure of Payment*] for mobilization of personnel and perform the design, with the timing for advance payment as stated in Clause 14.8.b hereunder. To receive the advance payment, the Contractor shall submit the application for advance payment in accordance with this Sub-Clause.

The Owner shall make advance payment to the Contractor after receiving the application for advance payment from the Contractor and (i) Performance Bond as regulated in Sub-Clause 4.2.2 [*Performance Bond*]; (ii) Advance Payment Bond as regulated at Sub-Clause 4.2.3 [*Advance Payment Bond*] for the Advance Payment amount and in the same currency of the Advance Payment. These kinds of Bonds must satisfy all requirements as stated at Sub-Clause 4.2.1 [*General Requirements*] and must be approved by the Owner.

Contractor has to guarantee that Advance Payment Bond shall remain effective until the total amount of the Advance Payment has been totally recovered. However the value of Advance Payment Bond can be reduced an amount as equivalent to the deducted amount from each payment. If the Advance Payment Bond clearly states the expiry dated and upon the date twenty eighth (28th) prior to the expiry date, total value of Advance Payment has not yet been recovered then the Contractor has to extend the effective date of the Advance Payment Bond until all the Advance Payment has been totally recovered.

The advance payment shall be recovered through proportional deductions from payments. Such deductions shall be made at the amortization rate at eighteen point

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seventy five percent (18,75%) as stipulated in Contract Agreement of the executed value, which shall be applied to the amount otherwise due (excluding the advance payment and deductions in accordance with Sub-Clause 2.5 [*Owner's Claims*] and repayments of retention), until such time as the advance payment has been repaid.

The advance payment shall be totally deducted when eighty percent (80%) of Contract Price has been paid by the Owner to the Contractor in accordance with the Contract.

If the Advance Payment has not been recovered prior to the issuance of the Taking-Over Certificate for Unit 1 or prior to termination under Clause 15 [*Termination by Owner*], Clause 16 [*Suspension and Termination by Contractor*] or Clause 19 [*Force Majeure*], as the case may be, the entire outstanding balance shall immediately become due and payable by the Contractor to the Owner.

14.4 **Application for Payments**

The Contractor shall submit four (04) copies of each application for payment to the Owner, in a form approved by the Owner, showing detail the amounts to which the Contractor considers himself to be entitled, together with supporting documents as stated in Appendix 1 of the Contract [*Terms and Procedures of Payment*].

The Application for payment shall include the following items, as applicable, which shall be expressed in the various currencies in which the Contract Price is payable, in the sequence listed:

- (a) the estimated contract value of the Works executed (including Variations but excluding items described in sub-paragraphs (b) to (f) below);
- (b) any amounts to be added and deducted for changes in legislation and changes in cost, in accordance with Sub-Clause 13.7 [*Adjustments for Changes in Legislation*] and Sub-Clause 13.8 [*Adjustments for Changes in Cost*];
- (c) any amount to be deducted for retention, calculated by applying the percentage of retention stated in Sub-clause 14.10 [*Payment Withheld and Retention*] to the total of the above amounts, until the amount so retained by the Owner reaches the limit of retention money stated in Sub-clause 14.10 [*Payment Withheld and Retention*];
- (d) any amounts to be added to and deducted from the advance payment and repayments in accordance with Sub-Clause 14.3 [*Advance Payment*];
- (e) any other additions or deductions which may have become due under the Contract or otherwise, including those under Clause 20 [*Claims, Disputes and Arbitration*]; and
- (f) the deduction of amounts included in previous statements;

14.5 **Payment Procedures**

Unless otherwise stated in the Contract, after completion of part or all of Works, Contractor shall submit to the Owner an Application for Payment signed by the authorized Representative. Each Application for Payment shall set forth the earned value for such Works and the sum of all prior payments made to that date. Each Application for Payment will be accompanied by:

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- (a) a status report describing, in such detail as Owner may reasonably request, the percentage completion of Works from the prior Progress Report;
- (b) certification from the Owner's Representative that part or all of Works within payment period has been achieved;
- (c) releases and waivers of liens (other than Permitted Liens) (if requested by Owner), which are effective under applicable Law and in form and substance satisfactory to Owner, from Contractor and all Subcontractors that performed Work included in such Application for Payment, for all Works covered by such Application for Payment (or any one prior thereto); and
- (d) if there is pending any dispute with respect to Work covered by such Application for Payment as a result of which Contractor intends to withhold payment from such Subcontractor, a report of such dispute and the circumstances thereof.

Within twenty eight (28) days after receipt of an Application for Payment together with the full set of payment documents which complies in all material respects with this Sub-Clause 14.5 [*Payment Procedures*], Owner shall pay the amount requested or pay such lesser amount as it determines is properly due, in each case less any amounts retained pursuant to Sub-Clause 14.10 [*Payment Withheld and Retention*]. If less than the full amount of the Application for Payment less amounts retained pursuant to Sub-Clause 14.10 is paid, Owner shall state in writing the reasons for paying such lesser sum.

In any cases the payment of Works and/or Goods shall not release the Contractor from any his obligations to perform the Works under the Contract and does not mean that the Owner has accepted or satisfied with the Works performed by the Contractor.

Payment procedures for the Works and/or Goods shall be in compliance with Appendix 1 [*Terms and Procedures of Payment*].

14.6 Plant and Material Intended for the Works

If the Contractor is entitled, under the Contract, to an interim payment for Plant and Materials which are not yet on the Site, the Contractor shall nevertheless not be entitled to such payment unless:

- (a) the relevant Plant and Materials are in the Country and have been marked as the Owner's property in accordance with the Owner's instructions; or
- (b) the Contractor has delivered to the Owner evidence of insurance and a bank guarantee in a form and issued by an entity approved by the Owner in amounts and currencies equal to such payment. This guarantee may be in a similar form to the form referred to in Sub-Clause 14.3 [*Advance Payment*] and shall be valid until the Plant and Materials are properly stored on Site and protected against loss, damage or deterioration; or
- (c) Material, structure, product to be constructed, installed into the Works after delivered to the Site shall be tested, observed of the quality and evaluated to be passed in accordance with the quality system of the Owner and the Contractor. However, in order to make payment under this sub-paragraph (c), both Parties has to sign a Contract appendix which shall be the basis of making payment.

14.7 Payments

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Thereafter, the Owner shall, within twenty eight (28) Working days after receiving an invoice and supporting documents, give to the Contractor notice of any items in the invoice with which the Owner disagrees, with supporting particulars. Payments due shall not be withheld, except that:

- (vi) if anything supplied or work done by the Contractor is not in accordance with the Contract, the cost of rectification or replacement may be withheld until rectification or replacement has been completed; and/or
- (vii) if the Contractor was or is failing to perform any work or obligation in accordance with the Contract, and had been so notified by the Owner, the value of this work or obligation may be withheld until the work or obligation has been performed.

The Owner may, by any payment, make any correction or modification that should properly be made to any amount previously considered due. Payment shall not be deemed to indicate the Owner's acceptance, approval, consent or satisfaction.

14.8 **Timing of Payments**

Except as otherwise stated in Sub-Clause 2.5 [*Owner's Claims*], the Owner shall pay to the Contractor:

- (a) The date of payment shall be the date when the Contractor has been notified by the Owner with bank notices in accordance with the Clause 14 [*Contract price and Payment*] of Conditions of Contract.
- (b) the advance payment:

The Owner will make the Advance Payment to the Contractor in accordance with Sub-Clause 14.3 [Advance Payment] within twenty eight (28) Working Days after the Contract becomes effective and receiving the Application for Advance Payment from the Contractor and the valid Advance Payment Bond as stated in the Sub-Clause 4.2.3 [*Advance Payment Bond*] and the Performance Bond as stated in the Sub-Clause 4.2.2 [*Performance Bond*] of the Contract.

- (c) the amount which is due in respect of each invoice, other than the Final Statement, within twenty eight (28) Working Days after receiving the invoice and supporting documents. The Owner shall have twenty eight (28) Working Days from the receipt of invoice and supporting documents to review and determine their compliance with requirements of the Contract and shall provide to the Contractor and the financing bank either an objection or an acceptance of such documents. Such objection documents shall be send to the Contractor to make the necessary correction within fifteen (15) Working Days from the receiving date. Upon receipt by the Contractor and financing bank of such acceptance, upon failure by the Contractor and financing bank to receive such acceptance or objection within twenty eight (28) Working Days after the date of receipt of the documents by the Owner, such documents shall be considered accepted with such acceptance or deemed acceptance being sufficient to trigger the payment/the payment obligation; and

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- (d) the final amount due, within forty five (45) working days after receiving the Final Statement and written discharge in accordance with Sub-Clause 14.11 [*Statement on Completion*]

The Application for Payment must specify the value in USD and/or VND in accordance with each member of Consortium's price and in accordance with the Contract.

14.9 **Not used**

14.10 **Payment Withheld and Retention**

The Owner may withhold from any payment due to Contractor such amounts as the Owner deem reasonably necessary or appropriate to protect it from Liability because of any one or more of the following reasons:

- (a) Defects in any Work, whether or not payment has been made therefore; failure of the Contractor to follow Sub-clause 2.5 [*Owner's Claims*];
- (b) the filing of third party claims relating to the Project for which Contractor is liable and reasonable evidence of such claims;
- (c) Contractor's failure to make payments to Subcontractors or workers for Work, which causes adverse effect to the progress of Works
- (d) any overpayments made by the Owner with respect to a previous payment;
- (e) any undisputed past-due liquidated damages
- (f) a Dispute exists as to the accuracy or completeness of any Application for Payment (but only with respect to the amount then in Dispute)

Any retention from payment will be subjected to Clause 14.5 [*Payment Procedure*] and this Clause 14.10. The Dispute due to such retention shall be dealt with under Clause 14.15 [*Payment Dispute*] and shall not be a basis for withholding payment of any undisputed amount. During the pendency of any such Dispute and the resolution thereof, Contractor shall continue to perform the Work in accordance with the provisions set forth herein.

The payment of retention money shall be made in accordance with Appendix 1 [*Terms and Procedure of Payment*] in the Contract after the Final Statement has been agreed by the Owner and the Contractor in accordance with Sub-Clause 14.11 [*Statement at Completion*].

14.11 **Statement at Completion**

Within eighty four (84) days after receiving the Taking-Over Certificate for the Works or the date on which the Taking-Over Certificate shall be deemed to be issued according to clause 10.1 [*Taking Over of the Works and Unit*], the Contractor shall submit to the Owner a draft final statement at completion with supporting documents, in accordance with Sub-Clause 14.4 [*Application for Payments*], showing:

- (a) the value of all work done in accordance with the Contract up to the date stated in the Taking-Over Certificate for the Works,
- (b) any further sums which the Contractor considers to be due, and

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The Owner shall make payments that are considered to be due according to the Contract. The Owner shall consider the draft of the final statement within fifteen (15) Working Days from the date of its submission to the Owner. In case the Owner does not present objections on the draft of the final statement within that term, the draft of the final statement shall be deemed agreed with the Owner and Owner is bound by it. This statement is referred to in these Conditions as the "Final Statement"

The Owner shall then give notice to the Contractor in accordance with Sub-Clause 14.7 [*Payments*] and make payment in accordance with Sub-Clause 14.8 [*Timing of Payments*].

If the Owner disagrees with or cannot verify any part of the draft final statement, the Contractor shall submit such further information as the Owner may reasonably require and shall make such changes in the draft as may be agreed between them. The Contractor shall then prepare and submit to the Owner the final statement as agreed. This agreed statement is referred to in these Conditions as the "Final Statement".

However if, following discussions between the Parties and any changes to the draft final statement which are agreed, it becomes evident that a dispute exists, the Owner shall pay the agreed parts of the draft final statement in accordance with Sub-Clause 14.7 [*Payments*] and Sub-Clause 14.8 [*Timing of Payments*]. Thereafter, if the dispute is finally resolved under Sub-Clause 20.2 [*Amicable Settlement*] or Sub-Clause 20.3 [*Arbitration*], the Contractor shall then prepare and submit to the Owner a Final Statement.

When the application for the final payment is submitted by the Contractor in this Sub-Clause, the Contractor shall submit a written "Minutes of the Contract execution completion" which confirms that the application for the final payment represents the full and final settlement of all monies due to the Contractor under or in connection with the Contract, provided that, such Minutes will not become effective until the Owner has paid any amount due to the Contractor.

14.12 **Cessation of Owner's Liability**

The Owner shall not be liable to the Contractor for any matter or thing under or in connection with the Contract or execution of the Works, except to the extent that the Contractor shall have included an amount expressly for it:

- (a) in the Final Statement; and also
- (b) (except for matters or things arising after the issue of the Taking-Over Certificate for the Works) in the Statement at completion described in Sub-Clause 14.11 [*Statement at Completion*].

However, this Sub-Clause shall not limit the Owner's liability under his indemnification obligations, or the Owner's liability in any case of fraud, deliberate default or reckless misconduct by the Owner.

14.13 **Currencies of Payment**

The Contract Price shall be paid in the currency or currencies named in Appendix 1 [*Terms and Procedure of Payment*] in the Contract. If more than one currency is so named, payments shall be made as follows:

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- (a) if the Contract Price was expressed in Local Currency only:
 - (i) the proportions or amounts of the Local and Foreign Currencies, and the fixed rates of exchange to be used for calculating the payments, shall be as stated in Appendix 1 of the Contract, except as otherwise agreed by both Parties;
 - (ii) payments and deductions under Sub-Clause 13.7 [*Adjustments for Changes in Legislation*] shall be made in the applicable currencies and proportions; and
 - (iii) other payments and deductions under sub-paragraphs (a) to (d) of Sub-Clause 14.4 [*Application for Payments*] shall be made in the currencies and proportions specified in sub-paragraph (a)(i) above;
- (b) payment of the damages specified in the Contract shall be made in the currencies and proportions specified in the Contract;
- (c) other payments to the Owner by the Contractor shall be made in the currency in which the sum was expended by the Owner, or in such currency as may be agreed by both Parties; and
- (d) if any amount payable by the Contractor to the Owner in a particular currency exceeds the sum payable by the Owner to the Contractor in that currency, the Owner may recover the balance of this amount from the sums otherwise payable to the Contractor in that currency.

14.14 Taxes and Duties

The Contractor shall be liable and responsible for all taxes, duties, tariffs, fees, imposes, excises and other taxes and charges payable in connection with the Contract levied on the Contractor in strict accordance with the applicable Laws of Vietnam. Contractor shall hold the Owner harmless with respect to claims resulting from tax obligations of the Contractor and Subcontractors in accordance with applicable regulations.

The Contractor shall pay custom duties, taxes and all other duties in respect of all material, Equipment and Plant components to be supplied by Contractor for the construction and erection as well as all tools and erection devices required thereof which arrive in Vietnam for the sole purpose of the implementation of the Contract and in accordance with the terms and conditions of the Contract.

The Contractor shall obtain, at its own cost, work permits from the authorities to enable any foreign personnel to Work in Vietnam. The Contractor shall be responsible for all formalities in connection with passports, obtaining visas, police permits and expenses for customs duties related to personal goods of the foreign personnel employed for the Work.

The Contractor shall accept full and exclusive liability for the payment of fees or taxes imposed by authorities having jurisdiction for unemployment insurance, old age pension, immunities or similar taxes, if any, which are determined by remuneration paid to the Contractor's employees. The Contract Price shall not be adjusted or amended in respect of such expenses.

