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REQUEST FOR PROPOSAL OF COOLING TOWER SYSTEMS

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1. PURPOSE

This Request for Proposal (RFP) invites qualified and experienced Engineering Consultants to submit a comprehensive proposal for providing complete Engineering Design, Procurement and Tendering Technical Support, purchasing phase technical support, and Expert Resident Supervision services covering all Construction, Testing, Pre-commissioning, and Commissioning activities for the Wet Cooling Tower System of the power generation plant.

The selected Consultant shall be responsible for all activities from basic design and optimization studies through the development of detailed engineering and technical procurement documents (including Material Requisitions and Tender Dossiers), and culminating in expert resident supervision of construction, testing, pre-commissioning, and commissioning, to ensure the temporary handover of a fully functional cooling system.

2. SCOPE OF WORK

The scope encompasses complete engineering, Procurement and supervision services for the Main Cooling Tower of the project, including all its subcomponents and parts (such as fill, drift eliminators, nozzles, basins, fans, gearboxes, motors, structural framing, and mechanical equipment). Additionally, the scope includes the engineering requirements specification for the cooling tower's interfaces with other systems.

The work is divided into six main phases, with Phase 1 being mandatory for this contract and other Phases subject to future addenda.

2.1. PHASE 1: STUDIES, SIMULATION & BASIC DESIGN

this phase shall freeze the design philosophy and develop all Basic Engineering documents required for definitive cost estimation and procurement planning. Deliverables shall include, but are not limited to:

- Process Design Basis, Basic Process Flow Diagrams (PFDs), and Piping & Instrumentation Diagrams (P&IDs).
- Terminal Point List with complete interface specifications (water quality, control signals, electrical connections).
- Basic Civil/Structural Drawings: Plot plans, foundation layouts, and structural drawings for cells, basin, and fan deck.

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- Basic Mechanical Deliverables: General Arrangement drawings, equipment layout, datasheets for major equipment (cooling tower, fans, motors, pumps), and preliminary mechanical calculations.
- Basic Electrical Documents: Preliminary Load List, Single Line Diagram, equipment layout, and protection philosophy.
- Basic Instrumentation & Control (I&C) Documents: Preliminary I/O List, Instrument Index, control & interlock philosophy, and cause & effect matrix.
- Preliminary Safety (HSE) and Quality (QA/QC) plans and requirements.
- Preliminary Bill of Materials (BOM) and Material Take-Offs (MTO).

2.2. PHASE 2: DETAILED ENGINEERING DESIGN & PROCUREMENT DOCUMENTATION (Subject to Addendum)

This phase shall produce all detailed engineering documents necessary for construction, fabrication, procurement, and commissioning. A core component of this stage is the preparation of technical procurement documents. Key deliverables include:

- Detailed Engineering Documents: Detailed fabrication & construction drawings (civil, structural, mechanical, piping isometries, electrical, I&C loop diagrams), detailed equipment datasheets, and final material take-offs (MTOs).
- Complete Tender & Procurement Dossier:
 - Material Requisitions (MRQs) and Technical Specifications for Mechanical, Electrical, I&C, and Fire Protection systems.
 - Vendor Document Requirement Lists (VDRLs) for all major equipment.
 - Technical Bid Analysis (TBA) framework and evaluation criteria.
 - Bill of Quantities (BOQ) and Unit Price Lists derived from the final MTOs.
 - Detailed Project Master Schedule.
- A comprehensive Project Quality Plan (PQP) and Inspection & Test Plans (ITPs).

The successful completion and approval of each stage are mandatory prerequisites for commencing the next stage. All deliverables, including native file formats, shall be submitted to the Client for review and approval.

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2.3. PHASE 3: TENDER PROCESS TECHNICAL SUPPORT (Subject to Addendum)

This phase involves providing specialized technical support to the Client during the tender and procurement processes following the completion of Phase 1 deliverables. It is divided into two main stages:

In this phase, the Consultant shall provide technical support to the Client during the project tender process based on the Phase 1 documentation. Key activities include:

- Preparation and issuance of Tender Documents based on Phase 1 outputs.
- Management of Tender Clarifications: Receiving, categorizing, and preparing technical responses to Bidder's Requests for Information (RFIs).
- Technical Bid Evaluation (TBE): Conducting detailed technical evaluation of received proposals (for up to 5 bidders) against the pre-defined criteria and the TBA framework developed in Phase 1.
- Preparation of a Technical Bid Evaluation (TBE) Report and providing technical recommendations to the Client.

