Call for Tenders No. NGAPD-2006 for “Kardia Mine Pumped Hydro Storage Plant: Early Technology Provider Involvement for Design, Supply, Erection and Commissioning of Pump, Turbine, Generator and Auxiliary Systems”.

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1. Introduction

1.1 Call for Tenders

The Public Power Corporation S.A. (hereinafter PPC or the Company), 30 Chalkokondyli Street, GR 104 32, Athens, pursuant to the provisions of:

- the Regulations for Works, Supplies and Services of PPC (RWSS/PPC, Board Decision No 4/09.02.2022) published on the official website of PPC at https://eprocurement.dei.gr/images/kepy_dei_ae.pdf and https://eprocurement.dei.gr/images/kepy_dei_ae_en.pdf, and
- the present Call for Tenders

hereby invites interested Tenderers to submit a Proposal for the Call for Tenders under number NGAPD-2006 for: "Kardia Mine Pumped Hydro Storage: Early Technology Provider Involvement Tender for Design, Supply, Erection and Commissioning of Pump, Turbine, Generator and auxiliary systems".

This Tender Procedure does not constitute a binding commitment for PPC to proceed with the employment of the Successful Tenderer. PPC reserves the sole right to suspend, defer or modify this Tender Procedure without any notice, and to terminate any discussions or negotiations, at any phase of the proceedings, without being liable to any Tenderer or other party. PPC, its advisors, its staff and any of its affiliates bear no responsibility and assume no obligation by any existing errors or omissions of this Tender Procedure. The Tenderers acquire no right and may not claim for any compensation from PPC, its advisors, its staff or any of its affiliates due to this Tender Procedure or their participation in it.

1.2 Tender Scope and Objectives

PPC intends to execute the Kardia Mine Pumped Hydro Storage Plant in two Lots, under two separate contracts as follows:

- **Lot 1:** Pump-Turbine, Generator and all directly related auxiliary systems and equipment that will be awarded in a two-stage process to the Successful Tenderer, under the present Tender Procedure
- **Lot 2:** Earthworks, civil and balance of plant electromechanical that will be assigned to a contractor (the Lot 2 Contractor) under a separate tender procedure

The present Tender Procedure refers to Lot 1 only.

Following the evaluation of the offers submitted by the Tenderers, the Company will nominate the Successful Tenderer. The Successful Tenderer of the present Tender Procedure will be awarded the Lot 1 in two stages as follows:

- Stage 1: nomination as the Preferred Technology Provider, who will sign:
  - Early Engineering Contract
  - Collaboration Engagement Agreement including Exclusivity and Heads of Terms (HoTs) for LOT 1
- Stage 2: Contract for Lot 1 Project Execution

During the execution of the Early Engineering Contract, the design for the project will be progressed to such extent that:

- the Lot 1 concept design and specifications will be finalized with the contribution of the Preferred Technology Provider and will form an integral part of the Employer Requirements, allowing for the signature of the Lot 1 Contract
- the Lot 2 specifications, quantities, drawings and interfaces between Lot 1 and Lot 2 will be detailed enough to allow for the Lot 2 to be tendered as an Turnkey Design and Build contract

The value of the Early Engineering Contract will be 1,00 % of Lot 1 Offered Price + 4 % of the Optional Price (applicable only to activated Options, if any).

The duration of the Early Engineering Contract will be 9 months.

The Offer for Lot 1 will remain valid for 15 months, and in any case throughout the Early Engineering Contract execution.

2. Glossary

Balance of Plant: all the electromechanical parts of the Plant that are not included in the Lot 1 scope.

Base Scope: means the main scope for Lot 1, without any option

Committee: PPC's competent Committee to open and evaluate the Tenders, issue decisions and evaluate any changes in the composition of a Tenderer.

Collaboration Engagement Agreement: means, the agreement between Employer and Successful Tenderer, intended to be signed simultaneously with the Early Engineering Contract, including exclusivity and Heads of Terms for Lot 1 Contract. Please refer to draft in Annex VI of this Call for Tenders.

Company or Client or Employer: means PPC

DoW: Division of Works between Lot 1 and Lot 2 (See Annex II "Technical Part")

Early Engineering Contract: means the contract between the Employer and the Successful Tenderer to advance the Project's design and contribute to the preparation of the Employer's Requirements towards finalization of the Lot 1 Contract under the FIDIC Yellow Book and tendering of the Lot 2 Contract.

Early Engineering Contractor or Preferred Technology Provider: means, the Successful Tenderer of this Tender Procedure after signing with the Company the Early Engineering Contract, who will work together with the Company and Tractebel for the finalisation of the Lot 1 Contract.

Early Engineering Scope of Services or Services: the services to be provided by the Early Engineering Contractor in accordance with the Early Engineering Contract, described in Clause 4.2 herein.

Eligibility Criteria: The minimum technical and financial criteria, specified in Clause 3.5, that Tenderers must fulfill in order to be eligible to proceed to the technical and financial evaluation of the present Tender Procedure

Employer's Requirements: means the documents entitled Employer's Requirements, that will be developed during the Early Engineering Contract and will be included in the Lot 1 Contract. Such documents specify the purpose, scope, and/or design and/or technical criteria, for the Project and comprises among others the technical specifications, the Scope of Works, the Drawings and other supplementary information.

Evaluation criteria: the criteria specified in Clause 3.11 based on which the proposals will be evaluated.

Letter of Final Tender: means the offer of the Lot 1 Contractor comprising the parts of the original Tender submitted by the Tenderer in response to the Call for Tenders No. NGAPD-2006, as may have been adjusted by mutual agreement during the execution of the Early Engineering Contract.

Technical Part: Annex II to this Call for Tenders, that provides a comprehensive description of the Project's scope of supply and services, technical requirements, time schedule and other essential specifications. It serves as the basis for Tenderers to prepare their Proposals, ensuring alignment with the Project's technical and performance expectations.

HoTs: Heads of Terms regarding the Lot 1 Contract (Clause 5.2)

Lots: means Lot 1 and Lot 2.

Lot 1: Pump Turbine and Auxiliaries, as further detailed under the column Lot 1 of the DoW.

Lot 1 Scope: Engineering, Procurement/Fabrication, Erection and Commissioning and all other services and works relevant to Lot 1 (See Annex II "Technical Part")

Lot 1 Contract or Contract for Lot 1 Project Execution: The Turnkey Design and Build Contract for the Lot 1 Scope that will be signed between the Company and the Preferred Technology Provider, after the conclusion of the Early Engineering Contract.

Lot 2: Civil and electromechanical Balance of Plant as further detailed under the column Lot 2 of the DoW.

Lot 2 Scope: Ground works, civil works, architectural works, landscaping and electromechanical works BoP, that will be assigned to the Lot 2 Contractor under a separate tendering procedure.

Lot 2 Contract or Contract for Lot 2 Project Execution: The Contract that will be concluded for the Lot 2 Scope between the Company and the Lot 2 Contractor.

Lot 2 Contractor: means the contractor that will execute the Lot 2 Scope, which will be awarded under a separate tendering procedure.

Offer or Proposal or Tender: The Offer for the conclusion of the Early Engineering Contract and Contract for Lot 1 Project Execution with the Company under the terms specified herein, electronically submitted with the required declaration and all required documents.

Offered Price: The financial proposal for the Base Scope of Lot 1 Project Execution.

Offered Options: are the items of the Options List that have been chosen to be offered by the Tenderer.

Options List: is the list of the Optional items that the Company wishes to be offered optionally by the Tenderers.

Optional Items: are the contents of the Options List, as specified on the DoW. Each Tenderer may freely include in his Offer any, all, or no Optional Item. Similarly, the Company may freely choose to select any, all, or none of the Offered Options.

Optional Price: the total price of the Selected Options.

Plant: The Kardia Pumped Hydro Storage plant.

Project: The Kardia Pumped Hydro Storage project.

Scope: means Lot 1 Scope, unless otherwise specified.

Selected Options: are those Optional Items that have been selected / officially requested by the Company.

Successful Tenderer: The Tenderer with the highest Aggregate Evaluation Score.

Schedule of Guarantees: The formal document that outlines the various guarantees, as this is presented in Annex III of the present, to be dully filled in by Tenderers, according to their Proposals.

System: the PPC Electronic Procurement System through the "tenderONE" platform of "cosmoONE" company.

Tractebel: The consultant that has been contracted by the Company for the *"Review & Evaluation of Conceptual/Pre-Feasibility study, Feasibility, study and Technical Specifications for EPC Tender – PHS Plant in depleted KARDIA Mine, Western Macedonia, Greece"*, that will work together with the Preferred Technology Provider and the Company to develop the design and specifications for Lot 1 and to prepare the necessary design, specifications, quantities and drawings the will allow the Tender for Lot 2 to be issued.

Tender Procedure: the present Call for Tenders.

Tenderer(s): economic operator(s) or associations of economic operator(s) that will participate in the present Tender Procedure.

3. Instructions To Tenderers

3.1 Information for Tenderers

3.1.1 Participation in the Tender Procedure will be open to natural or legal persons or partnerships / associations thereof which fully meet the following requirements stated in Clauses 3.4 and 3.5 below.

3.1.2 Competent PPC Division for the Procedure – Place and time of submission of Tenders

a. The competent PPC division for the Tender Procedure is the New Generation Activities Procurement Department (NGAPD - ΔΠΝΔΠ), located at 25 Patission Street, 104 45, Athens – Greece. For further information, you may contact Mr. Nikolaos Mathioulakis and Ms. Lydia Tsiaousi via email at N.Mathioulakis@ppcgroup.com and L.Tsiaousi@ppcgroup.com respectively.

b. The Tender Procedure will be conducted electronically through the "tenderONE" platform of "cosmoONE" company of the PPC Electronic Procurement System, hereinafter referred to as the "**System**", through the www.cosmo-one.gr or www.marketsite.gr portals. The System ensures at a minimum, using technical means and appropriate procedures, that:

i. The time and date of accepting the tenders are precisely determined.
ii. Access to information transmitted, prior to the specified dates, is fully prohibited.
iii. Only authorized persons are entitled to designate or modify dates for opening the submitted applications.
iv. Throughout the Tender Procedure, including the opening of the quotations, all or part of the information submitted may be accessed only by authorized persons and only after the specified date and time.
v. In the unlikely event of violation or attempted violation of the restrictions and/or terms of access, as per ii., iii. and iv., such violations or attempted violations are clearly traceable.

A prerequisite for participation of the interested parties, is registration with the System. Upon successful registration, they will be provided with System Access Codes, required for system login and applications and/or Tender submissions. Registration does not incur any expenses for interested parties.

Interested parties can download User Instructions for Registration and System's User Manual free of charge from the Company's official website, specifically https://eprocurement.dei.gr «Electronic Submission».

Tenderers that are already registered in the System are not required to register again. Nevertheless, upon logging into the System, they are strongly advised to promptly update any personal information.

In order to submit a tender for the Tender Procedure, interested parties established in EU countries are required to have a qualified digital signature (qualified electronic signature according to EU regulation 910/2014) of themselves in the case of a natural person and of the legal representative(s) in the case of a legal person, issued by a qualified trust service provider.

Tenderers established outside EU with no access to qualified electronic signatures according to the above paragraph, can sign and certify / authenticate their signature with any other legal means. In such cases, the Proposal shall be accompanied by a declaration stating that the country of origin does not provide for the use of qualified digital signature. Proposals shall be submitted by interested parties electronically with a date of commencement of the submission on the date of publication of the present Call for Tenders on the "tenderONE" platform and a closing date and time of submission on the 20th of October 2025 at 13.00 (Greece time). After the expiry of the above closing date and time, the submission of Offers is not possible.

c. The Tender Documents, setting out the tendering procedure and initial requirements for the execution of the "Kardia Mine Pumped Hydro Storage: Early Technology Provider Involvement for Design, Supply, Erection and Commissioning of Pump, Turbine, Generator and auxiliary systems" (ETPI), comprising the following:

This "Call for Tenders No. NPAPD-2006", including the following annexes:

- Annex I: "Financial Offer Submission Forms", including:
  - I.a. Total Offered Price Form
  - I.b. Total Offered Price Breakdown Form
  - I.c. Offered Options Price Form
  - I.d. Price Distribution Table (in case of Associations of Economic Operators)
- Annex II "Technical Part"
- Annex III "Schedule of Guarantees"
- Annex IV "Declaration Forms"
- Annex V "Advance Payment Guarantee Sample"
- Annex VI "Collaboration Engagement Agreement"

shall be available electronically through the "tenderOne" platform of "cosmoOne" (https://www.marketsite.gr/) and on PPC's e-procurement website (https://eprocurement.dei.gr/) , where they will remain posted until up to one (1) day prior to the end of the period for the submission of Proposals.

3.2 Communication

Any communication between PPC and the Tender procedure applicants shall be made electronically via the System using the "Contact" functionality.

Communication, update and distribution of electronic documents will be carried out through the System, using the following procedures:

- Uploading or communicating relevant information via messages
- Uploading of relevant information by PPC
- Uploading of relevant information by Tenderers

All data sent, notified, submitted, or uploaded are displayed at the user interface screens. In particular, the relevant timestamp constitutes proof of communication and circulation of documents through the System. If the Company sets deadlines for replies, resubmissions, clarifications, or similar requests in its communications to the Tenderers, these deadlines shall be fair and reasonable and shall be clearly stated in the respective communication.

3.3 Clarifications on Tender Documents

Tenderers may request additional information and clarifications regarding electronic documents of the Tender Procedure no later than fifteen (15) days before the deadline for submission of the Proposal through the "Contact" functionality of the System.

In case the deadline for submission of the Proposal is extended, the relevant deadline for request for additional information and clarifications may be extended accordingly at the sole discretion of PPC.

PPC will respond to requests submitted before the above closing date, not later than fifteen (15) days after their request and in any case five (5) days before the deadline for submission of the Proposal.

3.4 Admission of Tenderers

Participation in this Tender Procedure is open to economic operators or associations of economic operators established in:

1. A Member State of the European Union, or
2. A Member State of the European Economic Area (EEA), or
3. Third countries which have signed and ratified the Agreement on Government Procurement (GPA), to the extent that the contract to be awarded is covered by Annexes 1, 2, 4, 5 and the General Notes to the European Union's Appendix I to the GPA, or
4. Third countries not falling into the above cases that have concluded a bilateral or multilateral agreement with the European Union.

Third countries of cases 3 and 4 above, must additionally uphold EU-equivalent cybersecurity, data protection, trade regulations, and intellectual property standards, including but not limited to GDPR, the NIS2 Directive, and EU strategic trade and security regulations.
Economic operators controlled by, affiliated with, or significantly influenced by entities originating from jurisdictions that do not meet the above criteria shall be excluded from participation. This includes, but is not limited to:

- Subsidiaries, branches, or joint ventures where a majority stake (direct or indirect) is held by an entity from a non-compliant jurisdiction.
- Entities with decision-making, operational, or technological dependencies on a parent company or controlling entity from a non-compliant jurisdiction.

The Company reserves the right to assess and exclude any Tenderer based on security, regulatory, or strategic interest considerations in accordance with EU and national procurement laws. Additionally, PPC shall exclude Tenderers based in or significantly dependent on entities from jurisdictions subject to trade restrictions, sanctions, or embargoes imposed by the European Union, the United Kingdom, or other relevant international bodies.

Each Tenderer, individually or as a member of an association of economic operators, may submit only one Proposal. In case more than one Proposal is submitted by an economic operator, all such Proposals shall be rejected. Noncompliance with the present provision shall lead to the exclusion of all involved Tenderers.

A prerequisite for participation in the present Tender Procedure is the absence of exclusion grounds provided in para. 3.7 and the submittal of the relevant declaration in Annex IV (Tenderer Declaration).

No Offer shall be accepted from economic operators who have been excluded from PPC contracts for the period of their exclusion.

Tenderers must meet the above admission criteria as of the date of publication of this Call of Tender (the latest).

3.5 Eligibility Criteria

The Tenderers shall meet the following qualifying criteria:

1. The Tenderer shall provide evidence demonstrating having successfully completed the **hydraulic and mechanical design, model testing, manufacturing, supply, and commissioning of**

reversible pump/turbine for at least 1 project within the European Union of more than 70MW per unit and between 90 to 150 m water head commissioned in the last 10 years or at least 3 projects within European Union of more than 70MW per unit and between 90 to 150 m Water head commissioned in the last 20 years.

2. The Tenderer shall provide evidence demonstrating having successfully completed the mechanical and electrical basic and detail **design, supply, and commissioning of generator/motor** for at least 1 project within European Union of more than 80MVA per unit for a project between 90 and 150m water head commissioned in the last 10 years or at least 3 projects of more than 80MVA per unit for projects between 90 and 150 m water head commissioned in the last 20 years.

3. The Tenderer shall provide evidence demonstrating that they have successfully completed the design and supply of control system, governing system and excitation system for at least 1 Pump Hydro Storage (PHS) project within European Union of more than 75MW per unit commissioned in the last 10 years or at least 3 projects within European Union of more than 75MW per unit commissioned in the last 20 years.

4. Tenderers' Annual Turnover shall be higher than two hundred million (200.000.000) Euros for each of the last three financial years.

5. The Tenderer shall provide evidence of certification ISO 9001, IS0 14001 and ISO 45001.

It is explicitly stated that Tenderers participating in this Tender Procedure are not allowed to rely on the financial, technical, or professional capacity of a third party. Consequently, the provision of third-party experience (borrowed experience) is not permitted.

3.6 Special Provisions for Associations of Economic Operators

Associations of Economic Operators (consortia, joint ventures etc.) are not required to adopt a specific legal form for their participation in the Tender Procedure, provided that a clear and binding reference to the formation of the Association by the members of the Tenderer is included. The requirement for the Association to adopt a specific legal form before signing any agreement with PPC will depend on its legal and commercial structure, as well as applicable law.

It is explicitly agreed that all members of an Association of Economic Operators shall bear sole, indivisible, joint, and several liability towards PPC for fulfilling all obligations arising from the Association's participation in the Tender Procedure and all respective agreements with PPC.

Associations of Economic Operators may participate in this Tender Procedure, provided that all members thereof meet the requirements set out in Clauses 3.4 and 3.7 of the present Tender. Additionally, all eligibility criteria of Clause 3.5 must be met by at least the Leader of the Association, as designated in the Tenderer's Proposal Documents.

Remaining members of such an Association must each demonstrate an annual turnover proportionate to their percentage of participation in the Association, calculated based on the minimum Tenderer's Annual Turnover requirement specified in Sub-Clause 3.5.5 above. In the event that the tendering association is a group of companies (informal partnership/ association of persons without tax and legal status), the Proposal must be formulated in such a way as to ensure separate invoicing by the members of the group in accordance with Greek tax legislation and practice.

Otherwise, where the Proposal does not meet the above condition, if the Tenderer is selected as a Counterparty, they are obliged, before signing the contract, to include a legal/tax form that will allow joint invoicing and then for the signing of the contract they must also submit a certified copy of the document proving that the aforementioned requirement is met.

3.7 Grounds for exclusion

Any economic operator or association of economic operators shall be excluded from participation in this Tender procedure, if one or more of the grounds for exclusion described in the relevant Tenderer Declaration of Annex IV apply to them or to one of their members respectively.
The Tenderer, and in the case of an Association of economic operators, each member of the Association individually, must fill in and sign the above-mentioned Declaration.

3.8 Proposal Contents

3.8.1 Administrative Folder (Folder A)

- Audited statements of accounts for last three years
- List of eligibility reference projects including documentary evidence of compliance with technical criteria by the Tenderer
- Certificate of completion issued to the Tenderer by the respective client of each of the submitted eligibility reference projects
- "Certificate of Incorporation according to the applicable registry of the Tenderer's country of registration or equivalent
- Tenderer Declaration, as per Annex IV, signed by the Tenderer's legal representative or another duly and legally authorized person.
- Joint Responsibility Declaration, in case the Tenderer is an Association of Economic Operators, as per Annex IV, signed by all members' legal representatives or other duly and legally authorized person.

It is noted that, in the case of an Association of Economic Operators submitting a Proposal, each member thereof must also submit all Declarations required from Tenderers, as outlined above.
It is explicitly stated that **no Tender Participation Bond** is required in this Tender Procedure.

3.8.2 Technical Folder (Folder B)

I. **General**
1. Submission Letter
2. List of conditions deviations and exclusions

II. **Performance**
1. Schedule of Guarantees (filled in Annex III)

III. **Programme**
1. Lot 1 time schedule including Design, Model test, Manufacturing, Transportation, Erection, Commissioning

IV. **Technical & Drawings**
1. Technical Description
2. Powerhouse General Layout
3. Cross-Sectional views
4. Preliminary P&IDs
5. Electrical SLD
6. List of Suggested Spare Parts for two years operation

V. **HSE**
1. HSE Policy
2. HSE Statistics
3. Sub-contractors HSE Control and Management
4. Procedures for reporting Accidents

VI. **Contract Management**

1. Manufacturing Capacities and Capabilities
2. Lot 1 Contractor's Team CVs
3. Subcontractors' selection strategy
4. List of Key Subcontractors
5. Organogram of Project team
6. Quality Policy
7. Manpower Histograms
8. ISO Certificates
9. Training Programme
10. Lot 2 Contractor Interface strategy

VII. **Value Engineering submittals**

11. Proposal of alternative approaches to the scope, that will deliver added value to the Project, including technical description, estimation of cost impact on Lot 1 and on Lot 2 (if applicable), time and/or performance impact.

3.8.3 Financial Folder (Folder C)

The Financial Offer, for the requested Scope, will include:

1) The special electronic form(s) of the System, filled in by the Tenderer with the Offered Price.
2) Financial Offer only for the Base Scope, in pdf file format or equivalent, as per I.a. "TOTAL OFFERED PRICE FORM" of Annex I of the present.
3) Analysis of the above Financial Offer, in pdf file format or equivalent, according to the breakdown table in I.b. "TOTAL OFFERED PRICE BREAKDOWN FORM" of Annex I of the present.
4) The Financial Offer for the Optional Scope in pdf file format or equivalent, according to the breakdown table in I.c. "OFFERED OPTIONS PRICE FORM" of Annex I of the present.
5) Only in the case a Tenderer is an Association of Economic Operators, a Price Allocation Table of the Offered Price, according to I.d. "PRICE ALLOCATION TABLE" of Annex I of the present.

All the above forms must be signed by the Tenderer's legal representative or another duly and legally authorized person and submitted electronically in accordance with the instructions of the System.
It is specifically made clear that the Optional Price shall not be calculated in the Offered Price and as such should not be included in the forms I.a. and I.b. of Annex I of the present.

The Financial Offer refers to the completion of the Base Scope described in this Tender Procedure, and shall be submitted in the form of a lump-sum fee, including all traveling, accommodation and other related expenses. The same stands also for the financial offer for the Optional Scope.

All taxes, duties, levies etc. will be borne by the Tenderer, apart from VAT which, if applicable, will be borne by PPC.

Offers that are not submitted in the aforementioned form are considered unacceptable and thus shall be rejected.

3.9 Signature of submitted documents

All Tenderers are hereby required to submit their Proposals and all accompanying documents with a valid digital signature or a certified signature, in accordance with the requirements outlined in section 3.1.2.b above.

Tenderers must use a valid digital certificate issued by a recognized Certificate Authority to ensure the authenticity and integrity of their electronic submissions, or a signature certified by a notary public or another legally recognized authority to confirm its authenticity.

3.10 Electronic Opening and Evaluation of the Folders A and B (PHASE I)

All Proposals will be evaluated primarily to determine whether they meet the requirements set forth in this Tender Procedure, particularly the completeness and accuracy of the content in Folders A, B, and C. Proposals that fail to meet these requirements and/or contain incomplete submissions will be rejected.

The Committee appointed by the Company shall proceed with the simultaneous opening of Folders A and B on a duly appointed date and time and shall verify the completeness of the submitted documents against the requirements of Sub-Clauses 3.8.1 and 3.8.2 of this document.

Taking also into account the provisions regarding the admission of Tenderers and the grounds for exclusion, as referenced above, the Committee will determine which Proposals comply with the terms of the Tender Procedure.

For accepted Proposals, the Committee will calculate the Technical Evaluation Score (TES) and rank the Technical Offers of all accepted Proposals accordingly.

The **Technical Score** of each offer shall be assigned taking into consideration the following evaluation criteria with respective weights:

- **20% Performance Score (PS).** The guaranteed values submitted by each Tenderer included in the Schedule of Guarantees compared to the minimum requirements
- **20% Compliance Score (CS).** The Tenderer's compliance with Tender requirements
- **20% Value Engineering Score (VES).** The Value Engineering proposal offered by each Tenderer and the anticipated added value to the Project
- **15% Options Score (OS).** The number of optional items included in each Tenderer's Offer
- **15% Time Score (TS).** The proposed Project delivery time of each Offer
- **10% Quality Score (QS).** The quality and completeness of the Technical Proposal

The **Technical Evaluation Score** of each offer shall be calculated as follows:

TES(i) = 20% x PS (i) / PS(max) + 20% x CS(i) / CS(max) + 15% x VES(i) / VES(max) + 15% x OS(i) / OS(max) + 15% x TS(i) / TS(max) + 15% x QS(i) / QS(max)

Where:

TES (i) is the Technical Evaluation Score of the Offer (i)
PS (i) is the Performance Score of the Offer (i)
PS (max) is the maximum Performance Score among all acceptable Offers submitted
CS (i) is the Compliance Score of the Offer (i)
CS (max) is the maximum Compliance Score among all acceptable Offers submitted
VES (i) is the Value Engineering Score of the Offer (i)
VES (max) is the maximum Value Engineering Score among all acceptable Offers submitted
OS (i) is the Optional Score of the Offer (i)
OS (max) is the maximum Optional Score among all acceptable Offers submitted
TS (i) is the Time Score of the Offer (i)
TS (max) is the maximum Time Score among all acceptable Offers submitted
QS (i) is the Quality Score of the Offer (i)
QS (max) is the maximum Quality Score among all acceptable Offers submitted

The Committee shall record the results of this process in the relevant Minutes, which will include:

- The list of Tenderers rejected due to non-compliance with the requirements outlined in Clauses 3.4 to 3.8
- The list of Tenderers accepted and technically evaluated according to the above, who will proceed to Phase II

The outcome of Phase I will be communicated to all Tenderers via the System as follows:

- Tenderers rejected due to non-compliance with provisions included in Clauses 3.4 to 3.8 will be notified of the rejection of their Proposal. The notification will specify only the part of the Proposal that was not accepted and led to the rejection, with the level of detail deemed appropriate by the Committee.
- Tenderers with accepted Proposals will be notified that they will proceed to Phase II, without receiving any information regarding their Technical Evaluation Score or ranking.

3.11 Opening of Folder C - Financial Evaluation and Award of the Contract (Phase II)

Evaluation of the Financial Offers (Phase II) shall be conducted in at least two stages:

- Opening of Folder C and initial evaluation of Financial Offers
- Submission of Improved Financial Offers

3.11.1 Opening of Folder C – Financial Evaluation

The Financial Folder (Folder C) of the acceptable Proposals after evaluation of Folders A and B, shall be electronically unsealed by the competent Committee on a predetermined date and time set in the System by the Committee.

The Committee shall verify the compliance of qualified Tenderer's submitted Financial Offer (Folder C) with the requirements outlined in Sub-Clauses 3.8.3 of the present Tender Procedure.

The Financial Evaluation Score (FES) for each Offer shall be calculated using the following formula:

FES (i) = OP (min) / OP (i)

Where:
FES (i) is the Financial Evaluation Score of the Offer (i)
OP (min) is the lowest Offered Price among all acceptable Offers submitted and not rejected during Phase I
OP (i) is the Offered Price of the Offer under evaluation (i)

Optional Prices, if offered, will not be taken into account for the Financial Evaluation.

The intermediate ranking of the accepted Tenderers is determined. by the most techno-economically advantageous Proposal, i.e., the one achieving the highest Aggregate Evaluation Score (AES), which is the sum of the Technical Evaluation Score with a Weighting Factor of 30 % and the Financial Evaluation Score of the relevant Sub-project with a Weighting Factor of 70 %, according to the following formula:

AES (i) = TES (i) * 0.30 + FES (i) * 0.70

Where:
AES (i) is the Aggregate Evaluation Score of the Offer(i)
TES (i) is the Technical Evaluation Score of the Offer(i)
FES (i) is the Financial Evaluation Score of the Offer(i)

The Committee shall document the results of the financial evaluation and the respective intermediate ranking in the relevant Minutes. These Minutes shall include:

- Any Tenderers rejected in Phase II due to non-compliance with financial evaluation criteria.
- The ranking of admissible financial offers.

Each Tenderer shall be separately notified of their intermediate ranking via the System. The notification shall contain only the respective Tenderer's ranking and shall not disclose any details regarding other Tenderers.

3.11.2 Submission of Improved Financial Offers

Following the completion of the technical and financial evaluation of the initially submitted offers and the intermediate ranking of the accepted Tenderers who submitted acceptable offers, the Committee notifies each Tenderer individually through the System regarding the formal acceptance of their Offer, as outlined above.

If the Committee requests the submission of Improved Financial Offers, the first, second, and third ranked Tenderers, will be invited to electronically submit an improved financial offer through the System within a specified deadline upon the Committee's request. This process may be repeated more than once at the discretion of the Committee. The last submitted improved offer will be considered the best financial offer.

All other Tenderers are excluded from further participation in the process.

It is made specifically clear that each improved financial offer submitted by the invited at this stage Tenderers must:

- Strictly correspond to the initially declared technical specifications, as these were specified following evaluation of Folders A and B.
- Be equal to or lower than the initially submitted financial offer in the System or the most recently submitted improved offer (if lower). Any submission of an improved financial offer with prices higher than those in the Tenderer's initial offer or the most recent improved offer (whichever is lower) is explicitly defined as a breach of the Tenderer's obligations in this process.

The Best and Final Offer, as determined through the above process, will be used for the final evaluation and the determination of the final ranking of the Tenderers, the Early Engineering Contract being awarded to the Tenderer achieving the highest final Aggregate Evaluation Score (AES), calculated as per above.

In the event of equal offers, the bidders with equivalent bids will be invited to submit their best and final financial offer electronically through the System within a specified deadline.

If VAT is applicable on the invoices issued by the Preferred Technology Provider to PPC, this will not be included in the Tender price and will not be considered in the comparison of offers.

Finally, the Committee will prepare and sign an Offer Evaluation Report, detailing the entire process. Based on this report, an official notification letter with the process results, regarding only their own final ranking, will be issued and communicated to the Tenderers through the System.

If the Committee decides not to request any improved financial offers following the evaluation of all accepted proposals, the intermediate ranking defined in section 3.11.1 above will be considered the final ranking of this Tender Procedure.

3.12 Clarifications During the Evaluation Process

During the evaluation process of the Proposals (Phases I - II), the competent Committee may invite the Tenderers through the System to submit clarifications or additional information or supporting documentation, within the time period specified in the request for clarification which in any case shall not be less than five (5) working days from the date of PPC's relevant digital request.

Clarifications shall be provided only when requested by the competent Committee and only those referred to in the points requested shall be taken into account. In that case, the provision of clarifications is mandatory for the Tenderer. PPC may, at its request, accept the submission of supplements and/or clarifications of the submitted documents. Condition for acceptance is that the clarifications fully comply with the relevant requirements of the Tender Procedure.

Rejected Tenderers reserve the right to raise objections in accordance with the provisions of Clause 3.13 of the present Tender Procedure. The list of qualified Tenderers on both Phases shall be finalized after any objections have been examined.

3.13 Tenderers' Objections

Each Tenderer is entitled to submit objections solely in the event of rejection of their Proposal within the framework of this Tender Procedure and only on the grounds of said rejection. Objections must be submitted electronically via the System, with the date of registration in the System considered as the official submission date.

Objections shall be submitted within five (5) working days from the date on which the contested decision was communicated to the party submitting the objection.

Examination of Objections

- Objections shall be reviewed by a dedicated Committee established by PPC specifically for this purpose.
- The Committee shall examine the objections within fifteen (15) calendar days from the date of the objection.
- The Committee's decision shall be communicated electronically via the System and an email notification shall be sent to the complainant.

The Committee's decision rejecting an objection is final and irrevocable and cannot be further contested before PPC bodies.

The submission of Objections does not automatically prevent the continuation of this procedure, and any acceptance of Objections does not affect the validity of the procedure, but may lead, at the sole discretion of the Company, to the amendment of the Committee's decision or to the repetition of the procedure.

3.14 Personal Data Protection - Information on the processing of personal data

PPC informs, in its capacity as data controller, the natural person signing the Proposal as a Tenderer or as a Legal Representative of a Tenderer, that its competent bodies and executives and/or third parties, on its instructions and on its behalf, will process the below data as follows:

I. The scope of processing extends to the personal data included in the Proposal files and the evidentiary means submitted to PPC, in the context of this Tender Procedure, by the natural person who is himself a Tenderer or Legal Representative of a Tenderer.
II. The purpose of the processing is the evaluation of the Proposal, the selection of the Counterparty for the respective agreement, the protection of PPC's rights, the fulfilment of PPC's statutory obligations and the overall safety and protection of transactions. Identity and contact data may also be used by PPC to inform Tenderers about the evaluation of Proposals.
III. The recipients of the abovementioned data are:
   (a) Entities to which PPC assigns the execution of specific actions on its behalf, namely Advisors, executives, members of Evaluation Committees, Operators of the System and other agents thereof in general, subject to the condition of confidentiality in each case.
   (b) The State, other public bodies or judicial authorities or other authorities or judicial bodies within the scope of their competences.
IV. The data of the Tenderers will be kept for a period of time equal to the Contractual duration, and after its expiration for a period of five (5) years, for future tax-fiscal audits or donor audits or other audits provided for by the applicable legislation, unless a different retention period is provided for by the legislation in force. In the event of pending litigation, the data shall be kept until the end of the pending litigation. After the expiry of the above periods, the personal data will be destroyed.
V. The natural person who is either a Tenderer or a Legal Representative of the Tenderer, may exercise any legal rights regarding the personal data appertaining thereto, by contacting the Data Protection Officer of PPC.

VI. PPC is obliged to take all reasonable measures to ensure the confidentiality and security of the data processing and to protect the data from accidental or unlawful destruction, accidental loss, alteration, unauthorized disclosure or access by anyone and any other form of unlawful processing.

3.15 Cancellation of the Procedure

PPC reserves the right, by reasoned decision of its competent bodies, to cancel this Tender Procedure in whole or in part, or to restate it under the same or different terms at any stage of this Procedure and at its sole discretion. PPC shall cancel (or restate) the Procedure, in particular if:

- it was barren due to non-submission of Proposals or due to rejection of all Proposals or exclusion of all Tenderers
- it was conducted without observing the conditions set out in this Tender Procedure and in the relevant legislation, consequently affecting the result.
- competition has been insufficient
- the outcome following evaluation of the above set criteria, is unsatisfactory for the Company.
- the Company's needs have changed.
- the Contract cannot be properly executed, due to force majeure

3.16 Reservation of Rights

Participation in the Tender Procedure shall be equivalent to a declaration by the Tenderer that they were fully aware of all the terms, information and documents of the Tender Procedure.

PPC reserves the right to postpone the date of submission of Proposals or make any amendments to this Tender Procedure. These amendments will be included in relevant Supplements of this Tender Procedure, the issuance whereof will be published, as well as the Call.

PPC has no responsibility or obligation, in any event, to compensate the Tenderers for any expense or damage they might have suffered in preparing and submitting their Proposals, especially in the event that they are not accepted, or the Procedure is postponed or cancelled at any phase and time and for any reason or cause. Consequently, those who participate in the Tender Procedure and submit a Proposal, regardless of whether they were finally accepted or not, do not acquire any right whatsoever against PPC from this Tender Procedure and their general participation in the procedure.

With regards to the Optional Parts of the Scope, the Company reserves the right to select any, all or none of the Optional Items offered by the Successful Tenderer.

4. Early Engineering

4.1 Scope of Services

The aim of the Early Engineering Contract is for the Early Engineering Contractor to:

- support the Employer in the optimisation of the project
- complete the design, including all required studies and reporting, of the agreed scope and nature of the Works comprising the Lot 1 Contract to a level of detail sufficient for the Early Engineering Contractor to be able to:
    - agree to a lump sum Final Tender Price for the execution of those Works, and
    - provide sufficient information describing the Works under the Lot 2 Contract to be able to prepare the Tender Documents for that contract;
- support the Employer in the development and finalisation of the Employer's Requirements which describe and specify in detail the Works to be executed under the Lot 1 Contract, and which will form part of the Lot 1 Contract documentation for that contract;
- agree to the all the terms and conditions of the Lot 1 Contract including all contractual and commercial parts of the Lot 1 Contract.

The basis of all activities and deliverables shall be the "Early Technology Provider Involvement Tender – Technical Part" included in Annex II hereof.

The Early Engineering Contractor's entire team for the execution of the Services under Early Engineering Contract shall be based in the Early Engineering Contractor's offices in Europe.".

4.1.1 Activities

Value Engineering

- Organise and participate in monthly value engineering workshops
- Identify the necessary layout redundancy and options that will allow to accommodate planned and unplanned outages without total loss of capacity
- Elaborate the design philosophy, with regard to ease of maintenance and availability of parts not kept in stock
- Evaluate alternative configurations
- Perform Design optimization
- Propose value engineering options

General

- Collaborate with Tractebel with the feasibility and Tender Design finalisation
- Provide input to Tractebel as required
- Contribute to the preparation of Employer Requirements for Lot 1 Contract
- Contribute to the preparation of Employer Requirements for Lot 2 Contract
- Steady state and transient hydraulic design of waterways, outtake, intake and including tailrace.
- Ensure compatibility with the selected pump turbine number of units, characteristics and operating considerations.
- Stability Study to confirm the line charging operation mode
- Efficiencies in generation and pump mode and round-trip efficiency
- Initiate and progress the design for the Hydraulic model Test of the runner (that will be performed as soon as reasonably practical after Lot 1 signature)
- Dimensioning of Lot 1 equipment
- Lot 1 Technical Specifications finalization
- Contribution to and coordination with grid modelling
- Elaborate a list of concerns/risks and suggest mitigation measures
- Establish the O&M approach including monitoring and maintenance as well as handover process to the Company
- Scope definition for Balance of Plant (Lot 2 electromechanical equipment)
- Establish (any) Minimum Requirements for Balance of Plant (Lot 2 electromechanical equipment)

- Pre-dimensioning for the parts of the Balance of Plant (Lot 2 electromechanical equipment) which depend on Lot 1 input
- Establish all interface points between Lot 1 and Lot 2 and define the required conditions at battery limits

4.1.3 Deliverables

- Hydraulic Design Report (steady state and transient)
- Process Flow Diagrams (PFDs)
- Piping and Instrumentation Diagrams (PIDs)
- Start-up and shut down conditions of the plant.
- Control Philosophy (First draft)
- O&M Philosophy (First draft)
- Commissioning Philosophy and Methodology (First Draft)
- Overall layout of the powerhouse
- General Arrangement Drawings
- Equipment List
- Piping Line List
- Pump Turbine Datasheet
- Motor Generator Datasheet
- Technical Specification Pump Turbine
- Technical Specification for Mechanical Protection Equipment
- Technical Specification for Electrical Protection Equipment
- Technical Specification for Mechanical Equipment under Lot 1
- Single Line Diagram
- Consumer List
- Wiring Diagrams
- Technical Specification for all Electrical Equipment under Lot 1 (SFC, Phase Reversal, GCB, IPB, electrical protections)
- Technical Specification for all selected optional Electrical Equipment
- Control System Architecture
- Technical Specification for Plant Control System (DCS, SCADA)
- Technical Specification for Monitoring System
- Technical Specification for field Instruments
- Risk Analysis
- Detailed Time schedule (including milestones for Lot 2 Contractor)
- Erection methodology (including specific requirements for Lot 2 Contractor)
- Civil guide drawings (powerhouse)
- Detailed DoW between Lot 1 and Lot 2 including clear battery limits and conditions at battery limits as applicable
- Interface Matrix between Lot 1 and Lot 2, including:
  - all interfaces related to engineering, erection, construction and commissioning
  - necessary input data required from Lot 1 to Lot 2 and vice versa, including timing

4.2 General Conditions of Contract

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4.3 Particular Conditions of Contract

4.4.1 Part A. References from Clauses in the General Conditions

1.1 Definitions

1.1.4	Client's Representative	[Name of Representative]
1.1.5	Commencement Date	The Employer shall, no later than 28 days after the Effective Date, issue a Notice to the Early Engineering Contractor to commence the Services under this Agreement. The date on which the Notice is received by the Early Engineering Contractor shall constitute the Commencement Date.
1.1.8	Consultant's Representative	[Name of Representative]
1.1.9	Country	Greece
1.1.22	Project	"Early Engineering for Pump, Turbine, Generator and Auxiliary Systems of Kardia Mine Pumped Hydro Storage"
1.1.24	Time for Completion	263 days (9 months)

1.3 Notices and other Communications

1.3.1(c) Communication: [System of electronic communication accepted]

1.3.1(d) Address for communications

Client's address: [Address]

Email: (only when e-mail is accepted as a valid system for electronic communications) [Email]

Facsimile number: [Number]

Consultant's address: [Address]

Email: (only when e-mail is accepted as a valid system for electronic communications) [Email]

Facsimile number: [Number]

1.4 Law and Language

1.4.1 Law governing Agreement	Greek law
1.4.2 Ruling language of Agreement	English
1.4.3 Language for communications	The language for communications is English, except that for the limited purposes specified in this Sub-Clause the language of communication is Greek

1.8 Confidentiality

1.8.3 Period for expiry of confidentiality	Two years after the completion of the Services or the termination of this Agreement, however the Employer, at its discretion, may, upon the issue of a Notice to the Early Engineering Contractor prior to the expiry of this initial period of confidentiality, extend the period of confidentiality for up to a further two years for specific identified provisions of this Agreement.

1.9 Publication

1.9.1 Publication restrictions	Two years after the completion of the Services or the termination of this Agreement, however the Employer, at its discretion, may, upon the issue of a Notice to the Early Engineering Contractor prior to the expiry of this initial restriction period, extend the restriction period for up to a further two years.

3.9 Construction Administration

Not included in Services

7.4 Third Party Charges on Consultant

Exemption Applies

8.2 Duration of Liability

8.2.1 Period of Liability	Four years after the completion of the Services or the termination of this Agreement

8.3 Limit of Liability

8.3.1 Limit of Liability	100% of the Contract Price stated in Appendix 3 to this Agreement

9 Insurance

9.1.1 Insurances to be taken out by Consultant

Professional Indemnity Insurance	Five million euros (5.000.000€)
Public Liability Insurance	One million euros (1.000.000€)

10 Disputes and Arbitration

10.4.1 Arbitration rules	In the event that any disputes may arise between the parties, under or in connection with the present Agreement, that may not be resolved amicably within thirty (30) business days, or later date as may be mutually agreed, such disputes will be resolved in accordance with the Rules of Arbitration of International Chamber of Commerce (ICC) by three arbitrators to be appointed in accordance with such Rules. The Arbitration will take place in Athens, Greece.
10.4.1 Language of arbitration	English

4.4.2 Part B. Additional or Amended Clauses

1. Delete the text of sub-clause 1.1.3 in its entirety and substitute with the following: *"Wherever the term "**Client**" is used in the Conditions of Contract it is to be replaced by "**Employer**"."*

2. The following text is added at the end of Sub-Clause 1.1.6: "For the avoidance of doubt, Confidential Information also includes any piece of Information as designated in Sub-Clause 1.1 and Clause 5 [Confidentiality Obligations] of the Collaboration Engagement Agreement".

3. Delete the text of sub-clause 1.1.7 in its entirety and substitute with the following: *"Wherever the term "**Consultant**" is used in the Conditions of Contract it is to be replaced by "**Early Engineering Contractor".**"*

4. Delete the text of sub-clause 1.1.27 in its entirety and substitute with the following: *""**Works Contract**" means the contract for the execution of the permanent works, the design of which is the subject of the Services under this Agreement, and associated temporary works (if any) under the Project and which is referred to as "**Kardia Mine Pumped Storage Plant – Lot 1: Mechanical, Electrical and Control and Communication Works**"."*

5. Add the following new sub-clause 1.1.29: " *"**Employer**" means the Party named in the Form of Agreement and legal successors to the Employer and permitted assignees."*

6. Add the following new sub-clause 1.1.30: " *"Early Engineering Contractor" means the Party named in the Form of Agreement and legal successors to the Early Engineering Contractor and permitted assignees."*

7. Add the following new sub-clause 1.1.31: " *"**Tender**" means the tender submitted by the Early Engineering Contractor in response to the Employer's Call for Tenders No. NGAPD-2006 for the execution of the Services entitled "Kardia Mine Pumped Hydro Storage: Early Technology Provider Involvement for Design, Supply, Erection and Commissioning of Pump, Turbine, Generator and auxiliary systems".*

8. The following text is added at the end of Sub-Clause 1.4.3: "Notwithstanding the above, where (i) Documents to be analysed by the Early Engineering Contractor are originally in Greek, or (ii) The Early Engineering Contractor is required to provide input, reports, or documentation for submission to Greek Authorities, the communication language or the language of the Services may be Greek, but only to the extent necessary for such specific purposes.