The Contract price include import tax, except for taxes to be exempted under applicable Law of Vietnam and corresponding VAT tax. The Contractor shall acknowledge that the

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Owner shall apply and obtain the import tax exemption to goods, materials, equipment which constitute the fixed assets of the Power Plant, except for the goods, materials, equipment that can be produced, manufactured in Vietnam by local manufacturers. In order to apply the tax exemption, the Contractor has to submit the detail list of goods, materials, equipment to be imported at the Owner's request within three (03) working days from the Commencement Date. In all cases, the Contractor shall be responsible for its own costs, related fees and charges for any import tax arising out of goods, materials, equipment that are unable to apply the tax exemption or which can be produced within Vietnam but the Contractor decides to buy abroad.

For the avoidance of doubt, the Contractor shall be responsible for carrying out all import-related activities under the Contract using the tax exemption list provided by the Owner. The Contractor shall also be responsible for providing explanations to inspection and audit authorities and for implementing any conclusions, decisions, or directives issued as a result of such inspections or audits related to the importation of goods within the scope of the Contract. The Contractor shall bear all associated costs, including any penalties or charges arising therefrom, if any.

14.15 **Payment Disputes**

If there is a Dispute in respect to an amount owing, one Party shall (i) give notice to the other Party of such disputed amount together with sufficient information to outline the nature of the Dispute, which notice shall be delivered on or before the due date for payment of the disputed amount; (ii) pay undisputed amounts on or before the due date therefore; or (iii) use the dispute resolution procedure set forth in Clause 20 [*Claims, Disputes and Arbitration*].

END OF CLAUSE 14

15. TERMINATION BY OWNER

15.1 Notice to Correct

If the Contractor fails to carry out any obligation under the Contract, the Owner may by notice require the Contractor to make good the failure and to remedy it within a specified reasonable time.

15.2 Termination by Owner

The Owner shall be entitled to terminate the Contract if the Contractor:

- (a) fails to comply with Sub-Clause 4.2 [*Bonds*] or to correct a breach by the Contractor of a material obligation prior to the expiry of a notice under Sub-Clause 15.1 [*Notice to Correct*], or
- (b) abandons the Works or otherwise plainly demonstrates the intention not to continue performance of his obligations under the Contract, or
- (c) without reasonable excuse fails to proceed with the Works in accordance with Clause 8 [*Commencement, Delays and Suspension*], or
- (d) subcontracts the whole of the Works in breach of Sub-Clause 4.4 [Subcontractors] or assigns the Contract without the required agreement under Sub-Clause 4.2 [Performance Security], or
- (e) becomes bankrupt or insolvent, goes into liquidation, has a receiving or administration order made against him, compounds with his creditors, or carries on business under a receiver, trustee or manager for the benefit of his creditors, or if any act is done or event occurs which (under applicable Laws) has a similar effect to any of these acts or events, or
- (f) gives or offers to give (directly or indirectly) to any person any bribe, gift, gratuity, commission or other thing of value, as an inducement or reward:
 - (i) for doing or forbearing to do any action in relation to the Contract, or
 - (ii) for showing or forbearing to show favour or disfavour to any person in relation to the Contract, or
- (g) fails to attain the Minimum Performance Levels solely from his failure as referred to in Sub-Clause 9.4 [*Failure to Pass Tests on Completion*] after expiry of Cure Period, or
- (h) fails to pay any sum due to the Owner hereunder (being a sum which is in excess of the amount that the Owner at the time the relevant payment becomes due and payable is able to drawdown under the Bonds held by the Owner at such time, and which is not reasonably in dispute) and such failure is continuing for forty two (42) days following notice of failure to the Contractor, or
- (i) has attainment of the limit of liability on Delay Liquidated Damages in accordance with Sub-Clause 8.7, or
- (j) has the existence of a defect depriving the Owner of the benefit of the whole, or substantially the whole, of the Works that is irremovable after one hundred and eighty (180) days of grace period given by the Owner to the Contractor to correct or remedy that defect.

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or if any of the Contractor's Personnel, agents or Subcontractors gives or offers to give (directly or indirectly) to any person any such inducement or reward as is described in this sub-paragraph (f). However, lawful inducements and rewards to Contractor's Personnel shall not entitle termination.

In any of these events or circumstances, the Owner may, upon giving twenty one (21) days' notice to the Contractor, terminate the Contract and expel the Contractor from the Site. However, in the case of sub-paragraph (e) or (f), the Owner may by notice terminate the Contract immediately.

The Owner's election to terminate the Contract shall not prejudice any other rights of the Owner, under the Contract or otherwise.

The Contractor shall then leave the Site and deliver any required Goods, all Contractor's Documents, and other design documents made by or for him, to the Owner. However, the Contractor shall use his best efforts to comply immediately with any reasonable instructions included in the notice (i) for the assignment of any subcontract, and (ii) for the protection of life or property or for the safety of the Works.

After termination, the Owner may complete the Works and/or arrange for any other entities to do so. The Owner and these entities may then use any Goods, Contractor's Documents and other design documents made by or on behalf of the Contractor in connection with the Works.

The Owner shall then give notice that the Contractor's Equipment and Temporary Works will be released to the Contractor at or near the Site. The Contractor shall promptly arrange their removal, at the risk and cost of the Contractor. However, if by this time the Contractor has failed to make a payment due to the Owner, these items may be sold by the Owner in order to recover this payment. Any balance of the proceeds shall then be paid to the Contractor.

15.3 Valuation at date of Termination

- 15.3.1. If the Owner terminates the Contractor's engagement pursuant to Sub-Clause 15.2 [*Termination by Owner*], the Contractor's entitlement to compensation shall be as determined in accordance with this Clause 15.3.
- 15.3.2. Following termination of this Contract pursuant to Sub-Clause 15.2 [*Termination by Owner*], the Owner may elect to do one of the following within six (6) months of such termination:
- (a) to have the Works or Units completed and commissioned by itself or by other parties, the Contractor then being liable to the Owner in accordance with this Clause 15.3; or
 - (b) to accept the Works or Units as having attained Taking Over subject to a fair and reasonable reduction in the Contract Price, such reduction to be agreed by both Parties or, in default of agreement within forty five (45) days after the termination, determined by the Owner in accordance with Sub-Clause 3.5 [*Determination*] (subject to dispute resolution in accordance with Clause 20 [*Claims, Disputes and Arbitration*]). Any such reduction shall be agreed or determined with reference to the condition and performance of the Power Plant and the effect on the Works of the termination of the Contractor's engagement under the Contract (including but

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not limited to the impact of delay and performance shortfalls) and the Contractor shall pay or allow to the Owner such reductions forthwith upon such agreement or determination together with all those losses and expenses set out in Clause 15.3.3 (b)(ii) and (iii).

15.3.3. Where Sub-Clause 15.3.2(a) applies, then the following provisions shall be applied:

- (a) within thirty (30) days after the termination pursuant to Sub-Clause 15.2 [*Termination by Owner*], the Owner shall draw up and notify to the Contractor a provisional statement containing the Owner's fair and reasonable estimate of the amount which will be payable in accordance with this Sub-Clause 15.3.
- (b) within thirty (30) days after the completion of the Works, the Owner shall draw up an account setting out:
 - (i) any additional cost to the Owner of completing the Works (being any excess of the sums paid or payable to the Contractor under the Contract plus the reasonable costs incurred by the Owner in completing the Works over and above the Contract Price) or, where such sums and costs are less than the Contract Price, any shortfall;
 - (ii) the proved cost of rectification of any Defects; and
 - (iii) all justified loss and/or expenses incurred by the Owner as a result of the termination (including reasonable financing costs and any Delay Liquidated Damages and/or Performance Liquidated Damages payable in accordance with Sub-Clause 8.7 [*Delay Damages*] and/or Sub-Clause 9.4 [*Failure to Pass Tests on Completion*]).

The resulting balance shall be payable by the Owner to the Contractor or by the Contractor to the Owner (as the case may be), after making due allowance for any payment made by the Contractor under the estimate pursuant to Sub-clause 15.3.3(a).

15.3.4. Termination of the Contractor's engagement by the Owner shall not prejudice any other rights or remedies of the Owner under the Contract. The remedies expressly stated in this Contract shall be the sole and exclusive remedies of the Owner for the Contractor's liabilities arising out of or in connection with the Works or the Contract, despite any remedy otherwise available at law or in equity. Termination of the Contractor's engagement by the Owner shall not prejudice any other rights or remedies of the Owner under the Contract or otherwise.

15.4 **Payment after Termination**

After a notice of termination under Sub-Clause 15.2 [*Termination by Owner*] has taken effect, the Owner may:

- (a) proceed in accordance with Sub-Clause 2.5 [*Owner's Claims*],
- (b) withhold further payments to the Contractor until the costs of design, execution, completion and remedying of any defects, damages for delay in completion (if any), and all other costs incurred by the Owner, have been established, and/or
- (c) recover from the Contractor any justified losses and damages incurred by the Owner and any extra costs of completing the Works, after allowing for any sum due to the Contractor under Sub-Clause 15.3 [*Valuation at Date of Termination*].

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After recovering any such losses, damages and extra costs, the Owner shall pay any balance to the Contractor.

15.5 **Owner's Entitlement to Termination**

The Owner shall be entitled to terminate the Contract, at any reasonable time for the Owner's convenience when the Owner decides to terminate the Project, by giving the prior notice of such termination to the Contractor. After receiving the notice of the Owner, both parties shall discuss and apply the further steps of payment in accordance with Conditions of the Contract. The termination shall take effect twenty eight (28) days after the mutual agreement for payment is reached. The Owner shall not terminate the Contract under this Sub-Clause in order to execute the Works himself or to arrange for the Works to be executed by another contractor.

After this termination, the Contractor shall proceed in accordance with Sub-Clause 16.3 [*Cessation of Work and Removal of Contractor's Equipment*] and shall be paid in accordance with Sub-Clause 19.6 [*Optional Termination, Payment and Release*].

END OF CLAUSE 15

16. SUSPENSION AND TERMINATION BY CONTRACTOR

16.1 Contractor's Entitlement to Suspend Work

If the Owner fails to comply with Sub-Clause 14.8 [*Timing of Payments*], the Contractor may, after giving not less than twenty one (21) days' notice to the Owner, suspend work (or reduce the rate of work) unless and until the Contractor has received the reasonable evidence or payment, as the case may be and as described in the notice.

The Contractor's action shall not prejudice his entitlements to financing charges under Sub-Clause 14.9 [*Deferred Payment*] and to termination under Sub-Clause 16.2 [*Termination by Contractor*].

If the Contractor subsequently receives such evidence or payment (as described in the relevant Sub-Clause and in the above notice) before giving a notice of termination, the Contractor shall resume normal working as soon as is reasonably practicable.

If the Contractor suffers delay and/or incurs Cost as result of suspending work (or reducing the rate of work) in accordance with this Sub-Clause, the Contractor shall give notice to the Owner and shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any reasonable Cost, which shall be added to the Contract Price.

After receiving this notice, the Owner shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters.

16.2 Termination by Contractor

The Contractor shall be entitled to terminate the Contract if :

- (a) [Not used]
- (b) the Contractor does not receive the amount due within one hundred and eight (180) days after the expiry of the time stated in Sub-Clause 14.8 [*Timing of Payments*] within which payment is to be made (except for deductions in accordance with Sub-Clause 2.5 [*Owner's Claims*]) and for the case that the Financing Arrangement is late as stipulated under Sub-Clause 14.9 [*Deferred Payment*], or
- (c) the Owner substantially fails to perform his obligations under the Contract and such failure constitutes a material breach of, the Owner's obligations under the Contract, or
- (d) the Owner fails to comply with Sub-Clause 1.7 [*Assignment*], or
- (e) a prolonged suspension affects the whole of the Works as described in Sub-Clause 8.11 [*Prolonged Suspension*], or
- (f) the Owner becomes bankrupt or insolvent, goes into liquidation, has a receiving or administration order made against him, compounds with his creditors, or carries on business under a receiver, trustee or manager for the benefit of his creditors, or if any act is done or event occurs which (under applicable Laws) has a similar effect to any of these acts or events.

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In any of these events or circumstances, the Contractor may, upon giving fourteen (14) days' notice to the Owner, terminate the Contract. However, in the case of subparagraphs (e) or (f), the Contractor may by notice terminate the Contract immediately.

The Contractor's election to terminate the Contract shall not prejudice any other rights of the Contractor, under the Contract or otherwise.

16.3 Cessation of Work and Removal of Contractor's Equipment

After a notice of termination under Sub-Clause 15.5 [*Owner's Entitlement to Termination*], Sub-Clause 16.2 [*Termination by Contractor*] or Sub-Clause 19.6 [*Optional Termination, Payment and Release*] has taken effect, the Contractor shall promptly:

- (a) cease all further work, except for such work as may have been instructed by the Owner for the protection of life or property or for the safety of the Works,
- (b) hand over Contractor's Documents, Plant, Materials and other work, for which the Contractor has received payment, and
- (c) remove all other Goods from the Site, except as necessary for safety, and leave the Site.

16.4 Payment on Termination

After a notice of termination under Sub-Clause 16.2 [*Termination by Contractor*] has taken effect, the Owner shall promptly:

- (a) return to the Contractor any bond (including any 'refund bond') provided by the Contractor, and
- (b) pay the Contractor in accordance with Sub-Clause 19.6 [*Optional Termination, Payment and Release*], and
- (c) pay the Contractor the amount of any justified loss or damage incurred by the Contractor as a result of the termination.

END OF CLAUSE 16

17. RISK AND RESPONSIBILITY

17.1 Indemnities

The Contractor shall, at Contractor's cost and risk, indemnify and hold harmless the Owner, the Owner's Personnel, and their respective agents, against and from all claims, damages, losses and expenses (including legal fees and expenses) in respect of:

- (a) bodily injury, sickness, disease or death, of any person whatsoever arising out of or in the course of or by reason of the design, execution and completion of the Works and the remedying of any defects, unless attributable to any negligence, wilful act or breach of the Contract by the Owner, the Owner's Personnel, or any of their respective agents, and
- (b) damage to or loss of any property, real or personal (other than the Works), to the extent that such damage or loss:
 - (i) arises out of or in the course of or by reason of the design, execution and completion of the Works and the remedying of any defects, and
 - (ii) is not attributable to any negligence, wilful act or breach of the Contract by the Owner, the Owner's Personnel, their respective agents, or anyone directly or indirectly employed by any of them.

The Owner shall indemnify and hold harmless the Contractor, the Contractor's Personnel, and their respective agents, against and from all claims, damages, losses and expenses (including legal fees and expenses) in respect of bodily injury, sickness, disease or death, which is attributable to any negligence, wilful act or breach of the Contract by the Owner, the Owner's Personnel, or any of their respective agents.

If any proceedings are brought or any claim is made against a Party entitled to the benefit of an indemnity under this Clause 17.1, that Party shall promptly give the indemnifying Party notice thereof and the indemnifying Party may at its own expense but in the other Party's name conduct such proceedings or claim and any negotiations for settlement of any such proceedings or claim. If the indemnifying Party fails to notify the other Party within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the other Party shall be free to conduct the same on its own behalf.