2.4. PHASE 4: PROCUREMENT & VENDOR DOCUMENT REVIEW TECHNICAL SUPPORT (Subject to Addendum)

Following the selection of the contractor/vendor, the Consultant shall continue technical support during the procurement and contracting phase. Key activities include:

- Technical support during final negotiations with the selected vendor.
- Vendor Document Review (VDR): Thorough review and approval of all documents that the vendor/contractor is obligated to submit per the VDRL (e.g., workshop drawings, calculations, test procedures) for compliance with the contractual technical specifications.
- Witnessing of Factory Acceptance Tests (FAT): Attendance and supervision of FAT for major equipment and reporting.
- Technical support in managing technical variations during the procurement stage.
- Key Deliverables for this phase: Tender Technical Evaluation Reports (TBE), Vendor Document Review (VDR) reports, FAT witnessing reports, and technical minutes of meetings.

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2.5. PHASE 5: CONSTRUCTION & ERECTION SUPERVISION (Subject to Addendum)

This phase involves the provision of full-time, expert resident supervision services to ensure the constructed system conforms to the design documents, specifications, and quality standards.

In this phase, the Consultant shall provide on-site, resident supervision covering all construction and mechanical erection activities. Key responsibilities include:

- **Technical support of the construction contractor:** The Consultant shall provide proactive technical assistance to the construction contractor during all construction and erection phases. This includes clarifying design intent, interpreting drawings and specifications, proposing practical solutions to site-specific challenges, evaluating construction alternatives, responding to technical queries (TQs), and facilitating the resolution of engineering issues that arise on site. Such support aims to prevent delays, reduce rework, and ensure that the contractor's execution aligns efficiently with the design requirements.
- **Quality Assurance/Quality Control (QA/QC):** Monitoring and inspecting all site activities, including civil works (foundations, structures), mechanical erection (piping, equipment installation), and electrical/instrumentation installation to ensure compliance with approved drawings and specifications.
- **Progress Monitoring & Reporting:** Verifying construction progress against the approved schedule and providing daily/weekly progress reports to the Client.
- **Health, Safety & Environment (HSE) Supervision:** Monitoring the Contractor's adherence to the project HSE plan and relevant regulations.
- **Review of Contractor's Site Deliverables:** Reviewing and commenting on the Contractor's method statements, inspection & test plans (ITPs), and as-built documentation.
- **Non-Conformance Management:** Identifying, documenting, and tracking the resolution of any non-conformances or defects.

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2.6. PHASE 6: Pre-Commissioning, Commissioning, and Performance Tests Supervision (Subject to Addendum)

This phase involves the provision of full-time, expert resident supervision services during pre-commissioning, commissioning, and performance testing to ensure that all systems and components are properly tested, started up, and demonstrated to meet the specified design and operational requirements.

- In this phase, the Consultant shall provide on-site, resident supervision covering all pre-commissioning, commissioning, and performance test activities. Key responsibilities include:
- **Technical support to the construction/commissioning contractor:** The Consultant shall provide proactive technical assistance during all pre-commissioning and commissioning activities. This includes reviewing and approving commissioning procedures, interpreting test requirements, troubleshooting start-up issues, responding to technical queries (TQs), and facilitating resolution of engineering problems encountered during system turnover, cold and hot commissioning, and performance testing. Such support aims to ensure a safe, systematic, and efficient transition from construction to commercial operation.
- **Pre-Commissioning oversight:** The Consultant shall verify that all pre-commissioning activities (e.g., cleaning, flushing, drying, leak testing, component functional checks, loop checks, and rotation checks) are completed in accordance with approved procedures and manufacturer recommendations. The Consultant shall confirm that systems are ready for safe introduction of energy, fluids, or operating media.
- **Commissioning supervision:** The Consultant shall witness and supervise all commissioning activities, including first energization, initial start-up, system synchronization, load ramp-up, and operation at various load conditions. The Consultant shall verify that commissioning follows the approved sequence, respects safety limits, and complies with design specifications.
- **Performance tests supervision:** The Consultant shall oversee all performance tests (e.g., capacity, efficiency, heat rate, power output, emission levels, vibration, noise) to demonstrate that the completed system meets the guaranteed performance criteria. The Consultant shall ensure that test instruments are calibrated, test conditions are stable, and test procedures conform to applicable codes (e.g., ASME PTC, ISO, or project-specific standards). The Consultant shall witness data collection, verify calculations, and endorse final test results.