9. Sub-Clause 1.7.1 is amended as follows: "All Intellectual Property held in any medium, whether electronic or otherwise, created by the Early Engineering Contractor during the performance of the Services (Foreground Intellectual Property) is vested in the Early Engineering Contractor. The Early Engineering Contractor hereby grants to the Employer a royalty-free worldwide license to use and copy the Foreground Intellectual Property for any purpose in connection with the Project".

10. <u>After Sub-Clause 1.7.5 the following Sub-Clauses are added:</u>

    1.7.6 License Grant
    Notwithstanding the provisions of Sub-Clauses 1.7.1 to 1.7.4, the Early Engineering Contractor agrees that all technical input, documentation, specifications, designs, reports, the Tender submitted by the Early Engineering Contractor and the Services under this Agreement shall be licensed to the Employer on a royalty-free, irrevocable, worldwide, non-exclusive, and transferable basis. The Employer shall have the unrestricted right to use, modify, reproduce, and share such input for the purposes of the Project and any related activities, including but not limited to the engagement of third parties for the continuation or completion of the Project.

1.7.7 Waiver of Restriction
The Early Engineering Contractor expressly waives any right to assert or enforce any intellectual property rights in a manner that would restrict, delay, or otherwise hinder the Employer's use of the provided input and deliverables of the present Agreement. The Early Engineering Contractor shall not claim or enforce any intellectual property rights that would prevent the Employer from freely using, developing, or implementing the provided input and/or deliverables for the Project.

1.7.8 Use of Deliverables After Completion or Termination
In the event of the completion or termination of this Agreement, for any reason, the Employer shall retain the right to use all deliverables of the present Agreement, including but not limited to drawings, designs, reports, calculations, and specifications, without restriction, and may provide them to any third party, such as another consultant, supplier, or contractor, for the continuation and completion of the Project.

1.7.9 Third-Party Rights and Indemnity
The Early Engineering Contractor warrants that all input, materials, and deliverables in general provided under this Agreement are either owned by the Early Engineering Contractor or appropriately licensed for use by the Employer. The Early Engineering Contractor shall indemnify and hold harmless the Employer against any claims, damages, or liabilities arising from an alleged infringement of third-party intellectual property rights related to the provided input and deliverables.

1.7.10 Exclusion of Innovation
The Early Engineering Contractor acknowledges that this engagement does not involve the development of new intellectual property or innovative solutions but rather the provision of early engineering and technological input necessary for the execution of the Project. Any intellectual property provided shall be considered as technical information essential for the Project and shall not be subject to additional claims of proprietary rights beyond those specified in this Clause.The last paragraph of Sub-Clause 2.3.1 is amended as follows: "Sub-Clauses 2.3.1 (a) and (c) to (e) shall not apply where the principal place of business of the Early Engineering Contractor is a member state of the European Union or the European Economic Area".

11. Sub-Clause 2.4 of the General Conditions shall not apply.

12. Sub-Clause 2.6 of the General Conditions shall not apply.

13. Sub-Clause 3.7.2 is amended as follows: "3.7.2 "The cost of such replacement shall be borne by the Early Engineering Contractor:
    (a) where the replacement is at the initiative of the Early Engineering Contractor; and also
    (b) where the replacement is requested by the Employer by means of a Notice stating the reasons for it, provided that such reasons relate to the provision of the Services and shall be reasonable and not vexatious.".

14. After Sub-Clause 4.2.1 a new Sub-Clause 4.2.2 is inserted as follows

"**4.2.2 Acceptance of the Services and Performance Certificate**
Following the proper and full completion of the Services in accordance with this Agreement, the Early Engineering Contractor may submit a written request to the Employer for the acceptance of the Services. Within a reasonable period after receiving such request—and provided that the Employer is satisfied that all Services have been duly completed and any issues raised in prior Notices of Non-Conformance have been resolved—the Employer shall issue a Performance Certificate confirming the satisfactory completion of the Services. The issuance of the Performance Certificate shall constitute a condition precedent for the formal completion of the Agreement. Such issuance shall not affect any rights of the Employer under the Agreement in respect of defects, liability, or other post-completion obligations of the Early Engineering Contractor. If the Employer considers that the Services have not yet been completed in full, it shall notify the Early Engineering Contractor in writing, within fifteen (15) days of the Early

Engineering Contractor's request, identifying the outstanding items or deficiencies that must be remedied before the Performance Certificate can be issued".

15. Add the following new sub-clause 4.4.4.

"In the event that the Early Engineering Contractor exceeds the Time for Completion as specified in Appendix 4 for any reason or cause other than those expressly provided in Sub-Clause 4.4.1 of the General Conditions, delay-related penalties ("Delay Penalties") shall be imposed.

The Delay Penalties shall amount to 2,00 % (two per cent) of the Contract Price, as defined in section 3.1 of Appendix 3, inclusive of any variations, subsequent supplement(s), amendment(s) or any other written agreement(s) executed between the Parties, in connection with this Agreement. This penalty shall apply for each and every full week of delay beyond the Time for Completion, as stated in Appendix 4. A grace period of two weeks shall apply, during which no Delay Penalties shall be imposed. However, once the penalty is triggered, it shall be calculated retroactively from the first day of delay.

Notwithstanding the provisions of Sub-Clause 7.2.3, the Employer shall impose the Delay Penalties by withholding corresponding amounts from any future payments due to the Early Engineering Contractor under the Agreement.

The cumulative amount of Delay Penalties shall in no event exceed fifteen percent (15%) of the total Contract Price of the Agreement, inclusive of any variations, subsequent supplement(s), amendment(s) or any other written agreement(s) executed between the Parties, in connection with this Agreement. For the avoidance of doubt, the Delay Penalties stipulated herein shall constitute the Early Engineering Contractor's sole and exclusive financial liability towards the Employer in respect of any delay in completion of the Services."

16. After Sub-Clause 4.6 a new Sub-Clause 4.7 is inserted as follows

"**4.7 Submission and Review of Deliverables**
The Early Engineering Contractor shall submit each deliverable or output of the Services in accordance with the Programme and the Scope of Services, in both editable and PDF formats, accompanied by a transmittal note referencing the relevant deliverable title and its submission status (draft or final).

Within fifteen (15) days from receipt of each deliverable/output, the Employer may issue a Notice of Non-Conformance if the Employer has (a) any remarks or comments on the content, clarity, or adequacy of the deliverable/output; or (b) identified any defects or deficiencies therein.
The Notice of Non-Conformance shall set out the Employer's observations and may request the Early Engineering Contractor to either:
(a) correct, revise, or supplement the deliverable within seven (7) calendar days of receipt of the Notice, or within such other period as may be agreed between the Parties; or
(b) address the Employer's comments as part of the submission of a subsequent and related deliverable, where the Employer deems such sequencing appropriate.

Failure by the Employer to issue a Notice of Non-Conformance within the above fifteen (15) days shall not be deemed acceptance of the deliverable but shall constitute a waiver of the Employer's right to require corrections under this Sub-Clause, without prejudice to its other rights under the Agreement. The Early Engineering Contractor shall remain fully responsible for ensuring that all deliverables/outputs of Services comply with the Agreement, regardless of any Notice or lack thereof.

The timely and proper response by the Early Engineering Contractor to any Notice of Non-Conformance shall be a condition for the corresponding progress to be recognized under the Progress Measurement Mechanism. Failure to respond adequately or within the prescribed timeframe shall result in the relevant portion of the Services being marked as incomplete or non-

compliant, and the corresponding payment shall be deferred or withheld until satisfactory resolution".

17. Sub-Clause 6.1.2 c) of the General Conditions shall not apply.

18. Sub-Clause 6.4.1 (d) is amended as follows: "At its sole discretion upon giving the Early Engineering Contractor fifty-six (56) days' Notice".

19. Sub-Clause 6.5.4 of the General Conditions shall not apply.

20. Sub-Clause 7.1.2 of the General Conditions shall not apply.

4.4.3 Appendix 1 Scope of Services

Within this Agreement the Employer assigns and the Early Engineering Contractor assumes the obligation to provide timely, efficiently, and safely the Services, as analytically mentioned hereby in the following order of precedence:

1. Tenderer replies to Employer's queries (post tender submission)

2. Employer's replies to Tenderer's queries (before tender submission)

3. Clause 4.2 of the Tender

4. Early Engineering Contractor's offer

The Services apply to the Project as described in Annexes II and III of the Tender.

4.4.4 Appendix 2 Personnel, Equipment, Facilities and Services of Others to be Provided by the Employer

Not applicable

4.4.5 Appendix 3 Remuneration and Payment

3.1 Contract Price

The Contract Price for the Services provided under the Scope of Services of this Agreement, as described above in Appendix 1 herein, shall be equal to ***[1% of the Lot 1 Offered Price + 4% of the Optional Price]*** Euros (€_____).

The Contract Price shall be fixed and not subject to escalation.

The Contract Price shall be the full remuneration and shall cover any expenditure required for the provision of the Services, including among others and indicatively, personnel salaries and wages, the cost of personnel travelling expenses for the visits included in the Scope of the Agreement, the value of all materials and supplies that will be used for the provision of the Services, insurance fees, FOREX currency risks, general expenses (including taxes, duties, etc. enforced in the Country of the Early Engineering Contractor), encumbrances of any kind relating to personnel of any rank and mainly including the Early Engineering Contractor's contributions to social security organizations, the Early Engineering Contractor's profit, and any other expenses required for the Early Engineering Contractor's compliance with the provisions of the Agreement.

The Contract Price shall also include all costs related to the requested site visits in Greece (travelling, accommodation, allowances, etc.), either on site or not.

Any value added tax (VAT), or any other tax currently applicable or that may be imposed in the future in Greece on the invoices issued by the Early Engineering Contractor to the Employer in respect of the Services, shall be borne and paid exclusively by the Employer. Such taxes are not included in the Contract Price.

3.2 Payment Schedule

Invoices and payments to the Early Engineering Contractor shall be made as follows:

1. Advance Payment of 10% of the Contract Price shall be paid after the Commencement Date, against an Advance Payment Guarantee which shall be issued in accordance with the Sample of Annex V to the extent possible. The final form and content of the Advance Payment Guarantee must be approved by the Employer prior to its issuance, which approval shall not be unreasonably withheld. The Advance Payment Guarantee shall be irrevocable, unconditional and on-demand and shall be issued by any bank or insurance company from within the European Union having a long-term issuer credit rating of A (or better) from Standard & Poor's Ratings Group, or A2 (or better) from Moody's Investors Service (Moody's). A replacement guarantee shall be provided in case the credit rating of the bond issuing institution is downgraded.

   The remaining ninety percent (90%) of the Contract Price shall be paid to the Early Engineering Contractor in equal monthly instalments, in accordance with the Time for Completion set out in the Project Programme and subject to the following conditions. The Early Engineering Contractor shall be entitled to invoice the full amount of the monthly instalment, or a proportion thereof, based on the percentage of progress recorded in the Monthly Progress Certificate for the corresponding month. If the Monthly Progress Certificate indicates that the Early Engineering Contractor has completed services which, according to the Project Programme, had not been completed in a previous month, the Early Engineering Contractor shall, in addition to invoicing for the services performed in the current month, be entitled to invoice the amount corresponding to the certified services from the previous month.

2. Invoicing and Payments shall be made in EURO currency.

3. Payments shall be made within sixty (60) days from the date of issuance of the relevant Invoice, provided that the following conditions are met:

- the Invoice is accompanied by the corresponding Monthly Progress Certificate; and
- in cases where the Early Engineering Contractor is established in a foreign country with which Greece has entered into a Double Taxation Convention, and where Greek tax authorities require proof that the Early Engineering Contractor is subject to taxation in its country of residence, the Early Engineering Contractor shall submit the appropriate certificate of tax residence ("Form"). This Form must be duly completed and also signed by the competent tax authority of the Early Engineering Contractor's country and be delivered to the Employer. The Form must be renewed annually. Failure to provide a valid Form, duly signed and submitted to the Employer, shall prevent the Invoice from being submitted to the competent Greek tax authorities, and consequently, shall preclude the full payment of the Invoice.

3.3 Effects of Termination and Exceptional Costs and loss of profit

Following the provisions of Sub-Clause 6.5.3, in case of Termination under Sub-Clause 6.4.1 (d) and Sub Clause 6.4.2 (a) to (d), the Early Engineering Contractor shall submit only Exceptional Costs that constitute direct losses for review by the Employer. No loss of profit shall be paid to the Early Engineering Contractor.

4.4.6 Appendix 4 Programme

4.1 Commencement Date - Time for Completion

After the Effective Date, the Employer shall submit a formal notice to the Early Engineering Contractor for the commencement of Services under this Agreement. The date that the notice shall be submitted shall constitute the Commencement Date.
The Early Engineering Contractor shall complete the Services within the Time for Completion.
The Early Engineering Contractor shall perform the Site Visit within 15 days from the Commencement Date.

4.2 Project Programme

Following the provisions of Sub-Clause 4.3 of the General Conditions, the Early Engineering Contractor's first Programme submitted shall be evaluated by the Employer and rejected for resubmission or approved. The approved Programme shall constitute the Programme Baseline of the Project.

The Early Engineering Contractor shall submit, at the end of every month after the Commencement Date, a Tracking Programme that will depict the Baseline and a comparison between the Baseline and the actual condition, including completion progress per activity. The Tracking Programme shall be submitted both in "pdf" file format, as well as Time Schedule software used file format (MS Project).

Revision in the Programme Baseline may take place under a formal written request of any of the Parties and the consensus of both Parties to the new Programme.

4.3 Progress Measurement Mechanism

The Parties agree that, through a Progress Measurement Mechanism (PMM) to be mutually agreed the Employer shall monitor the progress of the Services in accordance with the Project Programme and shall issue instructions to the Early Engineering Contractor in the event of delays. The results of the PMM shall be recorded each month in a Monthly Progress Certificate, which shall form the basis for determining the Employer's monthly payments to the Early Engineering Contractor, in accordance with the provisions of Section 3.2 of Appendix 3 [Remuneration and Payment].

4.4.7 Appendix 5 Rules for Adjudication

Rules for Adjudication

General

1. Any reference in the Agreement to the Rules for Adjudication shall be deemed to be a reference to these Rules.
2. Definitions in the Agreement shall apply in these Rules.

Appointment of Adjudicator

3. The Parties shall jointly ensure the appointment of the Adjudicator. The Adjudicator shall be a suitably qualified person.
4. If for any reason the appointment of the Adjudicator is not agreed at the latest within 14 days of the reference of a dispute in accordance with these Rules, then either Party may apply, with a copy of the application to the other Party, to any appointing authority named in the Agreement or, if none, to the President of FIDIC or his nominee, to appoint an Adjudicator, and such appointment shall be final and conclusive.
5. The Adjudicator's appointment may be terminated by mutual agreement of the Parties. The Adjudicator's appointment shall expire when the Services have been completed or when any disputes referred to the Adjudicator shall have been withdrawn or decided, whichever is the later.

Terms of Appointment

6. The Adjudicator is to be, and is to remain throughout his appointment, impartial and independent of the Parties and shall immediately disclose in writing to the Parties anything of which he becomes aware which could affect his impartiality or independence.
7. The Adjudicator shall not give advice to the Parties or their representatives concerning the conduct of the project of which the Services form part other than in accordance with these Rules.
8. The Adjudicator shall not be called as a witness by the Parties to give evidence concerning any dispute in connection with, or arising out of, the Agreement.
9. The Adjudicator shall treat the details of the Agreement and all activities and hearings of the Adjudicator as confidential and shall not disclose the same without the prior written consent of the Parties. The Adjudicator shall not, without the consent of the Parties, assign or delegate any of his work under these Rules or engage legal or technical assistance.
10. The Adjudicator may resign by giving 28 days' notice to the Parties. In the event of resignation, death or incapacity, termination or a failure or refusal to perform the duties of Adjudicator under these Rules, the Parties shall agree upon a replacement Adjudicator within 14 days or Rule 4 shall apply.
11. The Adjudicator shall in no circumstances be liable for any claims for anything done or omitted in the discharge of the Adjudicator's duties unless the act or omission is shown to have been in bad faith.
12. If the Adjudicator shall knowingly breach any of the provisions of Rule 6 or act in bad faith, he shall not be entitled to any fees or expenses hereunder and shall reimburse each of the Parties for any fees and expenses properly paid to him if, as a consequence of such breach any proceedings or decisions of the Adjudicator are rendered void or ineffective.

Payment

13. The Adjudicator shall be paid the fees and expenses set out in the Adjudicator's Agreement
14. The retainer fee, if applicable, shall be payment in full for:
    a) being available, on 28 days' notice, for all hearings and visits;
    b) all office overhead expenses such as secretarial services, photocopying and office supplies incurred in connection with his duties;
    c) all services performed hereunder except those performed during the days referred to in Rule 15.
15. The daily fee shall be payable for each working day preparing for or attending visits or hearings or preparing decisions including any associated travelling time.
16. The retainer and daily fees shall remain fixed for the period of tenure of the Adjudicator.
17. All payments to the Adjudicator shall be made by the Parties as determined by the Adjudicator. The Adjudicator's invoices for any monthly retainer shall be submitted quarterly in advance and invoices for daily fees and expenses shall be submitted following the conclusion of a visit or hearing. All invoices shall contain a brief description of the activities performed during the relevant period. The Adjudicator may suspend work if any invoice remains unpaid at the expiry of the period for payment, provided that 7 days prior notice has been given to both Parties.
18. If a Party fails to pay an invoice addressed to it, the other Party shall be entitled to pay the sum due to the Adjudicator and recover the sum paid from the defaulting Party.

Procedure for Obtaining Adjudicator's Decision

19. A dispute between the Parties may be referred in writing by either Party to the Adjudicator for his decision, with a copy to the other Party. If the Adjudicator has not been agreed or appointed, the dispute shall be referred in writing to the other Party, together with a proposal for the appointment of an Adjudicator. A reference shall identify the dispute and refer to these Rules.
20. The Adjudicator may decide to conduct a hearing in which event he shall decide on the date, place and duration for the hearing. The Adjudicator may request that written statements from the Parties be presented to him prior to, at or after the hearing. The Parties shall promptly provide the Adjudicator with sufficient copies of any documentation and information relevant to the Agreement that he may request.
21. The Adjudicator shall act as an impartial expert, not as an arbitrator, and shall have full authority to conduct any hearing as he thinks fit, not being bound by any rules or procedures other than those set out herein. Without limiting the foregoing, the Adjudicator shall have power to:
    a) decide upon the Adjudicator's own jurisdiction, and as to the scope of any dispute referred to him,
    b) make use of his own specialist knowledge, if any,
    c) adopt an inquisitorial procedure,
    d) decide upon the payment of interest in accordance with the Agreement,

e) open up, review and revise any opinion, instruction, determination, certificate or valuation, related to the dispute,
f) refuse admission to hearings to any persons other than the Client, the Consultant and their respective representatives, and to proceed in the absence of any Party who the Adjudicator is satisfied received notice of the hearing.

22. All communications between either of the Parties and the Adjudicator and all hearings shall be in the language of the Adjudicator's Agreement. All such communications shall be copied to the other Party.
23. No later than the fifty-sixth day after the day on which the Adjudicator received a reference or, if later, the day on which the Adjudicator's Agreement came into effect, the Adjudicator shall give written notice of his decision to the Parties. Such decision shall include reasons and state that it is given under these Rules.

5. Contract for Lot 1 Project Execution

5.1 General Information

Following the completion of the Early Engineering Contract, including optimisation of the project concept, agreements on technical issues and achievement of all technical deliverables, the technical contents of the Lot 1 Contract, including the following, will have been finalized:

- Employer's Requirements, including:
  - Scope of Works (including Division of Work Between Lot 1 and Lot 2)
  - General Requirements Specification
  - Mechanical Works General and Particular Specifications
  - Electrical Works General and Particular Specifications
  - Instrumentation and Control Works General and Particular Specifications
  - Drawings (including Diagrams and Civil Works Guide Drawings)

- Technical Schedules, including:
  - Detailed Construction Schedule (initial Sub-Clause 8.3 Programme)
  - Schedule of Milestones
  - Erection sequence and methodology
  - Mechanical Works Technical Data Sheets
  - Electrical Works Technical Data Sheets
  - Instrumentation and Control Works Technical Data Sheets
  - Schedule of Functional Performance Guarantees
  - Contractor's Design and Construction Organisation and Key Personnel
  - List of Subcontractors and Subcontracted Works
  - Work Activity (Manufacturing, Erection and Testing) Method Statements
  - Risk Matrix
  - Permits and Licenses
  - Health and Safety Management Plan
  - Environmental Management Plan
  - Quality Management Plan

- Interface Schedule, including:
  - Interface Matrix between Lot 1 and Lot 2
  - Conditions at battery limits between Lot 1 and Lot2
  - Definition of Interface Dependencies and Obligations
  - Interface Notification and Information Exchange Requirements
  - Insurance Requirements
  - Dispute Adjudication Agreement

Similarly, all the commercial and contractual contents of the Lot 1 Contract, including the following, will have been finalized:

- General Conditions of Contract (FIDIC 1999 Yellow Book)
- Particular Conditions of Contract together with their Annexes, including:
  - Accepted Contract Amount and Schedule of Payments
  - Schedule of Rates and Prices
  - Cooperation and Interface Management
  - Performance Damages (Rates and Cap)
  - Delay Damages (Rates and Cap)

    - Insurance Requirements
    - Dispute Adjudication Agreement
- Contractual Forms, including:
    - Form of Contract Agreement
    - Form of Performance Security
    - Form of Advance Payment Security
    - Form of Retention Money Guarantee
    - Form of Parent Company Guarantee

The starting point for value of the Lot 1 Contract will be equal to the Offered Price plus the Optional Price minus the value of the Early Engineering Contract.

The final value of the Lot 1 Contract will be based on the above starting point as reasonably adapted due to any evolution in the design, specifications, division of works and battery limits that will have been mutually agreed at the end of the Early Engineering Contract.

5.2 Heads of Terms

General Conditions of Contract	FIDIC Yellow, First Edition 1999
Accepted Contract Amount	The starting point for value of the Lot 1 Accepted Contract Amount will be equal to the Offered Price plus the Optional Price, minus the value of the Early Engineering Contract. The final value of the Lot 1 Accepted Contract Amount will be based on the above starting point as reasonably adapted due to any evolution in the design, specifications, division of works and battery limits that will have been mutually agreed at the end of the Early Engineering Agreement.
Overall Liability Cap	100% of the Accepted Contract Amount. Carve-outs: costs of the Lot 1 Contractor properly completing the works, fraud, deliberate default, willful or reckless misconduct, gross negligence, abandonment and third-party indemnities (limited to property damage, bodily injury and IP infringements).
Indirect or Consequential Damages, Loss of profit	No party shall be liable to the other party for Indirect or Consequential Damages, Loss of profit Carve-outs: fraud, deliberate default, willful or reckless misconduct, gross negligence, abandonment and third-party indemnities (limited to property damage, bodily injury and IP infringements).
Relied Upon Information	1. Topographic Survey including boundaries 2. Environmental Permit The Technical Specifications/Employer's Requirements shall not be part of Rely Upon Information. Employer shall not be responsible for the accuracy of the Employer's Requirements considering that the Contractor will have participated in their formulation during the Early Engineering phase.
Design Risk Indemnification	The Contractor shall indemnify and hold harmless the Employer against all acts, errors or omissions by the Contractor in carrying out the Contractor's design obligations that result in the Works (or Section or Part or major item of Plant, if any), when completed, not being fit for the purpose(s) for which they are intended. The definition of fitness for purpose will be mutually agreed between the Parties.
Liquidated Damages Caps	Liquidated Delay Damages Cap: 15% (Carve-outs: fraud, deliberate default or reckless misconduct) Liquidated Performance Damages Cap: 15% Aggregate Liquidated Damages Cap: 25% LDs shall be sole and exclusive remedy
Liquidated Damages	All liquidated Damages rates and method of their application shall be based on the "no double dip" principle, Performance Liquidated Damages rates shall be as per the Schedule of Guarantees hereunder Delay Liquidated Damages: One milestone on Taking Over, milestones for each Section Completion and equipment delivery milestones: for a) pump-turbine runner and b) embedded parts (spiral case, draft tube, turbine pit lining, sole plates of the generator). The "no harm no foul" principle is not accepted. The Delay Liquidated Damages, is a genuine pre-estimate of the loss likely to be suffered by the Employer as a direct result of the failure by the Lot 1 Contractor to comply with Sub-Clause 8.2 [Time for Completion] and is proportionate to the Employer's legitimate interest in the Lot 1 Contractor's compliance therewith, with reference to the whole of the Works or the Section respectively.
Longstop Date	12 months
Sections	The following Section of the Works will be defined: • Completion of all Permanent Works save Units 3&4 (linked with Partial Taking Over).

	• Additional Sections will be defined to reflect the interdependencies between the Lot 1 and Lot 2 Contracts (not linked with Partial Taking Over).
Time for Completion of the Works	Partial Taking Over for completion of all Permanent Works save Units 3&4 = 4 years Overall Time for Completion = 4.5 years Note: Tenderers may propose alternative Times for Completion with their Offers, subject to evaluation. The Time for Completion for Partial Taking Over and the Overall Time for Completion shall be as agreed in the Early Engineering Contract.
Programming (Cl. 8.3)	As per FIDIC 2017, with the following amendments: • Engineer's period of review for the revised programme will be increased from 14 days to 21 days. • The submission of the initial programme will be a prerequisite for the Commencement Date. • The Lot 1 Contractor shall also submit an updated programme in any event every three months to reflect the actual progress on site. In addition: • the programme shall be drawn to a monthly time scale and shall show all Section Completion Dates and all other appropriate intermediate milestone dates for the detailed engineering and construction activities. Activity descriptions shall be discrete so that the actual and scheduled work progress can be determined. The Lot 1 Contractor shall identify the critical paths both in the activity listing and in the graphic display. • the Lot 1 Contractor shall submit and update on a monthly basis a 90-day Design Programme including submittal dates for all design deliverables on a daily time scale for the first 30-day period, and on a weekly time scale for the balance of the 90-day period. • the Lot 1 Contractor shall submit and update on a monthly basis a 90-day Construction and Installation Programme including all construction and installation activities, their descriptions, durations and dependencies on a daily time scale for the first 30-day period, and on a weekly time scale for the balance of the 90-day period.
Extension Of Time (EoT) (Cl. 4.15, 8.5 & 8.6)	Contractor will be entitled EoT, but not additional payment (except for reasonable, documented, additional costs associated with the EoT). Where the non-suitability or non-availability of an access route arises as a result of changes to that access route by a third party after the Base Date, where delays are caused by private utility entities. Stipulations of Sub-clause 20.1 Contractor's Claims shall apply regarding the mechanism of claiming such an EoT.
Access routes	The Lot 1 Contractor's attention is directed towards the permissible condition and load-bearing capacities of the existing road bridges and other structures as well as the surfacing along the public road network. The Lot 1 Contractor shall be responsible for satisfying himself that any of his vehicles or equipment which he intends to pass over any of these and other existing bridges and structures in the area will not damage or endanger the integrity or safety of the bridges, other structures and roadways, other traffic and vehicles or the general public.
Avoidance and mitigation of delays (Cl 4.1)	The Contractor shall take all reasonable steps to avoid delay and to mitigate the effects of any delay that may occur in the execution of the Works, without prejudice to any other obligation under the Contract.
Concurrent Delay	Concurrent Delay shall be treated in accordance with Core Principles no. 10 and 14 of the Society of Construction Law Delay and Disruption Protocol and their analysis therein.
Exceptionally Adverse Climatic Conditions (Cl. 8.4 (c))	It shall mean adverse climatic conditions at the Site which are Unforeseeable having regard to climatic data made available by the Employer and/or published in the Country for the geographical location of the Site.
Defects Notification Period	24 months from the Taking Over, with a refresh on defective parts up to a maximum aggregate of 4 years from Taking Over.

	"No evergreen" warranty principle will be followed
Latent Defects	Contractor shall remain liable under applicable law in respect of latent defects, after the Performance Certificate has been issued. Acceptance of the Works shall have the meaning ascribed to it in Article 692 of the Greek Civil Code.
Definition of fitness for purpose	At the end of first paragraph of Sub-Clause 4.1 after the word "Contract" the following shall be added: "(and each element of the Works shall be fit for its ordinary purpose)".
Payments	As per FIDIC Yellow / First Edition 1999 *
Total advance payment	Max 10%
Payment Terms	To be mutually agreed based on Payment Milestones, aiming to achieve neutral cash flow, as close as reasonably practical. The Milestones proposed are presented hereunder. They will be finalized during the Early Engineering Contract. • Advance Payment • Submission of an unpriced PO (e.g. turbine raw material) • Loads on concrete and powerhouse layout • Hydraulic model test completed • Successful FAT for major components • Delivery of Draft tubes and Draft tube gates • Delivery of Turbine pit liner and Spiral cases • Delivery of Generator anchoring plates • Delivery of Generator • Delivery of Pump-turbine runner • Ready for wet testing - U1 • Ready for wet testing - U2 • Ready for wet testing - U3 • Ready for wet testing - U4 • Partial Taking Over U1-U2 • Overall Taking Over
Reasonable Profit	Reasonable profit shall mean five percent (5%) of respective Cost
Currencies of Payment	EURO
Adjustment for Changes in Legislation (Change in Law)	In Greece: Employer Risk, as per FIDIC Yellow / First Edition 1999 Outside Greece: Contractor risk, as per FIDIC Yellow / First Edition 1999
Adjustment for Changes in Cost	Lot 1 Contract will include an indexation mechanism based on a mutually agreed price revision formula that will have a fixed portion of no less than 20% Proposed indices: • G = Producer Price Index (Germany) – Machinery; Index: 61241, Product Group: GP19-28 (2digit) • H = Producer Price Index (Germany) – Electrical Equipment; Index: 61241, Product Group: GP19-27 (2digit) • L = Eurostat Labor cost index by NACE Rev. 2 - Index (2020 = 100) for European Union 27 Countries - ([B-E] Industry (except Construction)) - ([SCA] Seasonally and Calendar Adjusted data) – ([D11] Wages and Salaries (Total)) • E = Eurostat Labor cost index by NACE Rev. 2 - Index (2020 = 100) for Greece - ([F] Construction) - ([SCA] Seasonally and Calendar Adjusted data) – ([D11] Wages and Salaries (Total)) If at the time for the calculation, any index has not yet been published, then the calculation will be done provisionally using the latest available indices. When all indices have been published, the final calculation will be performed, and any differences compared to the provisional calculation will be settled. The Reference Date for the price adjustment indices will be the date of submission of the Offer.
Bonds	Advance Payment Bond equal to the amount of the agreed Advance Payment.

	Performance Bond: 10% of the Accepted Contract Amount Parent Company Guarantee: Required, unless contract is signed directly with the ultimate parent company. All bonds shall be irrevocable, unconditional, non-transferable and "on first demand". URDG 758 shall be applicable for all bonds. Bonds shall be issued by any bank from within the European Union or the European Economic Area having a long-term issuer credit rating of A (or better) from Standard & Poor's Ratings Group, or A2 (or better) from Moody's Investors Service (Moody's), provided that such institution maintains a correspondent systemic bank in Greece through which the enforcement of the Bond may be effected without recourse to foreign proceedings. Replacement bond shall be provided in case credit rating of the bond issuing institution is downgraded.
Insurances	• Maximum Permitted Deductibles Amount for Insurance of Employer's Risks, EUR 100,000 (one hundred thousand Euros) • Minimum Amount of Third-Party Insurance, EUR 1,000,000 (one million Euros) per occurrence, with no limit on the number of occurrences • Insurance Required for Liability for Breach of Professional Duty, o Minimum amount: 2.5% of the replacement value of the Works o Period of cover: From the Commencement Date until the date of issue of the Performance Certificate for the Works • Insurance Required Against Liability for Fitness for Purpose • It shall be the responsibility of the Lot 1 Contractor to notify the insurer of any changes in the nature and extent of the work and to ensure the adequacy of the insurance cover at all times in accordance with the provisions of this Sub-Clause. • Only re-insurers with an international rating of "A" or better (under the Standard & Poor rating system) shall participate as re-insurers. • the Lot 1 Contractor shall effect and maintain professional indemnity insurance against liability arising out of any act, error or omission by the Lot 1 Contractor in carrying out the Lot 1 Contractor's design obligations in an amount not less than 5.000.000 €. Where the Lot 1 Contract involves manufacturing and/or fabrication of the Works or parts thereof at premises other than at the Site, the Lot 1 Contractor shall satisfy the Employer that all the Materials and Plant for incorporation in the Works are adequately insured during manufacture and/or fabrication and shipment to the Site and that any cost associated with the provision of such insurance is included in the Accepted Contract Amount.
Location of provision of services, project management, manufacturing and sourcing	Project Team: The complete Project Team of Lot 1 Contractor, including but not limited to the Project Management team, the Engineering team, and the Procurement team, will be based on Technology Provider's offices in Europe. Manufacturing Lot 1 Contractor will be allowed to manufacture equipment or components in industrial facilities outside Europe, only on the following conditions: • The industrial facilities are fully owned by the Technology Provider or the Technology Provider's holding/parent company. • The manufacturing will adhere to the same QAQC procedures that are followed by the Technology Provider's European industrial facilities. • The manufactured equipment and components will undergo the same inspections and tests that are followed by the Technology Provider's European industrial facilities. • European norms and standards will be followed for the finished products, but also for all raw materials or intermediate materials and components used in manufacturing.

	• All responsibility related to the quality and performance remains with the Technology Provider • Spare parts availability and delivery time is similar Supplier Sourcing With the above exception of Technology Provider's own industrial facilities for manufacturing, any equipment originating from jurisdictions not meeting the Employer's compliance standards may not be accepted.
Approvals	As per FIDIC Yellow / First Edition 1999 * Any approval or consent or any review by the Employer or the Engineer shall not relieve the Contractor from any obligation or responsibility.
Variations	As per FIDIC Yellow / First Edition 1999 *
Prompt Notice of Variations in case of Engineer's Instructions (Cl 3.3)	If the Contractor considers that an Engineer's instruction constitutes a Variation, the Contractor shall give a relevant notice to the Engineer with reasons. If the Engineer does not respond within 7 days confirming, revoking or varying the instruction, the Engineer shall be deemed to have revoked the instruction.
Tests on Completion and Trial Operation	All applicable guaranteed values of the Schedule of Guarantees shall be measured during the Tests on Completion. For the Tests on Completion to be considered successful, at least the rejection levels of each guaranteed parameter must be met. Following Tests on Completion the plant will enter the Trial Operation phase. Uninterrupted operation of 15 days will be a condition precedent for Taking Over. (Excuse events that will not trigger the restarting of the Uninterrupted operation will be defined such as minor outages or trips, and also disturbances not attributable to the Contractor)
Tests After Completion	Tests After Completion shall take place after 3000 hours of pumping, in order to prove the cavitation pitting guarantees.
Rejection	Rejection Limits for some critical guaranteed values of the shall be included in Lot 1 Contract, as per the proposed Schedule of Guarantees. Condition precedent for Taking Over shall be not exceeding the rejection limit for any of the above critical guaranteed values.
Suspension	As per FIDIC Yellow / First Edition 1999 *
Termination	As per FIDIC Yellow / First Edition 1999, and in addition: a) Employer shall be entitled to terminate when i) Lot 1 Contractor reaches the Liquidated Delay Damages cap, the Liquidated Performance Damages Cap, the Aggregate Liquidated Damages Cap or the Overall Liability Cap, ii) reaching the Longstop Date, iii) material breach, iv) failure to maintain required insurances b) the principle of FIDIC Yellow 2017, where initially a first 14 days' notice of Employer's/Contractor's intention to terminate the Contract is given, and then the Contract is terminated by a second notice to that effect, provided that the default has continued until the date of issue of the second notice.
Force Majeure	As per FIDIC Yellow / First Edition 1999 *
Language for communications	English
Governing Law	Laws of Greece
Ruling Language	English
Arbitration	As per FIDIC Yellow / First Edition 1999 * relevant clause, and additionally: in Athens – Greece, ICC Rules, 3 arbitrators, Greek Law, English language.

** As per FIDIC Yellow / First Edition 1999 means that the original FIDIC Yellow / First Edition 1999 risk allocation between the Employer and the Contractor shall be altered.*

Dispute Adjudication Board Provisions	
Dispute Adjudication Board	As per FIDIC Yellow / First Edition 1999 relevant clause, and additionally: in Athens (or at Site) – Greece, 3 members, Greek Law, English language.
Appointment of DAB	At the end of Sub-Clause 20.3 the following is added: "Both Parties and each appointed member shall promptly sign or shall be deemed to have signed the Dispute Adjudication Agreement provided by the member, under which: (i) the monthly services fee and daily fee shall be as stated in the terms of the appointment; and (ii) the law governing the Dispute Adjudication Agreement shall be the governing law of the Contract defined in Sub-Clause 1.4 [Law and Language]".
Enforcement of DAB decisions:	In Sub-Clause 15.2 a new case (g) should be added as follows: (g) fails to give effect promptly to a decision of the DAB in accordance with Sub-Clause 20.4 [Obtaining the Dispute Adjudication Board's Decision]". In the first paragraph of Sub-Clause 16.1, after the phrase "or Sub-Clause 14.7 [Payment]" the following phrase is added: "...or fails to give effect promptly to a decision of the DAB in accordance with Sub-Clause 20.4 [Obtaining the Dispute Adjudication Board's Decision]...". Furthermore, in the same paragraph after the phrase "reasonable evidence or payment" add the phrase "...or the Employer has given effect to the decision of the DAB...". The same phrase should be added in the third paragraph of the same Sub-Clause again after the phrase "evidence or payment". In Sub-Clause 16.2 a new case (h) should be added as follows: "(h) the Employer fails to give effect promptly to a decision of the DAB in accordance with Sub-Clause 20.4 [Obtaining the Dispute Adjudication Board's Decision]". In the fourth paragraph of Sub-Clause 20.4 after the phrase "who shall promptly give effect to it" the following phrase should be added: "whether or not notice of dissatisfaction has been given under this Sub-Clause". Sub-Clause 20.7 should be replaced with the following: "In the event that a Party fails to comply with any decision of the DAB, whether binding or final and binding, then the other Party may, without prejudice to any other rights it may have, refer the failure itself directly to arbitration under Sub-Clause 20.6 [Arbitration] in which case Sub-Clause 20.4 [Obtaining DAB's Decision] and Sub-Clause 20.5 [Amicable Settlement] shall not apply to this reference. The arbitral tribunal shall have the power, by way of summary or other expedited procedure, to order, whether by an interim or provisional measure or an award (as may be appropriate under applicable law or otherwise), the enforcement of that decision".
Expiry of DAB (20.8)	Sub-Clause 20.8 should be replaced as follows: "If a dispute arises between the Parties in connection with, or arising out of, the Contract or the execution of the Works and there is no DAB in place by reason of the expiry of the DAB's appointment: (a) Sub-Clause 20.4 [Obtaining Dispute Adjudication Board's Decision] and Sub-Clause 20.5 [Amicable Settlement] shall not apply, and (b) the dispute may be referred directly to arbitration under Sub-Clause 20.6 [Arbitration]".

Interface Management	
Other Contractors	"Other contractors" or "Others" means any party or parties having a direct contract with the Employer for work on the Project outside the scope of this Contract and shall include any subcontractor of such other contractor or other.
Claims from Lot 2 Contractor	If the Lot 1 Contractor revises any design input data it previously provided, making it more onerous, it shall be liable for any additional costs incurred by the Company as a result of claims or variations submitted by the Lot 2 Contractor arising from such revision.
Coordination and Interface Management	The Project involves other contracts, in particular the Lot 2 Contract (Kardia Mine Pumped Storage Plant: Civil Works and Balance of Electromechanical Plant), which will be awarded by the Employer to the Lot 2 Contractor, for the execution of various other works on the Project which will be performed concurrently with the Works under the Lot 1 Contract. A dedicated specification titled "Interfaces Between Contracts" will include particular requirements for co-ordinated working with the Lot 2 Contractor and will form part of the Employer's Requirements. It shall include among others, interfaces within working areas for which the Lot 1 Contractor is responsible as well as at other structures and locations. The Lot 1 Contractor shall co-ordinate his general day to day activities with the Lot 2 Contractor to avoid hindrance and obstruction of the Lot 2 Contractor as far as is appropriate and reasonable. This will include co-ordination and co-operation with the Lot 2 Contractor at any interfaces between the work of this Contract and the work of the Lot 2 Contract and for reasonable joint use of infrastructure such as roads, temporary access, installation or storage areas and other general site services. Such general and particular co-operation shall be foreseen and provided for in the Lot 1 Contractor's programming and is deemed to be included in the Accepted Contract Amount. It is the responsibility of the Lot 1 Contractor to ensure co-ordination and co-operation with the Lot 2 Contractor in the initial agreement of the detailed schedule of interfaces between the contracts (the "Interface Schedule"), and subsequently working in accordance with that Interface Schedule, as stipulated in the above-mentioned specification Interfaces Between Contracts. The final form of the Interface Schedule as mutually agreed by the Employer, the Lot 1 Contractor and the Lot 2 Contractor, shall be binding upon both the Lot 1 Contractor and the Lot 2 Contractor, and shall be part of both Lot 1 Contract and Lot 2 Contract. For all these combined activities the Lot 1 Contractor will make prior planning, in co-operation with the Engineer and the Lot 2 Contractor, to prepare for and execute these combined activities and to make every reasonable effort to facilitate these activities within the performance of the Works. No claim for delay arising from interfaces between the Lot 1 Contract and the Lot 2 Contract shall be admissible unless the Lot 1 Contractor can demonstrate that has attempted to provide all reasonable liaison and co-ordination in accordance with the requirements of the Lot 1 Contract but that nevertheless unavoidable or unreasonable delays with respect to the progress of the Works have been incurred by the Lot 1 Contractor as a direct result of the actions or omissions of the Lot 2 Contractor. In the course of complying with the provisions of the Lot 1 Contract, various physical and performance interfaces of the Lot 1 Contractor's developed construction methods and procedures may depend on facilities, equipment or services of organisations not under its control, which may include but not be limited to: (i) design interfaces with the Lot 2 Contractor; (ii) site facilities and access; (iii) construction and installation access interfaces;

	(iv) time and programming interfaces; and (v) testing/commissioning interfaces. The Lot 1 Contractor shall identify all interfaces with organisations not under its control, but which may affect its construction or installation work, including but not limited to the interfaces defined in the Interface Schedule, and shall submit to the Engineer an Interface Report describing clearly all these external interfaces together with the nature of the potential interface consequences. The Interface Report shall be submitted within [*] days after the Commencement Date and shall be updated and resubmitted whenever the conditions affecting any interfaces change or new relevant information becomes available. The Interface Report shall contain sufficient appropriate information which the Engineer and the relevant Interface Committee, in accordance with the above-mentioned dedicated specification titled "Interfaces Between Contracts", can take fully into account in order to avoid any unnecessary detrimental consequences on the programme of Works. It is necessary that the Lot 1 Contractor identifies all interfaces to ensure that the design at the interface is understood by affected parties and changes to one side of the interface are accepted and accommodated by the other interface party. The Lot 1 Contractor shall include in the Interface Report the process by which interfaces are identified and controlled. Similar provisions will be included in the Lot 2 Contract for the Lot 2 Contractor.
Section Completion Certificate	The Project involves other contracts, in particular the Lot 2 Contract (Kardia Mine Pumped Storage Plant: Civil Works and Balance of Electromechanical Plant), which will be awarded by the Employer to the Lot 2 Contractor for the execution of various other works on the Project which will be performed concurrently with the Works under this Contract. For the purpose of the execution of the overall Project, portions of the Works under the Lot 1 Contract must be constructed to specific stages either to enable work by the Lot 2 Contractor to proceed or continue or to facilitate the commissioning of the Project. Key construction stages of the Works under the Lot 1 Contract shall be defined in the Lot 1 Contract by Sections, for each of which a separate Time for Section Completion shall be defined. Upon achieving each Time for Section Completion by completing all work for that Section of the Works, to the satisfaction of the Engineer, the Engineer will issue a Section Completion Certificate. The Section Completion Certificate is the written confirmation that, on the basis of the information available to the Engineer at the time of its issue, the respective Section of the Works as defined in the Contract has been satisfactorily completed. The issue of a Section Completion Certificate shall under no circumstances be considered to constitute the use or occupation of any part of the Works or grounds for the issue of a Taking-Over Certificate pursuant to Sub-Clause 10.2 [Taking Over of Parts of the Works]. The Lot 2 Contractor as well as the personnel of the Employer and Engineer will also require joint use of infrastructure such as roads, temporary access, installation or storage areas and other general site services, and the Lot 1 Contractor will make every reasonable effort to facilitate these activities within the performance of the Works. These activities by the Lot 2 Contractor, the related supervision activities by the Employer's and the Engineer's personnel shall under no circumstances be considered to constitute the use or occupation of any part of the Works pursuant to Sub-Clause 10.2 [Taking Over of Parts of the Works] and shall not be grounds for the issue of any Taking-Over Certificates.

