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Qulliq Energy Corporation
Société d'énergie Qulliq
Qulliq Alruyaktuqtunik Ikumatjutilit

REQUEST FOR PROPOSAL

Qulliq Energy Corporation (QEC)

Construction of New Diesel Power Plant at Kugluktuk, Nunavut

Chapter 01 **Scope of Work**

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1- INTRODUCTION:

Kugluktuk power plant was constructed in 1968. The existing plant has a total capacity of 2195 KW. The power plant requires replacement due to the age of the facility and numerous problems related to infrastructure, equipment and safety.

The new power plant has to be built on lot 461 & 462 near the Petroleum Product Division's (PPD) tank farm at southwest corner of Kugluktuk Drive and Coronation Drive. The new power plant location will be outside of community with coordinates of 67°49'23.3"N 115°07'15.3"W in Kugluktuk, Kitikmeot region, Nunavut.

The project has three major components: Build new power plant, build two vertical fuel tanks and build grid connected 500KW solar panel in anticipated lot 459 and 460.

The work set out in this RFP is "DESIGN-BUILD" approach- The successful Contractor will design, procure and supply all required materials/equipment to Kugluktuk plant construction site. The Contractor will construct and commission new power plant that consists of but not limited to 4-gensets lineup including all ancillary systems with a total rated (continuous) minimum capacity of 2600 KW, two Outdoor vertical fuel storage tanks (1.2 million liter capacity each) with all-ancillary requirements and also build grid connected 500KW ground mounted Photovoltaic (PV) solar panel system with Battery Energy Storage System (BESS) option for transition from solar to diesel or vice versa.

This document shall be read in conjunction with the required design criteria specified in chapter 02 to 05, health, safety & environment (HS&E) in chapter 06 and appendixes & forms.

2- GENERAL OUTLINE:

The scope of work includes but not limited to all labor, material, equipment and services for planning, design (conceptual and detail), fabrication, supply, transportation and delivery, loading/off-loading, construction, project management, risk management, commissioning, testing and training require to build the new power plant with fuel storage and grid integrated PV system.

Following outlines but not limited to shall be considered by the Contractor

- a) Detail engineering design and construction of new Kugluktuk power plant shall be suited for Arctic Climate Conditions (extreme cold, blizzard and heavy snow accumulation) and will operate 24 hours per day and 365 days/year with four (4)-generator sets line up provision.
- b) Contractor shall review QEC provided Greenhouse Gas Mitigation & Climate Resilience Assessment reports and implement recommendation(s) as required for plant and PV installation.
- c) New power plant building shall be architecturally and structurally design to meet 40 years of life span.
- d) The new gensets and ancillary equipment shall be designed in anticipation of operating 8,000 hours per year at the continuous rating for a total life of 100,000 hours.
- e) Contractor shall be responsible to conform or perform geotechnical survey or any other study, if it deems necessary for foundation calculation, plant building orientation to avoid snow accumulation, design or other engineering requirement.

- f) Successful Contractor shall perform site visits to prepare plant, fuel tanks and PV system layout and to understand site engineering design requirements.
- g) Contractor shall develop detail engineering design, construction specifications and drawings and provide QEC to review.
- h) Contractor shall design, construct and commission grid integrated 500KW Photovoltaic (Solar panel) system with BESS to provide hybrid generation.
- i) Contractor shall design Battery Energy Storage System (BESS) with intension to provide support during transition from PV to Diesel.
- j) Contractor shall consider Chapter 05 for conducting study, concept development, detail design for PV system and for integration to QEC grid
- k) Contractor shall provide operational training to the plant operator

3- ENGINEERING SERVICES OUTLINE:

3.1 Architecture/Civil/Structure

- a) All work shall be in according to applicable codes & standards, regulations of local jurisdictions, QEC standards and safety regulations
- b) Design shall include Architectural, Structural and Civil calculation for Building, indoor & outdoor materials/equipment as define in design criteria (refer Chapter 02)
- c) Construction specification for Plant building and Site shall be based on battery limits (see section 10)
- d) Space for PV System's equipment shall be allocated inside power plant building.
- e) Civil & Structural requirements for PV system shall consider but not limited to Chapter 05.
- f) Snow accumulation and wind drifting studies shall be conducted by Contractor to finalize the orientation of plant building and outdoor equipment.