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- **Quality Assurance/Quality Control (QA/QC) for commissioning:** The Consultant shall monitor and inspect all commissioning and test activities to ensure compliance with approved procedures, safety standards, and contractual performance requirements. This includes verifying that all pre-requisite inspections, safety checks, and permits have been obtained before each commissioning step.
- **Progress monitoring & reporting:** The Consultant shall track commissioning and testing progress against the approved schedule, identify delays or constraints, and provide daily/weekly progress reports to the Client, including any deviations, test results, and outstanding punch-list items.
- **Health, Safety & Environment (HSE) supervision:** The Consultant shall monitor the Contractor's adherence to the project HSE plan during all commissioning and testing activities, with special attention to high-risk operations such as high-pressure, high-temperature, rotating equipment, and electrical energization.
- **Review of contractor's deliverables:** The Consultant shall review and comment on the Contractor's pre-commissioning/commissioning procedures, test plans, loop folders, start-up checklists, performance test protocols, and operating & maintenance manuals prior to execution.
- **Non-conformance & punch-list management:** The Consultant shall identify, document, and track the resolution of any non-conformances, deficiencies, or punch-list items discovered during pre-commissioning and commissioning. The Consultant shall verify that all critical items are closed before performance testing and that all remaining items are properly recorded for warranty follow-up.
- **Witnessing and sign-off:** The Consultant shall prepare or endorse formal certificates for each commissioning milestone (e.g., system ready for start-up, first fire, first synchronization, provisional acceptance, performance test acceptance) and shall recommend to the Client when to issue taking-over certificates or accept the system for commercial operation.

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3. TECHNICAL REQUIREMENTS & DESIGN BASIS

3.1. DESIGN ASSUMPTIONS & BID BASIS

The Bidder shall clearly state all design assumptions, preliminary process data, and engineering bases used for preparation of proposal, including but not limited to:

- Condenser heat load
- Cooling water flow rate
- Supply and return water temperatures optimized based on weather condition range
- Design approach and range
- Number of cooling tower cells

The proposed design point (approach, range, cell configuration) shall be the result of a techno-economic optimization study.

3.2. Plant and Site Data

- Gross/Net Electrical Output: ~325 MWe / ~300 MWe.
- Condenser Heat Load: [To be defined based on cycle balance].
- Condenser Inlet Steam Conditions: Mass flow rate of approximately 1200 ton/h, at an absolute pressure of 0.1 bar in normal operating condition.
- Site Location: Khuzestan province, east bank of Karun River.
- Elevation: 7.5 m above sea level.
- Ambient Design Conditions:
 - Normal Design Dry/Wet Bulb: +26.4°C / +17.82°C
 - Critical (1% Exceedance) Dry/Wet Bulb: +46.7°C / +28.2°C
 - Absolute Max/Min Temperature: +54°C / -2°C
 - Max Wind Velocity: 17 m/s
- Seismic Design: Structures shall be designed per ASCE 7-10 for Conventional SSCs with a horizontal PGA of 0.165g and vertical PGA of 0.11g (475-year recurrence). Safety-Related SSCs per ASCE 4 with PGA 0.37g (horizontal) and 0.245g (vertical) (10,000-year recurrence).

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3.3. Process & Performance Requirements

- System Type: Mechanical Draft, Wet Cooling Tower with basin.
- Cooling Water Flow & Temperature Range: based on the condenser inlet steam conditions and the selected design approach.
- Approach & Range: Optimized based on techno-economic study.
- Drift Loss: Shall not exceed the limit specified in the relevant environmental standard or project
- Guaranteed Performance: The cooling tower shall guarantee the supply of cooling water at the required temperature to condense the specified steam flow under all design operating conditions, from Normal to 1% exceedance ambient wet-bulb temperatures.
- Materials: All materials (fill, structure, basin) must be suitable for the chemical composition of the project's water source and the specified environment (corrosion resistance).