Call for Tenders **No. NGAPD-2006**

Scope: **«Kardia Mine Pumped Hydro Storage: Early Technology Provider Involvement for Design, Supply, Erection and Commissioning of Pump, Turbine, Generator and Auxiliary Systems»**

ANNEX I

FINANCIAL OFFER FORMS

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I.b. TOTAL OFFERED PRICE BREAKDOWN FORM 4
I.c. OFFERED OPTIONS PRICE FORM 5
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I.a. TOTAL OFFERED PRICE FORM

Public Power Corporation

New Generation Activities
Procurement Department

Call for Tenders
No. NGAPD-2006

ANNEX I.a.

Total Offered Price

Scope: "Kardia Mine Pumped Hydro Storage: Early Technology Provider Involvement for Design, Supply, Erection and Commissioning of Pump, Turbine, Generator and Auxiliary Systems"

S/N	Works / Service Description	Unit	Total Offered Price in numerical form (€)	Total Offered Price in written form (€)
1	Kardia Mine Pumped Hydro Storage: Early Technology Provider Involvement for Design, Supply, Erection and Commissioning of Pump, Turbine, Generator and Auxiliary Systems	Lump Sum		

*The Total Offered Price includes all traveling, accommodation and other project-related expenses

**The Total Offered Price is not inclusive of the Early Engineering price, to be calculated following completion of the Tender Procedure

FOR THE TENDERER

NOTE: All amounts must be stated both numerically and in words in the appropriate places. In case of discrepancies between them, the written amounts will prevail.

I.b. TOTAL OFFERED PRICE BREAKDOWN FORM

Public Power Corporation

New Generation Activities
Procurement Department

Call for Tenders
No. NGAPD-2006

ANNEX I.b.

Total Offered Price Breakdown

Scope: "Kardia Mine Pumped Hydro Storage: Early Technology Provider Involvement for Design, Supply, Erection and Commissioning of Pump, Turbine, Generator and Auxiliary Systems"

S/N	Work / Service Description	Unit	Quantity	Unit Price (€)	Offered Price (€)
Base Scope					
1.1	Pump-Turbines – 4 units	Lump Sum	100,00%		
1.2	Governing system – 4 units	Lump Sum	100,00%		
1.3	Inlet butterfly valves – 4 units	Lump Sum	100,00%		
1.4	Mechanical auxiliaries equipment	Lump Sum	100,00%		
1.5	Motor-generators – 4 units	Lump Sum	100,00%		
1.6	Excitation System – 4 units	Lump Sum	100,00%		
1.7	SFC – 2 units	Lump Sum	100,00%		
1.8	Accessories	Lump Sum	100,00%		
Sub Total 1.a					
1.9	Control system, including control room equipment:	Lump Sum	100,00%		
1.10	General electrical equipment	Lump Sum	100,00%		
1.11	Spare parts (for 2 years operation)	Lump Sum	100,00%		
1.12	Special tools	Lump Sum	100,00%		
Sub Total 1.b					
1.13	Design of the plant	Lump Sum	100,00%		
1.14	Pump-Turbine hydraulic model test	Lump Sum	100,00%		
1.15	Transportation to site	Lump Sum	100,00%		
1.16	Erection	Lump Sum	100,00%		
1.17	Commissioning	Lump Sum	100,00%		
1.18	Training	Lump Sum	100,00%		
Sub Total 1.c					
Total Offered Price in numerical form (1.a + 1.b + 1.c, in €):					
Total Offered Price in written form (1.a + 1.b + 1.c, in €):					

*The offered unit prices and the Total Offered Price include all traveling, accommodation and other project-related expenses

** If above Sub Totals and/or the Total Offered Price differ from those derived from the individual unit prices / offered prices, the said Sub Totals and/or the Total Offered Price will be corrected accordingly.

*** TheTotal Offered Price calculated - analysed herein must be exactly the same as the one provided in Annex I.a

****The Total Offered Price refers solely to the Base Scope price and is not inclusive of the Early Engineering price, to be calculated following completion of the Tender Procedure

FOR THE TENDERER

I.c. OFFERED OPTIONS PRICE FORM

Public Power Corporation

New Generation Activities
Procurement Department

Call for Tenders
No. NGAPD-2006

ANNEX I.b.

Offered Options Price

Scope: "Kardia Mine Pumped Hydro Storage: Early Technology Provider Involvement for Design, Supply, Erection and Commissioning of Pump, Turbine, Generator and Auxiliary Systems"

S/N	Optional Scope Description	Unit	Quantity	Unit Price (€)	Offered Price (€)
Opt.01	Step Up Transformer(s), including fire detection and protection	Lump Sum	100,00%		
Opt.02	Medium voltage AC system (switchgear, bus bar, etc.)	Lump Sum	100,00%		
Opt.03	Service/auxiliary transformers, including fire detection and protection)	Lump Sum	100,00%		
Opt.04	Low voltage AC system (essential and normal)	Lump Sum	100,00%		
Opt.05	DC System	Lump Sum	100,00%		
Opt.06	UPS system	Lump Sum	100,00%		
Opt.07	Backup diesel generator system for emergency and black start	Lump Sum	100,00%		

* Options shall be activated only if officially requested by the Company. As such, offered Options prices are not taken into account in the Total Offered Price.

** The offered unit prices for Options are inclusive of all traveling, accommodation and other project-related expenses.

*** If a Unit Price / Offered Price is not provided for any of the above items of Optional Scope, then the said item is not included in the Tenderer's Offer.

FOR THE TENDERER

I.d. PRICE DISTRIBUTION TABLE

Public Power Corporation

New Generation Activities
Procurement Department

Call for Tenders
No. NGAPD-2006

ANNEX I.d

Price Distribution Table

Scope: "Kardia Mine Pumped Hydro Storage: Early Technology Provider Involvement for Design, Supply, Erection and Commissioning of Pump, Turbine, Generator and Auxiliary Systems"

to be used and submitted only in cases of Tenderers being Associations of Economic Operators

S/N	Members of Association of Economic Operators	Participation Percentage (%)	Total Offered Price (as per Annex I.a)	Distribution per Member (€)
1	**Leader:** --- *Company Name* ---			
2	--- *Company Name* ---			
3	--- *Company Name* ---			
4	--- *Company Name* ---			

** The table may be amended, according to the proposed form of Association, upon agreement with the Company.*

FOR THE TENDERER

Call for Tenders **No. NGAPD-2006**

Scope: **«Kardia Mine Pumped Hydro Storage: Early Technology Provider Involvement for Design, Supply, Erection and Commissioning of Pump, Turbine, Generator and Auxiliary Systems»**

ANNEX II

TECHNICAL PART

CONTENTS

EARLY TECHNOLOGY PROVIDER INVOLVEMENT TENDER – TECHNICAL PART 3

Early Technology Provider Involvement Tender

Technical Part

PPC

GREECE

RESTRICTED

July 10, 2025

REPORT

W003724-REP-000005-H

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REPORT

Our ref. : W003724-REP-000005-H
Entity : Europe
Imputation : W003724

RESTRICTED

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Project : Kardia PHS
Country/State: Greece

Title : Early Technology Provider Involvement Tender - Technical Part
Subtitle : -
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F	2025-06-02	Head range adaptation	Final	Multiple	D. Grenier	I. Siskos
E	2025-03-12	Drawings and views added	Draft	Multiple	D. Grenier	I. Siskos
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KARDIA PHS

Early Technology Provider Involvement Tender - Technical Part

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KARDIA PHS
Early Technology Provider Involvement Tender - Technical Part

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KARDIA PHS
Early Technology Provider Involvement Tender - Technical Part

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KARDIA PHS
Early Technology Provider Involvement Tender - Technical Part

LIST OF ABBREVIATIONS AND ACRONYMS

CFSM	Converter-Fed Synchronous Machine
DEM	Digital Elevation Model
DFIM	Doubly-Fed Induction Machine
D/S	Downstream
EOT	Electric Overhead Travelling
EU	European Union
EUR	Euro
FAT	Factory Acceptance Tests
USD	United States Dollar
GCB	Generator Circuit Breaker
GDR	Geotechnical Data Report
GBR	Geotechnical Baseline Report
GRA	Geological Risk Assessment
GU	Geotechnical Unit
HSS	Hydraulic Steel Structure
IPB	Insulated Phase Busduct
MIV	Main Inlet Valve
MW	Mega Watt
MVA	Mega Volt Ampere
PFS	Pre-Feasibility Study
PHS	Pumped Hydroelectric Storage
PPC	Public Power Corporation
RfG	Requirements for Generators
rpm	Rotation Per Minute
U/S	Upstream

1. INTRODUCTION

Kardia mine Pumped Hydroelectric Storage (PHS) is a proposed hydroelectric scheme to be located in the prefecture of Kozani, Western Macedonia, northern Greece. The PHS is to be owned by **Public Power Corporation** (PPC), or "the Owner", who intends to award the O&M to a qualified operator through a dedicated tender procedure that will be issued on a later stage (not part of the present Request For Quotation - RFQ).

The Project aims to allow energy from intermittent sources (such as solar, wind) and other renewables, or excess electricity from continuous base-load sources (such as gas) to be saved for periods of higher demand. It would store energy in the form of gravitational potential energy of water, pumped from a lower elevation reservoir to a higher elevation. Low-cost surplus off-peak electric power is typically used to run the pumps. During periods of high electrical demand, the stored water is released through turbines to produce electric power.

Kardia mine PHS would take the advantage of difference in elevation between Kardia lignite mine pit decommissioned in 2021 to be used as lower reservoir and the surrounding plateau located around the mine to create an upper reservoir on the South-East of the mine.

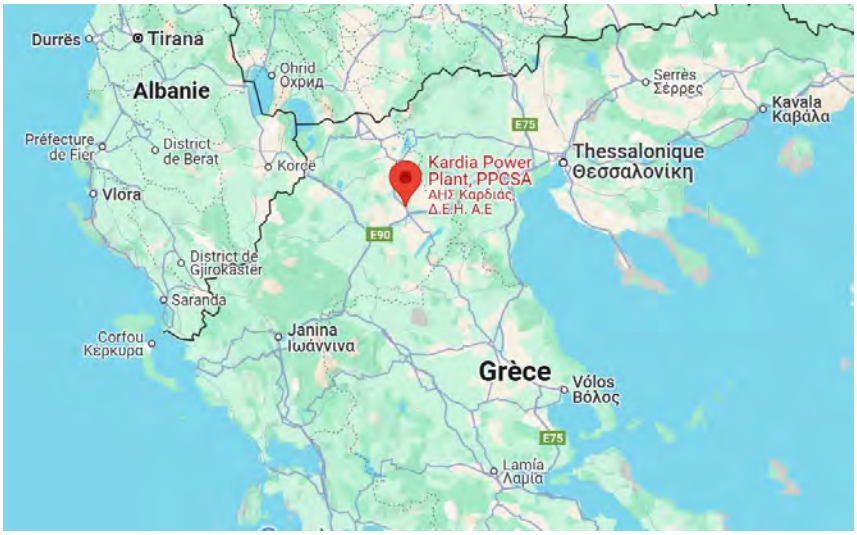


Figure 1-1: Location of the project

The project has undergone a conceptual / prefeasibility phase performed by PPC, which has been reviewed by Tractebel. During this prefeasibility review, no red flags were raised that could compromise the feasibility of the project. The site appears to be favourable for the construction of a PHS plant. A feasibility study is underway since the beginning of 2025. **The present document presents the main characteristics at this stage of the project, but which are subject to modifications and optimizations along with the feasibility study.**

Examples of possible changes, non-exhaustive, are:

- Upper and lower reservoirs min and max level (+/-3 meters)
- Length, diameter and number of penstocks,
- Setting of machines
- Connection to the grid layout

2. PROJECT DESCRIPTION

2.1. MAIN PROJECT OUTLINE

The Kardia PHS is a 320MW pumped-storage plant, to be built as a capacity and energy provider for the Greek National Grid. It will operate between two man-made water reservoirs, connected by a 0.80 km penstock pipeline, constituting of two open-air steel pipes. (Civil engineering, including the reservoirs and the penstock, are outside the scope of this RFQ.) Electric power will be supplied to the national grid through a switchyard located within the station perimeter.

At this stage of the project, the scheme comprises the following structures:

- The upper reservoir is located on the plateau on the South-East of the mine. Ground levels vary from 670 to 675 m asl, therefor the upper reservoir bottom elevation is proposed to be at 668 m asl. Full Supply Elevation is equal to 687 m asl. The upper dam - creating the upper reservoir - consists of an embankment dam forming a ring and is built at the location where four cooling towers of the decommissioned thermal power plant were built. It is equipped with a spillway and a bottom outlet.
- The lower reservoir is formed by the large mine pit. The final geometry of the future lower reservoir will be only known at the end of these operations of backfilling. The Full Supply Level of the lower reservoir is expected to be 543.50 m asl to create an active storage of approximately 7 hm^3. The bottom of lower reservoir reaches elevation down to 520 m asl
- The foreseen waterway, would include the following sections, from upper to lower reservoir:
  - Upper intakes, with trash racks and safety gates;
  - 2 upper open-air penstocks, placed along the South-East slopes of the mine pit, with a constant diameter of 6 m and a length of about 950 m from the upper intake to the bifurcations, with concrete anchored elbows. The choice of a rigid penstock or expansion joints is to be determined at feasibility stage. Moreover, several sections of pipe of different thicknesses will be determined with varying maximum water pressure.
  - 2 bifurcations connecting the penstocks to the units, one for each penstock
  - 4 main inlet valves of butterfly type, expected diameter of 2,6m
  - 4 draft tubes equipped with 4 gates (bonneted gate type).
  - 4 lower pressure penstocks – diameter : 4,7 m
  - Lower intake equipped with trash racks and stoplogs slots

  It should be noted that the waterway does not include an upper surge shaft or tank as the topography does not permit an easy construction of such a structure. This is a topographical constraint of the scheme. In that specific case, the overpressure and overspeed due to the transients can only be controlled by reducing the flow velocity in the waterway and therefore by increasing the diameter of the penstock.

- Powerhouse is open air type and made of reinforced concrete. It is founded at approximately El. 500 m asl and its top elevation is at ~El. 550.00 m asl – total height of ~50 m. This large excavation will be executed at the toe of the mine South-East slope, partially backfilled with deposits. After construction of the slab and the concrete walls of the powerhouse, the excavation will be backfilled to form a platform where transformers will be installed.
- The Powerhouse is housing four (4) Francis reversible fixed speed pump-turbines and an average and maximum total power at generation mode of respectively 280 MW and 320 MW.
- Four reinforced concrete culverts are connecting the powerhouse and the lower intake. Finally, a short channel is excavated between the intake and the reservoir. An outside gantry crane and an overhead bridge crane inside the Powerhouse are foreseen to handle heavy equipment. The transformers are located outside the powerhouse in a platform.

  A specific small gantry crane is foreseen at the lower intake to handle trash racks or stoplogs.

Following figures present the Project preliminary layouts. See APPENDIX B for preliminary drawings of the powerhouse.

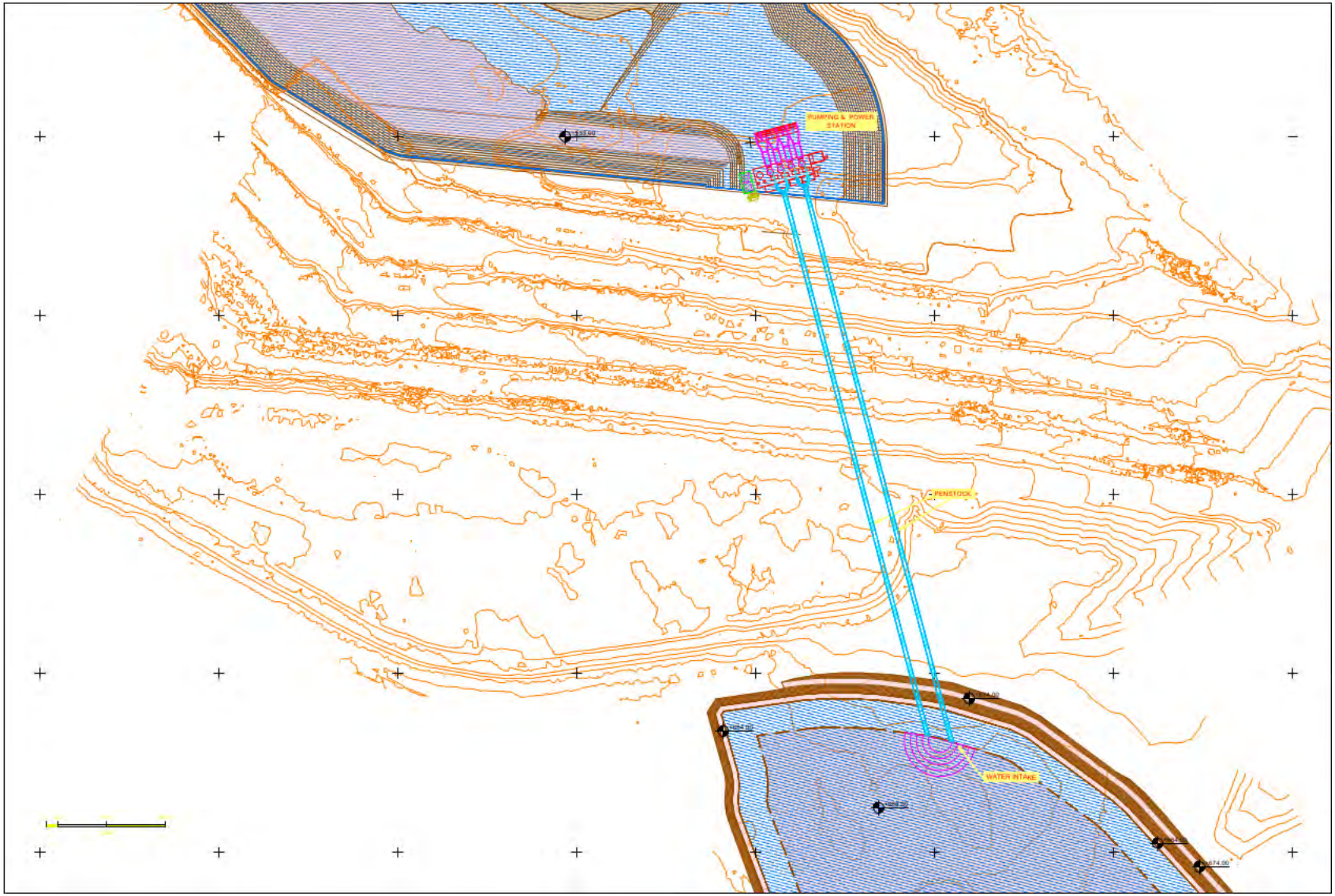


Figure 2-1: Plan View of Kardia Mine PSH as per PFS Design

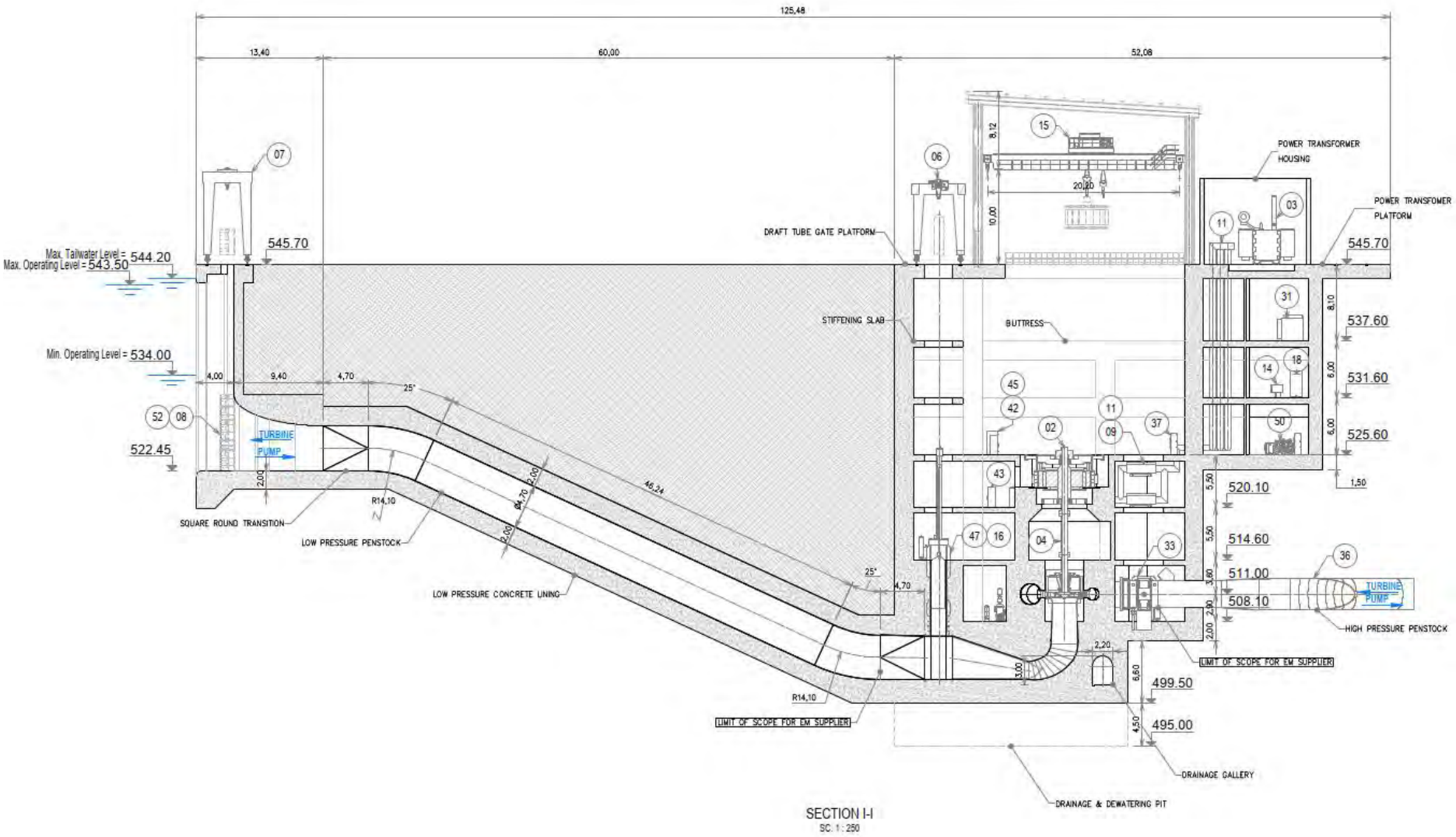


Figure 2-2: Kardia PHS powerhouse preliminary longitudinal cross section

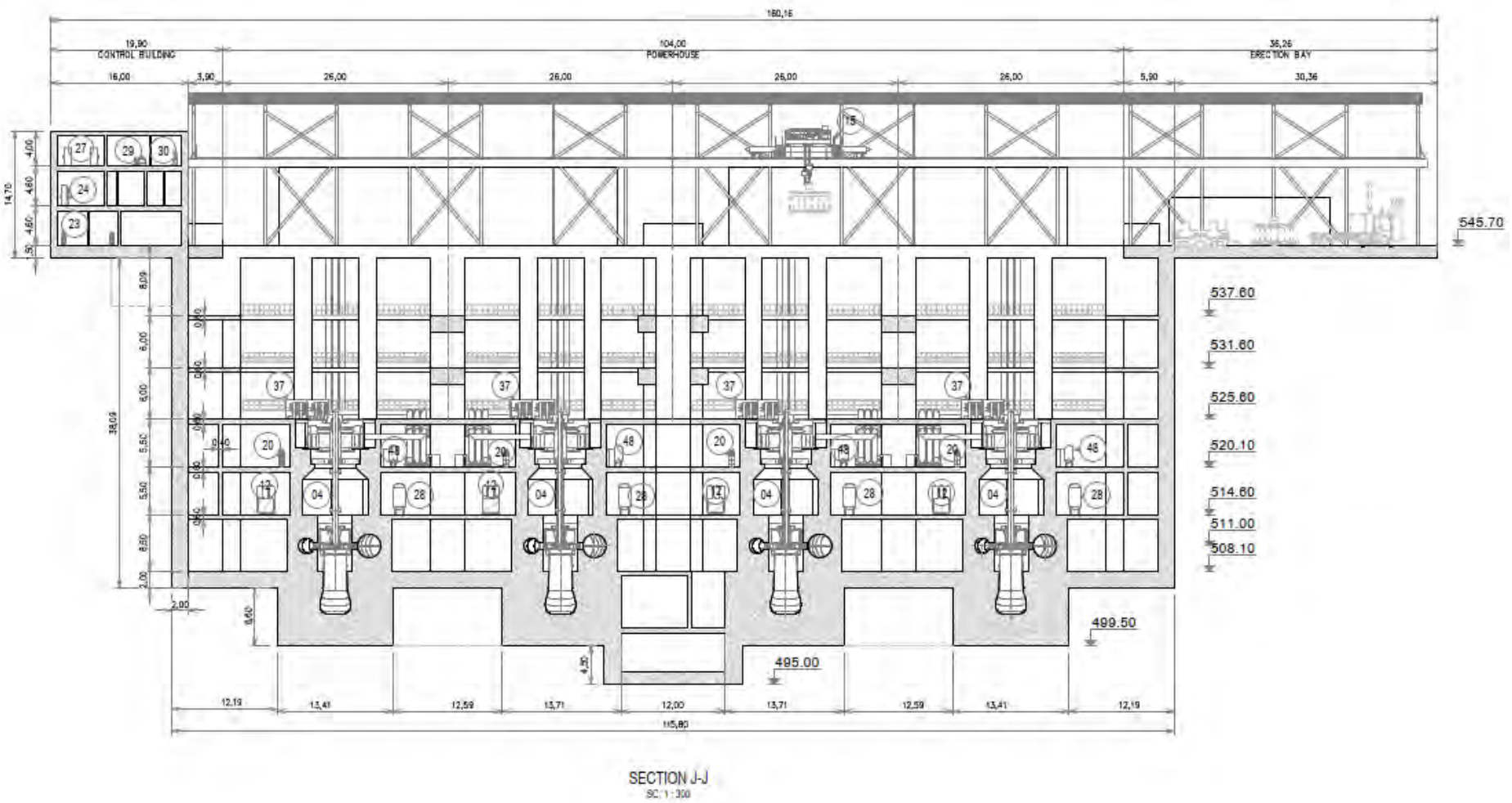


Figure 2-3: Kardia PHS powerhouse preliminary transversal cross section

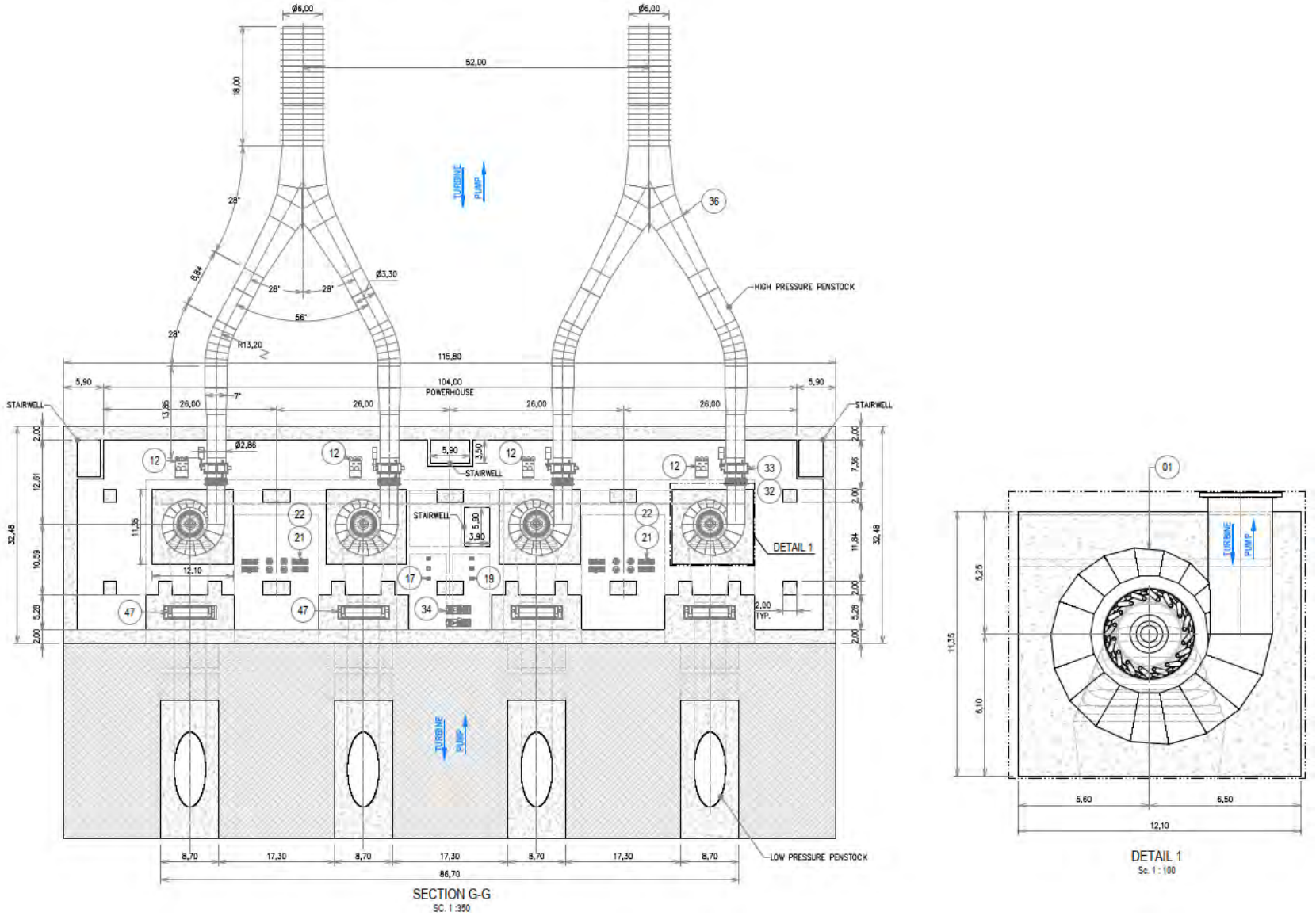


Figure 2-4: Kardia PHS powerhouse preliminary plan view

2.2. BATTERY LIMITS

2.2.1. MECHANICAL

This RFQ covers the mechanical equipment of the power plant from the penstock (not included) to the tailrace (not included), including the butterfly valves, pump-turbines (spiral cases, distributors, runners and shafts, cones, draft tubes), draft tube gates and all mechanical auxiliary equipment (including special tools, etc.) as further detailed in Chapter 2.3.

Some items will be quoted **optionally**, in line with the Division of Work presented in Chapter 2.3.

2.2.2. ELECTRICAL

This RFQ covers all the electrical and control equipment up and including the main power transformers terminals, including all the electrical and control equipment required for operation of the powerplant and for communication and control from outside the station as further described in Chapter 2.3.

See two Figures on next page showing the preliminary **Single Line Diagram**, and the preliminary **Control System** configuration.

Some items will be quoted **optionally**, in line with the Division of Work presented in Chapter 2.3.

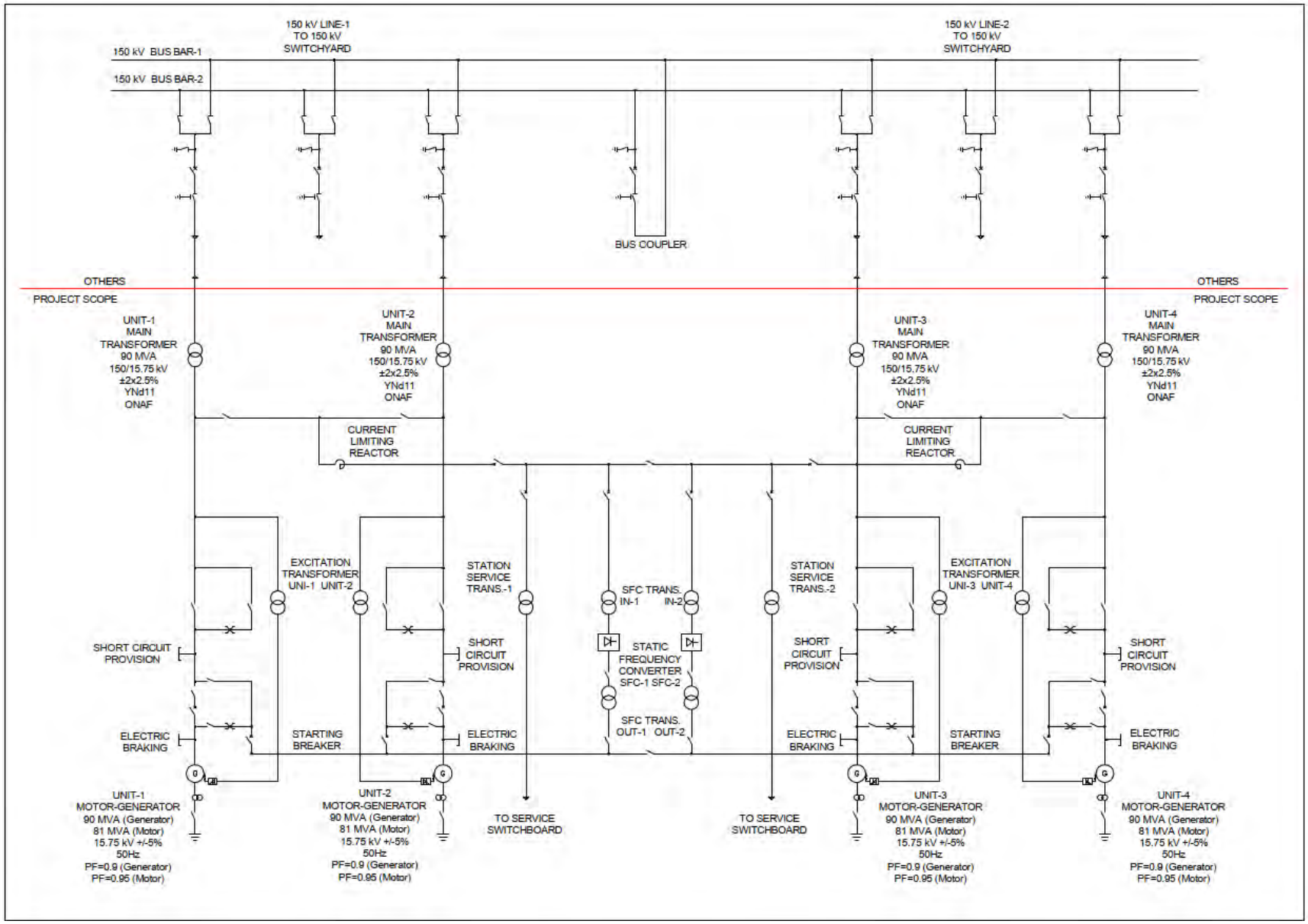


Figure 2-5: Preliminary Single Line Diagram describing electrical installation

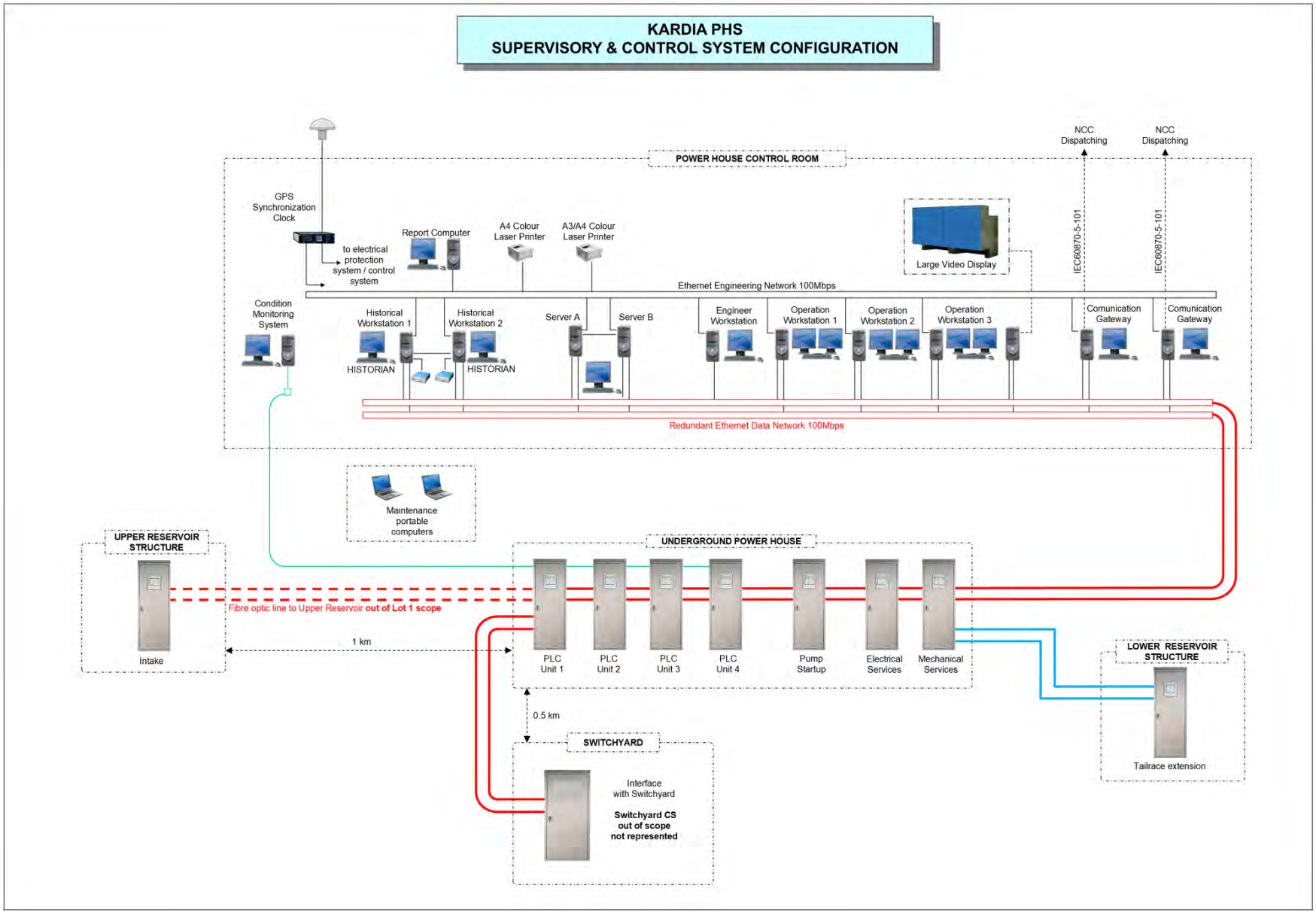


Figure 2-6: Preliminary Control System configuration

2.3. SCOPE OF SUPPLY AND SERVICES

The scope of Supply and Services includes:

- Basic and Detailed Design Engineering (including erection engineering)
- Pump-Turbine Hydraulic Model Test
- Procurement
- Fabrication & Transportation to Site
- Erection
- Inspection and Testing, including FATs, iFATs and SATs
- Commissioning
- Trial Operation
- Performance field testing on one unit
- Training of Owner's personnel
- Rectification of Defects during Defects Notification Period

It is clearly understood that the quotation is to be for the work completed in every respect. The quotation must therefore include for temporary works all incidental and contingent expenses and risks of every kind necessary to design, manufacture, erection complete and maintain the whole of the works.

This division of works is based on the following split:

- **Lot 1 : Technology Provider (TP)** – Design and build contract based on the FIDIC yellow book – **scope of the present Request For Quotation.**
- Lot 2 : Infrastructures Contractor (IC) – Design and build contract based on the FIDIC yellow book.
- Interface and coordination of Lot 1 and Lot 2 done by a third party Owner's Engineer.

The following table details the division of work for Lot 1, Lot 2, and Owner's Engineer.

R	= Responsible of design and construction
E	= Evaluate and incorporate
In	= Input / contribution required
V	= Visa

		Owner/Owner's Engineer	Contractors		
Item No.	**Scope Description**	**PPC**	**Lot 1 (TP)**	**Lot 2 (IC)**	**Remarks/key interface**
1	**Project Wide / General**				
1.1	Project land, permits etc.	R	E	E	
1.2	Environmental Approvals	R	E	E	
1.3	Overall project layout	In	E	R	
1.4	BIM digital model	E	In	R	
1.5	Document control system	R	E	E	
2	**Hydrology & Hydraulics**				
2.1	Head losses of water conveyance system	V	E	R	
2.2	Hydraulic transient studies	V	R	E	
2.3	Mode change timing	V	R	-	
2.4	Energy modelling, round trip efficiency	V	R	In	
2.5	Hydraulic design of intakes/outlets - upper & lower	V	E	R	
3	**Civil Works**				
3.1	Upper Reservoir, including lining, drainage, appurtenant structures etc. (e.g. LLO)	V	In	R	
3.2	Upper Intake/Outlet Structure	V	In	R	
3.3	Upper Reservoir Spillway	V	In	R	
3.4	Lower Reservoir, including appurtenant structures etc. (if any)	V	In	R	
3.5	Lower Intake/Outlet Structure	V	In	R	
3.6	Waterways including penstock steel liner and connecting steel liner from draft tube to lower Intake/Outlet Structure.	V	E	R	From Upper Intake/Outlet to Main Inlet Valve flange. From Draft Tube gate to Lower Intake/Outlet.
3.7	Powerhouse	V	E	R	
3.8	Provision of temporary Site Offices for Owner, Owner's Engineer and Meeting Rooms, including running costs	R	In	In	
3.9	Provision of temporary Site Offices for Contractor and subcontractors, workers welfare including changing rooms, canteen and toilets (including running costs)	V	R	R	Each lot responsible for his own supply

Item No.	Scope Description	PPC	Lot 1 (TP)	Lot 2 (IC)	Remarks/key interface
3.10	Main & local/site access roads, including connection to existing public roads, temporary roads and bridges	V	In	R	
3.11	Earthworks, all underground works, foundations, tunnels, galleries, culverts/duct banks	V	In	R	
3.12	Surface structures and building including offices, warehouse, workshop, utility buildings	E	In	R	-
3.13	All miscellaneous surface works including drainage, fencing, landscaping etc.	V	In	R	
4	**Primary Electromechanical Equipment**				
4.1	Main Inlet Valves including connecting sleeves with penstock and spiral cases, oleo hydraulic system, auxiliary systems and isolation valve	V	R	E	Pedestal is part of Lot 2. Interfaces with **Lot 2 (IC)** include civil loads and plant layout
4.2	Spiral Cases	V	R	E	Interfaces with **Lot 2 (IC)** include civil loads and plant layout
4.3	Pump-turbines and associated auxiliaries	V	R	E	
4.4	Draft tubes, including draft tube depression system	V	R	E	Interfaces with **Lot 2 (IC)** include civil loads and plant layout. Boundary between Lot 1 and Lot 2 is end of draft tube extension piece
4.5	Draft tube gates (bonneted type)	V	R	E	Interfaces with **Lot 2 (IC)** include civil loads and plant layout
4.6	Turbine governor system, including digital governor, HPU and all relevant sub-systems	V	R	E	Interfaces with **Lot 2 (IC)** include civil loads and plant layout
4.7	Unit cooling water system	V	R	E	Interfaces with **Lot 2 (IC)** include civil loads and plant layout
4.8	Motor-generator, including bearing oil system, excitation, excitation transformer and auxiliary equipment	V	R	E	Interfaces with **Lot 2 (IC)** include civil loads and plant layout
4.9	Static Frequency Converters (SFC), including SFC transformers	V	R	E	Interfaces with **Lot 2 (IC)** include civil loads and plant layout
4.10	Generator switchgear (Bus duct, GCB, etc.)	V	R	E	Interfaces with **Lot 2 (IC)** include civil loads and plant layout
4.11	IPBs	V	R	E	Interfaces with **Lot 2 (IC)** include civil loads and plant layout

Item No.	Scope Description	PPC	Lot 1 (TP)	Lot 2 (IC)	Remarks/key interface
4.12	Dynamic braking switch	V	R	E	Interfaces with **Lot 2 (IC)** include civil loads and plant layout
4.13	Phase reversal switches	V	R	E	Interfaces with **Lot 2 (IC)** include civil loads and plant layout
4.14	Step Up Transformer(s) (including fire detection and protection)	V	Optional	E	Interfaces with **Lot 2 (IC)** include civil loads and plant layout
5	**Electrical auxiliaries**				
5.1	Medium voltage AC system (switchgear, bus bar, etc.)	V	Optional	E	Interfaces with **Lot 2 (IC)** include electrical loads and plant layout
5.2	Cabling and piping	V	R	R	Each lot responsible for his own supply, interface to be detailed
5.3	Service/auxiliary transformers (including fire detection and protection)	V	Optional	E	Interfaces with **Lot 2 (IC)** include electrical loads and plant layout
5.4	Low voltage AC system (essential and normal)	V	Optional	E	Interfaces with **Lot 2 (IC)** include electrical loads and plant layout
5.5	DC System	V	Optional	E	Interfaces with **Lot 2 (IC)** include electrical loads and plant layout
5.6	UPS system	V	Optional	E	Interfaces with **Lot 2 (IC)** include electrical loads and plant layout
5.7	Backup diesel generators systems for emergency and black start	V	Optional	E	Interfaces with **Lot 2 (IC)** include electrical loads and plant layout
5.8	Electrical Plant Protection Systems	V	R	E	Interfaces with **Lot 2 (IC)** include electrical loads and plant layout
5.9	Plant control system (SCADA, DCS, plant controllers, etc.)	V	R	E	Several interfaces with building service systems, other control systems and the substation, as well as the National Grid Operator.
5.10	Condition monitoring and analysis system, including optimization and predictive maintenance tool.	V	R	E	
6	**Mechanical auxiliaries**				
6.1	Mechanical Plant Protection Systems	V	R	E	
6.2	Common (station) cooling water system including raw water pumps, primary open loop and secondary closed loop circuits.	V	R	In	For dewatering compressors, IPBs, HVAC. Input from **Lot 2 (IC)** for HVAC loads.
6.3	Drainage system including emergency drainage and OWS	V	R	E	Includes headrace and tailrace dewatering
6.4	Turbine dewatering (blowdown) system	V	R	E	

Item No.	Scope Description	PPC	Lot 1 (TP)	Lot 2 (IC)	Remarks/key interface
6.5	Oil storage and filtration system	V	R	E	Assume mobile tanks and filtering plant
6.6	Compressed air system (service air and instrument air)	V	In	R	
6.7	Low pressure compressed air system for inflatable seal and generator braking.	V	R	E	
6.8	High pressure compressed air system	V	R	E	
6.9	Powerhouse / assembly bay crane(s), other cranes and hoists	V	E	R	Input from **Lot 1 (TP)**, including locations and loads
6.10	Mechanical Workshop equipment	V	In	R	**Lot 1 (TP)** will provide any specific needs for EM equipment
6.11	Electrical Workshop equipment	V	In	R	**Lot 1 (TP)** will provide any specific needs for EM equipment
6.12	Special tools	V	R	-	
6.13	Piping and ducting including supports	V	R	R	Each lot responsible for his own supply. Piping and ducting are included in each subsystem (cooling, drainage, dewatering, HVAC, etc.) General integration is the responsibility of **Lot 2 (IC)**.
7	**Hydromechanical Equipment**				
7.1	Upper Intake trash racks, gates, stoplogs, hoists etc.	V	In	R	
7.2	Lower Intake trash racks, gates, stoplogs, hoists etc.	V	In	R	
7.3	All headwater, waterway and tailwater equipment	V	In	R	
8	**Building Services & other auxiliaries (including Master clock system / Time synchronization)**				
8.1	Overhead Medium Voltage line (or cable) from power house to upper reservoir, including fibre optic line for CS communication	V	E	R	**Lot 1 (TP)** shall supply characteristics for overhead line or cable / CS fibre optic line.
8.2	Earthing and lightning systems design	V	R	In	**Lot 2 (IC)** to provide its own equipment specifications
8.3	Embedded and buried earthing system installation, including interconnection to surface switchyard and at remote sites (e.g. intakes)	V	E	R	Procurement and Installation by **Lot 2 (IC),** supervision by **Lot 1 (TP)**
8.4	In-air earthing and bonding system procurement and installation (EM equipment, building services, metallic fittings and structures)	V	R	R	Each lot responsible for his own supply. For each subsystem and metallic element.