3.2 Mechanical & Piping:

- a) Calculation and analysis for residual heat recovery from engines shall be provided that will be utilized for plant heating and future district heating system (DHS) for community.
- b) Detail and Complete engineering design and calculations including piping network shall be provided for following systems but not limited to:
 - o Fuel system
 - o Lube oil system
 - o Genset Exhaust system
 - o Genset Air intake system
 - o Genset Cooling system
 - o Ventilation and Plant heating (HVAC) system
 - o Residual heat recovery from Engine jacketed water for plant heating & future district heating
 - o Engine Start – Compressed Air system
 - o Service air system
- c) Outdoor Vertical diesel storage tanks shall be single walled field fabricated, design as per API 650 requirements and NU regulations
- d) Indoor diesel storage Day tanks shall be double walled (ULC listed).
- e) Design shall include equipment maintenance, heavy parts replacement provision and safety based on industrial best practices for the following but not limited to:
 - o Generators – Overhead bridge crane (electrically operative)

- HVAC unit
- Outdoor Radiator
- Transformers
- a) Easy access to every equipment, valves and piping systems for maintenance and operational purposes shall be considered
- b) Five (5) storage tanks for maintenance purposes (waste oil, lube oil, new and used ethylene glycol and propylene glycol) with transfer pumps, measuring equipment, gauges etc. shall be included in proposal
- c) All piping, piping support, plumbing, ventilation and drainage work shall be part of construction scope.
- d) All painting and coating system shall be as per QEC guidelines **(Refer Appendix ESM- F & G)**

3.3 Electrical /Instrumentation:

- a) Equipment engineering design calculation / load and size calculation shall be provided
- b) Detail and Complete Electrical/Instrumentation/ Automation design shall be provided for following systems but not limited to:
 - Motor Control Center
 - Indoor Switchgear
 - Outdoor switchgear (One to One Transformers , Bus, Distribution panel & Recloser)
 - DC system (Battery, Battery Charger) and Inverter for critical power supply, if applicable.
 - Black start generator (emergency genset)
 - Electrical Motors for equipment (Fuel, Glycol, Lube circulation system, Engine, HVAC system, etc.), devices and controls.
 - PLC, Genset and equipment controls, Local Engine Control Panel (LECP), Remote Terminal unit (RTU) and Human machine interface (HMI) to integrate with QEC SCADA
- c) Fire Alarm and Fire suppression system design shall be according to QEC safety guidelines
- d) Detail Design/Calculation for power plant communication system shall be developed
- e) Design shall include common grounding network around the power plant for Diesel storage tanks, fence, structures and other equipment inside and outside the facility.
- f) Design shall include Interior, exterior lighting and emergency lighting
- g) Outdoor visual alarm and indoor visual and audible alarm for operational malfunctioning shall be included in design
- h) Auto dialer-Dual Redundant systems for fire alarm to notify Fire department, Plant operators and Main Power Plant (Iqaluit) shall be included in design
- i) Telephone and fax lines for office, control room auto-dialer and PLC modem shall be part of design and shall be in scope of Contractor's work
- j) Integration of PV system with Diesel generation and BESS shall be the responsibility of the contractor and minimum QEC requirements and mentioned in Chapter 05.

3.4 Others

- a) Design shall include Emergency shower, eyewash station, First aid Kits and portable Fire extinguishers selection in accordance with QEC guidelines.
- b) Above items , shall be marked in the plant layout drawing
- c) Washroom and its associated accessories including water tank and sewage storage tank shall be included in the Design and be the Scope of Contractor's work

- d) Shall allocate and Design designated area on site for handling waste oil and glycol drum with secondary containment to maintain environmental requirement as per Nunavut act and regulation
- e) Shall provide specification for Dry Powder type fire extinguishers, safety signage, markers, permanent nameplate etc.
- f) Shall be responsible to transfer telephone and internet system from old (existing plant) to new power plant during substantial completion stage under supervision of QEC plant operator, QEC IT and commissioning team

3.5 Design Phase:

Contractor requires efficient schedule management from design to project handover. Engineering design timeline shall be in line with Kugluktuk tight sealift season window and construction requirement. Following phases of project life cycle shall be considered during proposal submission:

3.5.1 Design sequence:

- a) Contractor to develop detail draft design from QEC conceptual design
- b) QEC to review draft design
- c) Contractor to make revision to the draft design
- d) QEC & Contractor are to accept the design
- e) Contractor to prepare Stamped Issue for Construction - IFC drawings package and release for execution.