3.4. Codes & Standards

A. Core Cooling Tower Design, Construction & Performance Standards

- 1 Cooling Technology Institute (CTI) Codes, including but not limited to: ATC-105, ATC-140, STD-201, Bulletin V.
- 2 ASME PTC 23, Atmospheric Water-Cooling Equipment (Performance Test Code).
- 3 IPS E-PR-790, Engineering Standard for Process Design of Cooling Towers.

B. Mechanical, Piping & Equipment Standards

- 4 ASME Boiler and Pressure Vessel Code, Section VIII, Div. 1 or 2 (for any pressurized vessels).
- 5 ASME B31.1, Power Piping.
- 6 Hydraulic Institute (HI) Standards (for Circulating Water & Make-up Water Pumps).
- 7 API 610 / ISO 13709, Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries.

C. Structural & Civil Standards

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8 ASCE 7, Minimum Design Loads for Buildings and Other Structures (for wind, seismic, snow loads).

9 AISC 360, Specification for Structural Steel Buildings.

10 ACI 318, Building Code Requirements for Structural Concrete.

D. Electrical & Instrumentation & Control (I&C) Standards

11 IEC 60034 (Series), Rotating Electrical Machines (for fan and pump motors).

12 IEEE 841, Standard for Petroleum and Chemical Industry - Severe Duty Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors.

13 IEC 60529 / ISO 20653, Degrees of Protection Provided by Enclosures (IP Code).

14 IEC 61131 (Series), Programmable Controllers (for control system PLC).

15 ANSI/ISA-5.1, Instrumentation Symbols and Identification.

E. Materials, Corrosion & Coatings Standards

16 ASTM International Standards (relevant to steel, concrete, polymers, coatings, and corrosion testing).

17 ISO 12944, Paints and Varnishes – Corrosion Protection of Steel Structures by Protective Paint Systems.

18 NACE SP0108 / ISO 20340, Corrosion Protection of Steel Structures by Protective Paint Systems in Atmospheric Environments.

F. Mandatory National & Local Standards

19 Iranian Standard No. 2800 (Standard for Seismic Resistant Design of Buildings).

20 Iranian National Building Regulations (Particularly Section 6, Loads on Structures).

21 Regulations and Instructions of Iran's Power Generation, Transmission & Distribution Management Company (Tavanir).

G. Quality, Health, Safety & Environmental (HSE) Standards

22 ISO 9001, Quality Management Systems.

23 ISO 14001, Environmental Management Systems.

24 ISO 45001, Occupational Health and Safety Management Systems.

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4. DELIVERABLES

The Consultant shall submit the following deliverables in both native/editable file formats and review-ready PDF format. Deliverables are organized according to the project phases and stages.

4.1. Phase 1 Deliverables, Basic Engineering Design

- Basic Engineering Document (BED) Package, containing:
 - Process: Process Design Basis, Basic PFDs and P&IDs, Heat & Mass Balance.
 - Civil/Structural: Plot plans, foundation layout drawings, preliminary structural drawings and calculations.
 - Mechanical: General Arrangement (GA) drawings, equipment layout, preliminary datasheets for major equipment (cooling tower cells, pumps, fans), and piping specifications.
 - Electrical: Preliminary Single Line Diagram (SLD), load list, equipment layout, and protection philosophy.
 - Instrumentation & Control (I&C): Preliminary I/O List, Instrument Index, control narrative, and Cause & Effect diagrams.
 - Other: Preliminary Bill of Materials (BOM), Material Take-Off (MTO), and HSE/QA plan.

4.2. Phase 2 Deliverables, – Detailed Engineering & Procurement Documentation

- Detailed Engineering Document (DED) Package, containing all for-construction and for-fabrication documents, including:
 - Detailed Drawings: Civil/Structural fabrication drawings, mechanical detail drawings, piping isometric drawings, electrical cable routing and termination drawings, I&C loop diagrams and installation details.
 - Final Specifications & Datasheets: Final, purchase-ready technical specifications and datasheets for all equipment and bulk materials.
 - Final Calculations: Detailed thermal, hydraulic, structural, and electrical calculations.
- Complete Tender & Procurement Dossier, ready for issuing to EPC contractors, including:

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- Material Requisitions (MRQs) for all packages.
- Vendor Document Requirement Lists (VDRLs) for all major equipment.
- Technical Specifications.
- Bill of Quantities (BOQ) and Price Schedule.
- Technical Bid Analysis (TBA) forms and evaluation criteria.
- Draft EPC Contract Technical Exhibits.