Unless the indemnifying Party has so failed to notify the other Party within the twenty-eight (28) day period, the other Party shall make no admission which may be prejudicial to the defence of any such proceedings or claims. The other Party shall, at the indemnifying Party's request, afford all available assistance to the indemnifying Party in conduction any such proceeding or claim and shall be reimbursed by the indemnifying Party for all reasonable expenses incurred in so doing.

17.2 Contractor's Care of the Works

The Contractor shall take full responsibility for the care of the Works and Goods from the Commencement Date until the Taking-Over Certificate is issued (or is deemed to be issued under Sub-Clause 10.1 [*Taking Over of the Works and Unit*]) for the Units, when responsibility for the care of the Works shall pass to the Owner. If a Taking-Over Certificate is issued (or is so deemed to be issued) for any Unit, responsibility for the care of such Unit shall then pass to the Owner.

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After responsibility has accordingly passed to the Owner, the Contractor shall take responsibility for the care of any work which is outstanding on the date stated in a Taking-Over Certificate, until this outstanding work has been completed.

If any loss or damage happens to the Works, Goods or Contractor's Documents during the period when the Contractor is responsible for their care, from any cause not listed in Sub-Clause 17.3 [*Owner's Risks*], the Contractor shall rectify the loss or damage at the Contractor's risk and cost, so that the Works, Goods and Contractor's Documents conform with the Contract.

The Contractor shall be liable for any loss or damage caused by any actions performed by the Contractor after a Taking-Over Certificate has been issued. The Contractor shall also be liable for any loss or damage which occurs after a Taking-Over Certificate has been issued and which arose from a previous event for which the Contractor was liable.

17.3 Owner's Risks

The risks referred to in Sub-Clause 17.4 [*Consequence of Owner's Risks*] below are:

- (a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,
- (b) rebellion, terrorism, revolution, insurrection, military or usurped power, or civil war within the Country,
- (c) riot, commotion or disorder within the Country by persons other than the Contractor's Personnel and other employees of the Contractor and Subcontractors,
- (d) munitions of war, explosive materials, ionising radiation or contamination by radio-activity, within the Country, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity, and
- (e) pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds.

17.4 Consequences of Owner's Risks

If and to the extent that any of the risks listed in Sub-Clause 17.3 above results in loss or damage to the Works, Goods or Contractor's Documents, the Contractor shall promptly give notice to the Owner and shall rectify this loss or damage to the extent required by the Owner.

If the Contractor suffers delay and/or incurs Cost from rectifying this loss or damage, the Contractor shall give a further notice to the Owner and shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) payment of any such Cost, which shall be added to the Contract Price.

After receiving this further notice, the Owner shall proceed in accordance with Sub Clause 3.5 [*Determinations*] to agree or determine these matters

17.5 Intellectual and Industrial Property Rights

In this Sub-Clause, "infringement" means an infringement (or alleged infringement) of any patent, registered design, copyright, trade mark, trade name, trade secret or other

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intellectual or industrial property right relating to the Works; and "claim" means a claim (or proceedings pursuing a claim) alleging an infringement.

Whenever a Party does not give notice to the other Party of any claim within 28 days of receiving the claim, the first Party shall be deemed to have waived any right to indemnity under this Sub-Clause.

The Owner shall indemnify and hold the Contractor harmless against and from any claim alleging an infringement which is or was:

- (a) an unavoidable result of the Contractor's compliance with the Technical Requirements, or
- (b) a result of any Works being used by the Owner:
 - (i) for a purpose other than that indicated by, or reasonably to be inferred from, the Contract, or
 - (ii) in conjunction with anything not supplied by the Contractor, unless such use was disclosed to the Contractor prior to the Contract signing date or is stated in the Contract.

The Contractor shall indemnify and hold the Owner harmless against and from any other claim which arises out of or in relation to (i) the Contractor's design, manufacture, construction or execution of the Works, (ii) the use of Contractor's Equipment, or (iii) the proper use of the Works.

If a Party is entitled to be indemnified under this Sub-Clause, the indemnifying Party may (at its cost) conduct negotiations for the settlement of the claim, and any litigation or arbitration which may arise from it. The other Party shall, at the request and cost of the indemnifying Party, assist in contesting the claim. This other Party (and its Personnel) shall not make any admission which might be prejudicial to the indemnifying Party, unless the indemnifying Party failed to take over the conduct of any negotiations, litigation or arbitration upon being requested to do so by such other Party.

17.6 Limitation of Liability

17.6.1 Neither Party shall be liable to the other Party whether pursuant to any provision of the Contract (including any indemnity), by way of damages for breach of contract, in tort, for breach of statutory duty, equity, or under any other legal theory, for any loss of profit or revenue, loss of use of equipment or associated equipment, loss of production or down time costs, loss of opportunity, loss of Contract, loss of goodwill, the cost of obtaining any new financing or maintaining any existing financing (including the making of any scheduled or other repayments or prepayment of debt and the payment of any interest and other costs, fees or expenses incurred in connection with the obtaining or maintaining of financing), provided always that this Clause 17.6.1 shall not prevent, limit or exclude:

- (a) liability for such losses or costs insofar as they form part of the pre-estimated losses for the purposes of calculation of Liquidated Damages provisions under the Contract; and
- (b) any liabilities pursuant to Clause 17.1 [*Indemnities*]

17.6.2 The total liability of the Contractor to the Owner, under or in connection with the Contract other than under Sub-Clause 17.1 [*Indemnities*] and Sub-Clause 17.5 [*Intellectual and*

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Industrial Property Rights], shall not exceed the Contract Price stated in the Contract Agreement.

This Sub-Clause shall not limit liability in any case of fraud, deliberate default or reckless misconduct by the defaulting Party.

- 17.6.3 The liability of the Contractor to the Owner for Delay Liquidated Damages and Performance Liquidated Damages for both Units shall not exceed, in aggregate, ten percent (10%) of the value of the Contract Price.
- 17.6.4 The remedies arising under the Contract are the sole and exclusive remedies of the Parties for the obligations and the liabilities arising under or in connection with the Contract as between the Parties, notwithstanding any remedy otherwise available at law or in equity or otherwise.

END OF CLAUSE 17

18. INSURANCE

18.1. General Requirements for Insurance

The Owner shall obtain and maintain a Construction All Risks (CAR) or Erection All Risks (EAR) insurance policy for not less than the full replacement value of the Works, Plant, Materials and Contractor's Documents including the costs of demolition, removal of debris and professional fees and profit with a minimum value equal to the Contract Price.

The expected policy conditions may include, subject to final agreement, the following coverages:

- (1) Removal of Debris
- (2) Strike, Riot, and Civil Commotion
- (3) Cross Liability
- (4) Extended Maintenance Cover – 24 months
- (5) Expediting Expenses/Overtime Expenses/Expenses Freight
- (6) Airfreight Expenses
- (7) Warranty Concerning Structures in Earthquake Zones
- (8) Warranty Concerning Underground Cables and Pipes
- (9) Off-Site storage
- (10) Waiver of subrogation against all the Insureds excluding suppliers and manufacturers
- (11) Payment on account
- (12) 72-hour clause
- (13) Professional fees
- (14) 50/50 clause
- (15) Escalation clause
- (16) Serial losses
- (17) War and Terrorism Exclusion
- (18) Automatic Reinstatement of sum insured
- (19) Vibration, removal or weakening of support
- (20) Named Loss Adjusters
- (21) Safety Measures with Respect to Precipitation, Flood and Inundation.
- (22) Special conditions concerning piling foundation and retaining wall works.
- (23) Special conditions concerning wet works
- (24) Special Conditions Concerning the Construction and/or Erection Time Schedule.

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- (25) Special Conditions Concerning Fire –Fighting Facilities and Fire Safety on Construction Sites.
- (26) Quarterly Project Progress report.
- (27) Risk survey on Eng.
- (28) EPI 65 Risks Survey
- (29) Claim Cooperation Clause

The General Exclusion shall include, but are not limited to, the following endorsements:

- (1) Terrorism Exclusion Endorsement (Reinsurance) - NMA 2921
- (2) Total Asbestos Exclusion
- (3) International Trade Sanction Clause
- (4) War and Civil war exclusion clause (LRMA G51- Amended)
- (5) Nuclear energy risks exclusion clause (Reinsurance) (1994) (Worldwide excluding U.S.A & Canada) NMA 1975a
- (6) Pollution/Contamination Exclusion Clause.

The Owner, the Contractor, its Subcontractors, Suppliers for their onsite activities, Owner's Engineer and all other parties responsible for constructing the Power Plant shall be named as additional insured under this policy. The Owner shall notify the Contractor of the date this insurance becomes effective. The insurance shall remain in effect until the date of issuance of the Taking-Over Certificate of Power Plant and shall be extended to cover the 24-month Warranty Period thereafter.

The Contractor shall provide all necessary information as required for CAR/EAR insurance within seven (7) days upon the receipt of requirement from the Owner/Insurer. The Contractor shall bear full responsibility for failing to do so and/or providing misleading information.

Upon any occurrence of an event claimable under the Construction/Erection All Risks insurance policy, the Contractor shall immediately replace or repair any loss or damage and complete the Works in accordance with the Contract

The Contractor shall purchase other insurances required for performance of this Contract. The Contractor shall affect all insurances, except for CAR/EAR as above mentioned, with the insurance provider (the "Insurer") chosen by the Contractor, however with the priority given to Vietnamese insurance providers, and shall give evidence thereof to the Owner.

All insurance policies shall be endorsed or otherwise provide that the Contractor's insurance shall be primary and not in excess to, or contributing with, any insurance maintained by any other party. All policies shall include a waiver of subrogation in favor of the Owner/Contractor/Consultant and all other additional insureds except in the case of workmen's compensation insurance and other statutory insurances. The Contractor shall be named as an additional insured where applicable. The liability policies shall provide severability of interests or cross liability inclusion clauses.

Upon any occurrence of an insured event claimable under the insurance policies, the Contractor shall promptly notify the Insurer and the Owner and send the Owner a copy

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of the claim to the Insurer and cooperate with the Owner in settling the claim. The Contractor shall negotiate and settle all claims with the Insurer but the Owner shall maintain the right to participate in any or all proceedings. If the Contractor fails to promptly attend to settlement of claims with the Insurer, the Owner shall, without prejudice to any rights that he may have against the Contractor, resend the option to settle the same directly with the Insurer. Any settlement reached between the Owner and Insurer shall be binding upon the Contractor.

Each policy insuring against loss or damage shall provide for payments to be made in US Dollars as the case may be to cover the claim from an insured Party. Payments received from the Insurer shall be used for the rectification of the loss or damage.

The Contractor shall submit to the Owner the following insurance documents within sixty (60) days from the Contract Commencement Date:

- (a) evidence that the insurances described in this Clause have been affected;
- (b) copies of the policies for the insurances described in this Clause;
- (c) evidence of payment of the insurance premiums.

The Owner and/or the Contractor shall comply with the conditions stipulated in each of the insurance policies. The Owner and/or the Contractor shall keep the Insurer informed of any relevant changes to the execution of the Works and ensure that insurance is maintained in accordance with this Clause.

The Contractor shall not make any material alteration to the terms of any insurance without the prior approval of the Owner. If the Insurer makes (or attempts to make) any alteration, the Contractor shall promptly give notice to the Owner.

If the Contractor fails to effect and keep in force any of the insurances it is required to effect and maintain under the Contract, or fails to provide satisfactory evidence and copies of policies in accordance with this Clause, the Owner may (at its option and without prejudice to any other right or remedy) effect insurance for the relevant coverage and pay the premiums due. The Contractor shall pay the amount of these premiums to the Owner, and the Contract Price shall be adjusted accordingly.

Nothing in this Clause limits the obligations, liabilities or responsibilities of the Contractor under the other terms of the Contract or otherwise. Any amounts not insured or not recovered from the Insurer shall be borne at the Contractor's expense in accordance with these obligations, liabilities or responsibilities. However, if the Contractor fails to effect and keep in force an insurance which is available and which it is required to effect and maintain under the Contract, and the Owner neither approves the omission nor effects insurance for the coverage relevant to this default, any moneys which should have been recoverable under this insurance shall be paid by the Contractor. Furthermore, the Owner assumes no responsibility for the solvency of the Insurer or the failure of the Insurer to settle any claim.

The Contractor at its own cost shall purchase any additional insurance it believes necessary to protect its interests. A summary of certain minimum provisions to be included in the Contractor's insurance policies is set forth in the Sub-Clauses below.

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18.2. Cargo Insurance

The Contractor shall, at its own cost, procure and maintain cargo insurance with a reputable Insurer, giving first priority to Vietnamese insurance companies. Such cargo insurance shall cover all Plant, Equipment, and Materials against all risks of loss or damage normally insurable, including but not limited to risks of war, strikes, riots, and civil commotions. Coverage shall extend from the commencement of loading at the manufacturer's premises through to arrival and unloading at the Site. The sum insured under such insurance shall not be less than 110% (one hundred and ten per cent) of the full replacement value of the insured property shipped including freight and insurance. The policy conditions shall include:

- (1) War, Strikes, Riot and Civil Commotion;
- (2) Institute Cargo Clauses (A);
- (3) Institute War Clauses (Cargo);
- (4) Institute Strike Clauses (Cargo);
- (5) Institute Cargo Clauses (Air);
- (6) Institute War Clauses (Air Cargo);
- (7) Institute Strike Clauses (Air Cargo);
- (8) Debris Removal;
- (9) Deferred Unpacking Clause;
- (10) Control of Damaged Goods Clause;
- (11) Replacement Clause;
- (12) Expediting Costs (Air Freight, Overtime Costs);
- (13) 50/50 Sharing Clause;
- (14) Institute Classification Clause;
- (15) Institute War Cancellation Clause;
- (16) Institute Radioactive Contamination Exclusion Clause;
- (17) Specific warranties in respect of surveys for loading, storage and unloading operations;
- (18) Deductible of money _____ Dollars to be advised each and every loss; and
- (19) Loss Payee Clause stating the Owner for all claims _____ Dollars.

The Contractor shall submit to the Owner such insurance documents as required under the Contract within 15 (fifteen) days prior to each shipment.

Upon any occurrence of an event claimable under the cargo insurance policy, the Contractor shall notify the insurance company and follow procedures in filing and settling the claim as set forth in the certificate of the insurance,

The Contractor shall, at its own cost and expense, immediately replace or repair any loss or damage and complete the Works in accordance with the Contract.

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18.3. Insurance for Contractor's Personnel

Prior to commencement of works on site, the Contractor shall affect and maintain workman's compensation insurance to cover all of the Contractor's Personnel in accordance with the Laws.

The Contractor shall affect and maintain insurance against liability for claims, damages, losses and expenses (including legal fees and expenses) arising from injury, sickness, disease or death of any person employed by the Contractor or any other of the Contractor's Personnel.

The insurance shall be maintained in full force and effect during the whole time that these personnel are assisting in the execution of the Works. For a Subcontractor's employees, the insurance may be affected by the Subcontractor, but the Contractor shall still be responsible for compliance with this Clause.

18.4. Professional Indemnity Insurance

Within thirty (30) days from the date of signing of the Contract, the Contractor shall be responsible to effect and maintain professional indemnity insurance against liability for claims, damages, losses and expenses (including legal fees and expenses) arising out of any errors or omissions in the design, supervision, or other consulting or engineering services performed by the Contractor in connection with the Works. The professional indemnity insurance shall have a minimum coverage limit of one hundred and twenty percent (120%) of each consultancy and / or engineering service value.