3.5.2 Design Coordination:

- a) Project design coordination shall be through Kickoff meeting, progress update through teleconference , Email correspondence and design review meetings or any other means through discussion later with mutual understanding
- b) Provide Design schedule and submit 2 (two) weeks look ahead schedule to monitor/review design progress in detail to ensure integrity of Critical Path.

3.5.3 Design Stages:

Detailed design submission shall be in following stages. Each stage shall need to complete prior to move to the next stage.

- 25% Design
- 50% Design
- 90% Design
- IFC Release

Minimum requirements for each stage is shown in following matrix:

Design Stage	Civil/ Architectural/Structural	Mechanical & Piping	Electrical & Automation	Others
25% Design (Issue for Review)	Preliminary Site and Plant layout	Preliminary Equipment layout dwgs.		
	Authentic Environmental Data	Preliminary P&ID & Block diagram	Single line diagram (SLD)	Document control list

Design Stage	Civil/ Architectural/Structural	Mechanical & Piping	Electrical & Automation	Others
50% Design (Issue for Review)	Structural calculations	Developed Equipment layout dwgs.	Complete Electrical load calculation (AC & DC)	
	Snow drifting, wind and geotechnical study	Developed Block diagram	Preliminary electrical load sizing	Document control list
	Developed Plant, Fuel tanks and PV System layout	Preliminary Power plant, Fuel tank and PV system design calculations	Genset & PV System complete specs	Document Distribution Transmittal log
	Developed Site layout	Updated P&IDs	Block diagram of control and protection system	
	Building floor plan & Elevations		Single Line Diagram of the Power Plant & PV system Auxiliary Circuits	
	Foundation plan		Preliminary PLC & Controller/Program	
	Painting details and color plan			

Design Stage	Civil/ Architectural/Structural	Mechanical & Piping	Electrical & Automation	Others
90% Design (Issue for Review)	Structural & Architecture details and material specification	Updated P&IDs	Protection and Control diagrams (AC and DC)	Eye Wash & Safety equipment details
	Site Plan including details and section views	Power plant & PV systems design calculations	Auxiliary 3-line Diagrams	Preliminary Fire suppression and Fire Alarm details
	Building floor plan & Elevations with details & section views	Mechanical equipment design and construction specification	Developed Automation and Control requirements	Updated Document control list
	Foundation design and details	Details of GA of equipment on Site & on Plant floor	PLC & Controller/Program details	Document Distribution Transmittal log
	Building roof details & section views	HVAC design and ducting routing	Lightning and Station Service layout and details	Hazardous material area classification
	Ceiling plan & details	Piping plan & layout for each system	Electrical and control Panel layout and specifications	
	Fence layout and details	Preliminary Bill of Materials	Distribution & Recloser details (outgoing switchgear)	
	Painting specification			
	Wall cladding, duct banks & trenches details			

Design Stage	Civil/ Architectural/Structural	Mechanical & Piping	Electrical & Automation	Others
Issue for Construction (IFC)	Final Structural design and Construction specifications	Final reviewed P&ID for all systems in Power Plant & PV system	Panels Schematic and Termination Detail drawings (include HVAC, MCC, Pump Motors, etc.)	Complete Fire suppression and Fire Alarm system
	Final Architectural design including plant internal details	Line list for every system (including Equipment, Piping and valves)	Final Electrical Equipment & Instrumentation design and material specifications	Commissioning requirements and Commissioning plan
	Architectural & Structural PV system design details	Mechanical equipment and piping system construction specification	Final Cable schedules	Final Document control list
	Openings. Door & windows schedules	Plumbing Layout and details	Complete Protection and Controls specifications	Plant operation Philosophy
	Bill of materials	HVAC ducting plan/layout and details	Grounding detailed drawings	Final Document Distribution Transmittal log
	Grading plan and Drainage details	Painting specification	Electrical Equipment & Automation/Instrument Data sheets	
	Final Fence layout, Pole rack location, Sea-can and other storage area including	Bill of Materials	Bill of Materials	
	Quality procedures	Piping Isometrics & piping supports details	Construction Specification	
		Equipment and Valves Data sheets	Quality procedures	
		Quality procedures	Conduits , Cable and Cable tray schedule and details	

Note:- Drawings & Design Documents:

After finalizing Detail Design, Contractor shall provide two (2) clearly readable sets of drawing (hard copy) on 11"x 17" paper size and two (2) sets of construction specification (hard copy) on 8.5"x 11" paper size along with electronic files to QEC Engineering

3.5.4 Construction Specification & Execution Plan:

Construction specifications and execution plan shall be submitted to QEC for review which include but not limited to followings:

- a) Site location details, Environmental data including snow, wind and seismic conditions
- b) General requirements, Work Restrictions and permit requirements
- c) Health & Safety and Environmental Regulatory requirements
- d) Housekeeping, Waste Management and Disposal requirement
- e) Temporary Utilities, Barriers and enclosures
- f) Workmanship during construction, installation and assembly requirements.
- g) Material Specification for each discipline
- h) QA/QC (Inspection, testing and Recording) requirements for each discipline
- i) Pre-commissioning & Commissioning for each discipline requirements & Plan
- j) End user Operational Training, Training Documents (O&M manual) and handover

4- CONSTRUCTION SERVICES OUTLINE

Contractor is responsible for site work safety and implementation of Occupational Health and Safety Act (OHSA) in accordance with Nunavut regulation. Contractor is required to submit their safety plan to QEC and get approval from QEC prior to commencement of work at site.

4.1 Construction phase:

- a) Contractor shall attend at a pre-construction/Kick off meeting or teleconference meeting.
- b) Contractor shall provide Execution plan including construction sequence and Construction Procedures.
- c) Contractor is responsible for mobilization and demobilization of personnel, equipment and materials to the Kugluktuk Nunavut power plant site.
- d) Preparation of the power plant site area and Contractor site office etc.
- e) All pre-assembled equipment shall be designed to be transported to Kugluktuk via marine freighter or any other means of transportation deemed necessary.
- f) Contractor shall purchase all necessary permits, coordination of inspections, payment of fees, etc. with the authority having jurisdiction.
- g) Contractor shall purchase or arrange water for Hydrostatic testing and water disposal
- h) Provide a site safety program to QEC including an on-site risk assessment and a site preparation plan. Refer QEC Health and Safety guidelines.
- i) Contractor shall deploy a dedicated fulltime safety representative to ensure compliance of all safety requirements during the entire duration of the project.
- j) Contractor shall provide an environmental protection plan to QEC such as prevention of water pollution, Landscape prevention and restoration, waste disposal, fuel/oil spill etc.
- k) Contractor shall arrange electrical power at no cost to QEC, their own construction power during construction, testing & commissioning phase and final handover to QEC.
- l) Contractor shall arrange all utilities such as Water, Heating, Compressed air, fuel etc., at no cost to QEC during construction, testing & commissioning phase and final handover to QEC.

4.2 QA/QC Documents

Contractor shall submit Quality Control plan including for inspection test plans and Procedures but not limited to:

- a) Procurement
- b) Material receiving and handing
- c) Civil work and Structural installations
- d) Mechanical work and Installations
- e) Electrical work and Installation
- f) Manufacturer and Field Test Reports
- g) Rejection, Rework and repair criteria

4.3 Construction Monitoring & Reporting

- a) Project Management plan shall be submitted to QEC for planning, scheduling, monitoring and reporting of project progress. Contractor shall ensure that Master Plan and Detail Schedule are practical and remain within specified Contract duration.
- b) Project monitoring and reporting:
 - As Project progresses shall keep QEC aware of changes to schedule, and possible consequences
 - Contractor shall closely monitor project progress such that any cause of delay immediately identified and removed if possible. If a delay is expected to affect a scheduled, the Contractor shall be required to notify QEC in writing.
 - Narrative reporting shall begin with statement on general status of Project followed by summarization of delays, potential problems, corrective measures and Project status criticality.
 - Contractor shall submit daily work status report with Tailboard meeting, Field safety inspection report and progress pictures and plan to next day work
 - Contractor shall submit monthly written report; showing Work to date performed, comparing Work progress to planned, and presenting current forecasts along with change in cash flow
 - Contractor shall submit monthly safety performance report
 - Contractor shall submit monthly cash flow projection

Note: Project progress shall not be considered as “progress” and progress Claim shall not be entertained until above-mentioned reports are submitted to QEC as required.