4.3. Phase 3 Deliverables

- Tender Clarification (RFI) responses.
- Technical Bid Evaluation (TBE) Reports for pre-qualified bidders.

4.4. Phase 4 Deliverables

- Vendor Document Review (VDR) logs and approval certificates.
- Factory Acceptance Test (FAT) procedures, witnessing reports, and certificates.

4.5. Phase 5 deliverables

- Daily/Weekly Site Supervision Reports.
- Quality Inspection & Test Reports (ITRs) and Non-Conformance Reports (NCRs).
- Marked-up As-Built drawings.
- Commissioning Test Procedures, reports, and punch lists.
- Performance Guarantee Test (PGT) report and compliance certificates.
- Final Project Close-Out Report.

4.6. Phase 6 deliverables

- Daily/Weekly Site Supervision Reports (covering commissioning activities).
- Pre-Commissioning Readiness Assessment Reports.
- Review Comment Logs for Contractor's Commissioning Procedures, Test Plans, and Loop Folders.

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- Commissioning Test Procedures (reviewed/endorsed) and Commissioning Test Reports.
- Punch Lists and Non-Conformance Reports (NCRs) specific to commissioning.
- Performance Guarantee Test (PGT) Report and Compliance Certificates.
- System Turnover and Milestone Certificates (e.g., Ready for Start-up, Provisional Acceptance).
- Final Commissioning Close-Out Report.

5. PROPOSAL SUBMISSION REQUIREMENTS

The proposal must be submitted in English and include two separate sealed volumes:

Volume 1: Technical Proposal

- Table of Contents & Executive Summary
- Understanding of Scope & Technical Approach: A detailed narrative demonstrating a thorough understanding of the project objectives, technical challenges (site conditions, performance requirements), and the overall engineering philosophy.
- Detailed Methodology & Work Plan: A comprehensive description of the proposed methodology for each Phase and Stage as defined in Section 2 (Scope of Work). This must include specific approaches for conceptual optimization, CFD simulation strategy, engineering design processes, and quality assurance/control measures.
- Company Profile & Relevant Experience:
 - Description of the company and its core competencies.
 - List of at least three (3) relevant and successfully completed projects within the last ten (10) years. For each project, provide: project name and location, client name and contact information (with prior consent), contract value, project duration, and a brief description of services rendered that are similar to this RFP.
 - Overall company organizational chart and the proposed dedicated project organization chart.
- Curriculum Vitae (CV) of Key Personnel: Detailed resumes for the proposed Project Manager, Lead Process Engineer, Lead Mechanical/Structural Engineer, and Lead

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CFD Specialist. CVs must clearly state the individual's role in the referenced similar projects and their committed percentage of time to this project.

- Preliminary Project Schedule: A detailed Gantt chart for Phase 1 only, clearly showing all activities, durations, dependencies, milestones, and key deliverables as per Section 4, aligned with the overall timeline in Section 5.
- List of Proposed Subcontractors (if applicable): For any specialized service to be subcontracted (e.g., advanced CFD analysis), provide the subcontractor's name, their specific scope, and their relevant experience.
- Clarifications, Assumptions & Exceptions: A tabulated list of any questions requiring clarification, assumptions made in preparing the proposal, and any exceptions taken to the requirements of this RFP. Each exception must include a detailed technical and commercial justification.

Volume 2: Commercial Proposal

- Detailed Price Breakdown (BOQ): A fixed, all-inclusive lump sum price in US Dollars (USD) for the complete and satisfactory execution of Phase 1 (Stages 1, 2, and 3). The price must be broken down in alignment with the deliverables listed in Section 4.1 and the project stages. A clear breakdown of engineering man-hours per discipline, software/licensing costs, and any other direct costs is required.
- Payment Schedule: A proposed schedule of payments, linked to the successful completion and Client approval of key deliverables and milestones defined in Section 4.1.
- Proposed Terms & Conditions: The Bidder's standard terms and conditions or a mark-up of the Client's draft contract (if provided), highlighting any proposed deviations.
- Validity of Offer: A statement confirming that the commercial offer is valid for a minimum period of one hundred and twenty (120) calendar days from the proposal submission.