Item No.	Scope Description	PPC	Lot 1 (TP)	Lot 2 (IC)	Remarks/key interface
8.5	Lightning protection system procurement and installation	V	E	R	Procurement and Installation by **Lot 2 (IC),** supervision by **Lot 1 (TP)**
8.6	Penstock Cathodic Protection design procurement and installation	V	In	R	If required, to be confirmed by **Lot 2 (IC)**
8.7	Powerhouse (EM equipment) Cathodic Protection design procurement and installation	V	R	In	If required, to be confirmed by **Lot 1 (TP)**
8.8	Small power and lighting	V	E	R	Interfaces with EPC include electrical loads and plant layout
8.9	Fire detection & alarm system	V	E	R	Inputs by **Lot 1 (TP)**
8.10	Information and Communication systems (ICS), including cybersecurity.	V	E	R	
8.11	Access control and intruder alarm systems	V	E	R	Internet, Wifi, telephones, etc.
8.12	CCTV and intruder detection systems	V	E	R	
8.13	Powerhouse vertical transport (lifts)	V	E	R	To be sized for plant maintainability according to relevant **Lot 1 (TP)** input
8.14	Domestic service and potable water system	V	E	R	
8.15	Sanitary drainage and wastewater system	V	E	R	
8.16	Ventilation & HVAC system	V	E	R	Cooling water from common system
8.17	Fire protection systems (wet and dry), including water supply and storage	V	E	R	Generator protection and transformer deluge included in **Lot 1 (TP)**. Integration by **Lot 2 (IC).**
8.18	First-fill (waterway priming) system, if needed	V	E	R	
8.19	Water supply system (from raw water supply pipe)	V	E	R	
9	**150kV Switchyard and Transmission Line (out of the project)**				
9.1	Switchyard and T/L land, permits etc.	R	-	E	
9.2	Switchyard civil works	V	-	E	Contractor licensed by the TSO
9.3	Switchyard electrical works	V	In	E	Contractor licensed by the TSO
9.4	Existing substation modifications / construction (if needed)	R	-	E	
9.5	Grid studies, connection application	R	In	-	
9.6	Transmission network interconnection	In	In	In	Responsibility is with TSO

Table 2-1: Division of work per lot

2.4. PRELIMINARY TIME SCHEDULE

★ ***CM for Contractual Milestone***

		Time	Year 0				Year 1				Year 2				Year 3				Year 4				Year 5			
			T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4
0	*Early Engineering*																									
1	Notice to Proceed to Lot 1					★																				
2	Notice to Proceed to Lot 2					★																				
3	Access road	3 months																								
4	Site preparation	6 months																								
5	Geological investigations	3 months																								
6	Reservoirs civil works																									
6.1	*Reservoirs design (Excav., embankments, etc.)*	3 months																								
6.2	*Upper reservoir works*	2 years																								
6.3	*Lower reservoir works*	1 year																								
7	Penstocks (2*800m)																									
7.1	*Lining design & manufacturing*	2 years																								
7.2	*Penstocks installation*	1 year																								
8	Powerhouse																									
8.1	*Civil & excavation design*	3 years																								
8.2	*Powerhouse excavations*	1 year																								
8.3	*Powerhouse civil works*	2 years																								
9	Powerhouse Electromechanical works																									
9.1	*Design and hydraulic model tests*	9 months																								
9.1A	***CM** - Witness model test*								★																	
9.2	*Mechanical & Electrical design*	2 years																								
9.2A	***CM** - Loads on concrete*									★																
9.2B	***CM** - Powerhouse layout*									★																
9.3	*Manufacturing & Transportation*	3 years																								
9.3A	***CM** - Draft tube and Draft tube gate - U1*	*available at site*										★														
9.3B	***CM** - Draft tube and Draft tube gate - U2*	*available at site*											★													
9.3C	***CM** - Draft tube and Draft tube gate - U3*	*available at site*												★												
9.3D	***CM** - Draft tube and Draft tube gate - U4*	*available at site*													★											
9.3E	***CM** - Turbine pit liner and Spiral case - U1*	*available at site*												★												
9.3F	***CM** - Turbine pit liner and Spiral case - U2*	*available at site*													★											
9.3G	***CM** - Turbine pit liner and Spiral case - U3*	*available at site*														★										
9.3H	***CM** - Turbine pit liner and Spiral case - U4*	*available at site*															★									
9.3I	***CM** - Generator anchoring plates - U1*	*available at site*													★											
9.3J	***CM** - Generator anchoring plates - U2*	*available at site*														★										
9.3K	***CM** - Generator anchoring plates - U3*	*available at site*															★									
9.3L	***CM** - Generator anchoring plates - U4*	*available at site*																★								
9.3M	***CM** - Pump-turbine runner - U1*	*available at site*																★								
9.3N	***CM** - Pump-turbine runner - U2*	*available at site*																	★							
9.3O	***CM** - Pump-turbine runner - U3*	*available at site*																		★						
9.3P	***CM** - Pump-turbine runner - U4*	*available at site*																			★					
9.4	*Installation*	3 years																								
9.4A	*Ready for wet testing - U1*																			☆						
9.4B	*Ready for wet testing - U2*																				☆					
9.4C	*Ready for wet testing - U3*																					☆				
9.4D	*Ready for wet testing - U4*																						☆			
10	Water filling - Wet testing - Commissioning	1 year																								
10.1	*Wet testing and commissioning - U1*	3 months																								
10.2	*Wet testing and commissioning - U2*	3 months																								
10.2A	***CM** - Partial Take Over - U1 & U2*																					★				
10.3	*Wet testing and commissioning - U3*	3 months																								
10.4	*Wet testing and commissioning - U4*	3 months																								
10.4A	***CM** - Partial Take Over - U3 & U4*																							★		

3. PROJECT INPUT DATA

The design of all components of the electromechanical equipment shall comply with current international Good Engineering Practices and be compatible with requirements of high reliability and durability.

The installations shall be designed to ensure reliable and easy operation and maintenance under all circumstances, requiring only minimal maintenance resources and without the interruption of the plant routine operation.

Equipment design shall fully consider the prevailing environment at the site of the works – climate, seismic conditions, water quality, etc. The Tenderers are required to fully ascertain these environmental conditions before submitting their Tenders.

3.1. PROJECT LIFETIME

The design life is the period for which the Works, when maintained in accordance with the maintenance plans, are fit to be used for their intended purpose without the loss of reliability or of structural, operational or aesthetic integrity.

The design life of individual Facilities and Components of the Works is given in the table below. A design life of 100 years shall be taken for the Permanent Works unless indicated otherwise in the tables or in the specific design requirements.

For all Components a manufacturer's certificated design life documentation shall be submitted for the Owner's approval. A test program shall be developed for Components for which the required design life is not adequately certified.

Certificates and test programs shall address all aspects that are relevant for the design life of the related Component, like frost/thaw resistance, fatigue strength, fire resistance, pressure wave resistance, resistance against de-icing salts, etc.

The test program shall be submitted for the Owner's approval.

Every Component of the Facility for which the design life is less than the design life of the related Facility shall be replaceable.

Ease of replacement of such Component shall be a primary design consideration.

Replacement of such Components shall be possible in a non-destructive manner to the surrounding structure and incur minimum disturbance to normal operating conditions.

The replacement procedures of such Components shall be described in the operation and maintenance manual.

The design life requirements for concrete structures shall be met without taking into account any favourable effects from a cathodic protection system whether or not such a system will be installed.

For design calculations, the design life of all temporary structures that have to function for a period of 6 months or longer shall be at least 15 years unless otherwise stated.

The design lives of the main structural elements are as indicated below.

Element	Life duration
Structure/equipment	
Permanent civil components	100 years
Water intakes	100 years
Powerhouse structure	100 years
Watertightness system for reservoirs	30 years (1)
Permanent Mechanical components	
Runner, bearings	30 years (3)
Embedded parts (spiral case, draft tube, steel lining)	30 years (2)
Major Mechanical equipment (Cranes, Upper safety gate, Draft tube gate, Main Inlet Valve, Trash Racks, Penstocks)	50 years
Mechanical Auxiliaries (dewatering, cooling, ventilation, air conditioning, fire protection and firefighting, compressed air supply systems, etc.)	40 years
Permanent Electrical components	
Motor generator	40 years
Power transformers	40 years
SFC	30 years
HV Switchgear (outdoor equipment gantries, OHL, civil structures etc.)	50 years
MV IPB type busbars	40 years
GCB, Phase reversal switches	30 years
MV/LV electrical distribution equipment	30 years
SCADA, protection and control system	15 years
Embedded and buried earthing system	100 years
Water Supply Component	
Pipe	100 years
Pumps	30 years
Mechanical equipment (filter, valve, air valve…)	40 years

(1): Either membrane replacement, or bituminous concrete full-face check-up repair works + bituminous sacrificial layer to renew.
(2): Full painting works to be considered after 30 years to extend life during without limitation.
(3): lifespan expandable by changing contact surfaces or performing repairs

Table 3-1. Minimum design service lifetime for elements

3.2. WATER QUALITY DATA

The reservoirs will be filled by the local aquifer water and in addition with water conveyed from the Polyfytos reservoir through existing pipelines. Water quality data for both abovementioned sources are presented in Appendix A.

3.3. CLIMATIC DATA

3.3.1. TEMPERATURE

Temperature data is available in hourly time-steps for the meteorological stations Koilada and Pontokomi from 01.01.2014 to 31.12.2024, a period of 11 years. Both stations are located in the vicinity of the Kardia mine.

For both stations, the average temperature during this period is 14.3°C. Since Pontokomi comprised of more outliers, data from Koilada was utilized. The assessment of the data was carried out on an hourly and a daily basis.

Next figure shows the monthly averaged data for the period 2014 to 2024. An increase in average temperature is observed (about 1°C in 11 years), primarily caused by warmer summers.

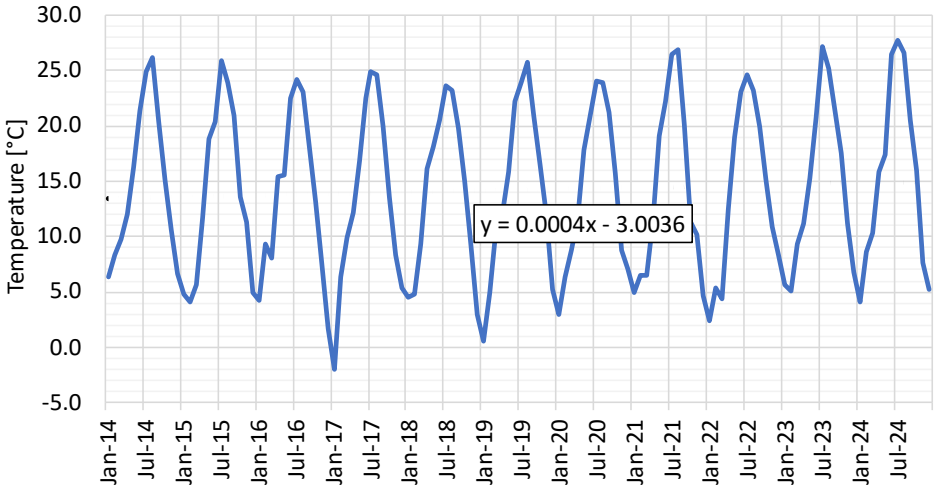


Figure 3-1: Monthly temperatures measured at Meteorological Station Koilada

Mean hourly and daily temperatures are shown in Figure 3-2 and Table 3-2, for each month of the year. For example, for July, the hottest month of the year, the average of all maximum hourly measurements amounts to 37.19°C; on a daily basis, this value reduces to 30.14°C. The lowest temperatures typically take place in January.

	Max Hourly Temperature [°C]	Min Hourly Temperature [°C]	Max Daily Temperature [°C]	Min Daily Temperature [°C]	Average Temperature [°C]
Jan	16.54	-8.96	10.96	-4.95	3.51
Feb	20.25	-5.69	12.83	-1.97	6.38
Mar	23.78	-2.48	15.40	1.78	8.43
Apr	27.41	1.07	19.70	5.78	12.90
May	30.83	6.85	23.00	11.38	17.29
Jun	35.45	10.92	28.37	15.64	22.07
Jul	37.19	13.50	30.14	18.74	25.23
Aug	36.42	14.19	28.67	19.71	24.76
Sep	34.32	8.18	26.14	13.21	20.28
Oct	27.52	4.17	20.62	8.63	14.78
Nov	22.80	-1.40	16.14	2.62	9.80
Dec	17.88	-5.57	11.33	-1.90	5.36

Table 3-2: Temperature measured at Meteorological Station Koilada

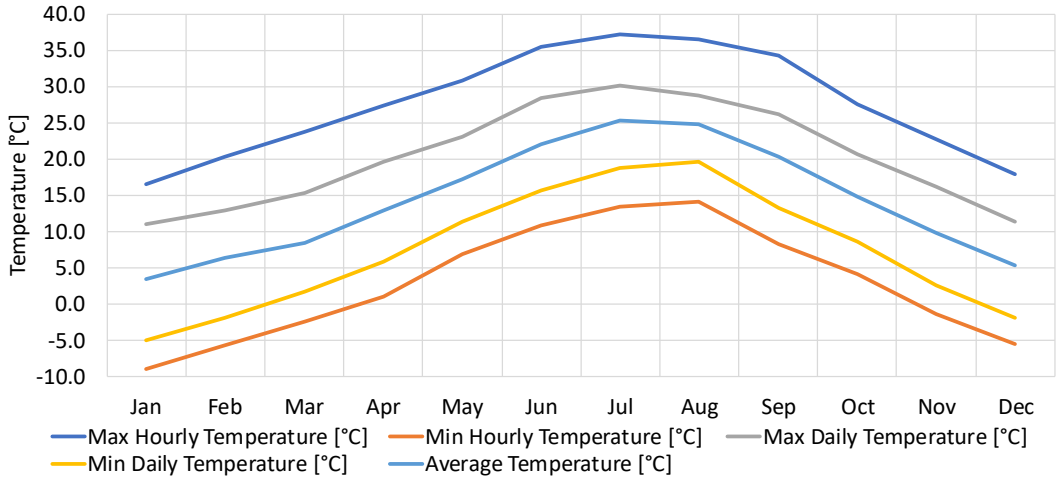


Figure 3-2: Temperature measured at Meteorological Station Koilada

3.3.2. RELATIVE HUMIDITY

As for temperature, relative humidity (RH) data is available in hourly time-steps for meteorological stations Koilada and Pontokomi from 01.01.2014 to 31.12.2024, a period of 11 years.

Pontokomi comprised of many outliers, such as values above 100%, therefore, data from Koilada was utilized. The assessment of the data was carried out on hourly and daily timesteps.

Figure 3-3 shows the monthly averaged RH for the period 2014 to 2024. The downward trend in RH is caused by a RH observed in 2014, otherwise there would not be a decline in RH.

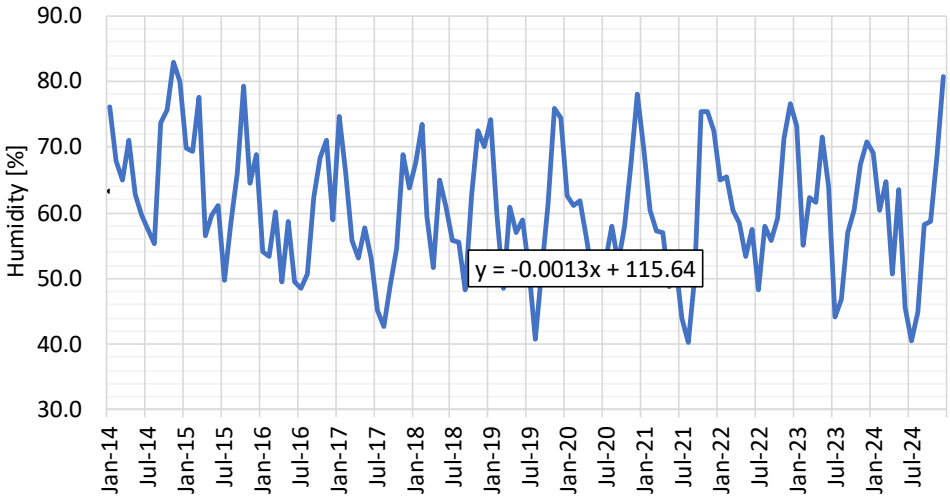


Figure 3-3: Monthly humidity measured at Meteorological Station Koilada

Mean hourly and daily RH values are shown in Table 3-3 and Figure 3-4 for each month of the year. Average maximum hourly RH ranges between 93.45% and 97.73%, minimum hourly RH between 16.82 % and 32.27%. On an average basis, highest RH is observed in December, whereas the lowest RH occurs in August.

	Max Hourly Relative Humidity [%]	Min Hourly Relative Humidity [%]	Max Daily Relative Humidity [%]	Min Daily Relative Humidity [%]	Average Relative Humidity [%]
Jan	96.27	30.64	92.03	48.89	68.77
Feb	94.73	21.73	83.83	40.72	62.93
Mar	97.00	17.55	89.60	36.48	61.22
Apr	95.45	17.82	84.74	36.30	57.01
May	96.91	21.09	82.17	39.94	58.95
Jun	94.73	19.82	80.63	35.95	55.86
Jul	95.45	17.09	78.82	31.93	48.89
Aug	93.45	16.82	76.14	34.48	50.14
Sep	95.27	20.82	82.73	37.48	56.79
Oct	94.73	24.09	84.85	45.97	64.88
Nov	97.73	29.64	92.56	50.64	71.51
Dec	96.91	32.27	92.58	50.67	72.28

Table 3-3: Relative humidity measured at Meteorological Station Koilada

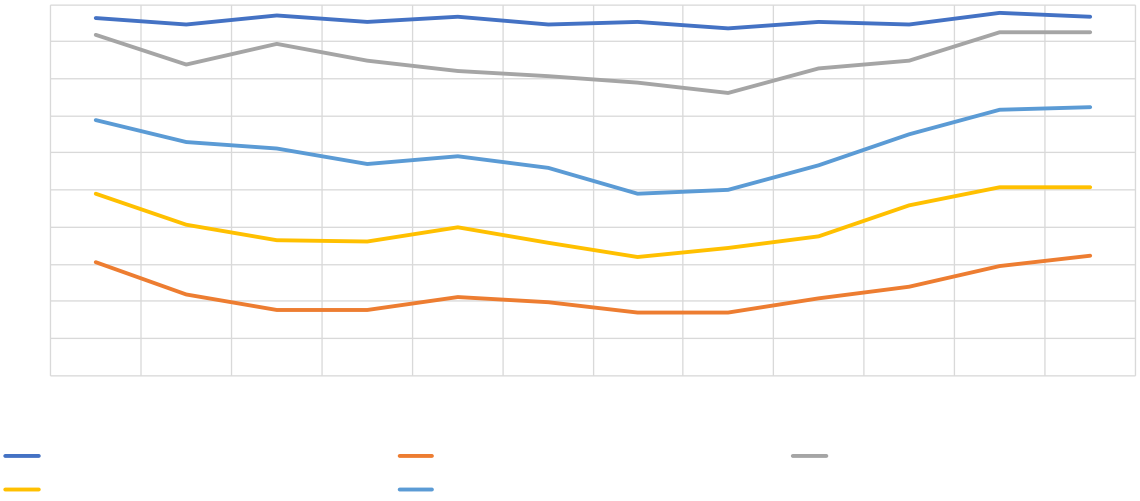


Figure 3-4: Relative humidity measured at Meteorological Station Koilada

3.4. SEISMIC HAZARD

Wherever relevant, the Tenderer shall take into account seismic-generated stresses by combining vertical and horizontal accelerations in their most unfavourable configuration. For each of these accelerations, the site maximum peak ground acceleration shall be considered.

Kardia PHS area lies in the “Zone I” seismic classification as determined in the Greek Annex of Eurocode 8, which corresponds to the design seismic acceleration value (*a*) of 0.16g for a return period of 475 years. An importance factor 1,4 must be considered.

According to the revision of the Seismic Hazard Map (Government Gazette 1154/B/12-8-2003) of the current Anti-Seismic Regulation (NEAK 2000), the area is classified as Zone I, which corresponds to the design seismic acceleration value of 0.16g for a return period of 475 years.

Following the provisions of ICOLD bulletin 72, and the requirements of PPC, two types of earthquake shall be considered:

- Safety Evaluation Earthquake (SEE) which has a return period about 3 000 years;
- Operating Basis Earthquake (OBE) which has a return period about 475 years.

A dedicated Seismic Report is ongoing.

3.5. RESERVOIRS

The project includes two man-made reservoirs as described in Chapter 2.1.

Active storage of Kardia PHS is defined by the volume between the maximum water level (MWL) and the minimum operating level (MOL).

At this stage of the study, we propose considering the following water level ranges, outlined in the paragraphs below, for an active storage of approximately 6.9 hm^3.

The water levels for the upper reservoir are shown in the following table:

Water levels	Elevation
Minimum Operating Level (MOL)	667.0 m
Maximum Water Level (MWL)	682.0 m

Table 3-4: Upper Reservoir Water Levels

The water levels for the lower reservoir are shown in the following table:

Water levels	Elevation
Minimum Operating Level (MOL)	534.0 m
Maximum Water Level (MWL)	543.5 m

Table 3-5: Lower Reservoir Water Levels

3.6. PENSTOCK

The penstock consists of two exposed (Cut & Cover) steel pipes, laid in parallel. All penstock pipes will be designed in accordance with the recommendations in ASCE and CECT standards. The pre-sizing will consider the most severe situations, in particular absolute vacuum inside the penstock in case of emergency closure of the butterfly valve.

- Number of pipes: 2
- Number of Pump-turbines per pipe: 2
- Length of each pipe: 950 m
- Diameter of each pipe: 6 m
- Generating discharge capacity per penstock: 2 x 67 $m^3.s^{-1}$
- Pumping discharge capacity per penstock: 2 x 60 $m^3.s^{-1}$

3.7. PUMP-TURBINE INPUT DATA

Parameter	Value	Comments
Main Inlet Valve technology	Butterfly valve	
Turbine technology	Vertical Reversible Francis	
Generator technology	Synchronous Motor-Generator	
Unit number	4	
Turbine output under max head (148m)	82.5 MW	Mechanical power on turbine shaft
Unit rated output	81 MW	At Generator terminals
Turbine output under rated head (140m)	82.5 MW	Mechanical power on turbine shaft
Turbine output under intermediate head (130m)	72.5 MW	Mechanical power on turbine shaft
Lower limit in turbine output	≤ 50%	% of full output for each head
Power input at max head (149.7m)	≥ 76.3 MW	Mechanical power on pump shaft
Power factor	0.90 0.95	In Generation mode In Consumption mode
Unit apparent power	90 MVA	
Generation time per day	8 hours	May vary during ETPI phase.
Pumping time per day	11 hours	May vary during ETPI phase.
Start&stop per day	4	
Lower reservoir MOL	534 masl	
Lower reservoir MWL	543.5 masl	
Upper reservoir MOL	667 masl	May vary during ETPI phase.
Upper reservoir MWL	682 masl	May vary during ETPI phase.
Gross head range	123.5 – 148 mWc	May vary during ETPI phase.
Unit setting (distributor centerline)	511 masl	May vary during ETPI phase.
Synchronous speed	333 rpm	Alternative offers are accepted
Waterways head loss	~2% of Gross head under max discharge conditions	Will be confirmed by Lot 2 Contractor.

Table 3-6: Pump-turbines input table

Pump-turbines should be designed in such a way that:

- **Operation in generating mode** (turbine) is to be optimized to cover full load to partial load operation down to 50% of max output, for a given net head. Priority is given to high load operation, flexibility being achieved by the number of units. See weighted average efficiency formula below, defined for turbine mechanical output on turbine shaft vs turbine net head. **Turbine efficiency shall include the butterfly MIV head losses**. The net head high pressure section measurement should be located on the high pressure side of the MIV.

  Turbine Weighted Average Efficiency (WAE) is to be obtained by the sum of products (efficiency x weighting factor) for all the operating points from Table 3-7.

Hn (m)	120.8	130	140	148.0
P (MW)	63.8*	72.5	82.5	82.5
100%	3%	12%	12%	3%
90%	3%	12%	12%	3%
80%	2%	8%	8%	2%
70%	1.5%	6%	6%	1.5%
60%	0.5%	2%	2%	0.5%
50%	0%	0%	0%	0%

Hn = Net head in turbine mode including MIV
P = Mechanical output on Turbine shaft
Load fractions are in % of max output under each given net head
(*) Max output under minimum head may vary, to be adjusted by the Tenderer according to max opening to achieve max output under other heads

Table 3-7: Weights for Turbine Operating points

On the next figure the expected operating range in output vs net head is shown, to be confirmed by the Tenderer in the deliverables. The minimum continuous output of 50% of max output per head shall be confirmed by the Tenderer. The area corresponds to a continuous and stable operation in turbine mode.

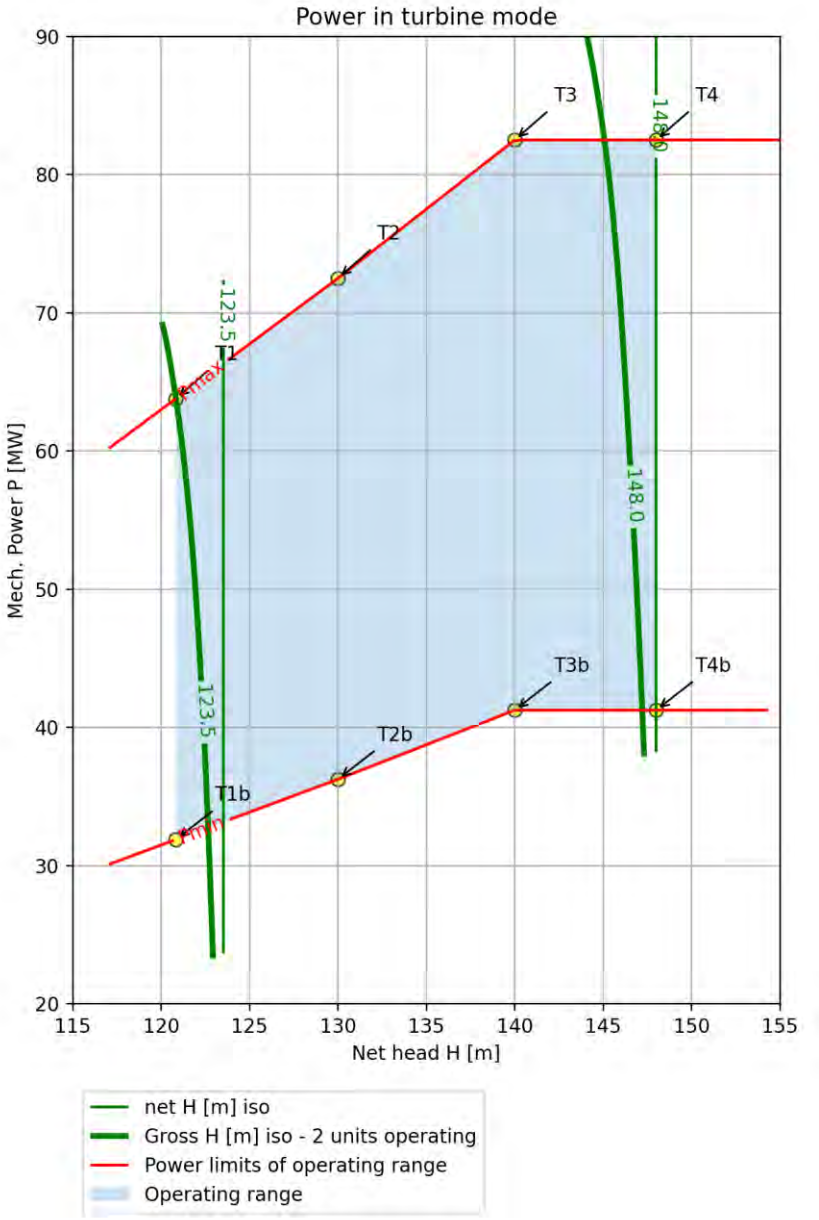


Figure 3-5: Turbine expected mechanical power output – continuous operating range

- **Operation in pumping mode** is to be optimized to cover the whole gross head range, with a priority given to intermediate heads. See weighted average efficiency formula below, defined for mechanical input on pump shaft vs pump net head. **Pump efficiency shall include the butterfly MIV head losses**. The net head high pressure section measurement should be located on the high pressure side of the MIV.

  Pump Weighted Average Efficiency (WAE) is to be obtained by the sum of products (efficiency x weighting factor) for all the operating points from Table 3-8.

Hn (m)	123.5	137	149.7
100%	25%	50%	25%
Hn = Net head in pump mode including MIV			

Table 3-8: Weights for Pump Operating points

On the next figure the expected operating range in pump mode with net head as a function of discharge is shown, to be confirmed by the Tenderer in the deliverables.

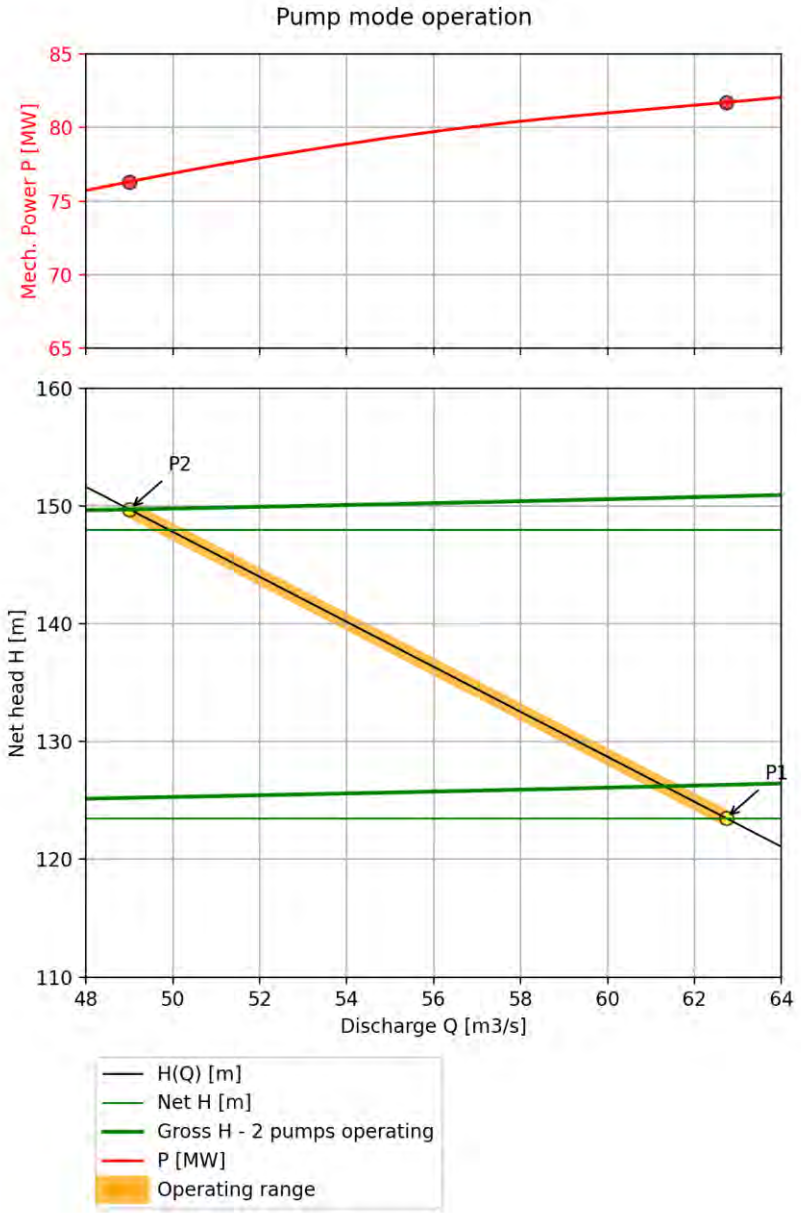


Figure 3-6: Pump expected head-flow curve - continuous operating range

- The pump-turbine should be designed in such a way to have a **cavitation free runner**. The maximum amount of cavitation pitting after one year or 3000 hours of operation in pumping mode shall be guaranteed. The guaranteed values (depth and volume) shall be those for a cavitation free runner, as set out in IEC 60609: amount of cavitation corresponding to IEC 60609 Fig. A.1 and A.2., with the following threshold values:
  - One fourth of minimum volume value from Fig. A.2: **$5*D^2$**
  - Approx. equivalent in dimension, that is the minimum depth value from Fig. A.1 divided by 1.6 (approx. cube root of 4): **$2.5*D^{0.4}$**

Guaranteed items will be the following:

- WAE Turbine
- WAE Pump
- Turbine mechanical max output under max and rated head
- Pump mechanical input under max head
- Cavitation pitting max depth per runner
- Cavitation pitting max volume per runner
- Motor and generator max efficiency
- Transformer max efficiency
- Noise and Vibration guarantees

3.8. ALLOWABLE MODE CHANGE TIMES

The different modes that are considered for the units are the following:

- **Stand still mode:**

The runner is stopped, filled with water. All auxiliaries are activated.

- **Generating Mode:**

Driven by the Pump-Turbine in turbine mode, the Generator provides active power to the grid, and can supply or absorb reactive electric power to/from the grid.

In this mode the unit can provide the following grid services:

- frequency control (within the unit load range);
- voltage control (within the unit PQ diagram).

- **Pumping Mode:**

The Motor, driving the Pump-Turbine in pump mode, uses the active power supplied by the grid to transfer water from the lower reservoir to the higher reservoir, thus storing potential energy. It can also supply or absorb reactive electric power to/from the grid.

In this mode the pump-turbines can provide the following grid services:

- voltage control (within the unit PQ diagram).

- **Synchronous condenser modes:**

The Unit is dewatered and spinning in air in the pump or turbine direction. It thus uses a limited amount of active power, but can supply or absorb reactive power, and contributes to the grid voltage control:

- Synchronous Condenser Mode in Generating rotation.
- Synchronous Condenser Mode in Pumping rotation.

- **Line Charging:**

The line charging mode of operation is used when the generator is to be connected to a transmission line which is not energized. The Manual regulator is selected and the exciter output is such as to cause the system voltage to be normal when the generator is placed on the transmission line.

This line charging mode capability shall be confirmed after the stability study, to be performed during the ETPI phase.

A typical Mode change diagram is presented on next figure.

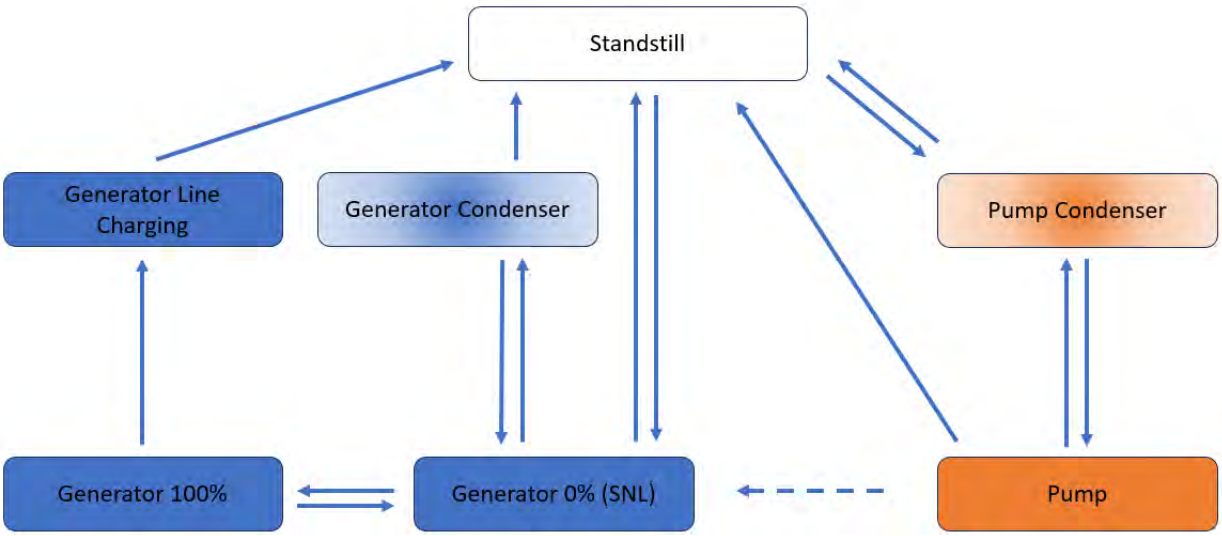


Figure 3-7: Mode change Diagram to be considered

Tenderer is to propose its own typical transition times. The sequence time for the main transition between modes shall be **guaranteed**, in particular the two following:

- Standstill to Generating (100%)
- Standstill to Pumping

4. CODES, GUIDELINES AND STANDARDS

4.1. HIERARCHY OF STANDARDS

In the event of any conflict in standards, the hierarchy of standards is as follows, with the standards occurring first in the list taking precedence over any standards later in the list:

1. Codes, Standards, Laws and Rules into force in Greece and Europe.
2. Particular Technical Specifications (**PTS**), see Chapter 5, and General Technical Specifications (**GTS**), see APPENDIX C
3. International standards.
4. National standards to which the manufacturer normally operates.

4.2. GENERAL STANDARDS

[1] International Commission on Large Dams (ICOLD)
[2] International Electrotechnical Commission (IEC)
[3] International Standards Organisation (ISO)
[4] European Committees for Standardisation (EN) including Eurocodes
[5] American National Standards Institute, (ANSI)
[6] American Society for Testing and Materials (ASTM)
[7] United States Army Corps of Engineers (USACE)
[8] United States Bureau of Reclamation (USBR)
[9] Japanese Industrial Standards (JIS)
[10] Deutsches Institut für Normung (DIN)
[11] British Standards Institutes (BSI)
[12] Verein Deutscher Ingenieure (VDI)
[13] Comité Français des Barrages et Réservoirs (CFBR-/ FRCOLD)
[14] Association Française de Normalisation (AFNOR)

4.3. SPECIFIC STANDARDS

[15] DIN 19704-1, Hydraulic steel structures – Part 1: Criteria for design and calculation, November 2014.
[16] DIN 19704-2, Hydraulic steel structures – Part 2: Design and manufacturing, November 2014.
[17] USACE EM 1110-2-2107, Design of Hydraulic Steel Structures, August 2022.
[18] USACE EM 1110-2-1602, Hydraulic Design of Reservoir Outlet Works, October 1980.

[19] Design Standards No.6, Hydraulic and Mechanical Equipment, Chapter 6: Bulkhead Gates and Stoplogs, USBR.

[20] Design Standards No.6, Hydraulic and Mechanical Equipment, Chapter 12: Trashracks and Trashrack Cleaning Devices.

[21] EN 15011, Cranes – Bridge and gantry cranes, December 2020.

[22] EN 13135:2013, Cranes – Safety – Design – Requirements for equipment, April 2018.

[23] ISO 4301-1, Cranes – Classification – Part 1: General

[24] EN 13001-1, Cranes – General design – Part 1: General principles and requirements, April 2015.

[25] EN 60204-32, Safety of machinery – Electrical equipment of machines – Part 32: Requirements for hoisting machines, September 2008.

[26] FEM, European Materials Handling Federation

[27] CMAA Specification No.70-2020, Multiple girder cranes.

[28] CMAA Specification No.74-2020, Single girder cranes.

[29] NFPA 850, Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations

[30] NFPA 851, Recommended Practice for Fire Protection for Hydroelectric Generating Plants.

[31] Hydroelectric Power Plant Trashrack Design, Journal of the POWER DIVISION – Proceedings of the American Society of Civil Engineers, January 1971.

[32] Design of Hydraulic Gates, Paulo C.F. Erbisti, 2nd Edition, 2014.

[33] Fundamentals of vortex intake flow, in. J. Knauss Swirling Flow Problems at intakes, IAHR Hydraulic Structures Manual, 1987

[34] ASCE Manuals and Reports on Engineering Practice No. 79, “Steel Penstocks”

[35] CECT Comité Européen De La Chaudronnerie Et De La Tôlerie - Recommendations for study, construction and assembly of penstocks

[36] CODAP Code for Construction of Unfined Pressure Vessels

[37] ASME Section VIII Boiler and Pressure Vessel Code (BPVC) - Rules for Construction of Pressure Vessels

[38] IIW-1823-07 International Institute of Welding - Recommendations for design of welds under fatigue cycling loads.

[39] EN 1991 Eurocode 1 : Actions on structures

[40] EN 1993-4-3 Eurocode 3 - Design of steel structures - Section 4-3 : piping

[41] EN 13445 Unfired pressure vessel

[42] EN 13480 Metallic Industrial Piping Design Rules

[43] AWWA M11 Steel Pipe – A Guide for Design and Installation

[44] AWWA C200 Standard for Steel Water Pipe Six Inches and Larger

[45] AWWA C206 Standard for Field Welding of Steel Water Pipe

[46] AWWA C208 Dimensions for Fabricated Steel Water Pipe Fittings

[47] AWWA C210-15 Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings

[48] USACE EM 1110-2-2901, Tunnels and Shafts in Rock, May 1997.

5. PRELIMINARY PARTICULAR TECHNICAL SPECIFICATIONS (PTS)

5.1. HYDRAULIC MACHINERY

5.1.1. PUMP-TURBINES

The four (4) Pump-Turbines shall be of the vertical shaft, single runner, with fixed speed, reversible Francis-type units, with movable wicket-gates, fixed stay vanes, steel-plate spiral cases and elbow-type suction draft tubes. Wicket gates shall be used to regulate power output and to control speed at starting, synchronization and shutting down during turbine operation.

- Nominal capacity: Each pump-turbine shall be specified to have a guaranteed turbine output of **82.5 MW** (mechanical output on turbine shaft) when operating under the nominal head at rated speed.
- Turning speed: **333 rpm**. (Tenderer may quote also for a different speed with the proper explanation).
- Distributor centerline is forecasted at **511 masl**. Tenderer may propose alternative values at a different elevation to minimize cavitation impact on pump-turbine.
- All four (4) Pump-Turbines should be capable of operating in **synchronous condenser mode**, both in turbine and pump rotation directions.
- The two Pump-Turbines on the same penstock should be able to operate in **hydraulic short-circuit mode**, one unit being in generating mode while the other in consumption mode, each one of them within its normal operating range (resp. turbine and pump modes).
- The pump-turbine should be designed in such a way to have a **cavitation free runner** in the continuous operating range, both in pump and in turbine modes.