4.4 Test & Commissioning:

- a) Contractor shall be responsible for detail Commissioning plan preparation and submission for QEC review and approval
- b) Contractor shall be responsible for Complete genset and ancillary equipment Factory Acceptance tests (FAT) at supplier’s facilities during engine testing (**refer Appendix ESM-D**); all gensets to be provided by the same supplier
- c) Complete Commissioning, Site Acceptance Test (SAT) and start-up services to bring the power plant to full operation shall be performed by qualified technicians, including operators training on site
- d) The Contractor shall provide an operator training checklist, operation philosophy of each system and carry out the operator training with QEC personnel on all equipment

- e) Contractor shall be responsible for integration of grid connected PV generation with diesel generation
- f) Contractor shall supply load bank for site testing and commissioning in accordance with QEC guidelines **(Refer Appendix ESM-D)**

5- POST-CONSTRUCTION SERVICES OUTLINE:

- a) Contractor shall finalize Red lines marking on IFC drawings. Markup IFC drawings (redlines) shall be provided on A1 paper size at Substantial completion of project.
- b) Contractor shall prepare “As-built” drawings (based on Redline markup created during construction & commissioning) **(Refer Appendix ESM-H)**

6- SCHEDULE:

Kugluktuk new power plant project including two vertical storage tanks shall be completed in two-year. **Commissioning of the Project shall be no later than Dec 31st 2020.** Proponent shall submit a Schedule to reflect the intended project schedule and reviews of deliverables accordingly along with monthly cash flow. It should be taken into consideration that this project has time constraint due to the short summer season and available sea-lift periods. Therefore, this project will require efficient schedule management and the following elements but not limited to will need to be executed by the Contractor:

- a) Contractor shall prepare and submit “Stamped IFC drawing” as per design phase guidelines prior to construction starting or component procurement.
- b) A preliminary control narrative shall be submitted to QEC for review at the design stage.
- c) Contractor shall agree that fine-tuning, set points, and the final control narrative will be determined in collaboration with QEC representative at the commissioning stage
- d) Early purchasing and shipment of long lead items shall be essential, such as the Gensets, Radiator, MCC and switchgears etc while finalizing the detailed power plant design in order to avail the sealift shipments.
- e) Contractor shall ensure reserving shipping spots during the sea-lift periods. If any of the sealifts for shipments of equipment and materials are missed, it shall be the responsibility of the Contractor to find alternative means to transport them to site to meet the project completion schedule without charging additional cost to QEC

Detail schedule shall cover

- Detail design (25, 50%, 90% & IFC)
- Procurement
- Construction
- Equipment Installation
- Pre-commissioning & Testing
- Commissioning
- Handover

7- TRANSPORTATION:

- a) Contractor shall ensure that the equipment and materials are transported to the construction site of the new plant.
- b) Contractor shall be responsible to ensure that the lead items order and shipment to location to meet the project completion schedules.
- c) Contractor shall be responsible for confirming and adhering to applicable marine and airlift shipment schedules as required for the timely completion of the project.
- d) Contractor shall be responsible for storage and handling of construction materials, equipment and components. Items and materials shall be stored and secured in robust weatherproof envelope and corrosion proof environment.

8- TESTING & INSPECTION:

- a) Contractor shall be responsible to conform that the latest editions and revisions of all applicable regulations, codes, standards and Manufacturer specifications guidelines are followed
- b) Contractor shall provide QEC's representative with reasonable access to work-in-progress and manufacturing facilities for inspection purposes.
- c) Contractor shall allow QEC and/or QEC designated third party to perform assessment/inspection/witness for quality control/assurance, if requires
- d) Contractor shall make provision to supply QEC with un-priced purchase orders and other service agreements for materials, equipment, labor and services to provide evidence of work progress.

9- SPARE PARTS & TOOLS:

- a) Contractor shall provide spare parts list as per manufacturer recommendation
- b) The Contractor shall Supply the following consumables for one-year normal operation (8,000 hours). The cost shall be specified in cost breakdown proposal.
 - Consumables such as Lube Oil, E.Glycol and P. Glycol
 - Fuel Filters (primary and secondary; if applicable)
 - Air filters
 - Oil filters
 - Seals, Gasket and O-rings
 - Genset Replacement parts recommended by manufacturer
 - Plant equipment Replacement parts recommended by manufacturer
 - Other consumable items (recommended by manufacturer)
- c) All spares shall be tagged with the manufacturer's number as well as the QEC's warehouse part number.
- d) The Contractor shall supply one complete set of special tools necessary to operate, maintain and overhaul the equipment supplied. Included are all tools, jigs, hydraulic or air-operated bolt-tensioning equipment, pullers and similar.
- e) All special tools shall be clearly and permanently engraved or otherwise identified to show their specific use.
- f) For hydraulic tools supplied, the complete hydraulic system shall be included i.e. pump, motor (if applicable), valves, fluid and trolley, if portable
- g) If electrically powered tools are supplied, they shall be rated 115V, 60 Hz, single phase, double insulated.