The policy shall have no limit on the number of occurrences and a maximum deductible limit of _____ Dollars.

18.5. Construction Equipment Insurance

Upon arrival of the construction equipment on site, the Contractor shall insure for all risks normally insurable, the construction equipment, including vehicles, used by the Contractor or its Subcontractors in connection with the execution of the Works according to the market value of such equipment and in accordance with the Laws of Vietnam.

The Contractor shall at all times keep in force, in as far as they may be applicable, marine policies in respect of all floating craft and equipment covering loss of or damage to such items and liability arising out of their use to include not only the full value thereof but also the cost of removing the same in the event of sinking whether or not the same is declared a total loss and including protection and indemnity and third party liability cover to an amount equal to the full value and estimated cost of removal in the event of sinking.

The Contractor shall confirm that the shipping company buys the floating craft insurance covering its loss on damage including the cost of removing the same in the event of sinking.

18.6. Third Party Liability Insurance

The Contractor shall, at its own cost, procure and maintain third party liability insurance with a reputable Insurer, giving first priority to Vietnamese insurance companies, to cover all claims, damages, losses, and expenses (including legal fees and expenses) arising from

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bodily injury, sickness, disease, or death of any third party, and/or loss of or damage to third party property caused by or in connection with the performance of the Works.

The insurance shall:

- Provide coverage with a minimum limit of liability of not less than _____ Dollars per occurrence and _____ Dollars in the aggregate;
- Be maintained in full force and effect throughout the performance of the Contract until the issuance of the Taking Over Certificate;
- Include a cross-liability clause ensuring that each insured party shall be treated as if a separate policy had been issued to each;
- Name the Owner, the Contractor, the Engineer, and other parties as additional insureds, without any right of subrogation against them;
- Include worldwide territorial limits, unless otherwise specified, with jurisdiction limited to Vietnam.

The Contractor shall submit evidence of the insurance, including copies of the policies and certificates of insurance, to the Owner within thirty (30) days from the Contract Commencement Date and prior to commencement of any Works on Site.

The Contractor shall ensure that the insurance policy is renewed and remains in effect until completion of the Works and final demobilization from the Site.

If the Contractor fails to effect or maintain the required insurance, the Owner may, without prejudice to any other rights or remedies, procure such insurance and recover the cost from the Contractor.

18.7. Approval of Insurance Policies

The Contractor shall provide for the Owner's review and approval, copies of all insurance policies that the Contractor intends to procure for this Project.

END OF CLAUSE 18

19. FORCE MAJEURE

19.1 Definition of Force Majeure

In this Clause, "Force Majeure" means an exceptional event or circumstance:

- (a) which is beyond a Party's control,
- (b) which such Party could not reasonably have provided against before entering into the Contract,
- (c) which, having arisen, such Party could not reasonably have avoided or overcome, and
- (d) which is not substantially attributable to the other Party.

Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (a) to (d) above are satisfied:

- (i) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,
- (ii) rebellion, terrorism, revolution, insurrection, military or usurped power, or civil war,
- (iii) riot, commotion, disorder, strike or lockout by persons other than the Contractor's Personnel and other employees of the Contractor and Subcontractors,
- (iv) munitions of war, explosive materials, ionising radiation or contamination by radio-activity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity, and
- (v) natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.

19.2 Notice of Force Majeure

If a Party is or will be prevented from performing any of its obligations under the Contract by Force Majeure, then it shall give notice to the other Party of the event or circumstances constituting the Force Majeure and shall specify the obligations, the performance of which is or will be prevented. The notice shall be given within fourteen (14) days after the Party became aware, of the relevant event or circumstance constituting Force Majeure.

The Party shall, having given notice, be excused performance of such obligations for so long as such Force Majeure prevents it from performing them.

Notwithstanding any other provision of this Clause, Force Majeure shall not apply to obligations of either Party to make payments to the other Party under the Contract.

19.3 Duty to Minimise Delay

Each Party shall at all times use all reasonable endeavours to minimise any delay in the performance of the Contract as a result of Force Majeure.

A Party shall give notice to the other Party when it ceases to be affected by the Force Majeure.

19.4 Consequences of Force Majeure

If the Contractor is prevented from performing any of his obligations under the Contract by Force Majeure of which notice has been given under Sub-Clause 19.2 [*Notice of Force Majeure*], and suffers delay and/or incurs Cost by reason of such Force Majeure, the Contractor shall be entitled subject to Sub-Clause 20.1 [*Contractor's Claims*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [*Extension of Time for Completion*], and
- (b) if the event or circumstance is of the kind described in sub-paragraphs (i) to (iv) of Sub-Clause 19.1 [*Definition of Force Majeure*] and, occurs in the Country, payment of any such Cost.

After receiving this notice, the Owner shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine these matters

19.5 Force Majeure Affecting Subcontractor

If any Subcontractor is entitled under any contract or agreement relating to the Works to relief from force majeure on terms additional to or broader than those specified in this Clause, such additional or broader force majeure events or circumstances shall not excuse the Contractor's non-performance or entitle him to relief under this Clause.

19.6 Optional Termination, Payment and Release

If the execution of substantially all the Works in progress is prevented for a continuous period of eighty four (84) days by reason of Force Majeure of which notice has been given under Sub-Clause 19.2 [*Notice of Force Majeure*], or for multiple periods which total more than one hundred and forty (140) days due to the same notified Force Majeure, then either Party may give to the other Party a notice of termination of the Contract. In this event of force majeure, the termination shall take effect twenty one (21) days after the notice is given, and the Contractor shall proceed in accordance with Sub-Clause 16.3 [*Cessation of Work and Removal of Contractor's Equipment*].

Upon such termination, the Owner shall pay to the Contractor the following amounts (less any such amounts paid to the Contractor prior to termination):

- (a) the amounts payable for any work carried out for which a price is stated in the Contract;
- (b) the cost of any Plant and Materials ordered for the Works which have been delivered to the Contractor, or for which the Contractor is liable to accept delivery. Such payment shall be made only after the Plant and Materials have become the property of (and are at the risk of) the Owner, and the Contractor has handed them over and made them available at the Owner's disposal;
- (c) any other Cost or liability which in the circumstances was reasonably incurred by the Contractor in the expectation of completing the Works;
- (d) the Cost of removal of Temporary Works and Contractor's Equipment from the Site and the return of these items to the Contractor's works in his country (or to any other destination at no greater cost); and

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- (e) the Cost of repatriation of the Contractor's staff and labour employed wholly in connection with the Works at the date of termination.

The resulting balance shall be payable by the Owner to the Contractor or by the Contractor to the Owner (as the case may be), after making due allowance for any payment owed by the Contractor to the Owner.

For the avoidance of doubt, the Contractor shall not be entitled to compensation pursuant to this Sub-clause 19.6 for any loss of profit in respect of work not executed, loss of income, revenue, or opportunity or indirect or consequential losses.

19.7 **Release from Performance under the Law**

Notwithstanding any other provision of this Clause, if any event or circumstance outside the control of the Parties (including, but not limited to, Force Majeure) arises which makes it impossible or unlawful for either or both Parties to fulfil its or their contractual obligations or which, under the law governing the Contract, entitles the Parties to be released from further performance of the Contract, then upon notice by either Party to the other Party of such event or circumstance:

- (a) the Parties shall be discharged from further performance, without prejudice to the rights of either Party in respect of any previous breach of the Contract, and
- (b) the sum payable by the Owner to the Contractor shall be the same as would have been payable under Sub-Clause 19.6 [*Optional Termination, Payment and Release*] if the Contract had been terminated under Sub-Clause 19.6.

END OF CLAUSE 19

20. CLAIMS, DISPUTES AND ARBITRATION

20.1 Contractor's Claims

If the Contractor considers himself to be entitled to any extension of the Time for Completion and/or any additional payment, under any Clause of these Conditions or otherwise in connection with the Contract, the Contractor shall give notice to the Owner, describing the event or circumstance giving rise to the claim. The notice shall be given as soon as practicable, and not later than twenty eight (28) days after the Contractor became aware of the event or circumstance.

If the Contractor fails to give notice of a claim within such period of twenty eight (28) days, the Time for Completion shall not be extended, the Contractor shall not be entitled to additional payment, and the Owner shall be discharged from all liability in connection with the claim. Otherwise, the following provisions of this Sub-Clause shall be applied.

The Contractor shall also submit any other notices which are required by the Contract, and supporting particulars for the claim, all as relevant to such event or circumstance.

The Contractor shall keep such contemporary records as may be necessary to substantiate any claim, either on the Site or at another location acceptable to the Owner. Without admitting liability, the Owner may, after receiving any notice under this Sub-Clause, monitor the record-keeping and/or instruct the Contractor to keep further contemporary records. The Contractor shall permit the Owner to inspect all these records, and shall (if instructed) submit copies to the Owner.

Within forty two (42) days after the Contractor became aware of the event or circumstance giving rise to the claim, or within such other period as may be proposed by the Contractor and approved by the Owner, the Contractor shall send to the Owner a fully detailed claim which includes full supporting particulars of the basis of the claim and of the extension of time and/or additional payment claimed. If the event or circumstance giving rise to the claim has a continuing effect:

- (a) this fully detailed claim shall be considered as interim;
- (b) the Contractor shall send further interim claims at monthly intervals, giving the accumulated delay and/or amount claimed, and such further particulars as the Owner may reasonably require; and
- (c) the Contractor shall send a final claim within 28 days after the end of the effects resulting from the event or circumstance, or within such other period as may be proposed by the Contractor and approved by the Owner.

Within forty two (42) days after receiving a claim and/or interim claim or any further particulars supporting a previous claim, or within such other period as may be proposed by the Owner and approved by the Contractor, the Owner shall respond with approval, or with disapproval and detailed comments. He may also request any necessary further particulars, but shall nevertheless give his response on the principles of the claim within such time.

Each interim payment shall include such amounts for any claim as have been-reasonably substantiated as due under the relevant provision of the Contract. Unless and until the particulars supplied are sufficient to substantiate the whole of the claim, the Contractor

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shall only be entitled to payment for such part of the claim as he has been able to substantiate.

The Owner shall proceed in accordance with Sub-Clause 3.5 [*Determinations*] to agree or determine (i) the extension (if any) of the Time for Completion (before or after its expiry) in accordance with Sub-Clause 8.4 [*Extension of Time for Completion*], and/or (ii) the additional payment (if any) to which the Contractor is entitled under the Contract.

The requirements of this Sub-Clause are in addition to those of any other Sub-Clause which may apply to a claim. If the Contractor fails to comply with this or another Sub-Clause in relation to any claim, any extension of time and/or additional payment shall take account of the extent (if any) to which the failure has prevented or prejudiced proper investigation of the claim, unless the claim is excluded under the second paragraph of this Sub-Clause.

20.2 **Amicable Settlement**

20.2.1 The Parties agree to seek to resolve any Dispute arising between them by mutual consultation.

20.2.2 If a Party is unable to settle a Dispute through mutual consultation it shall first refer the Dispute in writing to a committee comprising two [directors/senior managers] of the Parties who shall not be involved in the day to day running and/or management of the Contract ("**Management Committee**") with a copy of the notice of referral to the other Party. The Management Committee shall convene at a mutually agreed venue within fourteen (14) days of the notice of referral to consider the information available and provide the opinion within twenty-eight (28) days of the notice of referral, provided that the Parties may agree to longer periods for convening the Management Committee and for it to form an opinion.

20.2.3 If within such twenty-eight (28) day or longer period as aforesaid, an unanimous decision is reached by the Management Committee resolving the Dispute such decision shall be final and binding on the Parties.

20.3 **Arbitration**

Any Dispute arising out of or in connection with this Contract, including any question regarding its existence, validity or termination that cannot be settled amicably by the Parties under Clause 20.2 [*Amicable Settlement*] (including where the Management Committee does not reach an unanimous decision or is not properly convened in accordance with Clause 20.2), shall be referred to and finally resolved by arbitration in Singapore in accordance with the Arbitration Rules of the Singapore International Arbitration Centre ("**SIAC Rules**") for the time being in force, which rules to be incorporated by reference in this Clause. The number of arbitrators shall be three (03), each appoints one arbitrator, and the third one shall be appointed by two arbitrators of both Parties. In case, the third arbitrator shall be not agreed by both Parties, he shall be appointed by the Chairman of Centre.

The place of the arbitration shall be Singapore.

The applicable Law shall be Vietnamese.

The language of the arbitration shall be English.



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20.4 Works to Continue

Performance of the Contract shall continue during arbitration proceedings unless the Owner shall order suspension. If any such suspension is ordered, the reasonable costs incurred by the Contractor and occasioned thereby shall be added to the Contract Price.

No payments due or payable by the Owner shall be withheld on account of pending reference to arbitration.

20.5 Time Limit for Arbitration

No commencement of arbitration proceeding may be instigated later than one hundred and eighty (180) days after the issue of the Performance Certificate.

END OF CLAUSE 20

3. FORMS

3.1. FORM OF PERFORMANCE GUARANTEE

BANK
BRANCH (optional).....

PERFORMANCE BOND/GUARANTEE

To: _____ [City-Country], day ... month ... year ...
_____ [write Owner's name] (hereinafter referred to as the "Owner")

Pursuant to the request of _____ [insert name of the Contractor] (hereinafter referred to as the "Contractor"), who has been awarded the bidding package _____ [insert name of the package] and has committed to sign a contract to provide the services under the aforementioned package (hereinafter referred to as the "Contract");

Pursuant to the requirement set out in the Bidding Documents (or the Contract), the Contractor is required to submit to the Owner a guarantee issued by a bank for a specified amount to ensure its obligations and responsibilities in the performance of the Contract.

We, _____ [insert name of the bank], located in _____ [insert country or territory] with registered office at _____ [insert address of the bank] (hereinafter referred to as the "Bank"), hereby undertake to guarantee the performance of the Contractor under the Contract in an amount of _____ [insert amount in figures, in words, and in the currency as specified in Clause 6.1 of the Particular Conditions of Contract in the Bidding Documents]. We, unconditionally and irrevocably, undertake to pay the Owner any sum up to the maximum amount of _____ [insert guarantee amount] upon receipt of the Owner's document requesting the Bank to transfer the performance guarantee amount. Such payment shall be made within no later than five (05) working days from the date the Bank receives the Owner's first document (as stated in the document). We shall be responsible for transferring the guarantee amount to the account of the Owner as specified in the contract [Contract Name, Contract Number] dated [Contract date] without the need for any documentation proving a breach of contract between the Contractor and the Owner.

This guarantee shall be valid from the date of issuance until _____ [insert expiration date].

Authorized representative of the Bank
[insert full name, title, signature, and official stamp]

Note:

1. If the issuing bank requires a signed contract before issuing the guarantee, the relevant paragraph above may be revised as follows: "Pursuant to the request of _____ [insert name of the Contractor] (hereinafter referred to as the "Contractor"), who has been awarded the bidding package _____ [insert name of the package] and signed Contract No. ____ dated ____ [insert contract date] (hereinafter referred to as the "Contract")."
2. Bank address: include full address, telephone number, fax number, and email for contact purposes.
3. Validity period: insert a period that complies with the requirements stated in Clause 5.2 of the Conditions of Contract.

3.2 FORM OF PAYMENT GUARANTEE

BANK
BRANCH (optional).....