The Pump-Turbine hydraulic design shall be tested and approved by the Owner through a **reduced scale model test** following IEC 60193-2019 standard. The hydraulic waterways to be included into the geometrical homology shall go from Main Inlet Valve (MIV) upper reservoir side to Draft Tube lower reservoir side. MIV obturator is to be included in fully opened position – its maneuverability on the reduced scale model is not needed. Draft tube gate slots are to be included in the geometrical homology.

5.1.2. GOVERNING SYSTEM

The governing system of each turbine-generator shall be of the electronic-hydraulic type, with digital computerized PID control, with acceleration sensing, speed regulation, and stabilizing and diagnostic functions.

The governing system shall be supplied complete, with electrical speed sensors, actuators, restoring connections, oil pumps set, sump tank, pressure tank, oil piping to the pump turbine servomotors, and all controls, instrumentation and accessories necessary for a complete governing system. The governing system shall be pressurized by nitrogen bottles.

The governing system shall have provisions for remote starting and automatic load control equipment.

5.1.3. INLET BUTTERFLY VALVE

Each pump-turbine shall be provided with a butterfly shut-off valve between the spiral case and the penstock. This valve shall be capable of the following:

- Isolation of the pump-turbine from the penstock, allowing for performing maintenance work on the pump-turbine, without emptying the headrace.
- Normal shut-off.
- Emergency shut-off in the event the wicket gates fail to close.
- Emergency shut-off in case of loss of power (load rejection)
- It shall be able to shut off the inflow into the powerhouse, in case of burst of pipe downstream of the valve.

The butterfly valves shall be equipped of a by-pass to balance the pressure before opening.

The butterfly valves shall be supplied complete with a dedicated oil pressure unit, all controls, actuators and filling and dismantling pipes. Closing should be done by the mean of one of two counterweights per butterfly valve. The connecting sleeves with penstock and the spiral case should be supplied together with the butterfly valves.

The oil pressure unit shall be pressurized by nitrogen bottles.

5.1.4. DRAFT TUBE GATE

On the low pressure side of each turbine, at the end of the diverging part, a draft tube bonneted gate shall be provided, as integral part of the turbine draft tube.

The draft tube bonneted gate shall isolate the related turbine from the low pressure water intake, for inspection and maintenance without any influence on the operation of the other units. In addition, it shall shut off the inflow into the cavern, in case of burst of any pipe or manhole between the main inlet valve and the draft tube gate.

To prevent excessive pressure on the bonneted gate, hydraulic interlocking shall be implemented so that the bonneted gate can only be closed when the MIV is completely closed, and the MIV can only be opened when the bonneted gate is completely opened.

The draft tube gate shall be equipped of a by-pass to balance the pressure before opening. A safety valve shall be integrated to limit the pressure on the turbine side in case of leakage at MIV level.

The draft tube gates shall be supplied complete with a dedicated oil pressure unit, all controls, actuators and filling and dismantling pipes. Closing shall be capable by its own weight, closing speed shall be controlled by the oleo hydraulic system.

The oil pressure unit shall be pressurized by nitrogen bottles.

5.1.5. MECHANICAL AUXILIARY EQUIPMENT

The **mechanical auxiliary equipment as part of Lot 1 Technology Provider** should include:

- ✓ Cooling Water Systems
- ✓ Compressed Air Systems
- ✓ Station Drainage and Dewatering Systems
- ✓ Mechanical and Dielectric Oils handling and treatment Systems
- ✓ Fire Protection System of motors-generators and main power transformers
- ✓ Secondary lifting and handling capacities

5.1.5.1. Cooling Water Systems

A raw water system in open loop (primary circuit) shall be common for all cooling systems. Each unit shall have its own water collection (input and output) on the low pressure side. The primary circuit should be designed with a complete redundancy, in particular with two pumps and two automatic filters, each one of them being capable of providing the total required discharge.

A closed loop cooling system (secondary circuit), connected with the primary circuit through heat exchangers, shall be provided for removing excessive heat from the following systems:

- Pump-turbine and motor-generator;
- SFC cubicle and transformer (if necessary)
- High capacity compressors (if necessary)
- HVAC system

The secondary circuit should be designed with a complete redundancy, in particular with two pumps, each one of them being capable of providing the total required discharge.

Cooling water systems shall be designed on a unit basis to provide for the normal operation of the pump-turbine and motor-generator for cooling requirements.

The system's closed loop shall circulate treated water as is necessary for equipment cooling. Equipment shall be separated from raw water running in the heat exchangers

The closed loop cooling system shall be supplied with two 100% capacity pumps (one duty and one stand-by), pressure controls, expansion tanks, and all piping, valves and controls necessary to circulate water through the heat exchanger and plant equipment coolers.

A dedicated system will provide fine-filtrated water for turbine shaft seal spraying.

Provisions shall also be made for supplying pressurized shaft seal water during unit outages or idle periods.

5.1.5.2. Compressed Air Systems

The compressed air systems will consist at least of the following:

- Blowdown (dewatering) compressed air system (MP/HP) – **Part of Lot 1**
- Generator braking compressed air system (LP) – **Part of Lot 1**
- Station's service and instrument compressed air system (LP) – **Part of Lot 2 – not to be quoted in this RFQ**

The blowdown compressed air system shall be designed to depress water level in the draft-tube to below the runner, in order to reduce pump start-up load and to allow the runner to spin in air while the unit operates as a synchronous condenser.

The blowdown air compressor's capacity shall be sufficient to recharge the air system and to depress the unit within approximately ten minutes. The system shall be designed to operate at one bar barometric pressure, and be compatible with the data supplied in paragraph 3.3 – Climatic data.

A separate compressed low pressure air system shall be forecasted to feed the generator braking and the maintenance inflatable shaft seal.

The service and instrument compressed air system shall be capable of supplying air to any individual consumer within the plant according to demand and specifications.

Each compressed air system shall be supplied with all required controls and accessories (filters, pressure reducers, driers, coolers, etc.), and two full-capacity compressors, one duty and one standby. The standby compressor shall start automatically, should the duty compressor fail.

5.1.5.3. Station Drainage and Dewatering System

Two separate sumps are installed to recover respectively the drainage water and the unit dewatering.

The drainage water sump has its own set of pumps: 3 x 100 m^3/h submersible pumps (preliminary value – two pumps shall be sufficient to cover the usual drainage volume, one pump in back-up). The pumps evacuate the drained waters (seepage water, leakages, water discharged from automatic cleaning filters, water discharge from turbine shaft seals, etc.) through a collector pipe to the tailrace at lower water intake.

The dewatering sump has its own set of pumps: 2 x 300 m^3/h submersible pumps (preliminary value) used for the dewatering of the unit and final dewatering of the waterways. One pump (resp. two pumps) shall allow the final dewatering of the waterways (water level in penstock = lower reservoir MWL) in 20 hours (resp. 10 hours). The water is discharged through the collector pipe to the tailrace at lower water intake.

The 2 sumps are interconnected through an isolating gate/valve that permits to secure one set of pumps by the other, or to join the capacity of both pumping capacities in case of important dewatering service or flooding.

The drainage network comprises a water/oil separator and the oil collected will be pumped out for storage and recycling.

The power and control cubicles of dewatering and drainage pumping systems shall be installed at a top floor to be able to continue to operate even in case of flooding at lower floors.

5.1.5.4. Mechanical and Dielectric Oils handling and treatment system

Two oil treatment systems will be provided :

- One mobile oil treatment equipment and oil storage tanks (fixed and mobile) with associated piping network for mechanical oil (governing oil, bearings oil, MIV hydraulic oil);
- One mobile oil treatment equipment and mobile oil storage tanks with associated piping network for dielectric oil of transformers.

5.1.5.5. Fire Protection System

A fire protection system shall be provided for the motor-generators and transformers.

The firefighting system should be by default of water deluge type for the transformer and mist or inert gas for the generator. It should be in accordance with national regulations. Tenderer may propose types of firefighting system as an alternative.

General fire detection and protection system for the powerhouse, including offices, oil purification and storage room and other vital areas of the powerhouse that are exposed to fire hazards, and water intake and pumping facilities, is part of Lot 2 Infrastructures Contractor.

5.1.5.6. Heating, Ventilation and Air-conditioning Equipment (HVAC)

HVAC system is part of Lot 2 Infrastructures Contractor, not to be quoted with this RFQ. Lot 1 Technology Provider shall provide data to Lot 2 Infrastructures Contractor according to the project planning to be defined.

For information of the Lot 1 Technology Provider, the following basic criteria are adopted for the preliminary layout and sizing of the air conditioning and ventilation system:

- ✓ Ambient temperature in air-conditioned areas with permanent staff (control room, meeting rooms, offices, telecom rooms, rest rooms, etc.): between 21°C (winter) and 25°C (summer) with RH (relative humidity) 55% +/-5
- ✓ Ambient temperature in air-conditioned technical areas (sensitive equipment rooms, battery rooms, etc.) should be between 15°C and 30°C with RH (relative humidity) 55% +/-5
- ✓ In the other sections of the powerhouse, the HVAC system will be designed to compensate the heat dissipated by the equipment in the air of each room. Under no circumstances should the temperature inside the powerhouse exceed 35°C.

Design conditions are to be considered as follows (outdoor ambient conditions):

- Maximum dry-bulb temperature: +40°C outdoor, +45°C indoor
- Maximum wet-bulb temperature: +38°C
- Minimum dry-bulb temperature: -25°C outdoor, -15°C indoor

5.1.5.7. Lifting and handling capacities

Powerhouse / assembly bay travelling crane(s), other cranes and hoists are part of Lot 2 Infrastructures Contractor.

The lifting capacity of the main crane shall be fully adequate to tackle the heaviest assemblies of the Power Plant during erection (starting from above ground) and for plant maintenance.

Secondary handling equipment around specific elements of Lot 1 Technology Provider are to be quoted by the Tenderer, together with the special tools (Chapter 5.7.3), in particular the lifting beam for generator handling (stator and rotor) are part of Lot 1 Technology Provider scope.

5.2. ELECTRICAL EQUIPMENT

5.2.1. MOTOR-GENERATOR

Four identical indoors type vertical motor-generators are to be installed. Each shall be flange-connected and driven by a reversible hydraulic pump-turbine. Each shall have a minimum nominal output of **81 MW** when generating power under max water head and nominal speed of **333 RPM**.

5.2.1.1. Generator Rating Selection

Requirements for Generators (RfG) applying for Greek Transmission System Operator (TSO) should be respected, in particular for inertia and need of reactive power.

The criteria for sizing the output capacity of each generator shall be the maximum capacity, in turbine or pumping mode.

The generators shall be designed to carry this nominal capacity continuously at nominal voltage, frequency and power factor, without exceeding the temperature limit of Class B defined in the IEC 60085.

The equipment shall be mechanically designed to withstand continuously the maximum turbine output.

5.2.1.2. Motor-Generator Electrical Characteristics:

	Generator operation	Motor operation
Capacity at rated speed, frequency, voltage and power factor without exceeding maximum temperature rise, kVA	90 000	---
Motor shaft output at rated speed, frequency, voltage and rated power factor without exceeding the maximum rated temperature rise, kW	---	> 68 500
Rated power factor	0.9	0.95
Rated frequency, Hz	50	
Rated voltage, volts	15 750	
Speed, rpm	333	
Nominal current, Amps	3300	2970
Unsaturated (rated current) direct axis transient reactance not greater than, percents	35%	
Short circuit ratio not less than:	0.9	
THD (Total harmonic Distortion) not greater than, percent	5% as per IEC 60034-1	
Deviation factor of wave form measured in percent for line-to-line on open circuit at rated voltage and frequency, not more than, percent	10% as per ANSI C50-12	
Efficiency at rated load, not less than, percent	98.45%	98.55%

Table 5-1: Motor-Generator Electrical Characteristics

5.2.1.3. Motor-Generator Mechanical Characteristics

	Generator operation	Motor operation
Moment of Inertia (GD^2) of rotating parts of the generator, ton-m2	1900	
Maximum runaway speed, rpm	585	---
Direction of rotation when viewed from excitation side:	Clockwise	Counter clockwise.
Means of starting	---	Static Frequency Converter

Table 5-2: Motor-Generator Mechanical Characteristics

5.2.1.4. Motor-Generator Cooling

The motor-generators shall be air-cooled, with a closed-loop cooling system and water-to-air coolers, located symmetrically around the periphery of the stator frame. The coolers shall be designed to withstand the high pressure of the cooling water system and N-1 redundancy operation. Cooling air will be circulated throughout the machine housing by the fan action of the rotor and/or the possible action of motor driven fans, supplied by frequency converter drives to optimize efficiency at partial load.
The motor-generators shall have a conventional closed-loop cooling system with water-to-air coolers located symmetrically around the periphery of the stator frame. The coolers shall be designed to withstand the high pressure of the cooling water systems. The cooling air will be circulated throughout the machine housing by the fan action of the rotor, without any external blowers.

5.2.1.5. Temperature Rise

Temperature rise of the machine windings shall be rated to International Electro technical Commission (IEC) standards Class B insulation system as per IEC 60085 and 60034-1.

The motor-generators armature and field windings shall be rated for a maximum temperature rise of respectively 83K / 90K over a maximum ambient cooling temperature of 40^0C measured at the exit of the heat exchanger.

5.2.1.6. Other Pertinent Data

Stator windings shall be made with single-turn coils, with conductors transposed by the Roebel method and coils rigidly supported to prevent slippage. Windings shall be star-connected, for operation with high impedance grounded neutral.

A combined system of brakes and hydraulic lifting jacks shall be provided.

The upper thrust and guide bearing shall be insulated against shaft currents.

Electric heaters shall be mounted within the motor-generators air housing, to keep the insulation dry when not in operation.

A water-spray or inert gas fire protection system shall be provided inside each motor-generator housing.

5.2.1.7. Factory and Field Acceptance Tests

The motor-generator and excitation system capacity, factory and field test and other characteristics shall be specified in accordance with the latest International Electro technical Commission (IEC) Standards or any other international accepted standard.

5.2.2. EXCITATION SYSTEM

The excitation system shall be solid-state continuously acting rectifier-type, equipped with AC breaker located before the excitation system, and with DC field breaker located after the rectifier.

5.2.2.1. Ratings and Characteristics

The excitation systems shall be designed to provide negative excitation voltage and shall include provisions for initial excitation from the station battery and backup power from station service low voltage system. Accessories shall include non-linear field discharge resistors, an off-load polarity inverter feature and a solid-state voltage regulator. Excitation system shall be designed in a N-1 full redundancy.

- Excitation system voltage response time: not greater than 0.1 second.
- Excitation system voltage response ratio: not less than 2.5
- Excitation system minimum positive field forcing capability (ceiling voltage): 160 percents of rated field voltage at 130°C field winding temperature.

The excitation system shall be designed for automatic and manual control, and will be provided with a power system stabilizer, reactive current compensation and various limiter circuits.

The excitation system shall meet the requirements for line charging, from zero voltage to the rated voltage for the unit, transformer and transmission line, following the needs of local electrical grid as defined by TSO requirements.

5.2.3. STATIC FREQUENCY CONVERTER

5.2.3.1. Motor starting system

- The motor starting system shall be made of a soft starting method type using a **Static Frequency Converter** (SFC) – two (2) SFC to be provided for all four (4) units – as its primary starting method, and synchronous starting between units available as backup starting method (back-to-back operation: one unit in generating mode can be used to start any other unit in pumping mode – without SFC).

- Any of the two (2) SFC shall be able to start any one of the four (4) coupled motors/generators as a motor or as a synchronous condenser with its runner dewatered. The SFC shall accelerate the motor from zero to rated speed and shall automatically synchronize the motor to the power system.
- Any of the two (2) SFC shall be able to start two (2) units in sequence without delay between the motors, and without exceeding safe operating temperatures. The SFC should be able to restart this cycle within less than one hour.
- The two (2) SFC shall be capable of starting four (4) motors in sequence without delay between the motors, and without exceeding safe operating temperatures.
- The SFC shall be capable of providing automatic dynamic braking of any designated motor-generator from rated speed to zero both in generating and in motor mode. The SFC shall be able to stop the motor-generators in sequence without delay between the units and apply dynamic braking of the next motor-generator without exceeding safe operating temperatures.

In addition, the SFC will be able:

- To detect, when stopped, the position of the motor-generator rotor according to the measuring of the induced voltage of the stator without the need for a position encoder and producing a low-frequency torque in order to start the motor-generator in the pumping direction from zero speed, the runner being dewatered.
- To bring the speed of the motor-generator to a speed of 105% of the rated speed and to maintain this speed for a minimum duration of 30 minutes without exceeding safe operating temperatures.
- To precisely adjust the motor speed to a reference value between 95% and 105% of rated speed to enable fast synchronization. The oscillation of the speed around the reference value cannot exceed more than +-0.05% of the value of reference.
- To precisely adjust the motor-generator voltage to a reference voltage between 92.5% and 107.5% of rated voltage. Coordination with the excitation system will be made to ensure voltage stability.
- To provide dynamic regenerative braking in the directions of rotation of both generator and motor to produce a suitable braking torque in order to limit the braking times change of mode. Dynamic regenerative braking will be applied between 95% and 10 to 5% of rated speed.

5.2.3.2. Power supply

The SFC equipment shall be powered from a dedicated transformer supplied from the station medium voltage. If the SFC if operating at reduced voltage, it will require a step-up transformer and a by-bass switch at the SFC output on machine side.

5.2.3.3. Thyristors

The Thyristors used in the rectifier circuits shall be rated at a voltage to match the power supply voltage. Cooling of the Thyristors shall be by forced air or by water-to-air heat exchanger.

5.3. MAIN POWER TRANSFORMERS

Four (4) individual three-phase transformers shall be used for stepping up generator voltage from **15.75 kV** to the grid's **150 kV**, and for stepping down transmission system voltage for pumping operation from 150 kV to 15.75 kV. The transformers shall be oil-filled two windings with oil natural, air forced (ONAF) – OFAF to be quoted as an alternative. Each transformer shall be rated at **90 MVA** for 50 Hz. Operation, with expected minimum efficiency as per EU regulation (Tier-2 99.7%). The transformers will be installed outdoors within the station perimeter, taking into account the ambient climatic conditions.

The transformer windings, including all specified taps, shall be capable of delivering the specified capacity without exceeding a 65°C winding average temperature rise or 80°C temperature rise over 30°C average ambient temperature. The transformers shall be able to deliver the specified capacities both in step-up and in step-down operation.

5.3.1. RATINGS

As a general rule, transformers ratings shall meet the TSO requirements. TSO needs shall overrule the following characteristics in case of conflict.

- Main Power Transformers:
  - Quantity, installed: 4
  - Capacity, MVA: 90/100
  - Windings per phase: 2
  - Cooling: ONAF by default, and OFAF to be quoted as an alternative
  - Frequency, Hz.: 50
  - Phase angle displacement:High voltage, 30° ahead.

- High Voltage Windings:
  - Rated voltage, kV: 150
  - Short-time power-frequency withstand voltage, kV: 325
  - Lightning impulse withstand voltage, kV : 750
  - Connection: Star
  - No-load taps: ± 2x 2.5%

- Low Voltage Windings:
  - Voltage, kV: 15.75
  - Short-time power-frequency withstand voltage, kV: 38
  - Lightning impulse withstand voltage, kV : 95
  - Connection: Delta

- Current Transformers
  - High voltage line-end, each Bushing:Star
  - Neutral end:Delta.

5.3.2. ACCESSORIES

5.3.2.1. Bushings

Bushings shall be of the condenser type with copper conductors. High voltage bushings shall be housed in individual oil-filled compartments separated from the main tank oil, adequate for terminations of the 150 kV cables.

5.3.2.2. Electrical Systems Cooling Equipment

For all air-forcing fans, required for operations at 46°C shall be supplied. The system shall be operated from a dual, redundant 400 Volt, 3-phase power source.

5.3.2.3. Oil Preservation System

System shall allow oil volume to expand and retract without contact with the atmosphere. The conservator tank shall be equipped with a rubber diaphragm, to isolate oil from the ambient air.

5.3.2.4. Secondary Windings Termination

Flanges shall be provided around the low-voltage bushings, which will allow for connection to the housings of isolated phase busses.

5.3.2.5. Fire Detection

Heat detectors shall be installed around the transformers, for fire detection. These detectors shall be fixed temperature devices, set to trip at 190°F (88°C).

5.3.2.6. Transportation and Placement

An approved carrier, specializing in handling this type of equipment, shall deliver transformers to the project site. A "low-loader" type of truck shall be used, to assure transformer stability and safety during transportation. During its transportation, the transformer shall be equipped with a shock recorder (including a long life battery) and shall be filled with nitrogen (including manometer and nitrogen bottle for filling in).

Transformer handling on site shall be done by the power crane, and by use of special rails provided for sliding them to their designated point. Anchor points suitable for pulling the transformers shall be provided.

A sump shall be installed around the transformers concrete foundations covered with steel grating, to allow for quick drain and collection of oil during spills.

5.4. CONTROL SYSTEM

5.4.1. GENERAL

The power station shall be controlled by a Digital Control and monitoring System (DCS).

The DCS shall be microprocessor-based, distributed control and monitoring system consisting of the two following major levels, as described in the following chapters.

The complete architecture of DCS is described in Figure 2-5. Redundancy shall be included by default, especially for upper and lower reservoirs levels monitoring.

Note: the fibre optic communication line from power house to Upper Reservoir structure shall be included in **Lot 2 Infrastructures Contractor** scope, preferably installed together with the overhead line or cable. A redundant fibre optic line will be installed on one of the penstocks – also to be supplied by **Lot 2 Infrastructures Contractor**. Lot 1 Technology Provider shall supply characteristics for fibre optic lines.

5.4.2. LOCAL CONTROL LEVEL (LEVEL 1)

A set of Local Control Units (LCU) located at the powerhouse, to perform the primary interface and control functions between the plant operator and main station devices.

Each LCU shall be based on a redundant local PLC (redundancy of CPU, power supply, field network and communication cards) with one HMI and connected to the LAN for data exchange with the other LCU and the plant control system. The PLC will exchange signals with the redundant field by the mean of its own I/O modules or through remote I/O modules racks installed near the equipment in remote I/O rack cabinets or inside the cubicle of the different element. The remote I/O modules will interface the signal from the fields with the redundant field bus of the PLC.

The excitation system, the unit protection system, the turbine governor, the measuring system and other control and protecting devices which have independent control system shall preferably interface with the LCU directly via field bus for detailed data and hardwired connections for the main data (loss of the field-bus shall not interrupt operation)

In all cases, interfaces between Plant's control system and Package control systems (supplied by mechanical system providers) shall be included in the scope of supply.

The interface between level 1 and upper levels (as level 2) is granted through a Dual high-speed real-time network consisting of fibre optic cable. It shall be used to interconnect between the operator consoles and each main station device, and between the main elements of the DCS.

5.4.3. CONTROL ROOM LEVEL (LEVEL 2)

The control room will be located inside the powerhouse, and contain the following major equipment:

- Two (2) redundant servers
- Multiple operator workstations (WS) for centralized operation and monitoring of the project. The WS's shall provide the following:
  - Operator interface to access and initiate control sequences;
  - Access to controls, display status and alarms in a coherent logical manner;
  - Access to the system's real-time data base;

- Operator configurable trending capability for all I/O points.

Each of the WS's shall also include:

- Processing and communication units to connect the human-machine interface to the DCS and all DPU real time data;
- Two (2) high resolution color video display terminals (VDT), one keyboard, one track-ball and audible alarm device;

- Two (2) hard copy printers – one for alarms and one for periodic logs, station and shift reports.
- One (1) large video display, showing major project status and alarm points.
- One (1) programmer/engineer workstation, consisting of a monitor, keyboard and printer, will be used to access the DCS system for analysis, diagnostics, and program changes. In addition, two laptops will be included for local maintenance of the Control System devices.
- One (1) Synchronization Clock system shall be provided to ensure a common time reference for all programmable control systems like DCS/PCS system equipment, all other PLCs of the plant, protection systems, station utilities, etc. to ensure a common time reference.
- Two (1) redundant data storage workstations (HISTORIAN) to perform historical data base recording, trending and performance calculations shall be provided.
- Two (2) gateways for powerplant external communication with the National Grid Operator shall be provided. The communication shall be realised through protocol IEC 60870-5-101. Signal interface (according to IPTO's requirements) and the adequate equipment shall be provided for the 150kV Substation interconnection (the terminal point shall be an RTU installed in the substation communication room).

5.4.4. CONDITION MONITORING SYSTEM

At the local control level, closed and interfaced with the control system, a microcomputer system shall be provided for performance calculations (e.g. unit efficiency, reservoir management, etc.) and/or for data collection and interface with the plant information system.

Data processing system and tools will be supplied to execute performance calculations, condition monitoring and process optimization. Adequate equipment and software shall be provided for data acquisition of all process variables related to efficiency calculations, performance, process optimization and condition monitoring. A Computerized Maintenance Management System (CMMS) including a predictive maintenance tool shall be supplied as well, and the Lot 1 Contractor will update and fill all the data information and forms to the CMMS.

5.5. BUSES, SWITCHGEAR AND AUXILIARY BUSES

5.5.1. GENERATOR CIRCUIT BREAKER

Each motor-generating unit will be equipped with its own 15.75 kV circuit breaker with all related equipment (e.g. CTs, VTs, disconnector switches and earthing switches). Circuit breakers will be connected to the bus duct assemblies.

The generator circuit breaker will be of Vacuum or SF6 type and it has to fulfil the requirements according to IEEE (ANSI) C37.013 and IEC 62271 standards.

The disconnector and earthing switches will be provided.

The generator circuit breaker will be equipped with the short circuit provision for electrical testing purposes.

The proposed generator circuit breaker and its related system shall be the standard product of a competent manufacturer with proven high reliability and long-term operation records.

5.5.2. BUS DUCTS ASSEMBLIES

The 15.75 kV isolated-phase bus ducts (IPB) provides electrical connections to the motor-generators, circuit breakers, phase reversal switches, main transformer MV terminals, and current-limiting reactors.

Non-segregated phase bus will be used for the motor-generator starting circuit, for auxiliary busses used for metal-clad switchgear feeders and the excitation system AC and DC interconnections.

The busducts and switches to interconnect the units for back to back starting shall be also provided.

5.5.3. MAIN LEADS

The main leads of each motor-generator shall be an isolated-phase bus, rated at 15.75kV, 4,000 Amperes. An electrically continuous housing shall be used, to minimize magnetic flux resulting from the currents on each phase. Each bus shall consist of the following:

- Main isolated phase bus, to be connected to the low voltage bushings of the main power transformers.
- Isolated-phase taps from the main leads of each unit to the surge protection and potential transformer cubicle.
- Five-pole, motor-operated phase reversal switch for changing bus phasing when switching between generating and pumping modes.
- Disconnecting link and bus conductor test terminals installed in the main bus runs, between the motor-generator and the phase reversal switch.
- Three-pole, motor operated disconnecting switch for isolating the motor-generator and its excitation system during periods of inspection and maintenance.

5.5.4. STARTING BUS

The starting bus assemblies shall consist of isolated-phase bus sections, rated at 15.75 kV, running from the main leads of each unit to the starting circuit breaker, and non-segregated bus sections, also rated at 15.75 kV, connecting the SFC to each group of motor-generator starting circuit breakers. Each group shall consist of two units (e.g., units 1-2 and units 3-4). The schematic shall be designed so that either of the two SFC is capable of starting any unit (two (2) SFC for all four (4) units).

Similarly any unit shall be able to start any other unit in back to back mode.

5.5.5. NON-SEGREGATED PHASE AUXILIARY BUSSES

Non-segregated phase bus assemblies, rated at 15.75 kV, self-cooled, will connect the station service transformer 15.75 kV terminals to the SFC.

Non-segregated phase bus assemblies, rated, self-cooled, to connect the station service 15.75/0.4 kV transformer low voltage terminals to the main station switchboard.

5.6. GENERAL ELECTRICAL EQUIPMENT

5.6.1. VOLTAGE LEVELS

AC frequency is 50 Hz.

Voltage Level	Nominal Value
HV-AC: High voltage level	150 kV three phases
MV-AC: Medium voltage level (stator voltage)	15.75 kV three phases
MV-AC: Medium voltage level (inter sites links)	15.75 kV three phases
LV-AC: Low voltage level	400 V three phases
DC: voltage level (power and control)	220 V

Table 5-3: Voltage levels

For creepage distances, environment pollution level (according to IEC): Level IV (very heavy) corresponding to specific creepage distance of 31 mm/kV has to be considered.

5.6.2. EARTHING AND LIGHTNING PROTECTION

Lot 1 Technology Provider will be responsible for the design of the whole earthing system including lightning protection for the powerhouse building. Lot 1 Technology Provider will be responsible also of the delivery of the earthing connections for equipment.

Lot 1 Technology Provider shall evaluate design requirements, prepare detailed designs, and coordinate with civil works, providing Lot 2 Infrastructures Contractor with sizing, design details and installation guidelines. Lot 1 Technology Provider shall also supply materials, supervise installation, conduct testing, and oversee any necessary improvements.

- Earthing system shall be provided for all equipment supplied by Lot 1 Technology Provider, including the cable trays, piping networks, motors and transformers, etc. (to be included in current quotation for Lot 1).
- Lightning protection systems of civil structures and buildings are supplied by Lot 1 Technology Provider and installed by Lot 2 Infrastructures Contractor.
- Earthing and Lightning Protection Systems which is buried (in soil) or embedded (in concrete) is supplied by Lot 1 Technology Provider and installed by Lot 2 Infrastructures Contractor.

All metal works shall be earthed. All electrical equipment shall be connected through its own terminal to the earthing bus-bar in the switchboard by a continuous copper conductor within its appropriate cable or by copper conduit.

All metallic cases of instruments, control switches, relays, etc. shall be connected by means of bare copper conductors of not less than 2.5mm2, to the nearest earth bar.

The cables shielding shall be earthed in the same manner, to both ends of the cables.

Earth leakage circuit breaker (ELCB) shall be installed on the switchboards. The ELCB shall be connected by an insulated lead to a completely separate copper earthing rod.

The metal handrails and fences in front of transformers shall be electrically continuous and grounded at each corner. The metal gates shall be grounded by means of flexible copper conductors (Lot 2 Infrastructures Contractor).

The earthing system shall include the in-air above ground system (designed by Lot 1, procurement and installation by Lot 1 and Lot 2 – each lot responsible for his own supply), the underground and the in-structure earthing systems (designed and procurement by Lot 1, installed by Lot 2).

5.6.3. MV SWITCHGEAR

The 15.75 kV switchgear will be provided to supply Station Service Transformers and SFC. The switchgear will be equipped with the current transformer (CT), voltage transformer (VT), protection modules, communication, earthing, as well as a withdrawable vacuum or SF6 circuit breakers. The MV switchgear will be of modular type.

5.6.4. PHASE REVERSAL SWITCH

The 15.75 kV Phase Reversal Switch will be provided for each unit to reverse the motor phase sequence, enabling the pump motor to operate in both pumping (motor mode) and generating (turbine mode) configurations. The Phase Reversal Switch will ensure safe and reliable operation of the pump motors in both modes, with local and remote-control options, as well as visual status indicators for phase condition monitoring.

5.6.5. CURRENT LIMITING REACTORS

The Current Limiting Reactors will be provided for each unit group to limit inrush current during the startup of motors and to provide current limitation during fault conditions. These reactors will improve the stability of the electrical system and help protect equipment from overcurrent conditions.

5.6.6. LV AC/DC SWITCHGEAR

Under normal conditions the 400 V AC main distribution board of the PHS will be fed from one of the two (2) 1600 kVA (preliminary values), 15.75 / 0.4 kV station service transformers. The station service transformer 1 shall be fed from the group 1 (Unit-1-2) and the second station transformer shall be fed from the group 2 (Unit-3-4).

An Automatic Transfer Switch (ATS) shall be provided for the 400 V AC main distribution switchboard to ensure minimum interruption of the power supply during the failure of the any power sources/groups. ATS system will analyze and monitor both sources, ATS system shall have function to select primary and secondary source between two station service transformers and in case of failure of both of SS transformers emergency diesel generator shall be launched. ATS system shall normalize the condition after detecting, that one of the station service transformers is again energized.

Station service transformer circuit breakers located in the 400 V AC main distribution switchboard shall be electromechanically interlocked with each other in order to avoid parallel operation.

In case of a complete power failure the station service and unit auxiliary consumers will be supplied from the automatically starting 800 kVA (preliminary value), 0.4 kV emergency diesel generator set which will be connected to 400 V AC sub-distribution switchboard.

Emergency diesel generator circuit breakers will be electromechanically interlocked with the station service transformer circuit breakers in order to avoid the parallel operation of the DG with the SS transformers.

5.6.7. BATTERY SYSTEM

The 220 V DC system which shall be provide power for the protection system, the control equipment, the switchgear control and for the emergency lighting within the power house, shall comprise of two twin rectifiers, two lead-acid batteries, a main distribution board with two bus sections and bus tie-breaker, one sub-distribution boards as required.

If 48 V DC supply is required for the PLC-type control systems or the communication systems, including fibre-optic communication systems and telephone system corresponding DC/DC converters will be connected to the 220 V DC supply.

5.6.8. UPS SYSTEM

The UPS system consisting of two static converters connected to the 400 V AC system, each with its own battery system, and a 230 VAC distribution board to serve essential consumers of the control system, such as PC's, monitors and printers.

5.6.9. CABLES, CONDUITS, DUCTS, CABLE TRAYS

All the required medium voltage cables, AC/DC power cables, control cables, instrumentation cable, fibre-optic cables conduits ducts and cable trays required for all the PHS systems shall be provided.

5.6.10. EMERGENCY DIESEL GENERATORS

Powerhouse

An emergency diesel generating set with approximate capacity of 800 kVA, 0.4 kV shall provide emergency power to essential station services in the event of a loss of station service power and shall supply black start power to the 400 V AC system. The indoor-type diesel generator shall automatically start (battery starting) upon detection of a loss of voltage from the normal power supply to the switchgear assemblies, accelerate, and operate at the maximum anticipated emergency load, without exceeding a maximum transient voltage drop of 20%, as measured at the generator terminals.

The diesel-generator shall be sized based on the largest of the following load conditions:

- All normal station auxiliaries operating;
- All essential station auxiliaries operating, plus flood prevention loads;

- All essential station auxiliaries plus unit auxiliaries needed to start one main unit in generating mode.

The diesel electric generating unit shall be completely self-contained, designed for indoors service, with engine, generator, and all auxiliaries mounted on a common base, except for the main fuel tank, fuel oil day tank, exhaust silencer, control panel and remote mounted radiator. The main fuel tank shall have a capacity sufficient for 96 hours of continuous operation at full load. The tank shall be of the double wall construction, with an alarm for leakage occurring from the primary to the secondary containment.

Upper reservoir

Another emergency diesel-generating set with approximate capacity of 200 kVA, 0.4 kV shall provide emergency power to upper reservoir consumers in the event in case of failure of the supply from the medium voltage (MV) overhead line or cable. The indoors-type diesel generator shall start automatically upon a loss of voltage from the normal power supply to the switchgear assemblies, accelerate and operate at the maximum anticipated emergency load, without exceeding a maximum transient voltage drop of 20% as measured at the generator terminals.

The diesel-generator shall be sized based on the largest of the load condition. The diesel electric generating unit shall be completely self-contained, designed for indoors service, with engine, generator, and all auxiliaries mounted on a common base, except for the main fuel tank, fuel oil day tank, exhaust silencer, control panel and remote mounted radiator. The main fuel tank shall have a capacity sufficient for 24 hours of continuous operation at full load.

Both above mentioned diesel-generators will be included in the relevant optional price of the Lot 1.

5.6.11. INTAKE SUPPLY (UPPER RESERVOIR SIDE)

The power supply at the Upper Reservoir structure shall consist of a **step-down auxiliary transformer** with an initially estimated capacity of 200 kVA, connected to the 15.75 kV medium voltage (MV) overhead line or cable (MV line part of Lot 2 Infrastructures Contractor scope). Another 200 kVA **step-up auxiliary transformer** connected to the PHS main distribution switchboard is be supplied, to be located inside the power house.

As an alternative to the 15.75 kV voltage, Tenderers may propose another voltage value for the connection from the power house to the Upper Reservoir.

Power supply at the Upper Reservoir structure shall also include a 400 V AC sub-distribution switchboard, a 110 or 24 V DC system with charger and battery, and a diesel generator set (as described above) for emergency power supply. The equipment shall be located in the control and service building at the Upper Reservoir structure.

The above mentioned transformers and other electrical components will be included in the relevant optional price of Lot 1 Technology Provider.

Lot 1 Contractor shall supply characteristics for overhead line or cable, and for Control System fibre optic lines.

Note: the fibre optic communication line shall be included in the **Lot 2 scope**, preferably installed together with the overhead line or cable, connecting intake with powerhouse. A redundant fibre optic line will be installed on one of the penstocks – also to be supplied by **Lot 2 Infrastructures Contractor**.

5.7. MISCELLANEOUS

5.7.1. MECHANICAL AND ELECTRICAL WORKSHOP EQUIPMENT

A fully equipped workshop shall be provided in order to enable to carry out on site maintenance and minor repair jobs on the mechanical, electromechanical, electrical, control and instrumentation equipment.

Mechanical and Electrical Workshop is part of Lot 2 Infrastructures Contractor. Lot 1 Technology Provider, will provide any specific requirements for his equipment.

5.7.2. SPARE PARTS

Scope of supply shall include the supply of mechanical and electrical systems spare parts required for a 2-years continuous operation. Lot 1 Technology Provider will supply all the spare parts he deems necessary to be able to achieve the availability guarantee. Any spare parts used during the Defects Notification Period will be replaced by Lot 1 Technology Provider.

Spare parts balance of quantities shall be shared with Lot 2 Contractor soon enough to integrate relevant storage areas in the overall power plant layout.

5.7.3. SPECIAL TOOLS

Special tools required for first assembly as well as for maintenance shall be provided.

Permanent special tools balance of quantities shall be shared with Lot 2 Contractor soon enough to integrate relevant storage areas in the overall power plant layout.

5.7.4. DOCUMENTATION

The cost shall include quotation for later supply of:

- A list of the applicable standards and their applications.
- A complete set of documentation for the plant, including (but not limited to) all equipment specifications and calculations, manuals of operation, maintenance manuals, list of recommended spare parts, safety instructions.
- A complete set of drawings, including process and mechanical flow charts, as-built drawings, parts drawings, foundations and load drawings. Permanent special tools drawings (linked to any short or long term maintenance) shall be included.

All documentation shall be provided in hard copies and electronic media.

5.7.5. TECHNICAL INTERFACES BETWEEN LOTS

The cost shall include quotation for later supply of all necessary information to cover the technical interfaces between lots, such as (not limited to):

- Design of the powerhouse including loads applied due to equipment's own weight and dynamic forces rising from operation and the different stages of concreting
- Layout guide drawings
- Civil works guide drawings
- Civil works Loads

- HVAC interface data
- Control system & protection interface data
- Electrical loads
- Reservations in CW for instrumentation on penstock (water levels and head losses for hydraulic measures)

5.7.6. ERECTION, COMMISSIONING AND TRAINING

The cost shall include quotation for the needed manpower for preparation (including general design), execution and supervision of:

- Equipment transportation and erection
- Commissioning and Trial run (15 days of uninterrupted Trial Operation)
- Continuous hands-on training during the trial operation
- Class and hands-on training as follows:
  - Training of Operators and Managers (2 weeks) that will include detailed explanation of the HMI interface, the main control system (DCS/PCS), the Condition Monitoring System as well as all measuring and control equipment (package units, measuring instruments, analysers, etc).
  - One (1) week training on the operation and maintenance of the reversible pump turbine, main inlet valve and auxiliary systems (SFC, turbine governor system, hydraulic power units)
  - One (1) week training on the operation and maintenance of the motor generator and auxiliary systems (bearing oil system, excitation …)
  - One (1) week training on the operation and maintenance of the remaining mechanical and electrical equipment

5.7.7. FIELD TESTING

The cost shall include the quotation for the needed manpower and equipment for preparation, execution and supervision of one (1) field performance testing.

This field testing shall take place after the last unit being commissioned, to have a better flexibility using all units to change head conditions. An indicative timeline for the field test is proposed as follows:

- Instrumentation at site: 5 days
- Testing of instrumentation and calibration: 1 day
- Performance measurement in generation mode: 1 day
- Performance measurement in pumping mode: 1 day

The below durations are the minimum requirement. The cost shall include sufficient field testing to fulfill all the obligations arising from the Contract.

Field testing shall evaluate all guaranteed performance values as per IEC 60041 standard. Thermodynamic method is to be quoted by default, other methods can be quoted as alternatives. A report presenting measured values vs guarantees shall be delivered to the Owner.

5.7.8. GUARANTEES

The cost shall take into consideration that:

- Tenderer shall provide an unconditional guarantee (2-years Defects Notification Period - DNP) for the safe and efficient operation of the plant for a period of two years after commissioning.
- Tenderer shall provide written guarantees for the following on acceptance tests, with potential application of liquidated damages:
  - Efficiencies *(WAE Turbine, WAE Pump, Generator max efficiency, Motor max efficiency, Transformer efficiency)*;
  - Average availability of units during first two years of DNP
- Tenderer shall provide written guarantees, with methods of measurements and required means for rectifying the situation, for the following on acceptance tests:
  - Power output in generation mode;
  - Cavitation pitting (allowed loss of mass and pitting depth);
  - Transition times for mode change;
  - Noise and vibrations;

Note: for the good comparison between Tenderers, the Pump-Turbine and Motor-Generator efficiencies are to be given considering the indications in Table 5-4 regarding distribution of mechanical losses. During execution, hydraulic efficiency will be checked during the reduced scale model testing, and a combined hydraulic / mechanical / electrical efficiency will be checked during the field testing. WAE formulae will then combine Pump-Turbine and Motor-Generator efficiencies.

No	Name	Guaranteed Value
1	Turbine Weighted Average Efficiency (on shaft[1])	Min 90.50%
2	Pump Weighted Average Efficiency (on shaft[1])	Min 93.80%
3	Turbine mechanical output under 140m net head (on shaft[1])	Min 82.5 MW
4	Turbine mechanical output under 130m net head (on shaft[1])	Min 72.5 MW
5	Pump mechanical input under max head (on shaft[1])	Min 76.3 MW
6	Turbine mode minimum stable operation output ratio	Min 50%
7	Motor efficiency, pump mode, under min head (mechanical losses included[2])	Min 98.55%
8	Generator efficiency, turbine mode at 100% max output (mechanical losses included[2])	Min 98.45%
9	Generator efficiency, turbine mode at 50% max output (mechanical losses included[2])	Min 97.5%
10	Main power transformer (Tier-2) efficiency	Min 99.7%
11	Cavitation Pitting depth per runner (function of runner low pressure diameter D)	Max $2.5*D^{0.4}$ mm
12	Cavitation Pitting volume per runner (function of runner low pressure diameter D)	Max $5*D^2$ cm^3
13	Standstill to Generating (100%) transition time	Max 100 sec
14	Standstill to Pumping transition time	Max 350 sec

(1) Pump-Turbine guide bearing losses included. Net head including the MIV losses.