- h) All PC software, software manuals and any software keys shall be supplied to integrate, modify and access programs and data shall be supplied. Back-up copies of “As-Left” configuration shall be supplied on CD-ROM or DVD. Annual Licensing cost for the first year shall be included with a takeout price.
- i) Other minimum tool requirements are given below but not limited to
 - Electronic communications/ with adapters
 - Valve injector adjust kits or gensets,
 - Seal installer set/ liner tooling and any other tools that are deemed necessary for trouble shooting / maintenance.
 - A list of recommended tools shall be submitted to QEC review and approval.

10- BATTERY LIMITS:

Battery limits of Power Plant based on Scope of supply and work mentioned here below.

- a) Civil work – Site Fence plus all works related to fence (grounding, gravelling etc.).
- b) Mechanical work- Fuel pipeline Tie-in with PPD tank farm pipeline
- c) Electrical/Distribution work- As below.

QEC Supply	Plant Construction Contractor	Distribution Contractor
Take off Poles (3) with accessories to Plant Contractor	<ul style="list-style-type: none"> • Poles erection related civil work and pole installation • Provide Recloser (3 nos) • Provide and Install MV Cables from Bus to Takeoff pole • Testing of Recloser & MV Cables 	<ul style="list-style-type: none"> • Installation of Recloser • Install conductor from Recloser pole to take off pole

11- PROPONENT DATA REQUIREMENTS:

Contractor shall provide total project cost estimation. Cost estimation shall have two sections. Section A shall show cost breakdown for Power plant with two vertical fuel tanks. Section B shall provide cost breakdown for PV installation with BESS option for transition. Progress Claim invoicing shall also be separate in accordance with Section A & B.

The following information is to be provided as part of the submission:

- Complete price list with delivery lead times
- Proposed Data sheets (See Chapter 04).
- Genset life cycle cost analysis
- Procurement and shipping strategy;
- Construction schedule for power plant and Outdoor fuel storage tanks.
- Project list demonstrating the Proponent’s experience in building & supplying similar installations for extreme cold environments;
- Credential and Experience of Contractor team members assigned and will work for this new Power plant project including Outdoor Storage tank construction.

12- DELIVERABLES:

Design build contractor is responsible for providing complete design and construction documents for QEC review. The documents shall include but are not limited to following deliverables for each discipline and need to refer chapter 05 for Photovoltaic System minimum deliverables.

12.1 Architecture/Civil/Structure

1. List of all applicable codes & standards, and local jurisdictions acts & regulations for procurement, construction and testing
2. Detailed Site plan establish buildup (plant area) and non-build up area.
3. Assessment Report on wind and snow drifting to finalize building orientation.
4. Building and Outdoor storage tanks design calculation and specifications
5. Preparation of detailed Structural Steel drawings
6. Determination of foundation type for all equipment (Mechanical and Electrical) inside and outside of power plant
7. Provide detailed Architectural drawings including but not limited to
 - a) General outdoor power plant layout, included power plant building with related structures and equipment, storage area, storage shelter, access road, vehicle parking, fence, and gates
 - b) Main Floor Plan and mezzanine plan
 - c) Ceiling Plan
 - d) Power Plant Building Exterior (Elevation views, General Arrangement, Wall sections etc.)
 - e) Interior details (Section views, Elevation views, Wall sections, General Arrangement etc.)
 - f) Interior floor plan (Generator Hall, Electrical/ Battery/ Control room, Washroom etc.)
 - g) Foot prints for major and minor equipment inside and outside the Power plant
 - h) Foundation drawings
 - i) Doors, windows and other opening cutout drawings
 - j) Trench and electrical duct bank drawings
 - k) Outdoor Electrical switchgear (platform mounted transformer, bus and takeoff poles)
 - l) Final Grading and Paving Drawings
 - m) Interior and exterior and yard lighting layout
 - n) Fence layout and details
 - o) Pole rack, Sea-can and other storage area including Environmental/ Waste Storage pallets area
 - p) Drainage network layout and detail drawings
8. Provide Material Specification civil, architectural and structure work scope
9. Detailed Painting and coating specification
10. Bill of Material
11. 3D CAD model