[Country/City], day month year

ADVANCE PAYMENT BOND/GUARANTEE

To: _____ [write Owner's name] (hereinafter referred to as the "Owner")

Pursuant to the Contract _____ [Insert contract name, contract number, contract date]

In accordance with the advance payment clause stated in the specific conditions of the contract, _____ [Insert name and address of the Contractor] (hereinafter referred to as the "Contractor") shall submit to the Owner a bank guarantee to ensure that the Contractor uses the advance payment of _____ [Insert the value in figures, in words, and the currency used] for the right purpose of executing the contract.

We, _____ [insert name of the bank], located in _____ [insert country or territory] with registered office at _____ [insert address of the bank] (hereinafter referred to as the "Bank"), hereby undertake on behalf of the Contractor to unconditionally and irrevocably pay to the Owner an amount up to the value of this guarantee, being ... [Insert the amount in figures, in words, and the currency used], no later than five (05) working days from the date of receiving the first request document from the Owner (as dated on the Owner's document), without the need for any explanation or documentation proving a breach of contract between the Contractor and the Owner. In such case, we shall be responsible for transferring the guarantee amount to the account of the Owner specified in the contract [Insert contract name, contract number] dated [Insert contract date].

Furthermore, we agree that any changes, additions, or adjustments to the terms of the contract or any documents related to the contract signed between the Contractor and the Owner shall not alter any of our obligations under this guarantee.

The value of this guarantee will be gradually reduced in proportion to the advance payments that the Owner has recovered through the contract's payment cycles, after the Contractor submits a document confirming the amount recovered by the Owner in the payment cycles.

This guarantee shall be effective from the date of issuance until the ____ day of ___, ___, or until the Owner has recovered the full advance payment, whichever comes first. The validity period of the advance payment guarantee must be extended until the Owner has fully recovered the advance payment."

Authorized representative of the Bank
[insert full name, title, signature, and official stamp]

3. 3 FORM OF WARRANTY GUARANTEE

BANK
BRANCH (optional).....

[Country/City], day month year

WARRANTY BOND/GUARANTEE

To: _____ [write Owner's name] (hereinafter referred to as the "Owner")

Pursuant to the Contract _____ [Insert contract name, contract number, contract date]

Whereas the Owner and _____ [insert contractor's name], located at _____ [insert contractor's address] (hereinafter referred to as the 'Contractor') have entered into the Contract _____ [insert contract number, full name of the contract, contract signing date] (hereinafter referred to as the 'Contract');

AND WHEREAS the Owner requires under the Contract that the Contractor provide a warranty guarantee issued by a Bank in the amount of [insert amount in figures, in words, and currency used], to secure the Contractor's warranty obligations under the Contract;

We, _____ [insert name of the bank], located in _____ [insert country or territory] with registered office at _____ [insert address of the bank] (hereinafter referred to as the "Bank"), hereby undertake to guarantee the Contractor's performance of its warranty obligations under the Contract, in the amount of _____ [Insert amount in figures, in words, and currency used]. We hereby irrevocably and unconditionally commit to pay the Owner any amount up to _____ [Insert amount in figures, in words, and currency used] as stated above, upon receipt of the Owner's first document (as dated on the document issued by the Owner), without the need for any explanation, justification, or supporting documents evidencing any breach of contract by the Contractor, and without any objection or contestation by the Guarantor, the Contractor, or any third party. No later than five (05) working days from the date of receipt of such document of the Owner, we shall transfer the guaranteed amount into the bank account specified in the Contract No. _____ [Insert name, number, and date of the Contract].

This Guarantee shall be valid from the date of issuance until _____ [Insert the final date of the warranty period under the Contract] (hereinafter referred to as the "Validity Period").

Upon expiration of the Validity Period, this Guarantee shall become null and void, whether or not it has been returned to the Bank for cancellation, and any demand received by the Bank after the Validity Period shall be deemed invalid.

The Owner shall not assign or transfer this Guarantee in any form whatsoever. This Guarantee shall be governed by and construed in accordance with the laws of the Socialist Republic of Vietnam.

Authorized representative of the Bank
[insert full name, title, signature, and official stamp]

3. 4 FORM OF TAKING OVER CERTIFICATE

Date:

Contract

No^o: _____*[Name of Contract]*To: *[Name and address of Contractor]*

Gentlemen,

Pursuant to Sub-Clause 10.1 (Taking Over of the Works and Unit) of Conditions of Contract entered into between yourselves and the Owner dated *[date]*, relating to the *[brief description of the Power Plant]*, we hereby notify you that the Works met the requirement for Taking Over of the following part(s) of the Power Plant on the date specified below.

1. Description of the Power Plant or part thereof: *[description]*
2. Date of Taking Over: *[date]*

The records of the relevant tests, inspections, documents and any other matters giving evidence of Completion of the Works or parts thereof are attached to this Certificate.

The list containing any work or test and of any deficiency which shall be completed, repeated or corrected by you within the periods agreed by the Parties but not later than the Defects Notification Period for the Works or part thereof expires, is also attached to this Certificate.

This letter does not relieve you of your obligation to complete the execution of the Works in accordance with the Contract nor of your obligations during the Defects Notification Period.

Very truly yours,

For and on behalf of:	For and on behalf of:
.....	
(Engineer's name)	(Owner's Name)
.....	
(Signature)	(Signature)
.....	
(Name of Signatory)	(Name of Signatory)
.....	
Title of Signatory)	Title of Signatory)

3. 5 FORM OF PERFORMANCE CERTIFICATE

Date:

Contract

No^o: _____

[Name of Contract]

To: *[Name and address of Contractor]*

Gentlemen,

Pursuant to Sub-Clause 11.9 (Performance Certificate) of the Conditions of Contract entered into between yourselves and the Owner dated *[date]*, relating to the *[brief description of the Power Plant]*, we hereby notify you that the Contractor completed his obligations under the Contract of the following part(s) of the Power Plant on the date specified below.

1. Description of the Power Plant or part thereof: *[description]*
2. Date on which the Contractor completed his obligations under the Contract: *[date]*

The Defects Notification Period for the Works has expired and the Contractor has satisfied all reservations concerning all justified claims and remedied/corrected all faults, defects and deficiencies.

The Owner shall take full responsibility for the operation, maintenance and protection of such Works from the Date on which the Contractor completed his obligations under the Contract.

This Performance Certificate shall constitute the ultimate acceptance of the Works.

Very truly yours,

For and on behalf of:	For and on behalf of:
.....	
(Engineer's name)	(Owner's Name)
.....	
(Signature)	(Signature)
.....	
(Name of Signatory)	(Name of Signatory)
.....	
Title of Signatory)	Title of Signatory)

3. 6 FORM OF COMPLETION OF TRAINING

Date:

Contract

No^o: _____

[Name of Contract]

To: *[Name and address of Contractor]*

Gentlemen,

Pursuant to Sub-Clause 5.5 (Training) of the Conditions of Contract entered into between yourselves and the Owner dated *[date]*, relating to the *[brief description of the Power Plant]*, we hereby notify you that you have met the Contract requirement for the following Trainings on the date specified below.

1. Description of the Training Completed: *[description]*
2. Date of Training: *[date]*

Very truly yours,

For and on behalf of:	For and on behalf of:
.....	
(Engineer's name)	(Owner's Name)
.....	
(Signature)	(Signature)
.....	
(Name of Signatory)	(Name of Signatory)
.....	
Title of Signatory)	Title of Signatory)

**DOCUMENT NO. 4 - [LIST OF SUBCONTRACTORS AND
MANUFACTURERS]**

To be proposed by the Bidder and both Parties will reach an agreement during the contract negotiation including the origins of materials and equipment.

APPENDIX 3
PRICE SCHEDULES AND TERMS & PROCEDURES OF PAYMENT

Long Phu 1 Thermal Power Plant

3.1. PRICE SCHEDULE

No	Price Schedule	Amount		Note
		VND	USD	
I	Total value of works (Total value 1.1+1.2+2+3+4) before Taxes			
1.1	Price Schedule No 1.1: Value of Local Goods.			
1.2	Price Schedule No 1.2: Value of Imported Goods.			
2	Price Schedule No 2: Value of Installation.			
3	Price Schedule No 3: Value of Construction.			
4	Price Schedule No 4: Value of Services.			
II	Total of Taxes			
5	Corporate income tax (CIT)			
6	Value Added Tax (VAT)			
7	Other taxes, fees and charges			
III	Total Price include all taxes and related costs (I + II)			

Long Phu 1 Thermal Power Plant

PRICE SCHEDULE NO. 1.1: VALUE OF LOCAL GOODS (VND)

No	Description	Unit	Quantity	Amount (VND)	
				Price without Taxes	Total without Taxes
....	(1)	(2)	(3)	(4)	(5)
I	Total (without Taxes)				
II	Taxes				
					
					
III	Total (include Taxes)				

Long Phu 1 Thermal Power Plant

PRICE SCHEDULE NO. 1.2: VALUE OF IMPORTED GOODS (USD/VND)

No	Description	Unit	Quantity	Price without Taxes		Import Taxes	VAT taxes	Other taxes (if any)	Price include Taxes		Amount	
				VND	USD				VND	USD	VND	USD
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Total											

Long Phu 1 Thermal Power Plant

PRICE SCHEDULE NO. 2: VALUE OF INSTALLATION (VND)

No	Description	Unit	Quantity	Amount (VND)	
				Price without Taxes	Total without Taxes
....	(1)	(2)	(3)	(4)	(5)
I	Total (Without Taxes)				
II	Taxes				
					
					
III	Total (Include Taxes)				

Long Phu 1 Thermal Power Plant

PRICE SCHEDULE NO. 3: VALUE OF CONSTRUCTION (VND)

No	Description	Unit	Quantity	Amount (VND)	
				Price without Taxes	Total without Taxes
....	(1)	(2)	(3)	(4)	(5)
I	Total (Without Taxes)				
II	Taxes				
					
					
III	Total (Include Taxes)				

Long Phu 1 Thermal Power Plant

PRICE SCHEDULE NO. 4: VALUE OF SERVICES (USD/VND)

No	Description	Unit	Quantity	Amount (VND)		Amount (USD)	
				Price without Taxes	Total without Taxes	Price without Taxes	Total without Taxes
....	(1)	(2)	(3)	(4)	(5)	(6)	(7)
I	Total (without Taxes)						
II	Taxes						
							
							
III	Total (include Taxes)						

3.2. TERMS & PROCEDURES OF PAYMENT

A. GENERAL PAYMENT PROVISIONS

Unless otherwise stated in the Contract, the Contract Price shall be paid in accordance with the following:

(a) The payment currency shall be United States Dollars (USD) for the portion of the Contract Price in United States Dollars and Vietnamese Dong (VND) for the portion of the Contract Price in Vietnamese Dong;

(b) For taxes, fees and charges related to imported goods (paid in VND): The exchange rate applicable for payment shall be the selling rate at the Head Office of the Joint Stock Commercial Bank for Foreign Trade of Vietnam (Vietcombank) on the tax payment date of the corresponding import declaration.

(c) Payments for the Works and/or goods shall be based on the lump sum price of each item, as set out in the Detailed Price List in Appendix 3 [Price List and Payment Methods] of the Contract.

(d) Within thirty (30) days of the Contract's Effective Date, the Contractor shall submit an estimated monthly disbursement plan to the Owner. This plan shall be updated on a monthly basis.

The contents in this Appendix 1 are tentative, and the Contractor may propose changes to align with its technical proposal in the Bidding Documents. The Owner will consider the Contractor's proposal and the Parties will discuss and reach an agreement during the contract negotiation process. In case the Owner does not agree with the Contractor's proposal, the Parties must comply with the payment in accordance with the contents of this Appendix 1.

B. ADVANCE PAYMENT AND TERMS OF PAYMENT

1. Advance Payment

The Owner shall make Advance Payment for Contractor with an amount equivalent to fifteen percent (15%) of the Contract Price to its bank account within twenty eight (28) Working Days after receiving all related documents, including:

- (i) Four (04) originals of the Application for Advance Payment from Contractor.
- (ii) One (01) original and three (03) copies of the Irrevocable Advance Payment Bonds in accordance with Sub-Clause 4.2.3 [*Advance Payment Bonds*] of the Conditions of Contract.
- (iii) One (01) original and three (03) copies of the Performance Bond as regulated in Sub-Clause 4.2.2 [*Performance Bond*] of the Conditions of Contract.

2. Payments during Contract performance

2.1 Payment for Imported Goods

The Owner shall pay the Contractor up to ninety percent (90%) of the value of the corresponding Imported Goods for each item listed in Price Schedule No. 1.1, within twenty-eight (28) Working days after such items have been transported to the Site and upon receipt of the following complete documents:

(i) Application for payment in four (04) originals showing name of goods, quantity, unit price and total amount;

(ii) For Foreign Contractor: Commercial Invoice in four (04) originals for 100% amount of Goods of the payment period. For Local Contractor: One (01) original valid electronic VAT invoice for 100% amount of Goods of the payment period;

(iii) Customs Invoice and relevant documents for Customs Clearance Procedure in one (01) original and three (03) copies of the respective imported Goods;

(iv) Detailed Calculation Table, in four (04) originals which is applied for payment, including but not limited to the following information: Value of the completed work of the Milestone indication 100% the cost of work milestones (including VAT), value of advance payment recovery amount, value of deduction according to the Sub-Clause 14.10, payment application value after deduction of the above mentioned amount (duly signed and stamped by both Parties);

(v) Acceptance Protocol for the completed Milestone of the corresponding milestone, in four (04) originals, duly signed and stamped by both Parties;

(vi) Detailed Packing List in four (04) originals;

(vii) For transportation by sea: 2/3 full set of original clean “on board” ocean Bill of Lading and four (04) non-negotiable copies, made out to order of Consignee PetroVietnam Long Phu 1 Power Project Management Board (LP1PP), blank endorsed and marked “Freight Prepaid”; For transportation by air: 2/3 full set of original clean Airway Bill and four (04) non-negotiable copies, made out to order of Consignee PetroVietnam Long Phu 1 Power Project Management Board (LP1PP), blank endorsed and marked “Freight Prepaid”;

(viii) Certificate of Origin issued by the Chamber of Commerce of manufacturer’s country in one (01) original and three (03) copies;

(ix) Certificate of Quality issued by the manufacturer in four (04) originals;

(x) Pre-shipment Inspection Certificate signed by the Owner or Owner’s representative or third party on behalf of Owner in four (04) originals (if any)

(xi) Minutes of Goods, Materials, Equipment Receipt (MGMER) signed by and between Parties including OS&D report (if any) in four (04) originals;

(xii) Legal documents to prove that the goods have been lawfully imported, taxes and duties have been fully paid, and customs clearance has been properly completed: customs declaration, tax payment receipt, inspection report (if any) issued by the relevant government authorities, ...

(xiii) Other Supporting Documents, if any, as requested by the banks.