6. SCOPE OF WORK

Figure 1 illustrates the overall scope of services to be provided by the Engineering Consultant for the Wet Cooling Tower System of the Power Generation Project. The Consultant's responsibilities cover the complete engineering lifecycle of the cooling tower system, beginning with studies, simulation, and basic engineering design, followed by the development of detailed engineering and procurement documentation, and continuing with technical support during tendering and procurement processes.

	DOC. CODE	PROJ.	ST.	PROD.	DOC.	ISL. / BUILD.	DISC.	SYSTEM	SERIAL	REV.	
	REQUEST FOR PROPOSAL OF COOLING WATER SYSTEMS										
CONT. DOC. CODE	POWER PLANT'S COOLING TOWER PROJECT										PAGE
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In addition, the Consultant may be required to provide expert resident supervision during the construction, testing, pre-commissioning, and commissioning phases to ensure that the cooling tower system is implemented in full compliance with the approved engineering documents, technical specifications, and project quality requirements. The scope also includes coordination with all interfacing plant systems and support to the Client to ensure successful completion and temporary handover of the cooling tower system.

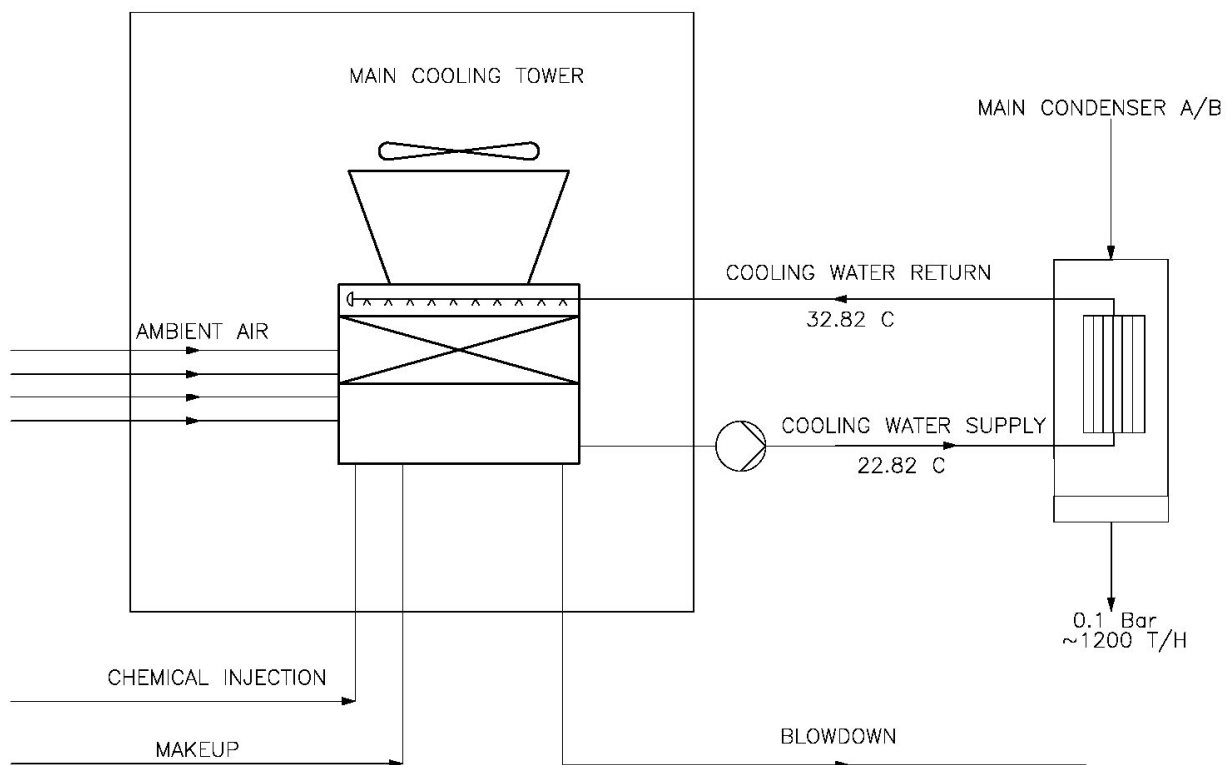


Figure 1: Overall Scope of Services for the Engineering Consultant