12.2 Mechanical & Piping

12.2.1 Mechanical

1. List of all applicable codes & standards, and local jurisdictions act & regulations for procurement, construction and testing
2. List of materials/equipment that require CRN as per codes and Nunavut Act or Regulations
3. Detailed Equipment design documents and calculations including but not limited to following
 - a) Outdoor Fuel Storage tanks
 - b) Fuel Day tanks (Double wall- Secondary containment)
 - c) Pressure vessels
 - d) Transfer and Circulation Pumps
 - e) Air Compressors
 - f) Plate type Heat Exchangers
 - g) Air handling units (heating and cooling load)
 - h) Fuel Cooler
 - i) Lube Oil and Glycol storage tanks (with secondary containment)
 - j) Generator outdoor radiator
 - k) Heat recovery system
4. Provide each equipment material specification suitable for specific service requirement
5. Provide equipment Data Sheets including pumps, compressors, valves, measuring instruments/meters, etc.
6. Provide Mechanical Equipment & piping list
7. Prepare and submit detailed drawings and submit for review including but not limited to following
 - a) Equipment layouts
 - b) Equipment arrangement & details
 - c) HVAC duct plan (routing), sectional drawings and flow diagram
8. Detailed Painting and coating specification
9. List of spare parts, their quantity and consumable items for routine/shutdown maintenance based on critical operation requirement

12.2.2 Piping

1. List of all applicable standard, codes and regulation for procurement , construction and testing
2. Hydraulic and material calculation such as wall thickness, corrosion allowance etc.
3. Detailed Piping system (pipe, valves, fittings, hardware etc.) material specification
4. stress analysis report
5. Piping List
6. Valves Data sheets
7. Detail Drawings including but not limited to
 - a) Block Flow Diagram
 - b) Piping and instrumentation diagram (P&IDs)
 - Outdoor Fuel Storage tank system
 - Heating and Cooling system
 - Engine cooling system

- Inside Plant- Fuel system
 - Compressed Air – Engine start up
 - Service Air
 - Lube oil and Glycol Handling
- c) Piping Plans for above mentioned P&IDs
 - d) Piping General Arrangement drawings
 - e) Isometric drawings
 - f) Piping Supports drawing and list
8. 3D CAD model
 9. Pipe, valves and fitting Material take-off
 10. Ducting material specification and material take -off
 11. Plumbing system (Washroom plumbing, portable water and sewage water)
 12. Detailed Painting and coating specification
 13. List of spare parts, quantity and consumable items for 8000 hours routine/shutdown maintenance based on critical operation requirement

12.3 [Genset](#)

1. List of all applicable codes & standards, and local jurisdictions act & regulations for procurement, construction and testing
2. Provide capacity details and performance curves.
3. Complete genset data sheets (Engine & Alternator)
4. Generator construction specification including accessories
5. Engine construction specification including accessories
6. Genset gauges and instruments specifications and requirements
7. Genset local control panel specifications and requirements
8. Engine cooling, fuel, lubrication specifications requirements
9. Alternator speed, voltage regulator specifications and requirements
10. Genset grounding system
11. Generator synchronization methodology based on QEC guidelines
12. Damping isolators specification/ requirements
13. Drawing shall include but not limited to
 - a) Genset general arrangement drawings and layout
 - b) Cooling, Fuel, Lube oil and Compressed air start drawings
 - c) P&ID
14. List of spare parts, quantity and consumable items for 8000 hours routine/shutdown maintenance based on critical operation requirement

12.4 [Electrical](#)

1. List of all applicable standard, codes and regulation for procurement , construction and testing
2. Electrical equipment and control panels design and selection criteria
3. List of electrical apparatus with Technical Data Sheets and Specifications
4. Electrical load list (AC & DC), include provision for transient building and storage area
5. Detailed Design drawings including but not limited to
 - a) Single line diagram of the Power Plant and Distribution Switchgear
 - b) Equipment Three-line diagram