2.2 Payments for the Local Goods

The Owner shall pay the Contractor up to ninety percent (90%) of the value of the corresponding Local Goods for each item listed in Price Schedule No. 1.2, within twenty-eight (28) Working days after such items have been transported to the Site and upon receipt of the following complete documents:

(i) Application for payment in four (04) originals showing name of goods, quantity, unit price and total amount;

(ii) For Foreign Contractor: Customs Invoice and relevant documents for Customs Clearance Procedure in one (01) original and three (03) copies of the respective imported Goods (if any) and; Commercial Invoice in four (04) originals for one hundred percent (100%) amount of Goods of the payment period. For Local Contractor: One (01) original valid electronic VAT invoice for one hundred percent (100%) amount of Goods of the payment period;

(iii) Detailed Calculation Table, in four (04) originals which is applied for payment, including but not limited to the following information: Value of the completed work of the Milestone indication 100% the cost of work milestones (including VAT), value of advance payment recovery amount, value of deduction according to the Sub-Clause 14.10, payment

application value after deduction of the above mentioned amount (duly signed and stamped by both Parties);

(iv) Acceptance Protocol for the completed Milestone of the corresponding milestone, in four (04) originals, duly signed and stamped by both Parties;

(v) Detailed Packing List in four (04) originals;

(vi) Certificate of Origin issued by the Chamber of Commerce of manufacturer's country in one (01) original and three (03) copies;

(vii) Certificate of Quality issued by the manufacturer in four (04) originals;

(viii) Pre-shipment Inspection Certificate signed by the Owner or Owner's representative or third party on behalf of Owner in four (04) originals (if any);

(ix) Minutes of Goods, Materials, Equipment Receipt (MGMER) signed by and between Parties including OS&D report (if any) in four (04) originals

2.3 Payment for installation, construction

The Owner shall pay the Contractor up to ninety percent (90%) of the corresponding value for the scope of work for the items/parts, as specified in Price Schedule No. 2, 3, within twenty-eight (28) Working days after such items/parts have been completed and upon receipt of the following complete documents:

(i) Application for payment in four (04) originals;

(ii) For Foreign Contractor: Commercial Invoice for one hundred percent (100%) amount of completed works in four (04) original. For Local Contractor: one (01) original valid electronic VAT invoice for one hundred percent (100%) amount of the accepted value of the milestone;

(iii) Acceptance Protocol for the corresponding completed Milestone, in four (04) originals, duly signed and stamped by both Parties;

(iv) Calculation table, in four (04) originals; of the value to be paid showing following detailed information: Value of the completed work of the Milestone indication one hundred percent (100%) the cost of work milestones (including VAT), value of advance payment recovery amount, value of deduction according to the Sub-Clause 14.10, payment application value after deduction of the above-mentioned amount (duly signed and stamped by both Parties).

2.4 Payment for Service Costs

The Owner shall pay the Contractor up to ninety percent (90%) of the value of the corresponding Service for the items listed in Price Schedule No. 4, within twenty-eight (28) Working days after such items have been completed and upon receipt of the following complete documents:

(i) Application for payment in four (04) originals;

(ii) Contractor: one (01) original valid electronic VAT invoice for one hundred percent (100%) amount of the accepted value of the milestone;

(iii) Acceptance Protocol for the corresponding completed Milestone, in four (04) originals, duly signed and stamped by both Parties;

(iv) Calculation table, in four (04) originals; of the value to be paid showing following detailed information: Value of the completed work of the Milestone indication one hundred percent (100%) the cost of work milestones (including VAT), value of advance payment recovery amount, value of deduction according to the Sub-Clause 14.10, payment application value after deduction of the above-mentioned amount (duly signed and stamped by both Parties);

(v) Original documents of completed products and services, such as:

- Training documents
- Technology transfer agreements
- Licenses or agreements in accordance with applicable regulations
- Factory maintenance procedures
- Plant completion documentation
- Minutes of Receipts of goods, signed by all Parties in accordance with the agreed

Delivery Process

3. Payment of Retention Money

The retention money shall be paid by the Owner to the Contractor in three (03) stages, as follows:

3.1 Payment for the withheld warranty amount

The Owner shall pay the withheld warranty amount to the Contractor (equivalent to five percent (5%) of the Contract Price) within 28 Working days upon receipt of the following complete documents:

- (i) Application for payment in four (04) originals;
- (ii) Warranty bond in one (01) original;
- (iii) Taking Over Certificate in one (01) original;

(iv) Calculation table, in four (04) originals; of the value to be paid showing following detailed information: Value of the completed work of the Milestone indication one hundred percent (100%) the cost of work milestones (including VAT), value of advance payment recovery amount, value of deduction according to the Sub-Clause 14.10, payment application value after deduction of the above mentioned amount (duly signed and stamped by both Parties).

3.2 After completion of the trial run, factory acceptance and contract settlement.

The Owner shall pay the Contractor up to one hundred percent (100%) of the value of the completed work in accordance with the Contract within 28 Working days upon receipt of the following complete documents:

- (i) Application for payment in four (04) originals.

(ii) Final Calculation table, in four (04) originals, of value to be paid showing following detailed information: Value of the completed works under the Contract, indicating the total cost of work milestones; Value of additional work (if any); Value of penalties deduction (if any); Proportional deductions; The amounts withheld in accordance with Sub-Clause 9.6.3; Payment application value after deductions of the mentioned amounts (duly signed and stamped by both Parties);

(iii) For Foreign Contractor: Commercial Invoice in four (04) originals. For Local Contractor: one (01) original valid electronic VAT invoice (if any).

(iv) Minutes of Acceptance of Completion of Trial Operation and Acceptance of the Factory, confirmed by the Owner and related parties in one (01) originals.

(v) Taking Over Certificate with signatures of authorized Owner's representative and the Contractor's Representative and stamps in one (01) originals .

3.3 Payment for the withheld amount in accordance with Sub-Clause 14.10 [Payment Withheld and Retention].

The Owner shall pay the withheld amount, as specified in Sub-Clause 14.10, to the Contractor within twenty-eight (28) Working days upon receipt of the following complete documents:

- (i) Application for payment in four (04) originals;
- (ii) The Owner's Certification according to Sub-Clause 14.10 in four (04) originals.

5. Contract liquidation

After the Parties have fulfilled all obligations of the Contract or the Contract is terminated according to its provisions, the Parties shall liquidate the Contract according to applicable regulations.

C OTHER REQUIREMENTS:

- For the Contractor: during the execution of the Contract, based on the specific payment terms applicable to each subcontract of consortium members, in accordance with the regulations of The State Bank concerning transactions in USD and VND, as well as of prevailing laws, if the Contractor proposes reasonably and the proposal does not contradict the provisions of the Contract Agreement and the Conditions of Contract, the Owner may consider signing supplementary appendices to adjust the Terms and Procedures of Payment in order to guarantee sufficient financing for the Contractor to execute The Works. Any such appendix, once signed, shall form an integral part of the Contract to ensure adequate financing for the Contractor in carrying out the Works.
- For the Owner: during the execution of the Contract, the Owner has the right to request the Contractor to modify/supplement documents of payment in compliance with prevailing laws of Vietnam. These modifications shall not contradict the provisions of Sub-Clause 14.4 [*Application for payment*] and Sub-Clause 14.5 [Payment Procedures] of the Conditions of Contract. The execution of this shall be in accordance with Sub-Clause 3.5

Appendix 4 - PERMITS AND LICENSES

Registration of office and legal representative of the Contractor (including sub-contractors) in Vietnam, Registration of using communication equipment, Permit for using contractor's equipment containing radiation source, Permit for using equipment that requires the safety measures (e.g boiler, pressure parts, hoist and cranes...), Quality Inspection certificate for goods and material (if required for cement, steel material, cables...), Telecommunication equipment standardization Certificate, Temporary residential Registration for the Vietnamese labor/staff of the Contractor on Site, Visa application and residential permit for expatriate staff of the Contractor on Site, Report (every 6 months) on the expatriate staff of the Contractor working on the Site, Permit for disposal of solid, liquid and toxic waste (during construction), Permit for using infrastructures outside the Project fence (electricity and water supply) except for the items already listed in the Contract, Approval letter for the waterway traffic safety plan....

I - Abbreviations

No.	Abbreviation	Meaning
1.	GVT	Government
2.	PM	Prime Minister
3.	SCONA	Standing committee of National Assembly
4.	PC	People's Committee of Hau Giang Province
5.	MOIT	Ministry of Industrial and Trade
6.	DOC	Department of Construction
7.	MOF	Ministry of Finance
8.	MOP	Ministry of Police
9.	PD	Police Department

LONG PHU 1 THERMAL POWER PLANT PROJECT

No.	Abbreviation	Meaning
10.	MOLISA	Ministry of Labor, Invalid and Social Affairs
11.	DOLISA	Department of Labor, Invalid and Social Affairs
12.	MIC	Ministry of Information and Communication
13.	MOFA	Ministry of Foreign Affairs
14.	MOST	Ministry of Science and Technology
15.	DOST	Department of Science and Technology
16.	MOARD	Ministry of Agriculture and Rural Development
17.	DOARD	Department of Agriculture and Rural Development
18.	DOE	Department of Electricity
19.	TD	Tax Department
20.	MONRE	Ministry of Natural Resource and Environment
21.	DONRE	Department of Natural Resource and Environment
22.	MOF	Ministry of Finance

II – List of licenses, permits, registration and approval obtained and arranged by the Contractor

No.	Description	Issued by	Remark
1.	Import license for telecommunication equipment	GDPT	

LONG PHU 1 THERMAL POWER PLANT PROJECT

No.	Description	Issued by	Remark
2.	Temporary import license for construction equipment of the Contractor	MOIT và/hoặc các bộ ngành liên quan MOIT and/or related authorities	
3.	Quality Inspection of imported equipment (if required)	Vietnam Registration Department /or related authorities	
4.	Transportation permits for oversize and overweight of the project	Vietnam Road Department – Ministry of Traffic and Transportation	
5.	Construction License	MOC	
6.	Registration of office and legal representative of the Contractor (including sub-contractors) in Vietnam	PC	Supported by Owner
7.	Registration of using communication equipment, if required	Television and frequency Control Dept.	Supported by Owner
8.	Permit for using frequency and information converter	Television and frequency Control Dept.	Supported by Owner
9.	Permit for using contractor's equipment containing radiation source	MOSTE	Supported by Owner
10.	Permit for using equipment that requires the safety measures (e.g boiler, pressure parts, hoist and cranes...)	Centre of measurement and safety inspection of equipment	Supported by Owner
11.	Quality Inspection certificate for goods and material (if required for cement, steel material, cables...)	Centre of measurement and quality inspection of equipment	Supported by Owner
12.	Telecommunication equipment standardization Certificate.	GDPT	Supported by Owner
13.	Temporary residential Registration for the Vietnamese labor/staff of the Contractor on Site	Commune police	Contractor is responsible for its own scope

LONG PHU 1 THERMAL POWER PLANT PROJECT

No.	Description	Issued by	Remark
14.	Working permit for expatriate labor of the Contractor	DOLISA	Contractor responsible for its own scope
15.	Visa application and residential permit for expatriate staff of the Contractor on Site	MOP, MOFA	Contractor responsible for its own scope
16.	Report (every 6 months) on the expatriate staff of the Contractor working on the Site	DOLISA	Contractor responsible for its own scope
17.	Permit for disposal of solid, liquid and toxic waste (during construction)	Environment protection authority	Supported by Owner
18.	Permit for using infrastructures outside the Project fence (electricity and water supply) except for the items already listed in the Contract	DOE, DOWS	Supported by Owner
19.	Permit for excavation of construction road, explode the mine (if any)	Road and traffic department	Supported by Owner
20.	Permit for removal or using of underground works including underground pipe and cables.	The Owner of the underground works	Supported by Owner
21.	Approval Document for the Plan to Ensure Inland Waterway Traffic Safety	Relevant inland waterway transport authorities	in accordance with the provisions of Circular No. 23/2011/TT-BGTVT
22.	Other licenses, permits, registration (if required)		

This license is temporary and will be finalized during the contract negotiation phase.



**PETROVIETNAM
LONG PHU 1 THERMAL POWER PLANT PROJECT
CONTRACT**

APPENDIX 7

SCHEDULE OF ENGINEERING DOCUMENTS AND SUBMISSION DATES

Based on the Level-2 Schedule submitted by the Contractor, the Contractor shall prepare and submit its Schedule of Engineering Documents within sixty (60) days from the Contract Commencement Date for approval.

CHAPTER VI

DOCUMENTS 6

PLANT PERFORMANCE GUARANTEE

**SECTION-IV
PERFORMANCE GUARANTEES**

TABLE OF CONTENTS

CLAUSE NO.	DESCRIPTION
4.1	GUARANTEE CONDITIONS
4.2	PLANT PERFORMANCE GUARANTEES VALUES IN PREVIOUS EPC CONTRACT
4.3	PLANT PERFORMANCE GUARANTEES VALUES INTENDED TO REMAIN BY THE OWNER
4.4	CONTRACTOR’S PERFORMANCE GUARANTEES
4.5	START-UP, INITIAL OPERATION, RELIABILITY RUN AND PERFORMANCE TESTS

SECTION-IV PERFORMANCE GUARANTEES

4.1. GUARANTEE CONDITIONS

4.1.1 Site data

Nos.	Reference conditions for Performance Guarantees	Unit	Specified Values					
			Average/ Design		Max.		Min.	
1	<u>Site Reference Conditions:</u>							
	- Atmospheric pressure	mbar	1,009		1,020		1,002	
	- Ambient air temperature (dry bulb)	°C	26.7		37.2		13.1	
	- Relative humidity	%	84		100		N/A	
	- Cooling water temperature	°C	30.0		32.4		25	
2	<u>Power Grid Operating Conditions:</u>							
	1) Grid Frequency							
	- Rated Frequency	Hz	50					
	- Normal Operation mode	Hz			50.2		49.8	
	- Single fault operation mode							
	Permissible Frequency Band.	Hz			51		49	
	Restoration time in order to put the frequency to the range of 49.5Hz ÷ 50.5Hz	Min.			02			
	Restoration time in order to put the frequency to the range of 49.8Hz ÷ 50.2Hz.	Min.			05			
	- Multi-fault, serious fault operation and extreme emergency mode							
	Permissible Frequency Band	Hz			52(*)		47.5(*)	
	Restoration time in order to put the frequency to the range of 49Hz ÷ 51Hz	Sec.			10			
	Restoration time in order to put the frequency to the range of 49.5Hz ÷ 50.5Hz	Min.			05			
	Restoration time in order to put the frequency to the range of 49.8Hz ÷ 50.2Hz.	Min.			10			
	2) Grid Voltage		Unit 1	Unit 2	Unit 1	Unit 2	Unit 1	Unit 2

Nos.	Reference conditions for Performance Guarantees	Unit	Specified Values					
			Average/ Design		Max.		Min.	
	- Rated voltage	kV	220	500				
	- Normal Operation mode	kV			242	525	209	475
	- Single fault operation mode	kV			242	550	198	450
	- Multi-fault, serious fault operation and extreme emergency mode	kV			264(*)	600(*)	176(*)	400(*)
	3) Cosphi (Power Factor)							
	- Lagging Power Factor		0.85					
	- Leading Power Factor		0.90					
	(*) Value in case of Grid disturbances of multiple elements defined in VN Grid code, refer to Circular No. 25/2016/TT-BCT dated 30/11/2016, Circular No. 30/2019/TT- BCT dated 18/11/2019, Circular No. 39/2022/TT-BCT dated 30/12/2022, Circular No. 40/2014/TT-BCT dated 05/11/2014 and Decide No. 106/QĐ-ĐTĐL dated 14/12/2018.							