(2) Motor-Generator guide and thrust bearings losses included (for thrust bearing, the whole shaft line weight and hydraulic thrust are to be considered in motor-generator efficiency)

Table 5-4: Items with guaranteed values

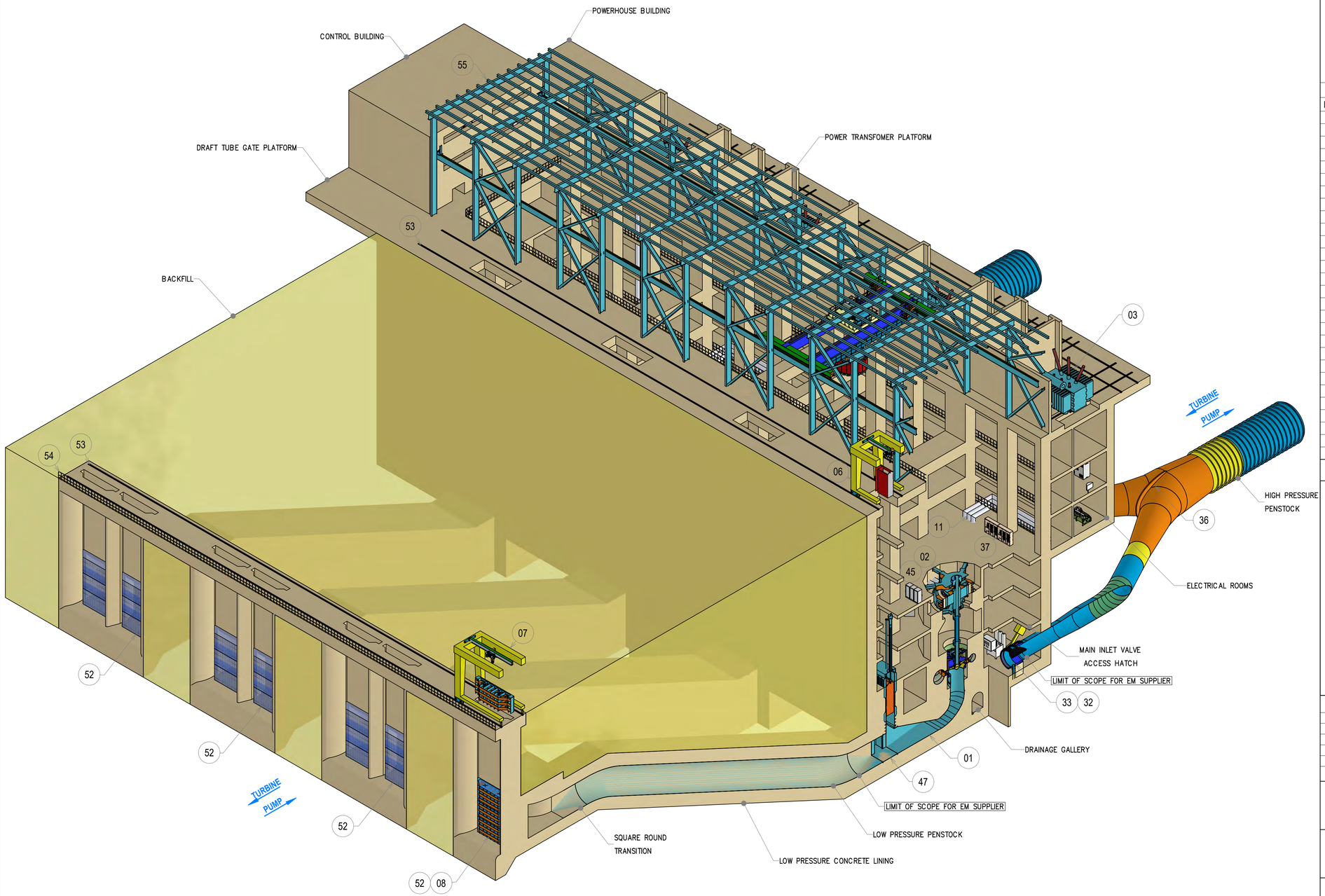
APPENDIX A. WATER QUALITY ANALYSIS

Water sampling_Kardia Mine Field, sump at the bottom of the mine (location of the prospective lower reservoir of the PHS)													
PARAMETERS in 2024	UNITS	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature	°C			12,5			31,1			24			13,7
pH		8,03	8,08	8,09	7,97	7,89	8,04	8,03	8,15	7,9	7,85	7,86	7,63
Conductivity	µS/cm	1061	1446	1428	1226	1404	1445	1482	659	1539	1324	1671	1142
Total Dissolved Solids (TDS)	mg/l	743	1012	998	857	982	1012	1037	395	1077,3	927	1169	799,4
Total suspended solids (TSS)	mg/l	4,7	2	1,9	1,8	1,8	0,2	17	<2	7	4	3	12
Ammonium NH^+_4	mg/l			0,079						10,262			0,198
Nitrites $\mathbf{NO}^-_2$	mg/l			2,74						0,75			0,02
Nitrates $\mathbf{NO}^-_3$	mg/l			15,9						11,10			0,60
Sulphate SO_4^{--}	mg/l			387,62						511,1			1648,5
Arsenicum (As)	µg/l	0,627	3,872	4,02	2	2,91	5,58	5,97	1,67	5,71	2,86	7,58	1,00
Cadmium (Cd)	µg/l	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0.1	<0.1	<0.1	<0.1
Chromium (Cr)	µg/l	2,1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1,50
Copper (Cu)	µg/l	<5,5	<5,5	<5,5	<5,5	<5,5	<1	<1	<1	<1	2,12	<1	<1
Mercury (Hg)	µg/l	<0,1	<0,1	<0,1	<0,1	<0,1	<0,05	<0,05	<0,05	<0.05	<0.05	<0.05	<0.05
Nickel (Ni)	µg/l	3,39	11,4	10,3	5,37	6,68	10,5	11,8	3,73	12,5	7,38	17,7	5,93
Lead (Pb)	µg/l	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0.1	0,131	<0.1	0,114
Zinc (Zn)	µg/l	<5	7,9	<5	<5	<5	<5	<5	<5	8,76	6,97	<5	5,31
Sodium Na^+	mg/l			10,1						25,38			14,31
Phosphorus total (P)	µg/l	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Chloride ions Cl^-	mg/l			8,964						8,50			58,53
Total Nitrogen				4,49						10,6			<0.5
Aluminium (Al)	µg/l	68,5	12,6	<10	14,2	14,9	<10	<10	31,2	<10	32,3	<10	80,0
Barium (Ba)	µg/l	54	39,1	38,6	48,2	44,1	27,4	33,4	52,3	37,9	53,0	61,0	74,9
Iron (Fe)	µg/l	90,3	41,0	35,2	31,8	31,4	17,8	9,13	44,5	74,7	93,1	108	148
Manganese (Mn)	µg/l	33	13,0	15,3	10,4	12	5,84	2,75	28,0	29,1	53,3	58,5	72,0
Antimony (Sb)	µg/l	<0,1	0,237	0,22	0,263	0,103	<0,1	0,147	<0,1	<0.1	0,245	<1	<1
Selenium (Se)	µg/l	1,38	<1	<1	1,21	<1	<1	<1	<1	<1	<1	<1	1,72
Vanadium (V)	µg/l	1,85	2,03	1,68	1,55	1,38	1,13	1,11	2,64	<1	1,54	<1	2,75
Molybdenum (Mo)	µg/l	1,85	2,72	2,69	2	2,51	2,25	1,93	2,23	1,71	1,91	1,74	5,24
Cobalt (Co)	µg/l	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tin (Sn)	µg/l	<0,6	<0,6	<0,6	<0,6	<0,6	<0,6	<0,6	<0,6	<0.6	<0.6	<0.6	<0.6
Boron (B)	µg/l	54,6	521	517	220	304	539	516	<20	526	213	478	96,6
Virillion (Be)	µg/l	<0,98	<0,98	<0,98	<0,98	<0,98	<1	<1	<1	<1	<1	<1	<1
Thallium (Tl)	µg/l	<0,1	<0,1	<0,1	<0,1	<0,1	<1	<1	<1	<1	<1	<1	<1
Strontium (Sr)	µg/l	495	647	635	540	623	666	686	510	731	648	796	649
Silicates SiO_2	mg/l			23,1						24,2			18,5
Magnesium Mg^{++}	mg/l			89,4						243,88			19,06
Calcium Ca^{++}	mg/l			123,1						200,8			165,97
Consumption $KMnO_4$	mg/l			1,43						1,37			1,28
Total Hardness of $CaCO_3$	mg/l			880	874	850	782	940	206	1020	770	1040	760

Water sampling_Kardia Mine Field, sump at the west side of the mine												
PARAMETERS in 2024	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature			11,5			29,4			26,4			10,7
pH	8,29	8,24	8,14	8,34	8,12	8,4	8,47	8,45	8,49	8,35	8,22	8,24
Conductivity	784	800	877	797	759	654	654	631	635	643	663	749
Total Dissolved Solids (TDS)	470	512	570	478	455	392	392	379	381	386	398	449,2
Total suspended solids (TSS)	6,4	2,3	1,1	1,2	1,5	5	1,9	5	2	3	3	9
Ammonium NH^{+}_{4}			0,124						0,207			0,068
Nitrites $\mathbf{NO}^{-}_{2}$			0,169						0,16			0,16
Nitrates $\mathbf{NO}^{-}_{3}$			27,3						23,05			0,03
Sulphate SO_4^{--}			30,14						148,24			785,1
Arsenicum (As)	1,15	1,22	1,07	1,12	1,05	1,17	1,28	1,41	1,65	1,57	1,447	1,51
Cadmium (Cd)	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0.1	<0.1	<0.1	<0.1
Chromium (Cr)	1,83	1,91	1,66	1,95	1,86	2,04	1,65	1,42	1,05	1,33	1,66	1,87
Copper (Cu)	<5,5	<5,5	<5,5	<5,5	<5,5	<1	<1	<1	<1	<1	<1	<1
Mercury (Hg)	<0,1	<0,1	<0,1	<0,1	<0,1	0,071	<0,05	<0,05	<0.05	<0.05	<0.05	<0.05
Nickel (Ni)	4,47	3,89	5,53	3,89	3,04	2,38	3,38	3,75	6,94	5,70	6,65	7,15
Lead (Pb)	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0.1	<0.1	<0.1	<0.1
Zinc (Zn)	<5	9,49	<5	<5	6,05	<5	<5	<5	<5	5,31	<5	<5
Sodium Na^{+}			9,1						9,53			6,88
Phosphorus total (P)	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Chloride ions Cl^{-}			11,18						19,41			12,99
Total Nitrogen			6,31						4,5			<0.5
Aluminium (Al)	52,6	15,4	21,3	52,3	<10	<10	10,7	<10	17,1	12,6	31,9	46,4
Barium (Ba)	25	24,2	26,5	25,8	25,4	24,5	25,8	24,3	26,1	26,1	30,5	33,6
Iron (Fe)	59	17,7	27	82,2	<5	<5	<5	<5	15,2	7,71	37,5	63,6
Manganese (Mn)	4,65	2,63	5,43	5,15	<1	<1	<1	1,50	1,53	1,69	2,8	8,9
Antimony (Sb)	0,142	0,216	0,253	0,163	0,141	0,130	0,912	<0,1	<0.1	0,381	<1	<1
Selenium (Se)	<1	<1	1,14	1,08	<1	<1	<1	<1	<1	<1	<1	1,86
Vanadium (V)	1,77	1,81	1,77	1,98	2,03	2,30	2,33	2,09	2,32	2,43	2,44	2,40
Molybdenum (Mo)	3,23	3,54	4,22	3,44	2,98	2,52	2,45	2,29	2,37	2,20	2,269	4,56
Cobalt (Co)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tin (Sn)	<0,6	<0,6	<0,6	<0,6	<0,6	<0,6	<0,6	<0,6	<0.6	<0.6	<0.6	<0.6
Boron (B)	<50	<50	56	<50	40,9	<50	<50	<20	<50	22,3	22,8	50,8
Virillion (Be)	<0,98	<0,98	<0,98	<0,98	<0,98	<1	<1	<1	<1	<1	<1	<1
Thallium (Tl)	<0,1	<0,1	<0,1	<0,1	<0,1	<1	<1	<1	<1	<1	<1	<1
Strontium (Sr)	250	244	247	234	225	202	202	208	220	219	214	251
Silicates SiO_2			6,1						17			14
Magnesium Mg^{++}			68,2						90,37			92,72
Calcium Ca^{++}			112,8						73,84			95,85
Consumption $KMnO_4$			4,26						4,11			1,25
Total Hardness of $CaCO_3$			520	530	510	364	380	194	540	462	512	480

Polyphytos water quality @ Ag. Dimitrios Water tank 2023-2024					
PARAMETERS	UNITS	2023.02	2023.09	2024.01	2024.09
pH (22,1ºC)		8,2	8,3	8,4	8,2
Conductivity	mS/cm	0,43	0,40	0,41	0,41
Total Dissolved Solids (TDS)	mg/L	262	210	222	234
Total suspended solids (TSS)	mg/L	< 4,0	< 4,0	< 4,0	< 4,0
Chemical oxygen demand (C.O.D.)	mg O_2/L			< 15	< 15
Ammonium (NH_4^+)	mg/L			< 0,02	
Nitrites (**NO_2**-)	mg/L	< 0,01	< 0,05	1,1	< 0,05
Bromide (Br-)	mg/L	< 0,5	< 0,1	0,86	< 0,1
Nitrates (NO_3^-)	mg/L	0,7	1,2	< 0,5	0,9
Sulphates (SO_4^{2-})	mg/L	16,0	22,0	0,81	20,0
Sulphides (S^{2-})				< 0,1	< 0,1
Sulphites (SO_3^{2-})	mg/L	< 2,0	< 0,1	< 0,1	< 0,1
Residual chlorine	µg/L			0,02	< 0,06
Hexavalent Chromium (Cr^{+6})	µg/L			< 0,03	< 0,03
Arsenicum (As)	µg/L	< 20,9	0,757	0,795	< 1,0
Cadmium (Cd)	µg/L	< 0,9	< 0,1	< 0,1	< 0,5
Chromium (Cr)	µg/L	< 1,6	< 1,0	< 1,0	< 1,0
Copper (Cu)	µg/L	< 2,7	< 5,5	< 5,5	< 0,57
Mercury (Hg)	µg/L	< 0,7	< 0,1	< 0,1	< 0,1
Nickel (Ni)	µg/L	< 4,4	2,68	3,8	2,44
Lead (Pb)	µg/L	< 9,2	< 0,1	< 0,1	< 0,57
Zinc (Zn)	µg/L	< 1,9	< 5	< 5	< 9,15
Sodium (Na^+)	mg/L	6,2		6,37	12,4
Phosphorus (P)	µg/L	< 50	< 50	< 50	< 50
Total organic carbon (TOC)	mg/L	1,8	40,3	47,0	22,0
Dissolved oxygen	µg/L			8,3	7,3
Chloride ions (Cl-)	mg/L	3,8	6,8	1,0	6,3
Fluorides (F-)	mg/L	0,1	< 0,1	1,6	< 0,1
Total Nitrogen (**TN**)	mg/L	0,6	< 1,0	< 1,0	< 0,1
Aluminium (Al)	µg/L	< 20	< 10		
Barium (Ba)	µg/L	17,8	18,1		
Iron (Fe)	µg/L	< 5	< 5		4,28
Manganese (Mn)	µg/L	< 0,5	< 1		
Antimony (Sb)	µg/L	< 20	0,193		
Selenium (Se)	µg/L	< 19,2	< 1	< 1	< 0,55
Vanadium (V)	µg/L	< 5	1,38		
Molybdenum (Mo)	µg/L	< 10	< 1		
Cobalt (Co)	µg/L	< 5	< 1		
Tin (Sn)	µg/L	< 20	< 0,6		
Boron (B)	µg/L	< 50	< 50		
Virillion (Be)	µg/L		< 0,98		
Thallium (Tl)	µg/L		< 0,01		
Strontium (Sr)	µg/L	184	178		
Cyanide (CN-)	mg/L	< 0,01	< 0,01	< 0,01	< 0,01
Phenols (PhoH)	mg/L	<0,05	0,05	< 0,05	< 1,0
Total Petroleum Hydrocarbons (THC)	mg/L	1,2	0,4	0,2	< 1,0
Silicates (SiO_2)	ppm	3,4	3,1	4,8	4,0
HCO_3	ppm	235,0	208,3	224,3	214,1
Magnesium (Mg)	ppm	32,2	27,7	27,0	27,1
Copper (Cu)	ppm	0,0	0,0	0,0	0,0
Calcium (Ca)	ppm	36,2	30,5	38,2	34,1
Consumption $KMnO_4$	mg/L	8,3	7,2	9,6	9,7
turbidity	NTU	2,1	1,5	2,2	1,3
p-alkalinity (p-alk.)	ppm	4,3	7,9	5,6	6,0
Total alkalinity (m-alk.)	ppm	198,2	174,6	187,9	179,4
Total Hardness (TH)	ppm CaCO3	223,0	189,9	206,3	196,5
Carbonate Hardness (CH)	ppm CaCO3	144,0	127,8	137,6	131,3
Non-carbonate Hardness (NCH)	ppm CaCO3	79,0	62,2	68,7	65,2
Calcium hardness (CaH)	ppm CaCO3	90,4	76,0	95,3	85,2
Magnesium hardness (MgH)	ppm CaCO3	132,6	113,9	111,0	111,3
Carbonate Ions (CO_3^-)	ppm	0,9	1,1	1,2	1,1

APPENDIX B. KARDIA POWERHOUSE PRELIMINARY LAYOUT DRAWINGS



KEY PLAN

BILL OF MATERIALS

ITEM	QTY	DESCRIPTION
01	4	TURBINE–PUMP (T/P)
02	4	GENERATOR–MOTOR
03	4	POWER TRANSFORMER
04	4	INTERMEDIATE SHAFT
05	4	SFC TRANSFORMER
06	1	DTG GRANTRY CRANE
07	1	LOWER INTAKE GRANTRY CRANE
08	6	LOWER INTAKE STOPLOG
09	8	REVERSAL SWITCH
10	4	GENERATOR CIRCUIT BREAKER
11	2	MV BUSDUCT
12	8	MIV HYDRAULIC PRESSURE UNIT
13	2	CURRENT LIMITING REACTOR – SFC
14	2	CURRENT LIMITING REACTOR – MV BUS
15	1	MAIN OVERHEAD BRIDGE CRANE
16	4	DTG HYDRAULIC PRESSURE UNIT
17	3	DEWATERING PUMP
18	2	STATION SERVICE TRANSFORMER
19	3	DRAINAGE PUMP
20	4	FIRE FIGHTING CO2 RACK
21	8	UNIT COOLING WATER PUMP
22	8	COOLING WATER FILTER
23	16	BATTERY RACK
24	2	BATTERY CHARGER
25	8	DC DISTRIBUTION BOARD
26	6	TELECOMMUNICATION BOARD
27	24	SERVER CUBICLE
28	4	HP AIR TANK – BLOWDOWN SYSTEM

BILL OF MATERIALS

ITEM	QTY	DESCRIPTION
29	2	OFFICE DESK
30	1	MAIN CONTROL DESK
31	2	STATIC FREQUENCY CONVERTER
32	4	MIV DISMANTLING JOINT
33	4	MAIN INLET VALVE
34	2	MAIN FIRE PUMP
35	1	COMMON AUX. DISTR. PANEL BOARD
36	2	BIFURCATION
37	4	UNIT AUX. DISTR. PANEL BOARD
38	2	DIESEL TANK
39	2	EMERGENCY DIESEL GENERATOR
40	17	MV – 6kV SWITCHBOARD
41	4	MV – 6kV SWITCHBOARD
42	4	MV – 6kV SWITCHBOARD
43	4	COMMON AUX. CONTROLLER (PLC)
44	4	UNIT AUX. MV SWITCHBOARD
45	24	UNIT CONTROL CUBICLE
46	4	UNIT CONTROL CUBICLE
47	4	DRAFT TUBE GATE
48	4	AIR TANK – UNIT BREAKING
49	4	AIR HANDLING UNIT (AHU) – MH
50	4	WATER CHILLER – MH
51	4	EXCITATION TRANSFORMER
52	24	LOWER INTAKE GRILLE – ELEMENT
53	1	TRANSFORMER RAILS
54	1	GUARDRAILS
55	1	ROOF STRUCTURE
56	4	DRAFT TUBE STEEL LINER

LEGEND

- E01 → Item Number
- Concrete in section
- TURBINE → Flow in turbine mode
- PUMP → Flow in pump mode
- -50.00 Elevation level (m.a.s.l)

NOTES
1.- Overall dimensions will be confirmed at later design stage.
2.- The part list is purely indicative and non-exhaustive.

REV	DATE	MODIFICATION	DRAWN	CHECKED	APPROVED
D					
C					
B	19/05/2025	SECOND EDITION	FWI	TDC	FTH
A	12/03/2025	FIRST EDITION	FWI	TDC	FTH

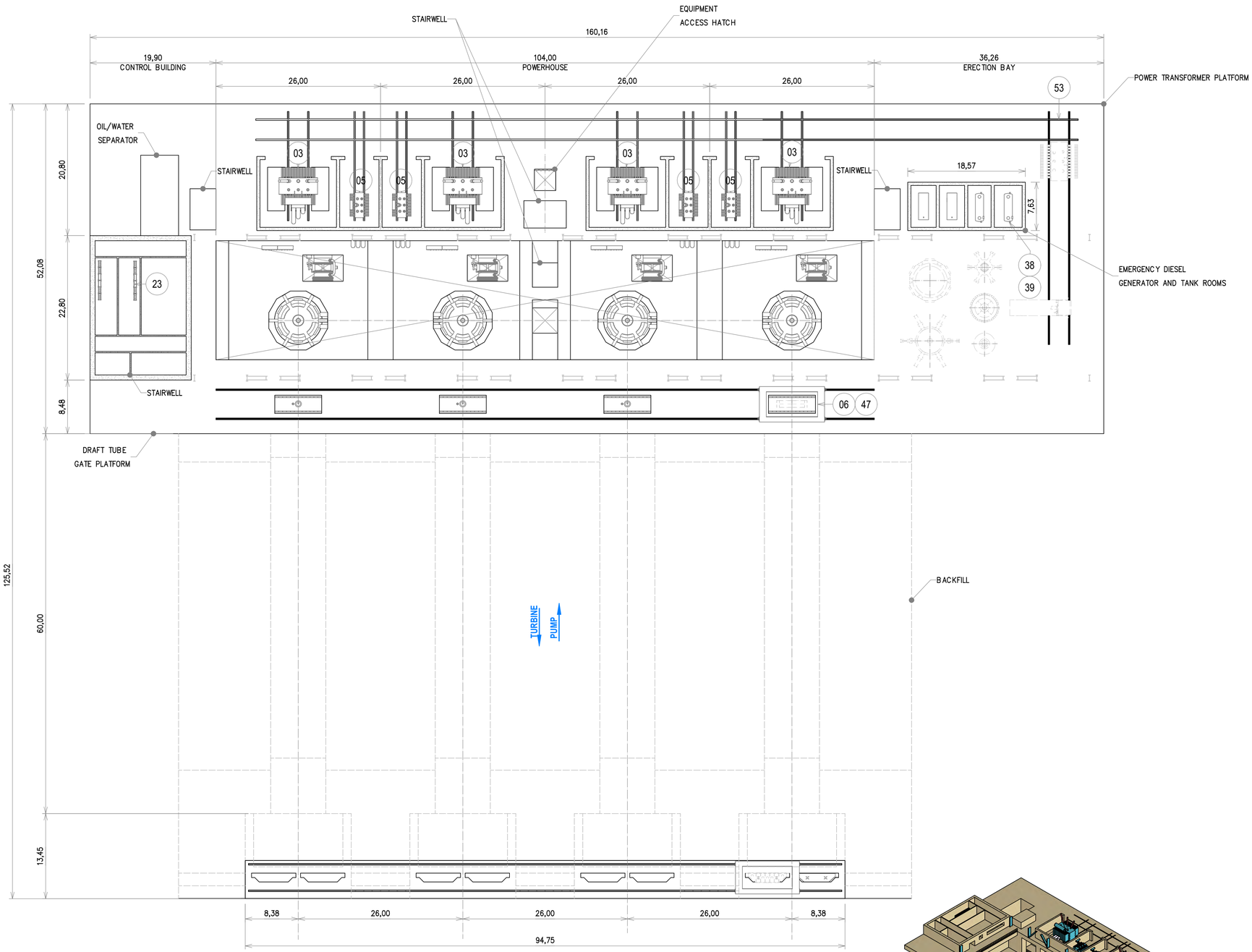
Customer
GREECE - WEST MACEDONIA
PUBLIC POWER CORPORATION S.A. (PPC SA)

Project
Kardia PHS Plant
EARLY TECHNICAL PROVIDER INVOLVEMENT

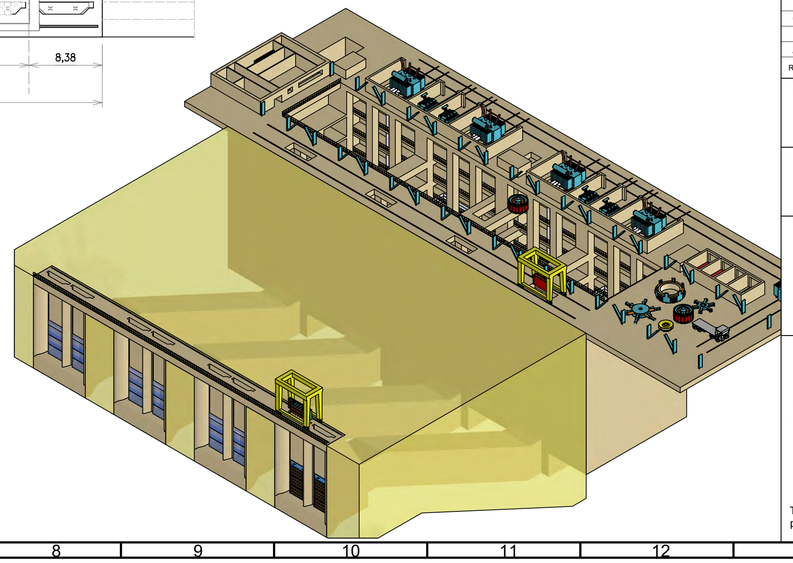
Subject
POWERHOUSE
ISOMETRIC VIEW

TRACTEBEL ENGINEERING S.A
Euroatrium - 7 rue Emmy Noether
93400 Saint-Ouen - FRANCE

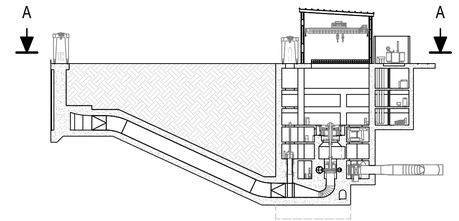
External Reference: -
Confidentiality Level: RESTRICTED
Computer File .dwg: KPHS-ETPI-PH - 001 ISOMETRIC VIEW.dwg
Scale : 1/: INDICATED
Imputation: W.003724 | Technical Division: LAYOUT | issuer: EFE | Nb Sheet: 1 | Size: A1
Drawing Name: KPHS-ETPI-PH-001
Rev.: B



SECTION A-A
SC. 1 :350



KEY PLAN



BILL OF MATERIALS			BILL OF MATERIALS		
ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
01	4	TURBINE–PUMP (T/P)	29	2	OFFICE DESK
02	4	GENERATOR–MOTOR	30	1	MAIN CONTROL DESK
03	4	POWER TRANSFORMER	31	2	STATIC FREQUENCY CONVERTER
04	4	INTERMEDIATE SHAFT	32	4	MIV DISMANTLING JOINT
05	4	SFC TRANSFORMER	33	4	MAIN INLET VALVE
06	1	DTG GRANTRY CRANE	34	2	MAIN FIRE PUMP
07	1	LOWER INTAKE GRANTRY CRANE	35	1	COMMON AUX. DISTR. PANEL BOARD
08	6	LOWER INTAKE STOPLOG	36	2	BIFURCATION
09	8	REVERSAL SWITCH	37	4	UNIT AUX. DISTR. PANEL BOARD
10	4	GENERATOR CIRCUIT BREAKER	38	2	DIESEL TANK
11	2	MV BUSDUCT	39	2	EMERGENCY DIESEL GENERATOR
12	8	MIV HYDRAULIC PRESSURE UNIT	40	17	MV – 6kV SWITCHBOARD
13	2	CURRENT LIMITING REACTOR – SFC	41	4	MV – 6kV SWITCHBOARD
14	2	CURRENT LIMITING REACTOR – MV BUS	42	4	MV – 6kV SWITCHBOARD
15	1	MAIN OVERHEAD BRIDGE CRANE	43	4	COMMON AUX. CONTROLLER (PLC)
16	4	DTG HYDRAULIC PRESSURE UNIT	44	4	UNIT AUX. MV SWITCHBOARD
17	3	DEWATERING PUMP	45	24	STATION SERVICE TRANSFORMER
18	2	STATION SERVICE TRANSFORMER	46	4	UNIT CONTROL CUBICLE
19	3	DRAINAGE PUMP	47	4	DRAFT TUBE GATE
20	4	FIRE FIGHTING CO2 RACK	48	4	AIR TANK – UNIT BREAKING
21	8	UNIT COOLING WATER PUMP	49	4	AIR HANDLING UNIT (AHU) – MH
22	8	COOLING WATER FILTER	50	4	WATER CHILLER – MH
23	16	BATTERY RACK	51	4	EXCITATION TRANSFORMER
24	2	BATTERY CHARGER	52	24	LOWER INTAKE GRILLE – ELEMENT
25	8	DC DISTRIBUTION BOARD	53	1	TRANSFORMER RAILS
26	6	TELECOMMUNICATION BOARD	54	1	GUARDRAILS
27	24	SERVER CUBICLE	55	1	ROOF STRUCTURE
28	4	HP AIR TANK – BLOWDOWN SYSTEM	56	4	DRAFT TUBE STEEL LINER

LEGEND

- E01 → Item Number
- Concrete in section
- Backfill in section
- -50.00 Elevation level (m.a.s.l)
- TURBINE → Flow in turbine mode
- PUMP → Flow in pump mode

NOTES
1.- Overall dimensions will be confirmed at later design stage.
2.- The part list is purely indicative and non-exhaustive.

REV	DATE	MODIFICATION	DRAWN	CHECKED	APPROVED
D					
C					
B	19/05/2025	SECOND EDITION	FWI	TDC	FTH
A	12/03/2025	FIRST EDITION	FWI	TDC	FTH

Customer
GREECE - WEST MACEDONIA
PUBLIC POWER CORPORATION S.A. (PPC SA)

Project
Kardia PHS Plant
EARLY TECHNICAL PROVIDER INVOLVEMENT

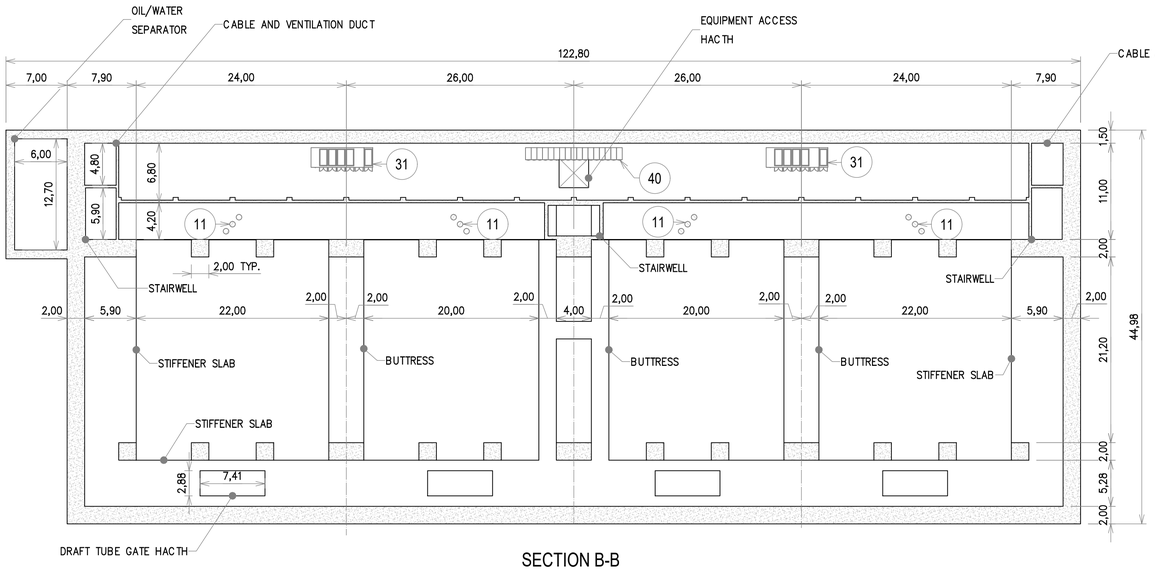
Subject
POWERHOUSE
ERECTION BAY LEVEL

TRACTEBEL ENGINEERING S.A
Euroatrium - 7 rue Emmy Noether
93400 Saint-Ouen - FRANCE

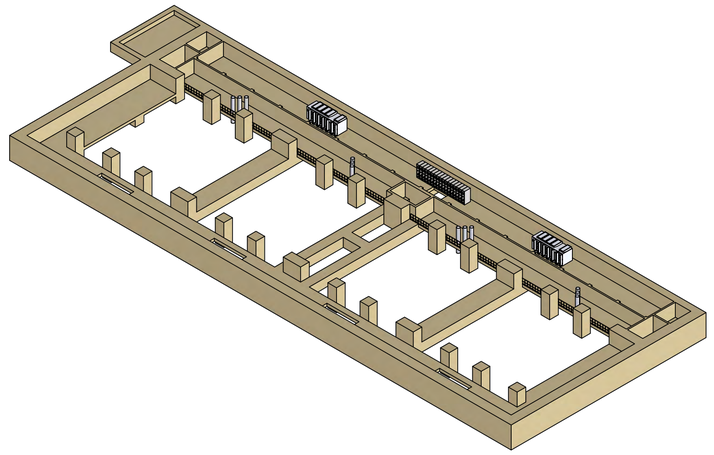
External Reference	Confidentiality Level
-	RESTRICTED
Computer File .dwg	Scale : 1/
KPHS-ETPI-PH-002 ERECTION BAY LEVEL.dwg	INDICATED

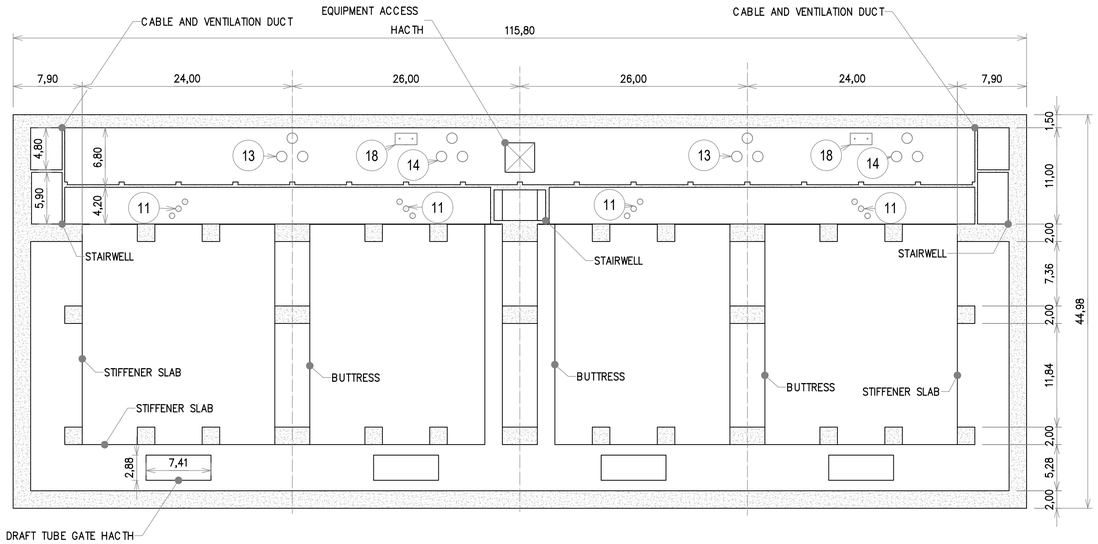
Imputation	Technical Division	issuer	Nb Sheet	Size
W.003724	LAYOUT	EFE	1	A1

Drawing Name: KPHS-ETPI-PH-002 — Rev.: B

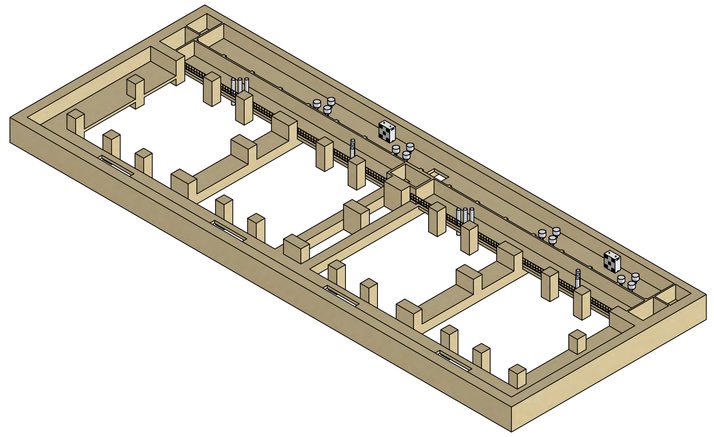


SECTION B-B
SC. 1 : 350

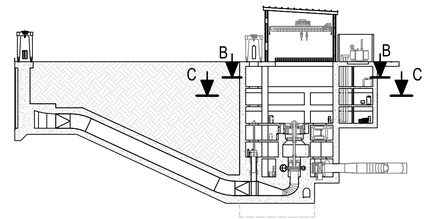




SECTION C-C
SC. 1 : 350



KEY PLAN



BILL OF MATERIALS			BILL OF MATERIALS		
ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
01	4	TURBINE–PUMP (T/P)	29	2	OFFICE DESK
02	4	GENERATOR–MOTOR	30	1	MAIN CONTROL DESK
03	4	POWER TRANSFORMER	31	2	STATIC FREQUENCY CONVERTER
04	4	INTERMEDIATE SHAFT	32	4	MIV DISMANTLING JOINT
05	4	SFC TRANSFORMER	33	4	MAIN INLET VALVE
06	1	DTG GRANTRY CRANE	34	2	MAIN FIRE PUMP
07	1	LOWER INTAKE GRANTRY CRANE	35	1	COMMON AUX. DISTR. PANEL BOARD
08	6	LOWER INTAKE STOPLOG	36	2	BIFURCATION
09	8	REVERSAL SWITCH	37	4	UNIT AUX. DISTR. PANEL BOARD
10	4	GENERATOR CIRCUIT BREAKER	38	2	DIESEL TANK
11	2	MV BUSDUCT	39	2	EMERGENCY DIESEL GENERATOR
12	8	MIV HYDRAULIC PRESSURE UNIT	40	17	MV – 6kV SWITCHBOARD
13	2	CURRENT LIMITING REACTOR – SFC	41	4	MV – 6kV SWITCHBOARD
14	2	CURRENT LIMITING REACTOR – MV BUS	42	4	MV – 6kV SWITCHBOARD
15	1	MAIN OVERHEAD BRIDGE CRANE	43	4	COMMON AUX. CONTROLLER (PLC)
16	4	DTG HYDRAULIC PRESSURE UNIT	44	4	UNIT AUX. MV SWITCHBOARD
17	3	DEWATERING PUMP	45	24	UNIT CONTROL CUBICLE
18	2	STATION SERVICE TRANSFORMER	46	4	UNIT CONTROL CUBICLE
19	3	DRAINAGE PUMP	47	4	DRAFT TUBE GATE
20	4	FIRE FIGHTING CO2 RACK	48	4	AIR TANK – UNIT BREAKING
21	8	UNIT COOLING WATER PUMP	49	4	AIR HANDLING UNIT (AHU) – MH
22	8	COOLING WATER FILTER	50	4	WATER CHILLER – MH
23	16	BATTERY RACK	51	4	EXCITATION TRANSFORMER
24	2	BATTERY CHARGER	52	24	LOWER INTAKE GRILLE – ELEMENT
25	8	DC DISTRIBUTION BOARD	53	1	TRANSFORMER RAILS
26	6	TELECOMMUNICATION BOARD	54	1	GUARDRAILS
27	24	SERVER CUBICLE	55	1	ROOF STRUCTURE
28	4	HP AIR TANK – BLOWDOWN SYSTEM	56	4	DRAFT TUBE STEEL LINER

LEGEND

E01 → Item Number

Concrete in section

Backfill in section

-50.00 Elevation level (m.a.s.l)

TURBINE → Flow in turbine mode

PUMP → Flow in pump mode

NOTES

1.- Overall dimensions will be confirmed at later design stage.
2.- The part list is purely indicative and non-exhaustive.

REV	DATE	MODIFICATION	DRAWN	CHECKED	APPROVED
D					
C					
B	19/05/2025	SECOND EDITION	FWI	TDC	FTH
A	12/03/2025	FIRST EDITION	FWI	TDC	FTH

Customer

GREECE - WEST MACEDONIA

PUBLIC POWER CORPORATION S.A. (PPC SA)

Project

Kardia PHS Plant

EARLY TECHNICAL PROVIDER INVOLVEMENT

Subject

POWERHOUSE

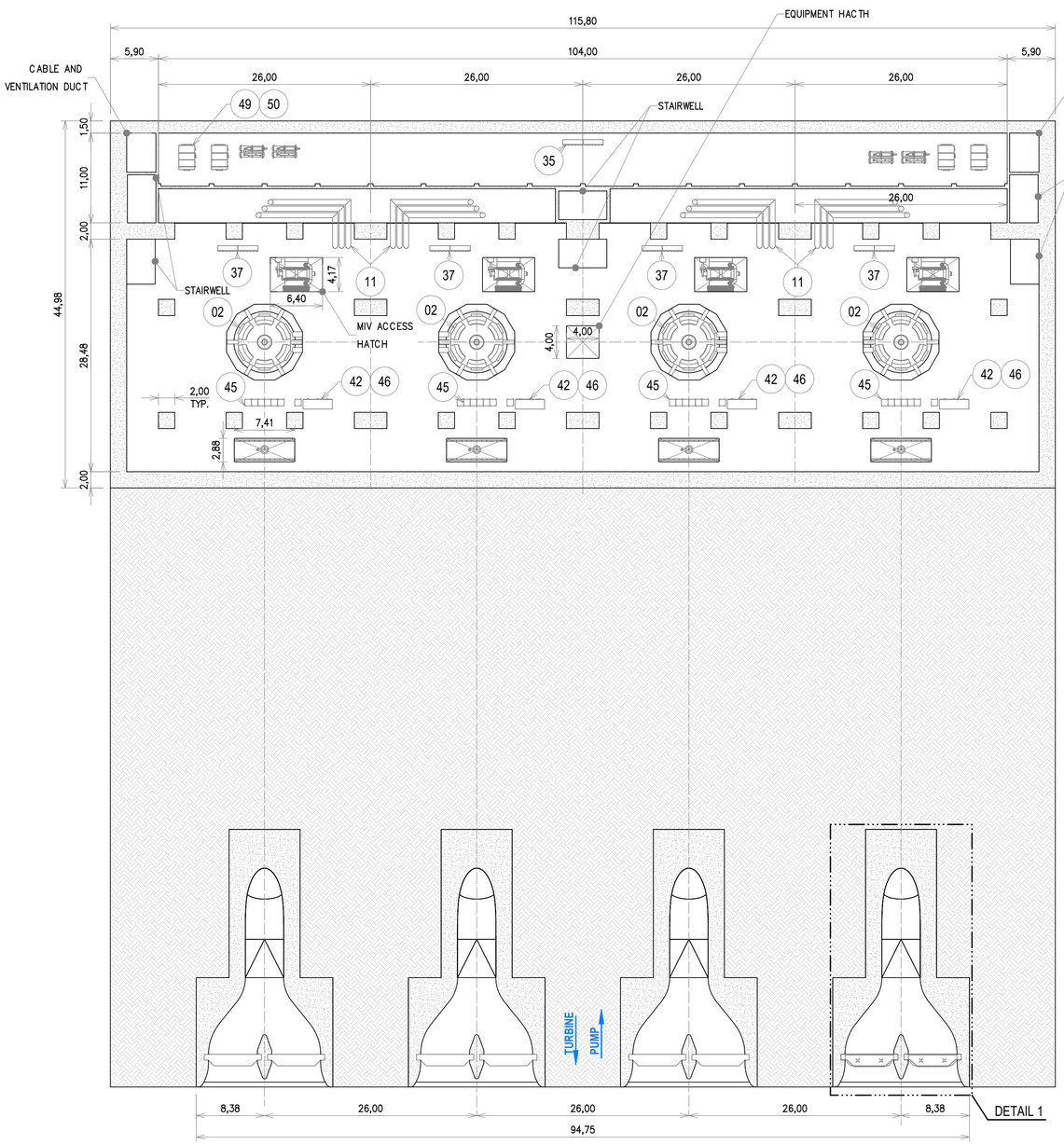
ELECTRICAL FLOORS

TRACTEBEL ENGINEERING S.A
Euroatrium - 7 rue Emmy Noether
93400 Saint-Ouen - FRANCE

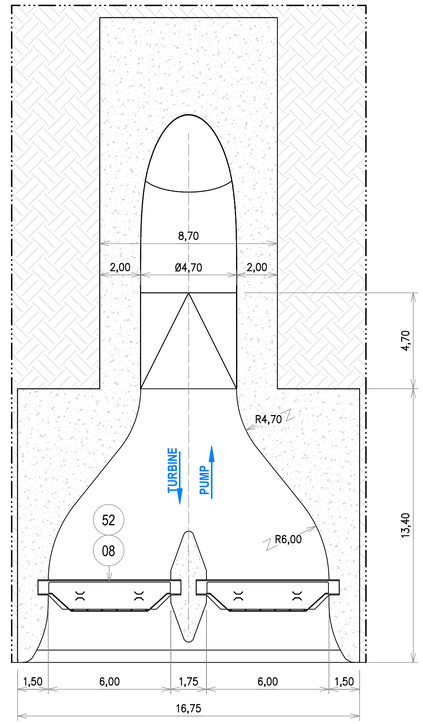
External Reference	Confidentiality Level
-	RESTRICTED
Computer File .dwg	Scale : 1/
KPHS-ETPI-PH-003 ELECTRICAL FLOORS.dwg	INDICATED

Imputation	Technical Division	issuer	Nb Sheet	Size
W.003724	LAYOUT	EFE	1	A1

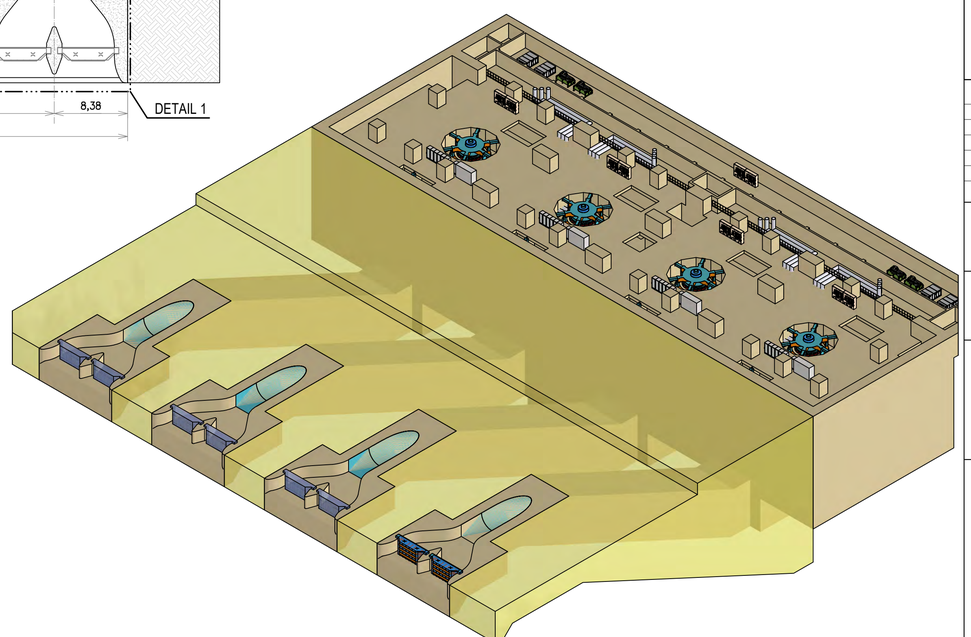
Drawing Name	Rev.
KPHS-ETPI-PH-003	B



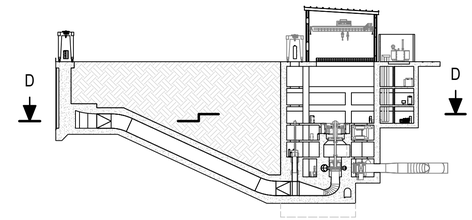
SECTION D-D
SC. 1 :350



DETAIL 1
sc. 1 : 150



KEY PLAN



BILL OF MATERIALS			BILL OF MATERIALS		
ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
01	4	TURBINE–PUMP (T/P)	29	2	OFFICE DESK
02	4	GENERATOR–MOTOR	30	1	MAIN CONTROL DESK
03	4	POWER TRANSFORMER	31	2	STATIC FREQUENCY CONVERTER
04	4	INTERMEDIATE SHAFT	32	4	MIV DISMANTLING JOINT
05	4	SFC TRANSFORMER	33	4	MAIN INLET VALVE
06	1	DTG GRANTRY CRANE	34	2	MAIN FIRE PUMP
07	1	LOWER INTAKE GRANTRY CRANE	35	1	COMMON AUX. DISTR. PANEL BOARD
08	6	LOWER INTAKE STOPLOG	36	2	BIFURCATION
09	8	REVERSAL SWITCH	37	4	UNIT AUX. DISTR. PANEL BOARD
10	4	GENERATOR CIRCUIT BREAKER	38	2	DIESEL TANK
11	2	MV BUSDUCT	39	2	EMERGENCY DIESEL GENERATOR
12	8	MIV HYDRAULIC PRESSURE UNIT	40	17	MV – 6kV SWITCHBOARD
13	2	CURRENT LIMITING REACTOR – SFC	41	4	MV – 6kV SWITCHBOARD
14	2	CURRENT LIMITING REACTOR – MV BUS	42	4	MV – 6kV SWITCHBOARD
15	1	MAIN OVERHEAD BRIDGE CRANE	43	4	COMMON AUX. CONTROLLER (PLC)
16	4	DTG HYDRAULIC PRESSURE UNIT	44	4	UNIT AUX. MV SWITCHBOARD
17	3	DEWATERING PUMP	45	24	UNIT CONTROL CUBICLE
18	2	STATION SERVICE TRANSFORMER	46	4	UNIT CONTROL CUBICLE
19	3	DRAINAGE PUMP	47	4	DRAFT TUBE GATE
20	4	FIRE FIGHTING CO2 RACK	48	4	AIR TANK – UNIT BREAKING
21	8	UNIT COOLING WATER PUMP	49	4	AIR HANDLING UNIT (AHU) – MH
22	8	COOLING WATER FILTER	50	4	WATER CHILLER – MH
23	16	BATTERY RACK	51	4	EXCITATION TRANSFORMER
24	2	BATTERY CHARGER	52	24	LOWER INTAKE GRILLE – ELEMENT
25	8	DC DISTRIBUTION BOARD	53	1	TRANSFORMER RAILS
26	6	TELECOMMUNICATION BOARD	54	1	GUARDRAILS
27	24	SERVER CUBICLE	55	1	ROOF STRUCTURE
28	4	HP AIR TANK – BLOWDOWN SYSTEM	56	4	DRAFT TUBE STEEL LINER

LEGEND

E01 → Item Number

Concrete in section

Backfill in section

-50.00 Elevation level (m.a.s.l)

TURBINE Flow in turbine mode

PUMP Flow in pump mode

NOTES
1.- Overall dimensions will be confirmed at later design stage.
2.- The part list is purely indicative and non-exhaustive.