4.1.2. Analysis of Coal and Ash

Parameters	Unit (By Weight)	Range (Design Coal)	Design Value on “As Received” (Wet) Basis) (Performance Coal)
Proximate Analysis			
Inherent Moisture	adb %	1 - 18	18.00
Total Moisture	ar %	Max 28	26.00
Fixed Carbon	adb %	35 - 60	35.646
Volatile Matter	adb %	26 - 45	34.29
Ash	adb%	Max. 15	4.06
Total Sulphur	adb%	Max. 1	0.89

HHV	adb, kcal/kg	5,500 – 6,500	4,963
Grindability	HGI	35 - 60	47
Ultimate Analysis			
Carbon	%	51 - 75	52.08
Hydrogen	%	4.0 – 7.5	3.10
Oxygen	%	By difference	12.87
Nitrogen	%	1.1 – 1.8	1.05
Sulfur	%	0.53 – 0.86 *	0.89
Chlorine		< 0.05	0.007
Ash	%	Max. 15	
Moisture	%	1 - 18	
Ash Component			
SiO ₂	adb, %	24-62	24.67
Al ₂ O ₃	adb, %	12-35	14.26
Fe ₂ O ₃	adb, %	5-22	11.89
CaO	adb, %	Max. 18	13.59
MgO	adb, %	0.5-8.6	4.89
Na ₂ O	adb, %	0.1-7.2	7.20
K ₂ O	adb, %	0.2-1.76	1.76
SO ₃	adb, %	0.3-20.34	20.34
P ₂ O ₅	adb, %	0.1-1.1	0.52
TiO ₂	adb, %	0.5-3	0.72
Mn ₃ O ₄	adb, %	0.04-0.2	0.16

Other	adb, %		0.00
Initial Deformation temperature	$^{\circ}\text{C}^*$	Min. 1,050	$\geq 1,050$
Sphere Temperature	$^{\circ}\text{C}^*$		
Hemisphere Temperature	$^{\circ}\text{C}^*$	Min. 1,100	$\geq 1,125$
Flow Temperature	$^{\circ}\text{C}$		$\geq 1,150$

4.1.3 Predict auxiliary power consumption approved:

The approved Guaranteed Total Plant Auxiliary Power Consumption 128.383 MW with detail consumption load of each system/equipment designed as attachment Table 12. During performance test, the power consumption of each system/equipment will be recorded, this will be the basis for allocating responsibility between the Parties if the system/equipment supplied by one Party consumes more power than the value in Table 12, causing the total Plant consumption to exceed the guaranteed value, and the Party shall be responsible accordingly.

4.2. PLANT PERFORMANCE GUARANTEES VALUES IN PREVIOUS EPC CONTRACT

	Items	Unit	Parameter for Performance Guarantee	Remarks
1	Guaranteed Gross Unit Rated Output	MW	600	Continuous output (MW) of 100% TMCR at Generator terminals under rated steam conditions at Turbine inlet and CW temperature of 30 Deg. C with 0% make-up with excitation power deducted.
2	Guaranteed Gross Unit Heat Rate	kcal/kWh	2 037	Unit Gross Heat Rate in Kcal/Kwh at 100% TMCR for constant pressure operation under rated steam conditions and condenser vacuum of 57 mm Hg(A) with zero make up and all heaters in service.
3	Guaranteed Total Plant Auxiliary Power Consumption	MW	128.383 (no BF)	100 % of TMCR HB Case C for EPC package;
4	Guaranteed Maximum Overload Capacity	MW	630	Continuous Output (MW) of 105% of TMCR at Generator terminals corresponding to VWO flow under rated steam conditions at Turbine Inlet and 0% make-up.

	Items	Unit	Parameter for Performance Guarantee	Remarks
5	Guaranteed Minimum Load Without Fuel Oil Support (BMCR)	%	40%	Firing performance coal; The Steam Generator load is decreased slowly (not above 6%/min)
6	Guaranteed Maximum Unburnt Carbon in Ash (Fly/Bottom)	%	5/8	Firing the design coal and range; Feed water quality meets the requirement; The measurement method is according to ASME PTC 4
7	Guaranteed Steam Generator Efficiency (HHV)	%	87.36	Measured at TMCR load, HB Case C; Steam Generator Fuel Efficiency is calculated according to the heat loss method of ASME PTC 4.0; Ambient air temperature 26.7°C; Ambient air relative humidity; 84% Barometric pressure 0.101325 MPa; Firing performance coal
8	Guaranteed Main Steam Capacity	t/hr	1,908.887	Measured at BMCR load, HB Case A; Firing the design coal and range
9	Air heater air-in-leakage after 3000 hrs	%	10	Steam Generator operates stably at BMCR load; firing performance coal; excess air remains at design value pulverizing system parameters meet the requirements of the Steam Generator.
10	Various part load operations		30% TMCR~ BMCR	firing the design coal and range; feed water quality meets the requirement

	Items	Unit	Parameter for Performance Guarantee	Remarks
11	Guaranteed Main Steam Temperature	°C	568.4	firing the design coal and range excess air remains at design value, Superheater outlet temperature , TMCR HBD Case C Short-term control range of $\pm 5.5^{\circ}\text{C}$ permitted.
12	Guaranteed RH Steam Temperature	°C	566.5	firing the design coal and range excess air remains at design value; Reheater outlet temperature, TMCR HBD Case C Short-term control range of $\pm 5.5^{\circ}\text{C}$ permitted.
13	Guaranteed Maximum Water-Steam Pressure Drop	bar	64.0	firing the design coal and range main steam, reheat steam and feed water parameters keep at rated value; feed water quality meets the requirement; measured at the outlet of the final FW heater to the inlet of the MS Stop Valve, TMCR HB Case C
14	Guaranteed Maximum Steam Pressure Drop	bar	4.27	firing the design coal and range main steam, reheat steam and feed water parameters keep at rated value; feed water quality meets the requirement; measured at the HP ST exhaust to the RH turbine intercept valve, TMCR HB Case C
15	Furnace Exit Gas Temperature	°C	1,210	The Furnace Exit Gas Temperature (FEGT) at the specified location does not exceed the specified maximum temperature at all loads up to and including BMCR; firing the design coal and range main steam, reheat steam and feed water parameters remain at rated value; excess air remains at design value

	Items	Unit	Parameter for Performance Guarantee	Remarks
16	Flue Gas Temperature	°C	135	firing the design coal and range main steam, reheat steam and feed water parameters remain at rated value; excess air remains at design value
17	Steam Temperature Imbalance at SH two side outlets	°C	10	firing the design coal and range; excess air remains at design value
18	Steam Temperature Imbalance at RH two side outlets	°C	10	firing the design coal and range; excess air remains at design value
19	Max superheater spray water flow	t/h	133.6	The Steam Generator operates stable at BMCR load; firing the design coal and range; excess air remains at design value
20	Reheater spray water flow	t/h	0	Steam Generator load is within 60%~100%BMCR; Steam Generator operates stably; firing the design coal and range; excess air remains at design value.
21	Circulation Pump flow	%	30% BMCR main steam flow	The Steam Generator operation is according to the instructions supplied by contractor

	Items	Unit	Parameter for Performance Guarantee	Remarks
22	Maximum ramp/sudden load change withstand capability		6% / per minute	
23	Mill Capacity		BMCR load and design coal - 53.3 t/h (t=27oC and RH-84%). Max mill capacity – 53.3*1.1=58.7 t/h.	BMCR load can be achieved with one mill out of service, 6 mills (5 mills in operation).
24	Guaranteed Turbine Exhaust Pressure	mm HG abs.	57	Measured at the LP STG exhaust hood interface with the condenser; Assuming 30 °C CW.
25	NOx Emission	mg/Nm ³	Max. 450	Equivalent NO ₂ at stack inlet at 6% excess oxygen
26	SOx Emission	mg/Nm ³	Max. 300	Equivalent SO ₂ at stack inlet at 6% excess oxygen
27	Outlet dust concentration	mg/Nm ³	Max. 50	Equivalent SO ₂ at stack inlet at 6% excess oxygen

	Items	Unit	Parameter for Performance Guarantee	Remarks
28	Operating frequency range	Hz	See document Volume II Technical proposal, _DCS and Electrical part, article 2.1	

4.3. PLANT PERFORMANCE GUARANTEES VALUES INTENDED TO REMAIN BY THE OWNER

4.3.1. The Owner intends to remain the following performance guarantees as bellows:

Project shall be guaranteed under approved FEED (Front-End Engineering Design). The main parameters of the plant are committed by the Owner to ensure to the competent authorities as follows:

	Items	Unit	Parameter for Performance Guarantee	Remarks
1	Guaranteed Gross Unit Rated Output	MW	600	Continuous output (MW) of 100% TMCR at Generator terminals under rated steam conditions at Turbine inlet and CW temperature of 30 Deg. C with 0% make-up with excitation power deducted.
2	Guaranteed Gross Unit Heat Rate	kcal/kWh	2 037	Unit Gross Heat Rate in Kcal/Kwh at 100% TMCR for constant pressure operation under rated steam conditions and condenser vacuum of 57 mm Hg(A) with zero make up and all heaters in service.
3	Guaranteed Total Plant Auxiliary Power Consumption	MW	128.383 (no BF)	BF = Booster Fan
4	Guaranteed Steam Generator Efficiency (HHV)	%	87.36	Measured at TMCR load, HB Case C; Steam Generator Fuel Efficiency is calculated according to the heat loss method of ASME PTC 4.0; Ambient air temperature 26.7°C; Ambient air relative humidity; 84% Barometric pressure 0.101325 MPa; Firing performance coal

	Items	Unit	Parameter for Performance Guarantee	Remarks
5	Guaranteed Turbine Exhaust Pressure	mm HG abs.	57	~~Measured at the LP STG exhaust hood interface with the condenser; Assuming 30 °C CW.~~
6	NOx Emission	mg/Nm ³	Max. 450	Equivalent NO ₂ at stack inlet at 6% excess oxygen. From 31/12/2031, the new outlet should be Max. 250 mg/Nm3 in compliant with QCVN 19:2024 National Technical Regulation on Industrial Emission
7	SOx Emission	mg/Nm ³	Max. 300	Equivalent SO ₂ at stack inlet at 6% excess oxygen . From 31/12/2031, the new outlet should be Max. 250 mg/Nm3 in compliant with QCVN 19:2024 National Technical Regulation on Industrial Emission
8	Outlet dust concentration	mg/Nm ³	Max. 50	Equivalent SO ₂ at stack inlet at 6% excess oxygen From 31/12/2031, the new outlet should be Max. 35 mg/Nm3 in compliant with QCVN 19:2024 National Technical Regulation on Industrial Emission

4.3.2. Performance Guarantees and Tests

Based on the Owner's guaranteed parameters for the entire plant, which is specified on FEED and the existing detail design, detailed calculations will be performed for the performance parameters of the constituent equipment/ systems to identify factors impacting the plant's overall guaranteed parameters, and responsibilities will be allocated between the Owner and Contractor according to their respective supply scopes.

The Bidder shall propose the methodology of engineering that meet the performance criteria, any deviation stated by Bidder with reasonable demonstration will be considered by the Owner.

The performance/acceptance tests for various equipment and systems shall be carried out as specified under the respective equipment specifications and those specified below shall be specifically applicable. All the guarantees shall be tested together as far as practicable.

The Performance guarantee tests shall be conducted for both the units

The performance tests shall be carried out with the unit operating at the guaranteed point conditions corresponding to 100%, 85%, 60%, 50% TMCR

4.3.2.1. Reliability Run and Performance Tests of whole Power Plant should be performed by Commissioning Contractor in separate Subcontract with the Owner.

4.3.2.2. Performance/Acceptance Tests Procedures

	Items	Performance/Acceptance Tests Procedures	Remarks
1	Overall Plant Performance	Latest ASME PTC 46 Performance Test Code on Overall Plant Performance	
2	Steam Generator	The performance tests shall be conducted in accordance with the latest version of ANSI PTC 4.0	
3	Turbine Generator	The performance test for the turbine generator set will be conducted in accordance with the latest edition of ASME-PTC-6	
4	Condenser	Performance test for the condenser shall be conducted in accordance with the latest edition of ASME PTC-12.2	
5	Feed Water Heaters and Drain Cooler	Performance test for feed water heaters shall be conducted in accordance with the latest edition of ASME PTC-12.1	
6	Deaerator	Performance test for deaerator shall be conducted in accordance with the latest edition of ASME PTC-12.3	

4.4. CONTRACTOR'S PERFORMANCE GUARANTEES

4.4.1. Contractor is responsible for following values:

4.4.2. Auxiliary Power Consumption

Contractor to fill the APC value for all equipment, which are supplied within Contractor's scope of supply

	Items	Unit	Parameter for Performance Guarantee	Remarks
1	Total Auxiliary Power Consumption	kW	--	
	In Details:			
1	Ammonia unloading and storage system	kW	--	
2	Turbine Oil Purification System	kW	--	
3	Condensate Polishing System	kW	--	
4	Miscellaneous cranes & hoist (additional crane)	kW	--	Not delivered portion.
5	Main CW piping and Aux. CW Piping	kW	N/a	
6	CCCW Heat Exchanger	kW	N/a	
7	Effluent Treatment System	kW	--	
8	Vertical Pumps & Horizontal Centrifugal Pumps	kW	--	
9	Generator Transformers Unit 1	kW	--	

	Items	Unit	Parameter for Performance Guarantee	Remarks
10	Station Transformer	kW	--	
11	Auxiliary Transformers	kW	N/a	
12	500kV/220kV System Interconnection	kW	N/a	
13	Distributed Control System (DCS)	kW	N/a	
14	Intake Chlorination System	kW	--	
15	HVAC System (except Admin building, Workshop, Warehouse, Canteen and separate BOPs packages)	kW	--	
17	HP & LP Bypass Valves	kW	N/a	
18	Control Valve	kW	N/a	
19	HP Safety Valves including Silencers	kW	N/a	
20	HP Valves & Piping specialties	kW	N/a	
21	LP valves & specialties	kW	N/a	
22	HP Piping (Power Cycle Piping) and HP Piping Hanger and Supports	kW	N/a	
23	Generator Circuit Breaker	kW	N/a	
24	Gas distribution system N2	kW	N/a	
25	10kV & 3kV Segregated phase busduct	kW	N/a	
26	400V PCC/MCC, ACDB & DCDB	kW	N/a	
27	Non-segregated Phase Busduct	kW	N/a	
28	Isolated phase busduct	kW	N/a	
29	Relay Panels & Metering Panel	kW	N/a	
30	220 DC System (with Lead Acid Battery)	kW	N/a	
31	UPS	kW	N/a	
32	Emergency DG Set	kW	N/a	
33	Under ground grounding system	kW	N/a	
34	Earthing (above ground) & Lightning System	kW	N/a	
35	Rotating Machine Condition Monitoring System (RMCMS)	kW	N/a	
36	Shop fabricated tanks	kW	N/a	
37	Field fabricated tanks	kW	N/a	
38	06 instrument air receiver and 04 Service air receiver	kW	N/a	
39	PC/Flue Gas/Air Duct and Specialties (Expansion joints, supporting steel structure, maintenance platform, air/gas mixture, hanger support,...)	kW	N/a	
40	Pipe Rack	kW	N/a	

	Items	Unit	Parameter for Performance Guarantee	Remarks
41	LP Piping and Specialties and Hanger & Support	kW	N/a	
42	Illumination System	kW	--	
43	CCTV Monitoring System	kW	N/a	
44	Online Environmental Monitoring System	kW	N/a	
45	- Plant communication System Technology - SCADA - VCGM/DIM	kW	N/a	
46	Boiler and BOP Field instruments	kW	N/a	
47	Thermal Insulation	kW	N/a	
48	Boiler Lagging and Insulation	kW	N/a	
49	Instrumentation Hardware-BOP	kW	N/a	
50	MV Power, LV Power & Control Cables	kW	N/a	
51	Cable routing (Cable trench, Cable Tray, duct bank & Accessories)	kW	N/a	
52	Instrumentation Cables	kW	N/a	
53	And all not-mentioned materials & equipment but need to be purchased by the Contractor in order to complete this package	kW	N/a	

4.4.3. Effluent and Sewage Discharge

The Bidder shall guarantee discharge of industrial and domestic wastewater as bellows:

	Items	Requirements	Remarks
1	Discharged industrial wastewater	Comply with QCVN 40:2025/BTNMT National Technical Regulation on Industrial Wastewater and Regulations of the Local Government	Apply in column A of table 1 (F>2000 m2/day) and & column A of table 2.
2	Discharged domestic waste water	Comply with QCVN 14:2025/BTNMT National Technical Regulation on Domestic Wastewater.	Apply in column A, table 2.

4.4.4. Qualities of treated condensate water (Condensate Polishing Plant)

The Bidder shall guarantee treated condensate water as below:

Contaminants	Unit	Normal Condition	Start Up Condition	Tube Leakage Condition
TDS- Total Dissolved Solids	µg/dm ³	< 25	< 50	

SiO ₂ - Silicic acid content	µg/dm ³	< 5	< 50	
Total Ferric Iron	µg/dm ³	< 5	< 100	
Total Copper	µg/dm ³	< 1	< 15	
pH value (runs in H/OH mode)		6.5 ± 7.5	6.5 ± 7.5	
Electrical conductivity	µS/cm	< 0,1	< 0,2	
Cl - Chlorides	µg/dm ³	< 2	< 10	
Na - Sodium	µg/dm ³	< 2	< 5	< 20
Crud (mostly black oxide of iron)	µg/dm ³	< 5	< 100	
Specific electrical conductivity	µS/cm	< 0,1	< 0,2	
O ₂ – Oxygen content before the Boiler	µg/dm ³	50÷150		
NH ₃ - Ammonia	µg/dm ³	≤ 500		
N ₂ H ₄ - Hydrazine	µg/dm ³			
TOC – Total organic carbon	µg/dm ³	≤ 100		
Oil product content	µg/dm ³	≤ 0.1		
SO ₄ - Sulphates	µg/dm ³	≤ 2		
Total hardness	µg-eq/dm ³	≤ 0.2		

Above guarantee are based on the following crude condensate analyses:

Contaminants	Unit	Normal Condition	Start Up Condition	Tube leakage
Ammonia	ppb	100	-	-
Total Dissolved Solids (TDS, ammonia and Silica excluded)	ppb	100	650	Normal +2,000
Copper	ppb	5	-	-
Total Ferric Iron	ppb	50	1,000	-
pH value (polisher runs at 25 ⁰ C with H / OH mode)	ppb	-	-	-
Chloride (as Cl)	ppb	20	100	-
Na - Sodium	ppb	10	20	-
Silica (as SiO ₂)	ppb	30	500	-
Crud (mostly black oxide of iron)	ppb	50	1,000	-

Conductivity (at 25°C)	μS/cm	0.3	2	-
Temperature	°C	50	50	-

4.4.5. Noise emissions

	Items	Unit	Parameter for Performance Guarantee	Remarks
1	Noise level at boundary (on land side) at any load	dB(A)	≤ 70 from 06.00 to 21.00 hrs ≤ 55 from 21.00 to 06.00 hrs	QCVN 26:2010/BTNMT
2	Noise level at 1 m from equipment	dB(A)	≤ 85	
3	Noise level at working place, Center control room and Administration Office with ventilation/ Air cond.	dB(A)	≤ 65	

Regarding the performance guarantee for *Waste water discharges, Treated condensate water after CPU and Noise emissions*, Bidder is responsible for ensuring the parameters as committed. In case of test failure, the contractor must be responsible for checking, repairing, correcting and re-checking until the committed parameters are achieved.

4.5 START-UP, INITIAL OPERATION, RELIABILITY RUN AND PERFORMANCE TESTS

4.5.1 General

Start-Up, Initial Operation, Reliability Run and Performance Tests shall be performed by the Commissioning Contractor for Bidder's information to coordinate.

The following field inspections and tests shall be carried out in the sequence detailed below, and the successful performance and completion of all the tests taken together shall constitute the Owner acceptance tests. The Bidder shall provide supervisory services during field inspection and tests

Commissioning Contractor	Bidder / Contractor
	After completion of erection and/or installation, and before being put into operation, each unit and all its appurtenances shall be thoroughly cleaned and then inspected, for correctness and completeness of installation and acceptability for placing in operation. All piping system shall be flushed, chemically cleaned, steam blown, air blown as required and cleanliness demonstrated using acceptable industry standards. Procedures to accomplish this work shall be subject to Owner's approval
	The check outs during the pre-commissioning period should be programmed to follow the construction completion schedule. Each system, as it is completed by construction and turned over to the commissioning (start-up) engineer(s), should be checked out and cleaned. The checking and inspection of individual systems should then follow a prescribed schedule.
Provide commissioning & start-up supervisory engineering staff specially identified for the period commencing with start-up and extending from initial operation to all performance tests	
Furnish the calibration devices, special test instruments, etc. required to prepare for and conduct the performance tests	
Commissioning, & start-up supervisory engineering personnel shall conduct training for the Owner's personnel prior to and during this period and shall train them so that they will be able to operate and maintain the new equipment satisfactorily after acceptance by the Owner	
On completion of inspection, checking and after the pre-commissioning tests are satisfactorily over, the complete equipment shall be placed on Initial Operation during which period the complete equipment shall be operated integral with sub-systems and supporting equipment as a complete plant.	- Fixing the defectives, re-calibration instruments within scope installation of Bidder during Start-Up, Initial Operation, Reliability Run and Performance Tests. - In case the defectives occur with the Owner's equipment not from installation mistakes, Bidder shall propose fixing solutions and perform fixing with defective materials/equipment provided by the Owner.

When the equipment is operating properly, its characteristics shall be recorded on the start-up report sheets. Copies of typical start-up report shall be given to the Owner. Start-up reports for all equipment shall be completed before the start of the Reliability Run	

4.5.2 Initial Operation, Reliability Run

The plant shall be on Reliability Run during which period all necessary adjustments shall be made while operating over the full load range enabling the plant to be made ready for performance and guarantee tests.

The duration of Reliability Run of the complete plant & equipment for each unit in the automatic mode of control shall be thirty (30) days out of which at least seventy two (72) hours shall be in continuous operation on full load or any other duration as may be agreed to between the Owner and the Contractor. The Reliability Run shall be considered successful, provided such item of the equipment can be operated, continuously at the specified operating characteristics for the period of Reliability Run.

For the period of Reliability Run, the time of operation with load range from 60% load to 100% load depend on dispatching by National Electricity System and Market Operation Company Limited (NSMO), minor interruptions not exceeding one (1) to Two (2) hours at a time caused during the continuous operation shall not affect the total duration of Reliability Run. Maximum number of such interruption during the reliability run shall be four (4). However, if in the opinion of the Owner, the interruption is long, the Reliability Run shall be prolonged for the period equivalent to the duration of interruption.

A Reliability Run report comprising observations and recordings of various parameters to be measured, in respect of the above run shall be prepared by the the Commissioning Contractor for each unit and witness signature by Contractor. This report besides recording the details of the various observations during operation shall also include the dates of start and finish of the Reliability Run and shall be signed by the representatives of the Parties. The report shall have sheets, recording and print out of all the details of interruption occurred, adjustments made, any minor repairs done during the Reliability Run. Based on the observations, necessary modifications/repairs to the plant shall be carried out to the full satisfaction of the Owner to enable the later to accord permission to carry out Performance and Guarantee Tests on the plant. However, minor defects which do not endanger the safe operation of the equipment shall not be considered as reasons for withholding the aforesaid permission.

Should any major failure or interruption occur in any portion of the plant due to or arising from faulty design, materials, workmanship or omissions or incorrect erection, sufficient to prevent safe and full commercial use of the plant, the reliability run shall be considered void and the reliability test period of 30 days shall recommence for that unit after the Parties has remedied the cause of defects respectively to scope of supply and scope of erection by Parties

Major Failure

Major failure means failure or interruption in any portion of the plant due to or arising from faulty design, material or workmanship, omission or incorrect erection to prevent safe and full use of the plant equipment during the Reliability Run period of 30 days.

Reliability Run would be considered a failure for any one of the following:

- (i) Failure to operate in accordance with normal operating procedures with all plant

systems under automatic control.

- (ii) Plant tripping or reduction in plant output.
- (iii) Failure to meet Guaranteed Maximum Emission Rate at any time.
- (iv) The Contractor/ Owner performs significant repairs or overhauls respectively to scope of supply and scope of erection by Parties.
- (v) Unauthorized adjustment during Reliability Run. Unauthorized adjustment means that adjustment made without a Permit To Work. However, in emergency situations, immediate adjustment may be necessary. In this case, the adjustment made should be recorded and the effect of such adjustment on the validity of the Reliability Run will be discussed and decided by the commissioning committee (created for this purpose before the start of the Reliability Run) between Owner, Commissioning Contractor and the Contractor.
- (vi) Failure to start-up/shut-down as and when required according to normal procedure.
- (vii) Major defects to warrant plant shut-down or interruption for repair which would otherwise affect safety of personnel and/or plant and equipment.
- (viii) Failure to respond correctly during the run back or emergency trip.

In the event of failure, the reliability run test period of 30 days shall recommence after the Parties has remedied the cause of the defect.

4.5.3 Performance and Guarantee Test

- a) The final tests as to the performance and guarantees shall be conducted at site, after the reliability run, by the Commissioning Contractor with full involvement of the Owner and witness by the Contractor. The necessary operating inputs shall be provided by the Owner. The engineering staff for commissioning and start-up of the Commissioning Contractor shall ensure that the equipment are ready for such tests. The Owner shall associate his necessary supporting staff with the Commissioning Contractor, Contractor to carry out the various activities related to PG tests. The necessary labour/supporting staff etc. shall be provided by the Commissioning Contractor and coordinate by the Contractor. Such tests will be conducted within a period of three (3) months after the successful completion of Reliability Run. Any extension of time beyond the above three (3) months shall be mutually agreed upon.
- b) These tests shall be binding on all the Parties of the each Contract to determine compliance of the equipment with the performance criteria.

The Commissioning Contractor shall submit the test procedure for Owner's approval within twelve (12) months from the date of letter of award of the contract. The test shall be carried out by the test grade instruments as stipulated in the applicable test code. These instruments shall be calibrated by the Commissioning Contractor in a laboratory duly approved by Owner. Batch calibration will not be acceptable. The available instrumentation and control equipment in the plant if found suitable could also be used with the prior approval of the Owner after calibrations in the plant/outside laboratory. The tests will be conducted at the specified load points, and as near the specified cycle conditions as practicable. Proper corrections in calculations to take into account the conditions which do not correspond to the specified conditions will be applied in the test report as brought out under the respective sections of the specification.

The Commissioning Contractor in coordinate with the Contractor shall submit for Owner's approval the detailed Performance Test procedure containing the following:

- (i) Object of the test
 - (ii) Scope
 - (iii) Various guaranteed parameters & tests as per contract
 - (iv) Method of conductance of test and test code
 - (v) Duration of test, frequency of readings & number of test runs.
 - (vi) Method of calculation
 - (vii) Correction curves
 - (viii) Instrument list consisting of range, accuracy, least count and location of instruments.
 - (ix) Scheme showing measurement points
 - (x) Sample calculation
 - (xi) Acceptance criteria
 - (xii) Any other information required for conducting the test.
- c) All special test grade instruments, including flow nozzles etc., equipment, tools and tackles, required for the successful completion of the Performance and Guarantee Tests shall be brought for the purpose of test, free of cost by the Commissioning Contractor.
- d) The guaranteed performance figures of the equipment shall be proved by the Parties during these Performance and Guarantee Tests. The Commissioning Contractor shall submit a detailed test report in the manner, already agreed to within one (1) month time of completion of the test, for Owner's approval. Should the Owner's assessment of these tests show any deterioration from the guaranteed values the Contractor/ Owner shall modify the equipment as required to enable it to meet the guarantees according to respective Parties scope of supply. In such case Performance and Guarantee Tests shall be repeated after one (1) month, from the date the equipment is ready for retest and all costs for modifications including labour, materials and the cost of additional testing to prove that the equipment meets the guarantees, shall be borne respectively with the Parties scope of supply.
- e) The specific tests to be conducted on equipment have been brought out in the technical specifications. The procedure to be submitted by the Commissioning Contractor should include the detailed methodology to conduct these tests/verify the guarantees offered by the Contractor notwithstanding whether these attract liquidated damages or not.
- f) Instrument accuracies shall be in accordance with the relevant test codes. All instrument in-accuracies if applicable shall be computed as per the code and values will be corrected to the advantage of the Owner. No negative tolerance will be allowed. For example, if the inaccuracy of instrumentation has been worked out to be 1%, the measured values will be assessed to be 1% inferior.
- g) The Bidder and the Commissioning Contractor shall coordinate to establish the following modes of operation to the satisfaction of the Owner before acceptance test:

- (i) Operation of each system by remote manual control.
 - (ii) Operation of the entire system in integrated manner on auto control.
 - (iii) Operation of the entire plant with auto-control loops fully implemented including different modes of load control with the help of control system.
- h) Ten (10) copies of the test reports are to be furnished by the Commissioning Contractor with coordinate by the Contractor to the Owner backed up with jointly signed data sheets.

Wherever it is not practicable to conduct the performance guarantee test at site, and an accurate test to prove the guaranteed parameter has already been conducted in the shop test, such a test may not be repeated, if so agreed by the Owner. However, in such cases, should there be any short fall in the performance during shop tests, the liquidated damages will be calculated on that basis.

4.5.4 Final completion test

On the completion of the Completion Tests of both Units and after the Parties confirm that the Facility is deemed ready for the carrying out of the Final Completion Test.

Without prejudice to the more detailed requirements as given elsewhere in the Contract, the Bidder must demonstrate that while the Facility is operating in accordance with normal operating procedures (except as necessarily modified for testing purposes) and within the limits of output specified, either continuously or intermittently as may be more convenient for the Owner and in compliance with all applicable laws and all statutory approvals:

- (i) The Facility must be available for not less than 168 consecutive hours. During this time, the Facility must operate continuously at full load for at least 72 hours, and for the rest of the period at any load as required by the Owner;
- (ii) Air emissions and noise levels of the Facility must be in compliance with guaranteed requirements; and
- (iii) Effluent discharge from the Facility must be in compliance with guaranteed requirements.

If any failure or interruption occurs in the Facility or any portion of the Facility due to, or arising from, defects in design, materials or workmanship which is sufficient to prevent the agreed usage of the equipment, the Final Completion Tests must be repeated after the Parties has remedied the causes of failure respectively to scope of supply of Parties and scope of erection by Parties.

The Final Completion Tests procedure must be agreed between the Owner and the Bidder prior to the Final Completion Tests being commenced.