REV	DATE	MODIFICATION	DRAWN	CHECKED	APPROVED
D					
C					
B	19/05/2025	SECOND EDITION	FWI	TDC	FTH
A	12/03/2025	FIRST EDITION	FWI	TDC	FTH

Customer

GREECE - WEST MACEDONIA

PUBLIC POWER CORPORATION S.A. (PPC SA)

Project

Kardia PHS Plant

EARLY TECHNICAL PROVIDER INVOLVEMENT

Subject

POWERHOUSE

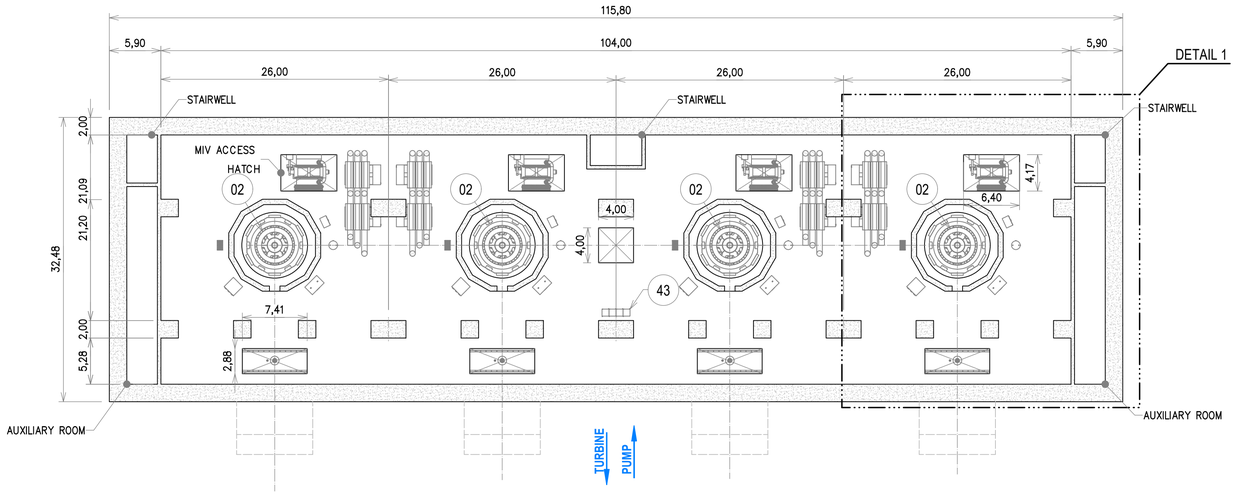
UPPER LEVEL & ELECTRICAL FLOORS

TRACTEBEL ENGINEERING S.A
Euroatrium - 7 rue Emmy Noether
93400 Saint-Ouen - FRANCE

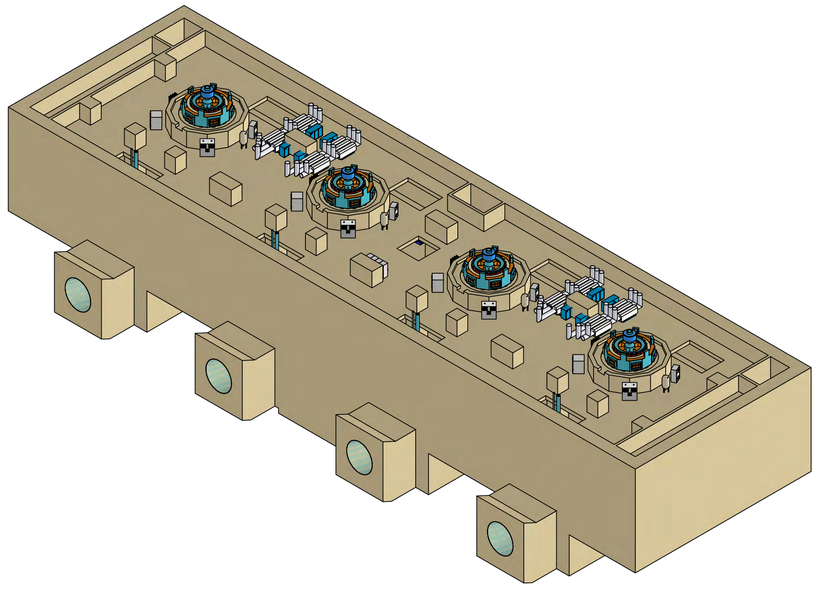
External Reference	Confidentiality Level
-	RESTRICTED
Computer File .dwg	Scale : 1/
KPHS-ETPI-PH-004 UPPER LEVEL.dwg	INDICATED

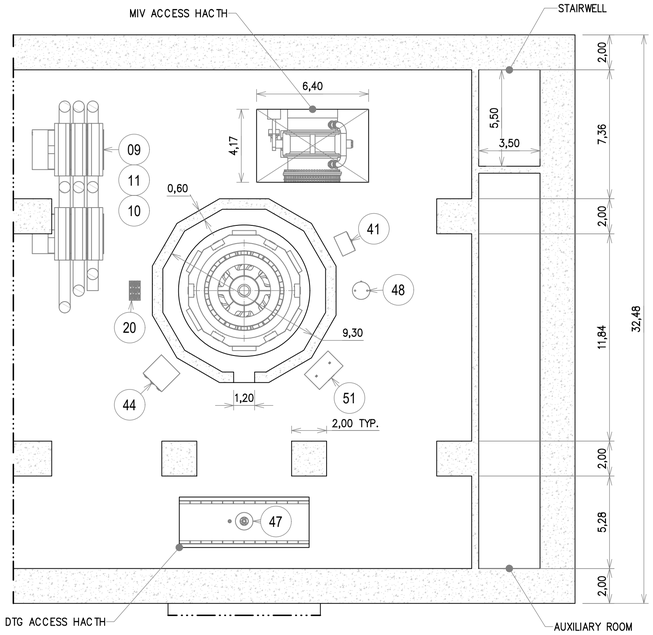
Imputation	Technical Division	issuer	Nb Sheet	Size
W.003724	LAYOUT	EFE	1	A1

Drawing Name	Rev.
KPHS-ETPI-PH-004	B



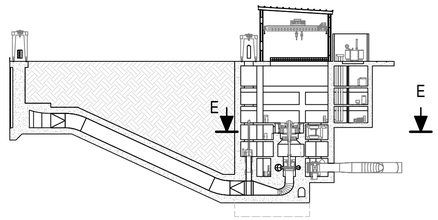
SECTION E-E
SC. 1 :350





DETAIL 1
sc. 1 : 175

KEY PLAN



BILL OF MATERIALS			BILL OF MATERIALS		
ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
01	4	TURBINE–PUMP (T/P)	29	2	OFFICE DESK
02	4	GENERATOR–MOTOR	30	1	MAIN CONTROL DESK
03	4	POWER TRANSFORMER	31	2	STATIC FREQUENCY CONVERTER
04	4	INTERMEDIATE SHAFT	32	4	MIV DISMANTLING JOINT
05	4	SFC TRANSFORMER	33	4	MAIN INLET VALVE
06	1	DTG GRANTRY CRANE	34	2	MAIN FIRE PUMP
07	1	LOWER INTAKE GRANTRY CRANE	35	1	COMMON AUX. DISTR. PANEL BOARD
08	6	LOWER INTAKE STOPLOG	36	2	BIFURCATION
09	8	REVERSAL SWITCH	37	4	UNIT AUX. DISTR. PANEL BOARD
10	4	GENERATOR CIRCUIT BREAKER	38	2	DIESEL TANK
11	2	MV BUSDUCT	39	2	EMERGENCY DIESEL GENERATOR
12	8	MIV HYDRAULIC PRESSURE UNIT	40	17	MV – 6kV SWITCHBOARD
13	2	CURRENT LIMITING REACTOR – SFC	41	4	MV – 6kV SWITCHBOARD
14	2	CURRENT LIMITING REACTOR – MV BUS	42	4	MV – 6kV SWITCHBOARD
15	1	MAIN OVERHEAD BRIDGE CRANE	43	4	COMMON AUX. CONTROLLER (PLC)
16	4	DTG HYDRAULIC PRESSURE UNIT	44	4	UNIT AUX. MV SWITCHBOARD
17	3	DEWATERING PUMP	45	24	UNIT CONTROL CUBICLE
18	2	STATION SERVICE TRANSFORMER	46	4	UNIT CONTROL CUBICLE
19	3	DRAINAGE PUMP	47	4	DRAFT TUBE GATE
20	4	FIRE FIGHTING CO2 RACK	48	4	AIR TANK – UNIT BREAKING
21	8	UNIT COOLING WATER PUMP	49	4	AIR HANDLING UNIT (AHU) – MH
22	8	COOLING WATER FILTER	50	4	WATER CHILLER – MH
23	16	BATTERY RACK	51	4	EXCITATION TRANSFORMER
24	2	BATTERY CHARGER	52	24	LOWER INTAKE GRILLE – ELEMENT
25	8	DC DISTRIBUTION BOARD	53	1	TRANSFORMER RAILS
26	6	TELECOMMUNICATION BOARD	54	1	GUARDRAILS
27	24	SERVER CUBICLE	55	1	ROOF STRUCTURE
28	4	HP AIR TANK – BLOWDOWN SYSTEM	56	4	DRAFT TUBE STEEL LINER

LEGEND

E01 → Item Number

Concrete in section

Backfill in section

-50.00 Elevation level (m.a.s.l)

TURBINE → Flow in turbine mode

PUMP → Flow in pump mode

NOTES
1.- Overall dimensions will be confirmed at later design stage.
2.- The part list is purely indicative and non-exhaustive.

REV	DATE	MODIFICATION	DRAWN	CHECKED	APPROVED
D					
C					
B	19/05/2025	SECOND EDITION	FWI	TDC	FTH
A	12/03/2025	FIRST EDITION	FWI	TDC	FTH

Customer
GREECE - WEST MACEDONIA
PUBLIC POWER CORPORATION S.A. (PPC SA)

Project
Kardia PHS Plant
EARLY TECHNICAL PROVIDER INVOLVEMENT

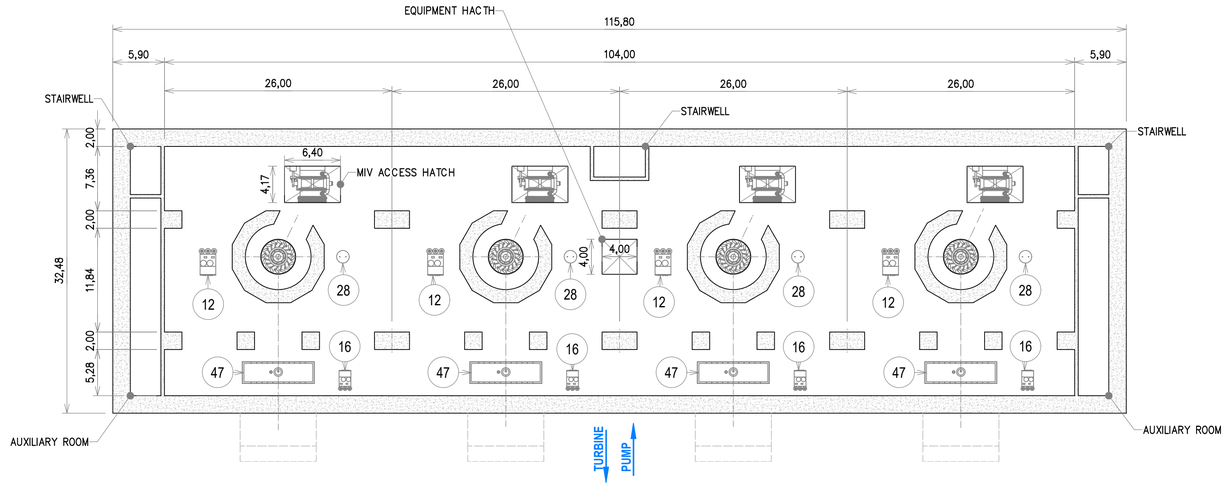
Subject
POWERHOUSE
GENERATOR LEVEL

TRACTEBEL ENGINEERING S.A
Euroatrium - 7 rue Emmy Noether
93400 Saint-Ouen - FRANCE

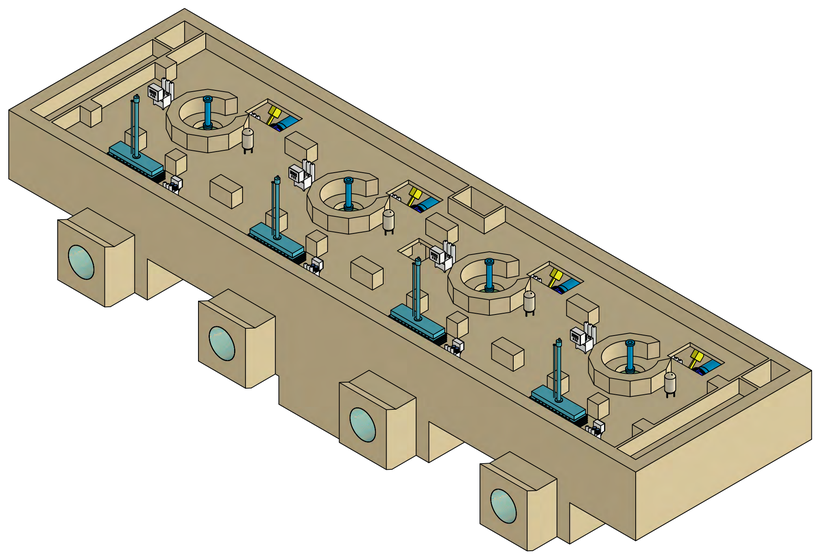
External Reference	Confidentiality Level
-	RESTRICTED
Computer File .dwg	Scale : 1/
KPHS-ETPI-PH-005 GENERATOR LEVEL.dwg	INDICATED

Imputation	Technical Division	issuer	Nb Sheet	Size
W.003724	LAYOUT	EFE	1	A1

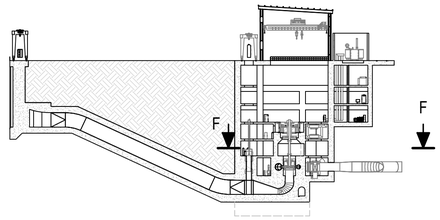
Drawing Name: KPHS-ETPI-PH-005 — Rev.: B



SECTION F-F
SC. 1 :350



KEY PLAN



BILL OF MATERIALS			BILL OF MATERIALS		
ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
01	4	TURBINE–PUMP (T/P)	29	2	OFFICE DESK
02	4	GENERATOR–MOTOR	30	1	MAIN CONTROL DESK
03	4	POWER TRANSFORMER	31	2	STATIC FREQUENCY CONVERTER
04	4	INTERMEDIATE SHAFT	32	4	MIV DISMANTLING JOINT
05	4	SFC TRANSFORMER	33	4	MAIN INLET VALVE
06	1	DTG GRANTRY CRANE	34	2	MAIN FIRE PUMP
07	1	LOWER INTAKE GRANTRY CRANE	35	1	COMMON AUX. DISTR. PANEL BOARD
08	6	LOWER INTAKE STOPLOG	36	2	BIFURCATION
09	8	REVERSAL SWITCH	37	4	UNIT AUX. DISTR. PANEL BOARD
10	4	GENERATOR CIRCUIT BREAKER	38	2	DIESEL TANK
11	2	MV BUSDUCT	39	2	EMERGENCY DIESEL GENERATOR
12	8	MIV HYDRAULIC PRESSURE UNIT	40	17	MV – 6kV SWITCHBOARD
13	2	CURRENT LIMITING REACTOR – SFC	41	4	MV – 6kV SWITCHBOARD
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17	3	DEWATERING PUMP	45	24	UNIT CONTROL CUBICLE
18	2	STATION SERVICE TRANSFORMER	46	4	UNIT CONTROL CUBICLE
19	3	DRAINAGE PUMP	47	4	DRAFT TUBE GATE
20	4	FIRE FIGHTING CO2 RACK	48	4	AIR TANK – UNIT BREAKING
21	8	UNIT COOLING WATER PUMP	49	4	AIR HANDLING UNIT (AHU) – MH
22	8	COOLING WATER FILTER	50	4	WATER CHILLER – MH
23	16	BATTERY RACK	51	4	EXCITATION TRANSFORMER
24	2	BATTERY CHARGER	52	24	LOWER INTAKE GRILLE – ELEMENT
25	8	DC DISTRIBUTION BOARD	53	1	TRANSFORMER RAILS
26	6	TELECOMMUNICATION BOARD	54	1	GUARDRAILS
27	24	SERVER CUBICLE	55	1	ROOF STRUCTURE
28	4	HP AIR TANK – BLOWDOWN SYSTEM	56	4	DRAFT TUBE STEEL LINER

LEGEND

E01 → Item Number

Concrete in section

Backfill in section

-50.00 Elevation level (m.a.s.l)

TURBINE Flow in turbine mode

PUMP Flow in pump mode

NOTES
1.- Overall dimensions will be confirmed at later design stage.
2.- The part list is purely indicative and non-exhaustive.

REV	DATE	MODIFICATION	DRAWN	CHECKED	APPROVED
D					
C					
B	19/05/2025	SECOND EDITION	FWI	TDC	FTH
A	12/03/2025	FIRST EDITION	FWI	TDC	FTH

Customer
GREECE - WEST MACEDONIA
PUBLIC POWER CORPORATION S.A. (PPC SA)

Project
Kardia PHS Plant
EARLY TECHNICAL PROVIDER INVOLVEMENT

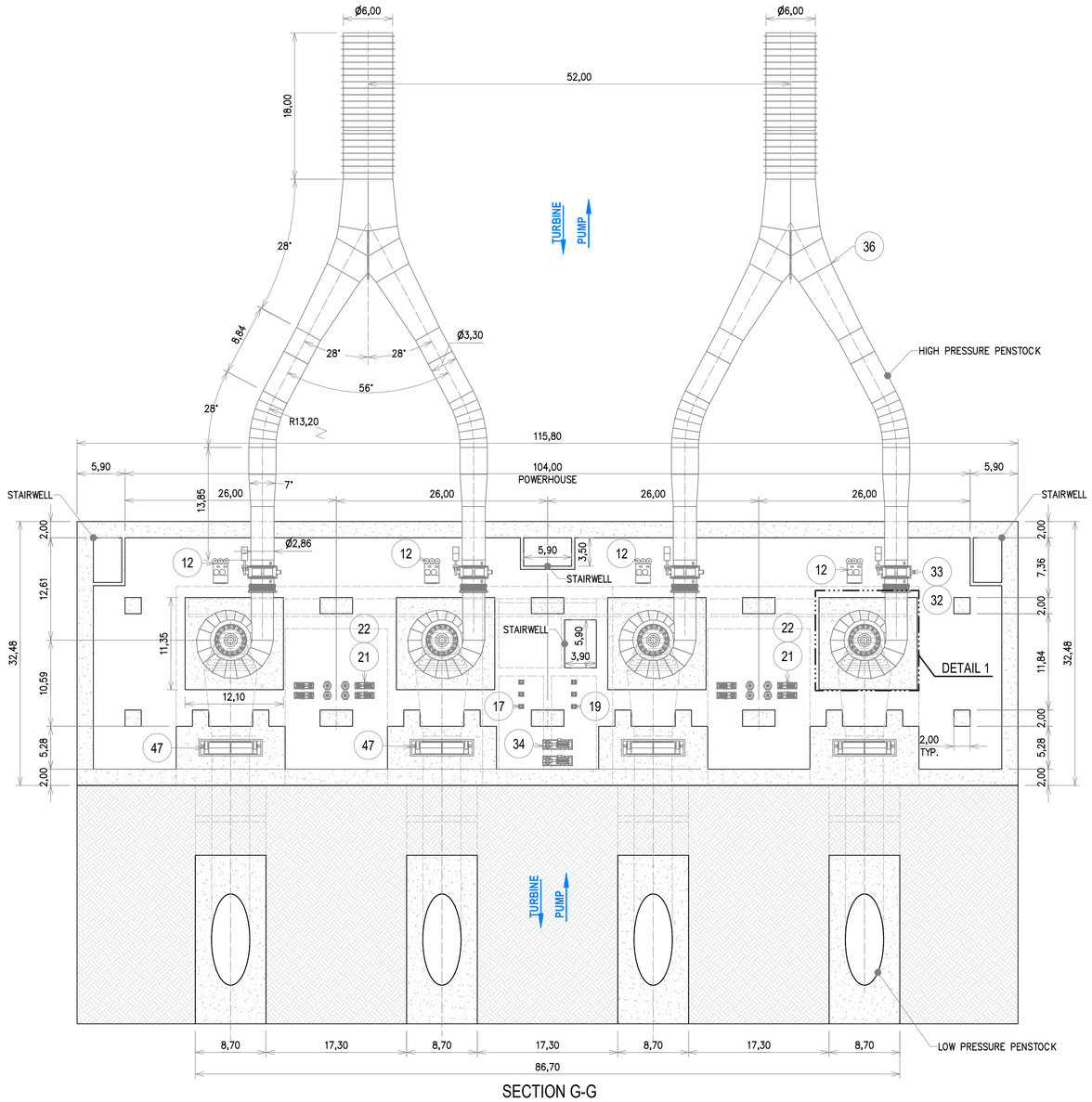
Subject
POWERHOUSE
TURBINE-PUMP LEVEL

TRACTEBEL ENGINEERING S.A
Euroatrium - 7 rue Emmy Noether
93400 Saint-Ouen - FRANCE

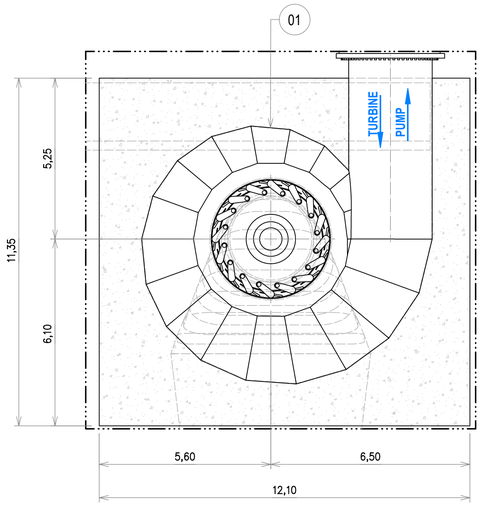
External Reference	Confidentiality Level
-	RESTRICTED
Computer File .dwg	Scale : 1/
KPHS-ETPI-PH-006 TURBINE LEVEL.dwg	INDICATED

Imputation	Technical Division	issuer	Nb Sheet	Size
W.003724	LAYOUT	EFE	1	A1

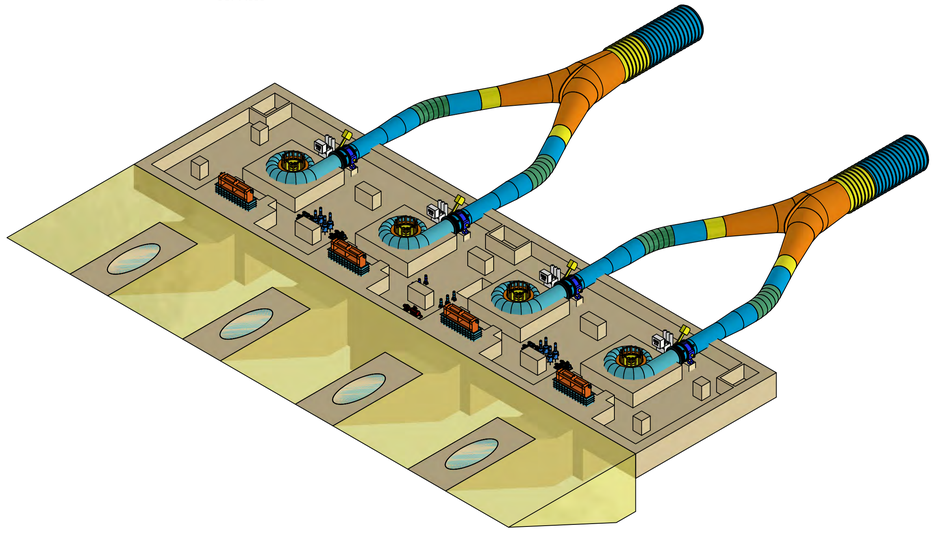
Drawing Name: KPHS-ETPI-PH-006 — Rev.: B



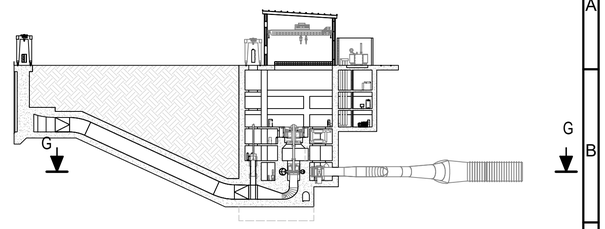
SECTION G-G
SC. 1 :350



DETAIL 1
Sc. 1 : 100



KEY PLAN



BILL OF MATERIALS			BILL OF MATERIALS		
ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
01	4	TURBINE–PUMP (T/P)	29	2	OFFICE DESK
02	4	GENERATOR–MOTOR	30	1	MAIN CONTROL DESK
03	4	POWER TRANSFORMER	31	2	STATIC FREQUENCY CONVERTER
04	4	INTERMEDIATE SHAFT	32	4	MIV DISMANTLING JOINT
05	4	SFC TRANSFORMER	33	4	MAIN INLET VALVE
06	1	DTG GRANTRY CRANE	34	2	MAIN FIRE PUMP
07	1	LOWER INTAKE GRANTRY CRANE	35	1	COMMON AUX. DISTR. PANEL BOARD
08	6	LOWER INTAKE STOPLOG	36	2	BIFURCATION
09	8	REVERSAL SWITCH	37	4	UNIT AUX. DISTR. PANEL BOARD
10	4	GENERATOR CIRCUIT BREAKER	38	2	DIESEL TANK
11	2	MV BUSDUCT	39	2	EMERGENCY DIESEL GENERATOR
12	8	MIV HYDRAULIC PRESSURE UNIT	40	17	MV – 6kV SWITCHBOARD
13	2	CURRENT LIMITING REACTOR – SFC	41	4	MV – 6kV SWITCHBOARD
14	2	CURRENT LIMITING REACTOR – MV BUS	42	4	MV – 6kV SWITCHBOARD
15	1	MAIN OVERHEAD BRIDGE CRANE	43	4	COMMON AUX. CONTROLLER (PLC)
16	4	DTG HYDRAULIC PRESSURE UNIT	44	4	UNIT AUX. MV SWITCHBOARD
17	3	DEWATERING PUMP	45	24	UNIT CONTROL CUBICLE
18	2	STATION SERVICE TRANSFORMER	46	4	UNIT CONTROL CUBICLE
19	3	DRAINAGE PUMP	47	4	DRAFT TUBE GATE
20	4	FIRE FIGHTING CO2 RACK	48	4	AIR TANK – UNIT BREAKING
21	8	UNIT COOLING WATER PUMP	49	4	AIR HANDLING UNIT (AHU) – MH
22	8	COOLING WATER FILTER	50	4	WATER CHILLER – MH
23	16	BATTERY RACK	51	4	EXCITATION TRANSFORMER
24	2	BATTERY CHARGER	52	24	LOWER INTAKE GRILLE – ELEMENT
25	8	DC DISTRIBUTION BOARD	53	1	TRANSFORMER RAILS
26	6	TELECOMMUNICATION BOARD	54	1	GUARDRAILS
27	24	SERVER CUBICLE	55	1	ROOF STRUCTURE
28	4	HP AIR TANK – BLOWDOWN SYSTEM	56	4	DRAFT TUBE STEEL LINER

LEGEND

E01 → Item Number

Concrete in section

Backfill in section

-50.00 Elevation level (m.a.s.l)

TURBINE Flow in turbine mode

PUMP Flow in pump mode

NOTES
1.- Overall dimensions will be confirmed at later design stage.
2.- The part list is purely indicative and non-exhaustive.

REV	DATE	MODIFICATION	DRAWN	CHECKED	APPROVED
D					
C					
B	19/05/2025	SECOND EDITION	FWI	TDC	FTH
A	12/03/2025	FIRST EDITION	FWI	TDC	FTH

Customer
GREECE - WEST MACEDONIA
PUBLIC POWER CORPORATION S.A. (PPC SA)

Project
Kardia PHS Plant
EARLY TECHNICAL PROVIDER INVOLVEMENT

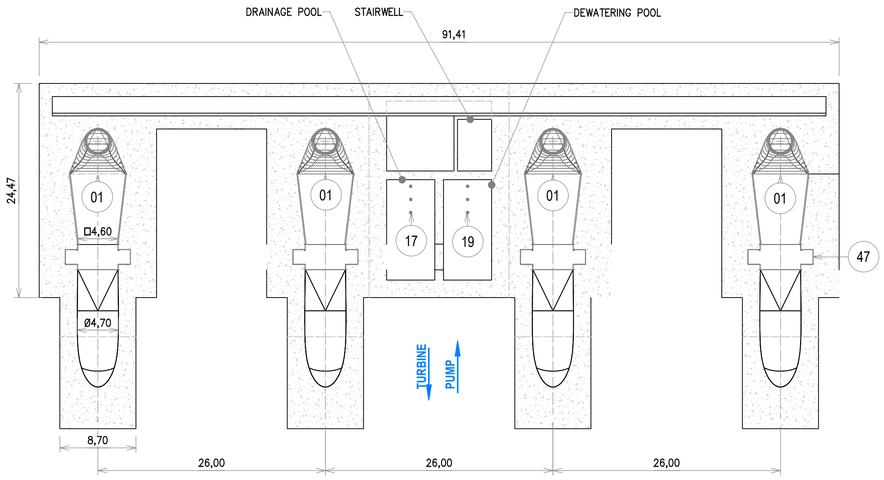
Subject
POWERHOUSE
SPIRAL CASE LEVEL

TRACTEBEL ENGIE
TRACTEBEL ENGINEERING S.A
Euroatrium - 7 rue Emmy Noether
93400 Saint-Ouen - FRANCE

External Reference	Confidentiality Level
-	RESTRICTED
Computer File .dwg	Scale : 1/
KPHS-ETPI-PH-007 SPIRAL CASE LEVEL.dwg	INDICATED

Imputation	Technical Division	issuer	Nb Sheet	Size
W.003724	LAYOUT	EFE	1	A1

Drawing Name	Rev.
KPHS-ETPI-PH-007	B



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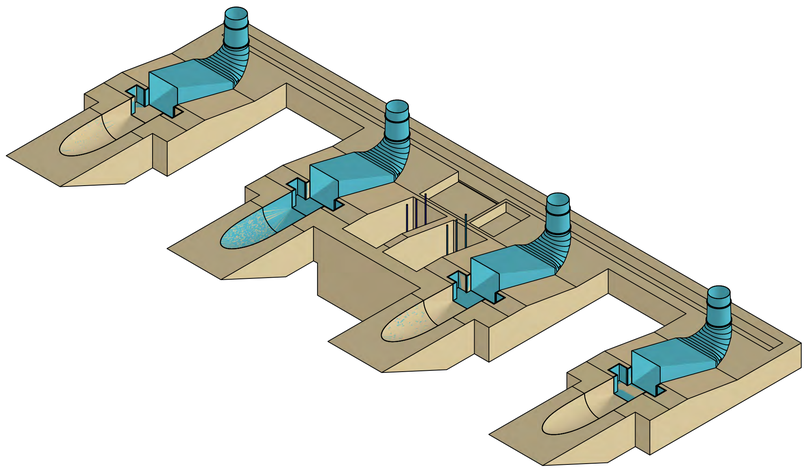
SC. 1 :350



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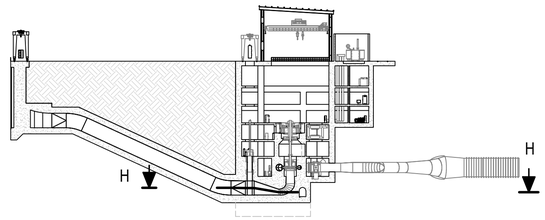

BILL OF MATERIALS			BILL OF MATERIALS		
ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
01	4	TURBINE–PUMP (T/P)	29	2	OFFICE DESK
02	4	GENERATOR–MOTOR	30	1	MAIN CONTROL DESK
03	4	POWER TRANSFORMER	31	2	STATIC FREQUENCY CONVERTER
04	4	INTERMEDIATE SHAFT	32	4	MIV DISMANTLING JOINT
05	4	SFC TRANSFORMER	33	4	MAIN INLET VALVE
06	1	DTG GRANTRY CRANE	34	2	MAIN FIRE PUMP
07	1	LOWER INTAKE GRANTRY CRANE	35	1	COMMON AUX. DISTR. PANEL BOARD
08	6	LOWER INTAKE STOPLOG	36	2	BIFURCATION
09	8	REVERSAL SWITCH	37	4	UNIT AUX. DISTR. PANEL BOARD
10	4	GENERATOR CIRCUIT BREAKER	38	2	DIESEL TANK
11	2	MV BUSDUCT	39	2	EMERGENCY DIESEL GENERATOR
12	8	MIV HYDRAULIC PRESSURE UNIT	40	17	MV – 6kV SWITCHBOARD
13	2	CURRENT LIMITING REACTOR – SFC	41	4	MV – 6kV SWITCHBOARD
14	2	CURRENT LIMITING REACTOR – MV BUS	42	4	MV – 6kV SWITCHBOARD
15	1	MAIN OVERHEAD BRIDGE CRANE	43	4	COMMON AUX. CONTROLLER (PLC)
16	4	DTG HYDRAULIC PRESSURE UNIT	44	4	UNIT AUX. MV SWITCHBOARD
17	3	DEWATERING PUMP	45	24	UNIT CONTROL CUBICLE
18	2	STATION SERVICE TRANSFORMER	46	4	UNIT CONTROL CUBICLE
19	3	DRAINAGE PUMP	47	4	DRAFT TUBE GATE
20	4	FIRE FIGHTING CO2 RACK	48	4	AIR TANK – UNIT BREAKING
21	8	UNIT COOLING WATER PUMP	49	4	AIR HANDLING UNIT (AHU) – MH
22	8	COOLING WATER FILTER	50	4	WATER CHILLER – MH
23	16	BATTERY RACK	51	4	EXCITATION TRANSFORMER
24	2	BATTERY CHARGER	52	24	LOWER INTAKE GRILLE – ELEMENT
25	8	DC DISTRIBUTION BOARD	53	1	TRANSFORMER RAILS
26	6	TELECOMMUNICATION BOARD	54	1	GUARDRAILS
27	24	SERVER CUBICLE	55	1	ROOF STRUCTURE
28	4	HP AIR TANK – BLOWDOWN SYSTEM	56	4	DRAFT TUBE STEEL LINER

LEGEND

E01 → Item Number

Concrete in section

Backfill in section

-50.00 Elevation level (m.a.s.l)

TURBINE Flow in turbine mode

PUMP Flow in pump mode

NOTES
1.- Overall dimensions will be confirmed at later design stage.
2.- The part list is purely indicative and non-exhaustive.

REV	DATE	MODIFICATION	DRAWN	CHECKED	APPROVED
D					
C					
B	19/05/2025	SECOND EDITION	FWI	TDC	FTH
A	12/03/2025	FIRST EDITION	FWI	TDC	FTH

Customer
GREECE - WEST MACEDONIA
PUBLIC POWER CORPORATION S.A. (PPC SA)

Project
Kardia PHS Plant
EARLY TECHNICAL PROVIDER INVOLVEMENT

Subject
POWERHOUSE
DRAFT TUBE LEVEL

TRACTEBEL ENGINEERING S.A
Euroatrium - 7 rue Emmy Noether
93400 Saint-Ouen - FRANCE

External Reference: -
Confidentiality Level: RESTRICTED
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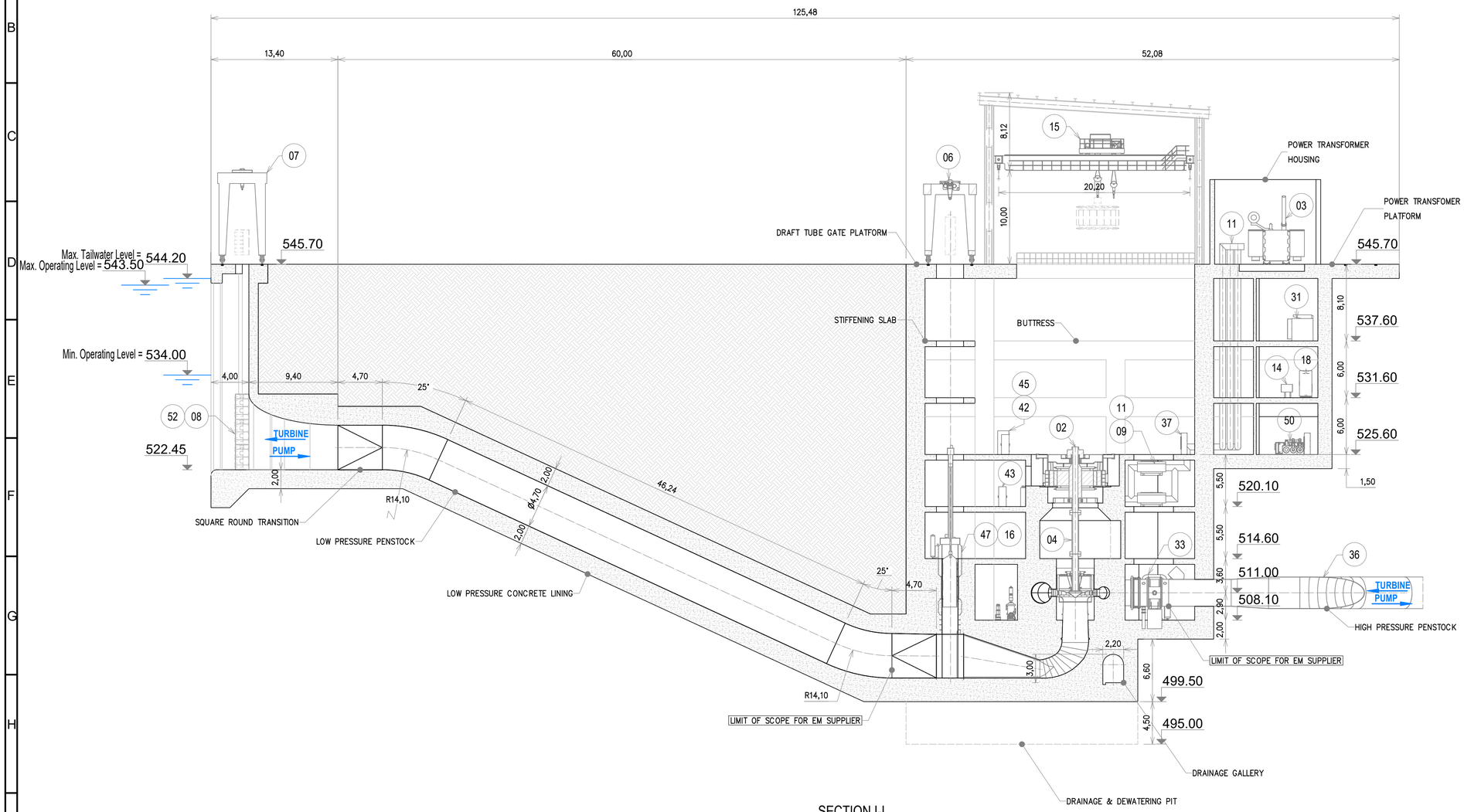
Scale : 1/: INDICATED
Imputation: W.003724
Technical Division: LAYOUT
Issuer: EFE
Nb Sheet: 1
Size: A1
Drawing Name: KPHS-ETPI-PH-008
Rev.: B



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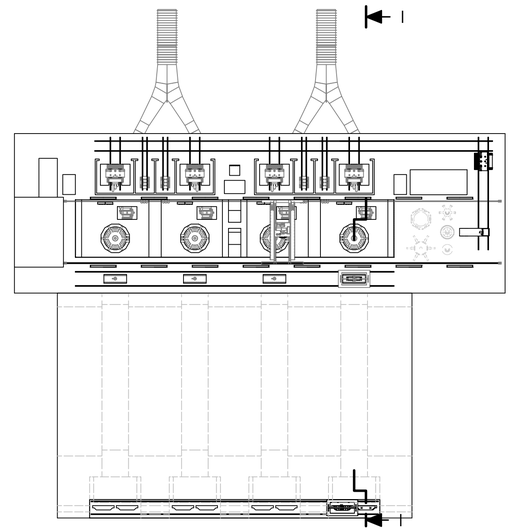
SC. 1 : 250

KEY PLAN



LEGEND

- E01 → Item Number
- Concrete in section
- Backfill in section
- -50.00 Elevation level (m.a.s.l)
- TURBINE → Flow in turbine mode
- PUMP → Flow in pump mode

NOTES
1.- Overall dimensions will be confirmed at later design stage.
2.- The part list is purely indicative and non-exhaustive.

BILL OF MATERIALS			BILL OF MATERIALS			BILL OF MATERIALS		
ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
01	4	TURBINE–PUMP (T/P)	20	4	FIRE FIGHTING CO2 RACK	39	2	EMERGENCY DIESEL GENERATOR
02	4	GENERATOR–MOTOR	21	8	UNIT COOLING WATER PUMP	40	17	MV – 6kV SWITCHBOARD
03	4	POWER TRANSFORMER	22	8	COOLING WATER FILTER	41	4	MV – 6kV SWITCHBOARD
04	4	INTERMEDIATE SHAFT	23	16	BATTERY RACK	42	4	MV – 6kV SWITCHBOARD
05	4	SFC TRANSFORMER	24	2	BATTERY CHARGER	43	4	COMMON AUX. CONTROLLER (PLC)
06	1	DTG GRANTRY CRANE	25	8	DC DISTRIBUTION BOARD	44	4	UNIT AUX. MV SWITCHBOARD
07	1	LOWER INTAKE GRANTRY CRANE	26	6	TELECOMMUNICATION BOARD	45	24	UNIT CONTROL CUBICLE
08	6	LOWER INTAKE STOPLOG	27	24	SERVER CUBICLE	46	4	UNIT CONTROL CUBICLE
09	8	REVERSAL SWITCH	28	4	HP AIR TANK – BLOWDOWN SYSTEM	47	4	DRAFT TUBE GATE
10	4	GENERATOR CIRCUIT BREAKER	29	2	OFFICE DESK	48	4	AIR TANK – UNIT BREAKING
11	2	MV BUSDUCT	30	1	MAIN CONTROL DESK	49	4	AIR HANDLING UNIT (AHU) – MH
12	8	MIV HYDRAULIC PRESSURE UNIT	31	2	STATIC FREQUENCY CONVERTER	50	4	WATER CHILLER – MH
13	2	CURRENT LIMITING REACTOR – SFC	32	4	MIV DISMANTLING JOINT	51	4	EXCITATION TRANSFORMER
14	2	CURRENT LIMITING REACTOR – MV BUS	33	4	MAIN INLET VALVE	52	24	LOWER INTAKE GRILLE – ELEMENT
15	1	MAIN OVERHEAD BRIDGE CRANE	34	2	MAIN FIRE PUMP	53	1	TRANSFORMER RAILS
16	4	DTG HYDRAULIC PRESSURE UNIT	35	1	COMMON AUX. DISTR. PANEL BOARD	54	1	GUARDRAILS
17	3	DEWATERING PUMP	36	2	BIFURCATION	55	1	ROOF STRUCTURE
18	2	STATION SERVICE TRANSFORMER	37	4	UNIT AUX. DISTR. PANEL BOARD	56	4	DRAFT TUBE STEEL LINER
19	3	DRAINAGE PUMP	38	2	DIESEL TANK			

REV	DATE	MODIFICATION	DRAWN	CHECKED	APPROVED
D					
C					
B	19/05/2025	SECOND EDITION	FWI	TDC	FTH
A	12/03/2025	FIRST EDITION	FWI	TDC	FTH

Customer
GREECE - WEST MACEDONIA
PUBLIC POWER CORPORATION S.A. (PPC SA)

Project
Kardia PHS Plant
EARLY TECHNICAL PROVIDER INVOLVEMENT

Subject
POWERHOUSE
CROSS SECTION

TRACTEBEL ENGIE
TRACTEBEL ENGINEERING S.A
Euroatrium - 7 rue Emmy Noether
93400 Saint-Ouen - FRANCE

External Reference: -
Confidentiality Level: RESTRICTED
Computer File .dwg: KPHS-ETPI-PH-009 TRANSVERSAL CROSS SECTION.dwg
Scale : 1/: INDICATED

Imputation	Technical Division	issuer	Nb Sheet	Size
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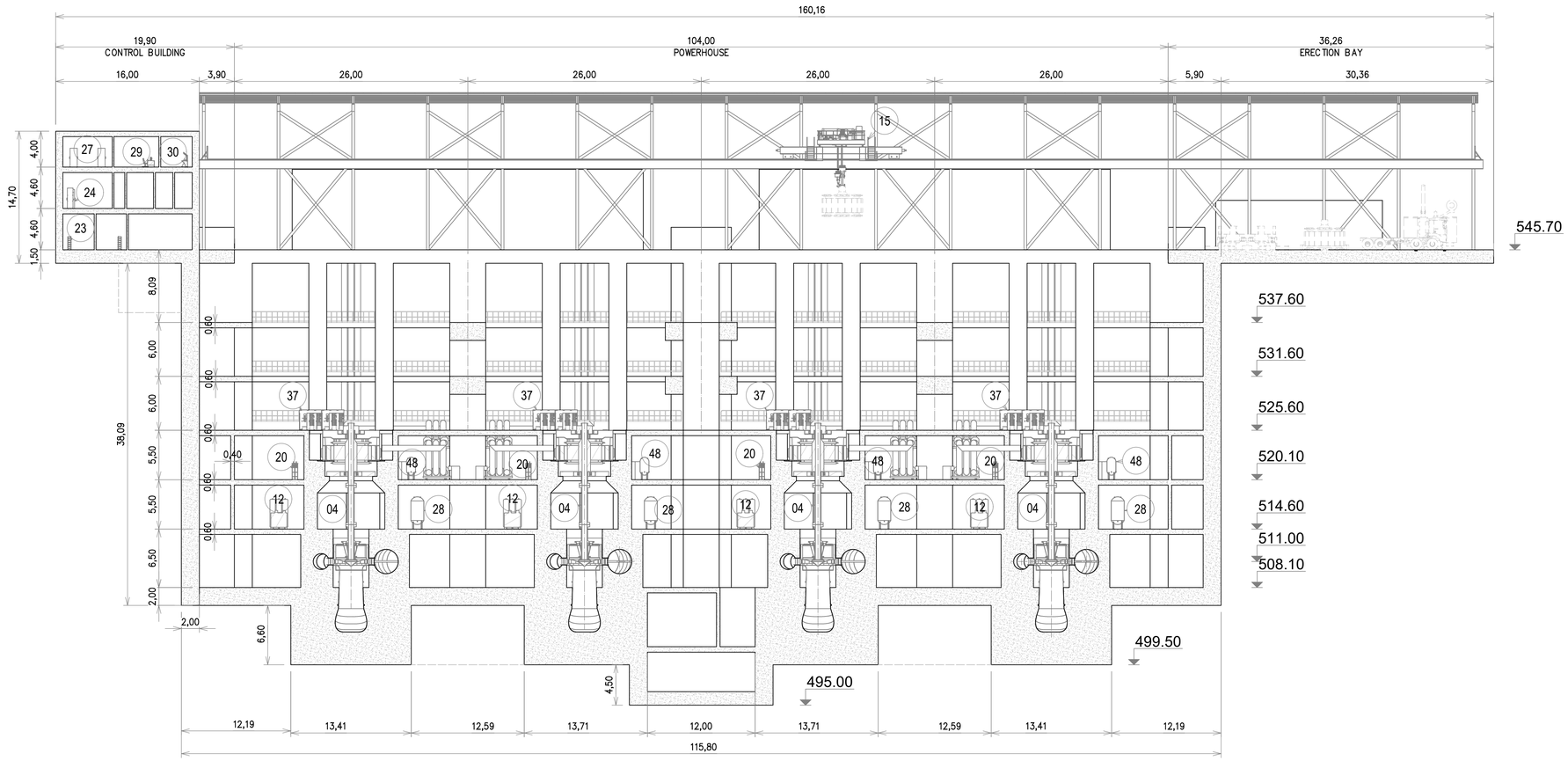
Drawing Name: KPHS-ETPI-PH-009
Rev.: B



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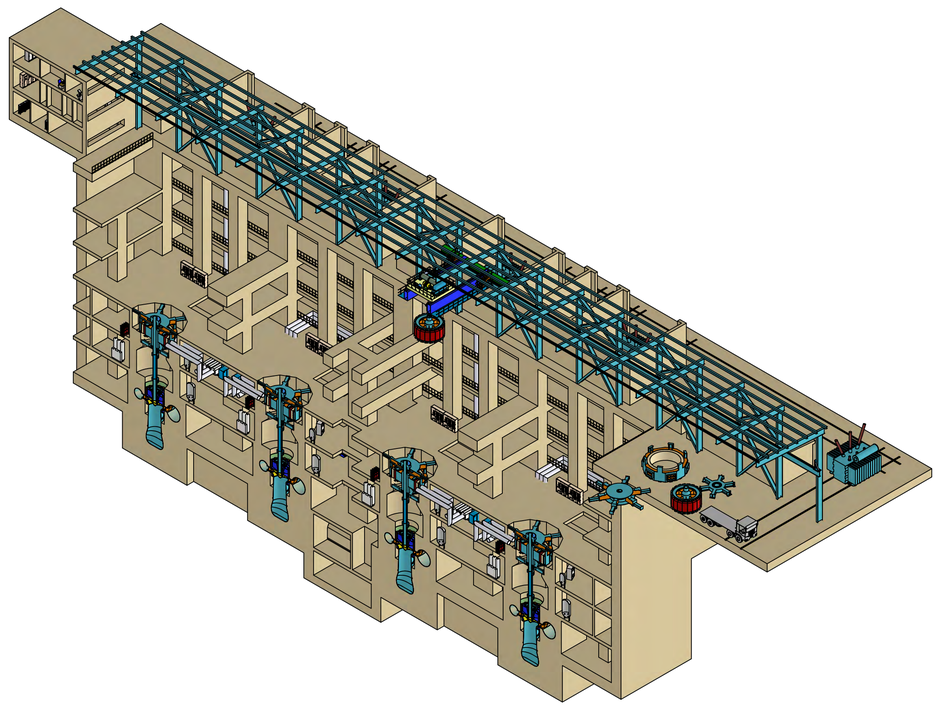
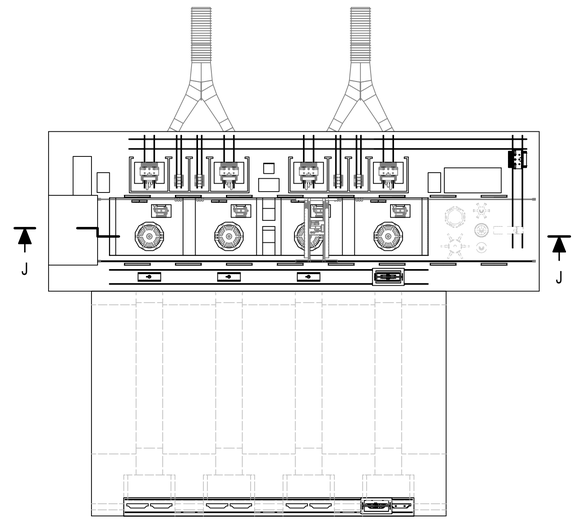
SC. 1 : 300



KEY PLAN



LEGEND

- E01 → Item Number
- Concrete in section
- Backfill in section
- -50.00 Elevation level (m.a.s.l)
- TURBINE Flow in turbine mode
- PUMP Flow in pump mode

NOTES
1.- Overall dimensions will be confirmed at later design stage.
2.- The part list is purely indicative and non-exhaustive.

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
01	4	TURBINE–PUMP (T/P)	30	1	MAIN CONTROL DESK
02	4	GENERATOR–MOTOR	31	2	STATIC FREQUENCY CONVERTER
03	4	POWER TRANSFORMER	32	4	MIV DISMANTLING JOINT
04	4	INTERMEDIATE SHAFT	33	4	MAIN INLET VALVE
05	4	SFC TRANSFORMER	34	2	MAIN FIRE PUMP
06	1	DTG GRANTRY CRANE	35	1	COMMON AUX. DISTR. PANEL BOARD
07	1	LOWER INTAKE GRANTRY CRANE	36	2	BIFURCATION
08	6	LOWER INTAKE STOPLOG	37	4	UNIT AUX. DISTR. PANEL BOARD
09	8	REVERSAL SWITCH	38	2	DIESEL TANK
10	4	GENERATOR CIRCUIT BREAKER	39	2	EMERGENCY DIESEL GENERATOR
11	2	MV BUSDUCT	40	17	MV – 6kV SWITCHBOARD
12	8	MIV HYDRAULIC PRESSURE UNIT	41	4	MV – 6kV SWITCHBOARD
13	2	CURRENT LIMITING REACTOR – SFC	42	4	MV – 6kV SWITCHBOARD
14	2	CURRENT LIMITING REACTOR – MV BUS	43	4	COMMON AUX. CONTROLLER (PLC)
15	1	MAIN OVERHEAD BRIDGE CRANE	44	4	UNIT AUX. MV SWITCHBOARD
16	4	DTG HYDRAULIC PRESSURE UNIT	45	24	UNIT CONTROL CUBICLE
17	3	DEWATERING PUMP	46	4	UNIT CONTROL CUBICLE
18	2	STATION SERVICE TRANSFORMER	47	4	DRAFT TUBE GATE
19	3	DRAINAGE PUMP	48	4	AIR TANK – UNIT BREAKING
20	4	FIRE FIGHTING CO2 RACK	49	4	AIR HANDLING UNIT (AHU) – MH
21	8	UNIT COOLING WATER PUMP	50	4	WATER CHILLER – MH
22	8	COOLING WATER FILTER	51	4	EXCITATION TRANSFORMER
23	16	BATTERY RACK	52	24	LOWER INTAKE GRILLE – ELEMENT
24	2	BATTERY CHARGER	53	1	TRANSFORMER RAILS
25	8	DC DISTRIBUTION BOARD	54	1	GUARDRAILS
26	6	TELECOMMUNICATION BOARD	55	1	ROOF STRUCTURE
27	24	SERVER CUBICLE	56	4	DRAFT TUBE STEEL LINER
28	4	HP AIR TANK – BLOWDOWN SYSTEM	C	1	
29	2	OFFICE DESK			

REV	DATE	MODIFICATION	DRAWN	CHECKED	APPROVED
D					
C					
B	19/05/2025	SECOND EDITION	FWI	TDC	FTH
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Customer
GREECE - WEST MACEDONIA
PUBLIC POWER CORPORATION S.A. (PPC SA)

Project
Kardia PHS Plant
EARLY TECHNICAL PROVIDER INVOLVEMENT

Subject
POWERHOUSE
LONGITUDINAL CROSS SECTION

TRACTEBEL ENGINEERING S.A
Euroatrium - 7 rue Emmy Noether
93400 Saint-Ouen - FRANCE

External Reference: -
Confidentiality Level: RESTRICTED
Computer File .dwg: KPHS-ETPI-PH-010 LONGITUDINAL CROSS SECTION.dwg
Scale : 1/: INDICATED
Imputation: W.003724
Technical Division: LAYOUT
Issuer: EFE
Nb Sheet: 1
Size: A1
Drawing Name: KPHS-ETPI-PH-010
Rev.: B

APPENDIX C. GTS (GENERAL TECHNICAL SPECIFICATIONS)

At the helm of the Energy Transition, Tractebel provides a full range of engineering and consulting services throughout the life cycle of its clients' projects, including design and project management. As one of the world's largest engineering consultancy companies and with more than 150 years of experience, it's our mission to actively shape the world of tomorrow. With about 5,000 experts and offices in 33 countries, we are able to offer our customers multidisciplinary solutions in energy, water and urban.

TRACTEBEL ENGINEERING S.A.

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David GRENIER
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david.grenier@tractebel.engie.com

Call for Tenders **No. NGAPD-2006**

Scope: **«Kardia Mine Pumped Hydro Storage: Early Technology Provider Involvement for Design, Supply, Erection and Commissioning of Pump, Turbine, Generator and Auxiliary Systems»**

ANNEX III

SCHEDULE OF GUARANTEES

CONTENTS

SCHEDULE OF GUARANTEES.....3

SCHEDULE OF GUARANTEES

No	Name	Guaranteed Value	Measured at	Rejection Limit	Performance LD	Performance LD rate	Comment
1	Turbine Weighted Average Efficiency (WAE) on turbine shaft	Min 90.50%	Model Test and Tests on completion	1 percentage point lower than the guaranteed value	Yes	1,5% of Lot 1 Contract Value per each 0,1% of efficiency shortfall	If during Model Test the Turbine WAE falls short of the rejection limit, the Lot 1 Contractor will have to improve the design and repeat the Model Test. If during Model Test the Turbine WAE, is higher than the rejection limit, but falls short of the guaranteed value, Performance LD's will be calculated and paid, unless the Contractor decides to improve the design and repeat the Model Test. If LD's are paid at this stage, the Model Test Turbine WAE will become the new Turbine WAE guarantee. During Tests On Completion a combined turbine and generator efficiency test will be performed. The actual WAE of turbine and generator will be compared against the Turbine WAE guarantee (as it may have been modified after Model Test) after applying the Generator's Guaranteed Performance curve). In case of shortfall additional Performance LD's will be calculated and paid.
2	Pump Weighted Average Efficiency (WAE) on turbine shaft	Min 93.80%	Model Test and Tests on completion	1 percentage point lower than the guaranteed value	Yes	1,5% of Lot 1 Contract Value per each 0,1% of efficiency shortfall	If during Model Test the Pump WAE falls short of the rejection limit, the Lot 1 Contractor will have to improve the design and repeat the Model Test. If during Model Test the Pump WAE, is higher than the rejection limit, but falls short of the guaranteed value, Performance LD's will be calculated and paid, unless the Contractor decides to improve the design and repeat the Model Test. If LD's are paid at this stage, the Model Test Pump WAE will become the new Pump WAE guarantee. During Tests On Completion a combined pump and motos efficiency test will be performed. The actual WAE of pump and motor will be compared against the Pump WAE guarantee (as it may have been modified after Model Test) after applying the Motor's Guaranteed Performance curve. In case of shortfall additional Performance LD's will be calculated and paid.
3	Turbine mechanical output under max head	Min 82.5 MW	Model Test and Tests on completion	N/A	No LD, Taking Over and Make Good during DNP	Not Applicable	

No	Name	Guaranteed Value	Measured at	Rejection Limit	Performance LD	Performance LD rate	Comment
4	Turbine mechanical output under 130 head	Min 72.5 MW	Model Test and Tests on completion	N/A	No LD, Taking Over and Make Good during DNP	Not Applicable	
5	Pump mechanical input under max head (on shaft*)	Min 76,3 MW	Model Test and Tests on completion	N/A	No LD, Taking Over and Make Good during DNP	Not Applicable	**Pump-Turbine guide bearing losses included. Net head including the MIV losses.*
6	Turbine mode minimum stable operation output ratio	Min 50%	Model Test and Tests on completion	N/A	No LD, Taking Over and Make Good during DNP	Not Applicable	
7	Motor efficiency, pump mode, under min head (mechanical losses included*)	Min 98.55%	Shop Test and Tests on completion	1 percentage point lower than the guaranteed value	Yes	1,5% of Lot 1 Contract Value per each 0,1% of efficiency shortfall (combined with pump)	Shop Test will have to achieve rejection limit. This guarantee will be replaced by the pump performance curve During Tests on Completion the combined pump and motor test will be performed and the stipulations of line 2 above will apply. **Motor-Generator guide and thrust bearings losses included (for thrust bearing, the whole shaft line weight and hydraulic thrust are to be considered in motor-generator efficiency)*
8	Generator efficiency, turbine mode at 100% max output (mechanical losses included*)	Min 98.45%	Shop Test and Tests on completion	1 percentage point lower than the guaranteed value	Yes	1,5% of Lot 1 Contract Value per each 0,1% of efficiency shortfall (combined with turbine)	Shop Test will have to achieve rejection limit. This guarantee will be replaced by the pump performance curve During Tests on Completion the combined turbine and generator test will be performed and the stipulations of line 1 above will apply. **Motor-Generator guide and thrust bearings losses included (for thrust bearing, the whole shaft line weight and hydraulic thrust are to be considered in motor-generator efficiency)*
9	Generator efficiency, turbine mode at 50% max output (mechanical losses included*)	Min 97.5%	Shop Test and Tests on completion	1 percentage point lower than the guaranteed value	NO	Not Applicable	Same as above

No	Name	Guaranteed Value	Measured at	Rejection Limit	Performance LD	Performance LD rate	Comment
10	Main power transformer (Tier-2) efficiency	Min 99.7%	Shop Test Tests on completion	N/A	No LD, Taking Over and Make Good during DNP	Not Applicable	If transformer is not under Lot 1, this guarantee will be moved to Lot 2
11	Cavitation Pitting depth per runner (function of runner low pressure diameter D)	Max $2.5*D^{0.4}$ mm	Tests After Completion after each 3000 hours of operation in pumping mode	N/A	No LD, Make Good, during DNP	Not Applicable	Lot 1 Contractor will have to repair the pitting by grinding and welding. In addition, Lot 1 Contractor will have to make good the underlying problem of the cavitation pitting This will trigger an extension of DNP, up to the maximum aggregate of 4 years.
12	Cavitation Pitting volume per runner (function of runner low pressure diameter D)	Max $5*D^2$ cm^3	Tests After Completion after each 3000 hours of operation in pumping mode	N/A	No LD, Make Good, during DNP	Not Applicable	Lot 1 Contractor will have to repair the pitting by grinding and welding. In addition, Lot 1 Contractor will have to make good the underlying problem of the cavitation pitting. This will trigger an extension of DNP, up to the maximum aggregate of 4 years. If cavitation still occurs after 3 repairs / 4 years, then the Lot 1 Contractor must provide a new hydraulic at his own cost (new hydraulic design, new model test, new runners)
13	Standstill to Generating (100%) transition time	Max 100 sec	Tests on completion	N/A	No LD, Taking Over and Make Good during DNP	Not Applicable	
14	Standstill to Pumping transition time	Max 350 sec	Tests on completion	N/A	No LD, Taking Over and Make Good during DNP	Not Applicable	
15	Noise guarantees	TBD	Tests on completion	No, to the extent that the plant can safely operate according to applicable legislation	No LD, Make Good, either before Taking Over or during DNP	Not Applicable	
16	Vibration guarantees	TBD	Tests on completion	No, to the extent that	No LD,	Not Applicable	

No	Name	Guaranteed Value	Measured at	Rejection Limit	Performance LD	Performance LD rate	Comment
				the plant can safely operate according to applicable legislation	Make Good, either before Taking Over or during DNP		

Call for Tenders **No. NGAPD-2006**

Scope: **«Kardia Mine Pumped Hydro Storage: Early Technology Provider Involvement for Design, Supply, Erection and Commissioning of Pump, Turbine, Generator and Auxiliary Systems»**

ANNEX IV

DECLARATION FORMS

CONTENTS

TENDERER DECLARATION 3
JOINT RESPONSIBILITY DECLARATION 5

TEMPLATE

TENDERER DECLARATION

I, [Your Full Legal Name], the undersigned acting as representing [Tenderer Name], hereby declare our intention to participate in the **Call for Tenders No. NGAPD-2006 for the Scope: "Kardia Mine Pumped Hydro Storage: Early Technology Provider Involvement for Design, Supply, Erection and Commissioning of Pump, Turbine, Generator and Auxiliary Systems"** organized by PPC S.A. The following information and statements are provided in accordance with the requirements outlined in the tender documents:

1. Tenderer Information:
    - Name: [Tenderer's/legal person Name]
    - Registered Address: [Company Address]
    - Legal Representative Name:
    - Company Identification/Registered Number:
    - Contact Information: [Company Phone Number, Email Address]
    - Legal Entity: [e.g., Group of Companies)

(indicate the relevant register, the relevant legislation of their country of fiscal residence and the necessary information for their access - web address, telephone, Contact person etc.)

2. We hereby declare our acceptance of the terms and conditions and we affirm our compliance with all the specifications, requirements, and terms outlined in the Call for Tenders.

3. We declare that until the day of the submission of our Proposal, we do not fall under any of the grounds for exclusion from participation in this Tender Procedure, as detailed in Article 4 (4) of the RWSS/PPC, and summarized as follows:

I. Participation in a criminal organisation, as defined in ar. 2 of the Council Framework Decision 2008/841/JHA of 24 October 2008 on the fight against organised crime.

II. Corruption – bribery, as per article 3 of "Anti-corruption Act" and article 3 of the Convention on the fight against corruption involving officials of the European Communities or officials of Member States of the European Union and Article 2(1) of Council Framework Decision 2003/568/JHA.

III. Fraud within the meaning of Articles 386 and 386A of the Criminal Code or Article 1 of the Convention on the protection of the European Communities' financial interests

IV. Terrorist offences or offences linked to terrorist activities as defined in the Directive (EU) 2017/541 of the European Parliament and of the Council of 15 March 2017 on combating terrorism and replacing Council Framework Decision 2002/475/JHA and amending Council Decision 2005/671/JHA or moral or accessorial liability or attempted commission of crime.

V. Money laundering or financing of terrorism as defined in article 1 of the EU Directive (EU) 2015/849 of the European Parliament and of the Council of 20 May 2015 on the prevention of the use of the financial system for the purposes of money laundering or terrorist financing.

VI. Child labour and other forms of human trafficking, according to article 2 of the EU Directive 2011/36/EU

VII. Severe or continuous non-compliance with environmental, social security and labour legislation

VIII. Bankruptcy, subjection to restructuring procedure, special liquidation, administrative receivership or composition procedure or suspension of business activities or any other similar situation.

4. We confirm that there is no conflict of interest that would affect our ability to participate impartially in this tender procedure, in accordance with the provisions of the Company's Conflict of Interest Policy posted on the Company's site (https://www.ppcgroup.com/media/h4wiax4c/conflict-of-interest-policy-of-public-power-corporation-sa.pdf).

5. We have read, complied and adhered to the company's Code of Conduct (https://www.ppcgroup.com/media/1mbky2av/code-of-conduct-09-06-2022-en_.pdf).

6. In the event of a late change to any detail of our application, regarding the conditions for the absence of exclusion grounds, throughout the term of validity of the Proposal, the Tenderer undertakes to notify PPC immediately of the change in question, otherwise PPC may exclude him from the Tender.

7. Our Proposal shall remain valid throughout the specified validity period as per Article 1.2 of the said Call for Tenders. Throughout the abovementioned "validity period", prospective Tenderers, shall be precluded from withdrawing, modifying or supplementing in any way their already submitted Proposal.

Date: .....

The Declarants

(Full name - capacity - signature)

TEMPLATE

JOINT RESPONSIBILITY DECLARATION

In the case of a Partnership / Association of natural and/or legal persons

We, the undersigned members ……[1]…… for ……[2]……

1. ……

2. ……

3. ……

declare that, within the framework of submission of our Proposal to the above procedure, and in case of award of the contract to us, we will be fully liable towards PPC, jointly, undivided and severally during the performance of our obligations arising from our Tender and the contract.

Date: ……

The Declarants

(Full name - capacity - signature)

ΟΔΗΓΙΕΣ
INSTRUCTIONS

[1] Depending on the form of the tenderer, e.g. "Partnership" or "Association" or "joint venture" shall be indicated

[2] Indicate the object of the procedure

Call for Tenders **No. NGAPD-2006**

Scope: **«Kardia Mine Pumped Hydro Storage: Early Technology Provider Involvement for Design, Supply, Erection and Commissioning of Pump, Turbine, Generator and Auxiliary Systems»**

ANNEX V

ADVANCE PAYMENT GUARANTEE SAMPLE

CONTENTS

ADVANCE PAYMENT GUARANTEE SAMPLE 3

ADVANCE PAYMENT GUARANTEE SAMPLE

Date:

To

PUBLIC POWER CORPORATION S.A.
30 Chalkokondyli str., 104 32 ATHENS

We inform you that we irrevocably and unreservedly guarantee to you in favour of your Counterparty:

……[1]……

waiving expressly irrevocably and unconditionally the right to discuss and divide, as well as the non-personal objections of the primary debtor, being liable in full and as self-debtors and up to the amount of ……[2]……, which represents the advance payment given by you to the Counterparty to Contract No …… A copy of this has been handed over to us, and its receipt is hereby confirmed.
The object of the Contract is …… with a contractual budget of ……

In any event where, under the guarantee, you would consider that the above Counterparty has breached any of their obligations from those undertaken with the above Contract, we hereby undertake to pay you without delay and without any objection the amount of the guarantee in whole or in part, in accordance with your instructions and within five (5) days from your request, without any authorization, action or consent of the Counterparty being required for the above payment and without regard to any objection or reservation or recourse to the Courts or Arbitration, with a request for the non-forfeiture of the present or its place under judicial sequestration.

Finally, we hereby declare that our guarantee will remain valid until the Counterparty has fulfilled all of their obligations under the relevant Contract and any addendums thereto, but not later than ……[3]…… months from the date on which the validity of the Contract begins. The validity of this guarantee will be extended beyond the aforementioned deadline without any objection from us, upon your written request submitted before the expiry date of this guarantee.

Upon the expiration of the guarantee period or the extension requested by PPC, this guarantee will be returned to us

---

ΟΔΗΓΙΕΣ
INSTRUCTIONS

[1] Depending on the form of the Counterparty, the issuer of the letter of guarantee shall indicate one of the following options:

- In the case of a natural person: …… (full name, father's name) ……, …… (TIN) ……, …… (address) …… or
- In case of a legal person: …… (name) ……, ……(TIN) ……, …… (headquarters address) …… or
- In case of a Partnership/Association: of natural or legal persons

  a) …… (name) ……, …… (TIN) ……, …… (address of residence or headquarters) ……

b) ..... (name) ....., ... (TIN) ....., ... (address of residence or headquarters) .....
..... etc .....
acting in this case as Partnership/Association and each member is jointly liable towards PPC

[2] The amount in Euros shall be written in full and in numbers

[3] The appropriate number of months shall be completed by the PPC Division that carries out the selection procedure, taking into account the time frame for the completion of payments of the Contract plus a margin for any delays (e.g. in a project with a time horizon of completion of payments or temporary acceptance thereof of eight (8) months, the maximum validity of the guarantee may be set at ten (10) months)

Call for Tenders **No. NGAPD-2006**

Scope: **«Kardia Mine Pumped Hydro Storage: Early Technology Provider Involvement for Design, Supply, Erection and Commissioning of Pump, Turbine, Generator and Auxiliary Systems»**

ANNEX VI

COLLABORATION ENGAGEMENT AGREEMENT

CONTENTS

COLLABORATION ENGAGEMENT AGREEMENT 3

COLLABORATION ENGAGEMENT AGREEMENT

THIS COLLABORATION ENGAGEMENT is dated _____

BETWEEN:

PPC (the **Employer**); and

_____ (the "**Early Engineering Contractor**")

each a **Party** and together the **Parties.**

IT IS AGREED as follows:

INTERPRETATION

In this **Agreement**:

Affiliates means any subsidiary or holding company of either **Party** or a subsidiary of the holding company of such company

Base Price: means the starting point for the value of the Lot 1 Contract, which will be equal to [*The Offered Price minus any commercial discount*] plus [*The total price of the Options selected by PPC*].

Early Engineering Contract: means the contract between the **Employer** and the **Early**

Engineering Contractor to advance the project's design and contribute to the preparation of the Employer's Requirements towards finalization of the **Lot 1 Contract** under the FIDIC Yellow Book and tendering the **Lot 2 Contract**.

Exclusivity Period means the period starting on the date of this **Agreement** and ending on the earlier of (i) the day falling fifteen (15) months after the date of this **Agreement** (or any longer period agreed in writing between the **Parties**) and (ii) termination of this **Agreement**

Heads of Terms means the key terms that the **Lot 1 Contract** will be based on, detailed in **Annex 1**

Information means any information of whatever nature relating to the **Project** or the **Process** supplied either prior to or after the date of this **Agreement** by a **Party** or its **Affiliates** or **Representatives** to the other **Party** in writing, orally or otherwise together with any reports or other documents prepared by either **Party** or on either **Party**'s behalf which contain or otherwise reflect any such information

Insolvent means being unable to pay debts as they fall due, becoming bankrupt, going into liquidation (either voluntary or compulsory unless as part of a bona fide scheme of reconstruction or amalgamation), being dissolved, compounding with its creditors or having a liquidator, supervisor, receiver, administrative receiver, administrator, compulsory manager, trustee or other similar officer appointed for the whole or any part of its assets or the taking of any corporate action, legal proceedings or other procedure or step (including the making of an application, the presentation of a petition, the filing or service of a notice or the passing of a resolution) in relation to

dissolution, liquidation, provisional liquidation, administration, administrative receivership or receivership, or any local equivalent of any of the foregoing

Initial Lot 1 Scope: engineering, procurement/fabrication, erection and commissioning and all other services and works relevant to the pump, turbine, generator and relevant auxiliaries of the **Kardia PHS,** as further detailed in Annex 2, Appendix 1 [Technical part of RFQ]

Lot 1 Scope: will be the **Initial Lot 1 Scope** appropriately adjusted, due to any evolution in the design, specifications, division of works and battery limits that will have been agreed by both **Parties** at the end of the **Early Engineering Agreement**

Lot 1 Contract: means the binding engineering, procurement and construction agreement that will be based on the Heads of Terms to be entered into between the **Employer** and the **Early Engineering Contractor**, for the **Lot 1 Scope** of the **Kardia PHS**

Lot 1 Contract Value: means the price that will be mutually agreed for **Lot 1 Contract**, which will include an indexation mechanism in respect of certain elements of the price in order to capture cost increases in respect of such elements

Lot 2 Scope: means the earthworks, architectural, civil works and electromechanical balance of plant of the **Kardia PHS**

Lot 2 Contract: means the engineering, procurement and construction contract for **Lot 2 Scope** to be entered into between the **Employer** and an EPC contractor

Kardia PHS means the proposed pumped hydro storage plant that meets the technical specifications detailed in Annex 2, Appendix 1 [Technical part of RFQ]

Project means the development of the **Kardia PHS** and associated infrastructure.

Representatives means, with respect to a **Party** and its **Affiliates**, its' employees, directors, offices, consultants, contractors, subcontractors, agents and professional advisers.

Tractebel: means the consultant that has been contracted by the **Employer** to perform the feasibility study and prepare the technical specifications of the **Kardia PHS**, that will work together with the **Early Engineering Contractor** and the **Employer** to further develop the design and specifications for **Lot 1 Scope** and to prepare the necessary design, specifications, quantities and drawings that will allow a tender for **Lot 2 Contract** to be issued.

Process means the negotiation of the **Lot 1 Contract** between the **Employer** and the **Early Engineering Contractor** (or any of their **Affiliates**), and the agreement on the final draft of **Lot 1 Contract** including all technical and commercial schedules.

The headings in this **Agreement** do not affect its interpretation.

THE STATUS OF THIS AGREEMENT AND THE LOT 1 CONTRACT

On the date on which the **Lot 1 Contract** is executed by both **Parties**, the terms of the **Lot 1 Contract** will automatically supersede this **Agreement** and this **Agreement** will cease to have any further effect and both **Parties** hereby waive all rights to claim against the other in connection with any actual or contingent liabilities under this **Agreement** which exist at the date of such cessation.

The **Parties** agree to use the **Heads of Terms** as the starting point for the **Process**.

Following completion of the **Early Engineering Contract** and subject to clause 6.3, the **Parties** hereby agree to work together in good faith to conclude the **Process** and sign the **Lot 1 Contract,** as soon as reasonably practical but in any event within the **Exclusivity Period**.

EMPLOYER'S OBLIGATIONS

During the **Exclusivity Period** the **Employer** must not solicit or otherwise encourage an offer for, or negotiate terms relating to, the **Process** or enter into the **Process** with anyone other than the **Early Engineering Contractor** or any of its **Affiliates**.

During the **Exclusivity Period**, the **Employer** will use reasonable endeavours to:

a. Ensure that **Tractebel** collaborates with the **Early Engineering Contractor** and timely and diligently performs the feasibility study and prepares the technical specifications of the **Kardia PHS.**
b. Prepare and launch a tender for **Lot 2** and nominate a preferred bidder for the **Lot 2 Contract**.

CONTRACTOR'S OBLIGATIONS

The **Early Engineering Contractor** agrees to assist the **Employer** in good faith in the development of the **Project** during the **Exclusivity Period** in all activities which may require its input, including but not limited to the fulfilment of the **Early Engineering Contractor**'s obligations under the **Early Engineering Agreement**.

The **Early Engineering Contractor** commits that the **Lot 1 Contract Value**, will not be higher than the **Base Price**, minus the value of the **Early Engineering Contract**, as reasonably adapted due to:

- agreed differences between the **Initial Lot 1 Scope** and the **Lot 1 Scope**
- mutually agreed between the **Parties** deviations from the **Heads of Terms**

The **Early Engineering Contractor** commits to finalize the **Process** and sign the **Lot 1 Contract,** as soon as reasonably practical after the completion of the **Early Engineering Contract**.

CONFIDENTIALITY OBLIGATIONS

The **Employer** and the **Early Engineering Contractor** acknowledge that the **Information** is confidential, and each **Party** receives the **Information** under a duty of confidentiality to the other **Party** and for the exclusive purpose of discussions and negotiations about the **Process**.

Each **Party** must:

a. keep confidential and not, directly or indirectly, disclose to any person, other than as permitted under paragraph (d), each **Party**'s interest in, and its discussions and negotiations with the other **Party** in connection with, the **Process**;
b. keep all **Information** confidential and not disclose any **Information** to any person, other than as permitted under paragraph (d);
c. use the Information solely for the purpose of pursuing the **Process** and not for any other purpose;
d. without the other **Party**'s prior written consent, not disclose any **Information** to any person other than:
    i. to its **Representatives** who, in each case, need to know the **Information** for the purpose of negotiating, advising on, or financing the **Process**;
    ii. to the extent required by law or by the regulations of a recognized stock exchange or any other regulatory body;

iii. to any of its **Affiliates** directly involved in the Project; or
iv. **Information** which is already in the public domain or has otherwise come into the possession of the relevant **Party** other than as a result of a breach of this **Agreement** or disclosure by the other **Party**.

e. procure that each person to whom disclosure of **Information** is made as permitted under paragraph (d) is made aware (in advance of disclosure) of the **Confidentiality Obligations** of this **Agreement** and use all reasonable endeavours to procure that each such person adheres to those **Confidentiality Obligations**; and
f. on written request by either **Party** made at any time after the end of the **Exclusivity Period**, destroy promptly all **Information** without keeping any copies.

Notwithstanding Clause 5.2(f) above, either **Party** and its **Affiliates** and **Representatives** may retain the **Information** if required to do so by law, rule or regulation, including the rules of an applicable professional body, or its bona fide internal document retention policies, provided that any such **Information** is kept confidential in accordance with the terms of this **Agreement**.

STEPWISE BINDING NEGOTIATION MECHANISM FOR LOT 1 SCOPE

The **Parties** agree that negotiations regarding the **Lot 1 Scope** shall take place in distinct and sequential rounds, each following the progress and findings of the **Early Engineering Contract**. The scope elements agreed upon in each round shall be recorded in writing and signed by both **Parties**, becoming binding and irrevocable for all subsequent rounds and for the final **Lot 1 Contract**. The **Early Engineering Contractor** shall not be entitled to dispute or delay the incorporation of such scope elements into the final contract.

The **Early Engineering Contractor** shall not have the right to modify, revoke, or renegotiate any agreed scope elements from a previous round, unless expressly approved in writing by the **Employer**. Any deviation from a previously agreed scope must be (i) directly linked to findings of the **Early Engineering Contract**, and (b) approved solely at the **Employer**'s discretion, without any obligation for **PPC** to accept proposed changes. The **Employer** shall have the right to reject any proposed modification if it considers that such modification (a) materially alters previously agreed terms, or (b) leads to an unjustified increase in cost or risk.

If the **Early Engineering Contractor** attempts to withdraw from, alter, or renegotiate an agreed scope element in subsequent rounds, the **Employer** shall have the right to immediately suspend further negotiations until compliance is restored.

If the **Early Engineering Contractor** persistently fails to comply with prior agreements on scope, the **Employer** shall have the right to (i) terminate negotiations unilaterally and exclude the **Early Engineering Contractor** from the final **Lot 1 Contract**; (ii) seek alternative procurement solutions for the relevant scope elements; (iii) recover costs associated with the breach, including expenses from the **Early Engineering Contract** and potential cost differentials from engaging an alternative contractor.

TERMINATION

Either **Party** may serve a notice of termination on the other **Party** on any of the grounds set out in clause 7.3, upon receipt of which this **Agreement** will automatically terminate with immediate effect and save clause 6.4 (iii) neither **Party** will be liable to the other for any costs and/or losses arising out of or in connection with such termination.

This **Agreement** may only be terminated in accordance with the express provisions of this clause 7.

The Employer may terminate at any time if:
a. during the **Exclusivity Period**, it decides not to proceed with the **Project**

b. the **Exclusivity Period** has expired and the **Process** has not completed
c. during the **Exclusivity Period** the **Contractor** fails to comply with any of its obligations under Clause 4 and Clause 6
d. The **Early Engineering Contractor** becomes **Insolvent**

The **Early Engineering Contractor** may terminate at any time if:
a. the **Exclusivity Period** has expired and the **Process** has not completed.
b. the **Employer** becomes **Insolvent**

Notwithstanding clause 7.1, the Employer is entitled to claim from the **Early Engineering Contractor** the entire value of the **Early Engineering Contract** if the **Employer** terminates this **Agreement** as a result of the **Early Engineering Contractor's** failure to comply with its obligations under 4.2 or 4.3.

Clauses 1, 5 and 9 to 12 inclusive of this **Agreement** remain in full force notwithstanding service of a termination notice. Clause 5 shall remain in force until the date falling five (5) years after the date of this **Agreement**. A termination notice does not affect the **Employer**'s accrued rights in connection with any breach of this **Agreement** by the **Early Engineering Contractor**, or the **Early Engineering Contractor**'s accrued rights in connection with any breach of this **Agreement** by the **Employer**, which may have occurred before the termination notice is served.

For the avoidance of doubt all of the rights in, and any materials produced in connection with, the works carried out under this **Agreement** shall belong to the **Employer**.

COSTS

Each **Party** at its exclusive risk shall bear its own costs related to this **Agreement**, unless otherwise mutually agreed in advance in writing.

CONSEQUENTIAL LOSS

No **Party** shall be liable to the other **Party** for any loss of profits, loss of revenue, loss of contract, loss of permit, loss of use, loss of goodwill, loss of opportunity (including where such losses are considered foreseeable or direct losses) or any other indirect, consequential or special loss or damage of any nature whatsoever. For the avoidance of doubt Employer's claims under clauses 6.4 (iii) and 7.4 do not fall under this clause 9.1 under any circumstances.

WARRANTIES

Each of the **Parties** warrants to the other that it has full power and authority to enter into this **Agreement** and carry out the actions contemplated under this **Agreement**, and that its entry into and performance under the terms of this **Agreement** will not infringe the rights of any third party or cause it to be in breach of any obligations to a third party.

GENERAL

None of the **Parties** shall be entitled to hold itself out as being the agent of the other **Party** for any purpose whatsoever without receiving the prior written consent of the other.

Nothing in this **Agreement** shall create a partnership between the **Parties**.

The **Employer** may assign, transfer, novate, or otherwise dispose of any or all of its rights and obligations under this **Agreement**, in whole or in part, without requiring the **Early Engineering Contractor**'s consent, to (a) any Affiliate of the **Employer**; or (b) any financial institution, lender, or security agent providing debt financing, refinancing, or Project-related funding, including any trustee or nominee acting on their behalf. The **Early Engineering Contractor** shall, upon request by the **Employer**, execute all necessary documents and provide all reasonable cooperation to effect any such assignment, transfer, or novation, provided that such

assignment does not materially increase the **Early Engineering Contractor**'s obligations or liabilities under this **Agreement**.

The **Early Engineering Contractor** shall not assign, transfer, novate, or subcontract any of its rights or obligations under this Agreement without the prior written consent of the **Employer**, which shall not be unreasonably withheld.

GOVERNING LAW AND JURISDICTION

This **Agreement** and any non-contractual obligations arising out of or in connection with it shall be governed by and construed in accordance with laws of Greece.

The Greek courts have exclusive jurisdiction to settle any dispute arising out of or in connection with this **Agreement** (including a dispute relating to any non-contractual obligations arising out of or in connection with this **Agreement**) and the **Parties** submit to the exclusive jurisdiction of the Greek courts.

The **Parties** waive any objection to the Greek courts on grounds that they are an inconvenient or inappropriate forum to settle any such disputes.

This **Agreement** has been signed by the **Parties** (or their duly authorised representatives) on the date stated at the beginning of this **Agreement**.

SIGNATORIES

ANNEX 1
Heads of Terms

ANNEX 2
Early Engineering Contract