- Generator Power and Control and Protection Wiring Diagrams
 - MCC (Motor Control Center) Three Line Diagram
 - AC and DC Ancillary Circuits
 - Emergency (Black-start, Emergency Lights, etc.)
- c) All Electrical panels, Terminal Cabinets and Junction boxes outline drawings
 - d) All Electrical panels, Terminal Cabinets and Junction boxes termination drawings
 - e) Cable Schedule
 - f) Exterior and interior plant lighting layout drawing
 - g) Equipment general arrangement (floor plan and section view)
 - h) Grounding and Bonding Layout drawing and details
 - i) Cable Routing and Cable Trays layout
6. Detailed Equipment design calculations/sizing including but not limited to the following
- a) Motor Control Center
 - b) Arc Resistance Switchgear
 - c) Arc Flash for MV and LV distribution
 - d) Automatic Transfer Switch
 - e) Emergency (Black Start) generator
 - f) Station service Transformer (4160/600V and 600/240/120V)
 - g) DC (Battery and Battery Charger)
 - h) Low voltage distribution and control panels (Lighting, Fire alarm etc.)
 - i) Motors (pump, compressor, fans etc.)
 - j) Indoor and Outdoor lighting (Luminaire)
 - k) Power cables
 - l) System fault level calculation
 - m) Neutral Grounding
 - n) Service load,
 - o) Cable sizing for short circuit, voltage drop and de-rating factors
7. Short-circuit, Protection and Relay coordination studies
8. Metering Equipment
9. Hook up, switching and integration details with renewable energy (solar system)
10. Coating specification
11. List of spare parts and quantity for maintenance based on critical operation requirement for 8000 hours of operation.

12.5 Instrumentation

1. List of all applicable codes & standards, and local jurisdictions act & regulation for procurement , construction and testing
2. Instrumentation devices design and selection criteria having 40 years of life cycle.
3. Material specification for devices as per service and weather requirement
4. Instrument list and Data Sheets
5. Instrumentation I/O (Input/Output) list
6. Devices, sensors, gauges detail design specifications, calculations, controls and Sizing
 - a) MCC to Equipment and Devices schematic diagram e.g. Pump, Fan, Air handling unit (AHU), Radiator Fan Motor, VFDs (Variable Frequency Drive) etc.
 - b) Battery room – Gas detection and exhaust fan control schematic
 - c) AHU Control schematic

- d) Heater control schematic
 - e) Feeder & Breaker control schematic
 - f) Feeder & Engine DC control schematic
 - g) Loop diagram
 - h) Hook up drawings
 - i) Instrumentation with tags in P&IDs
7. List of spare parts and quantity for maintenance based on critical operation requirement

12.6 [Automation](#)

1. List of all applicable standard, codes and regulation for procurement , construction and testing
2. Determine automation and communication requirements for the project
3. Detail Design and selection criteria for PLC & Controller/Program, Local Engine Control Panel (LECP), Remote Terminal unit (RTU) and Human Machine Interface (HMI) based on the QEC guidelines
4. Material specification for RTU and PLC components
5. Identification of Network restrictions (bandwidth, connectivity etc.) in conjunction with QEC IT
6. Design drawings including but not limited to
 - o PLC & I/O list and interlock drawings
 - o LECP layout, schematic and termination drawings
7. Detail mechanism for RTU interfaces with Switchgears, MCC, battery system and with PLC (All measurement points & fault points) system
8. Selection and approval of PLC manufacturer and its equipment requirements based on QEC guidelines
9. Detailed drawings including but not limited to
 - o PLC panel Layout
 - o PLC – I/O module schematic
10. Overall Power plant communication – Ethernet system
11. Auto dialer requirements and material specification from Power plant to Fire Marcel office (Fire station) and Operational head.
12. Material specification for communication system (Telephones, Computer systems, LAN and Ethernet cable etc.)
13. Provide technical and material specification of Close Circuit Television (CCTV) security cameras and their monitoring method
14. List of spare parts

12.7 [Commissioning](#)

1. Site Acceptance Test Plan
2. Provide Start-up and commissioning protocols and philosophy
3. Detail Commissioning checklist as per QEC guidelines

12.8 [Safety & Environment](#)

1. Hazardous material area classification
2. Fall Arrest roof anchor points drawing and specification
3. Eye Wash stations specification (OSHA/UL and ANSI compliance)
4. Eye Wash foot print on power plant floor plan
5. Emergency exit signage shall be CSA & NEMA rated with LED light source

6. Arc Flash Labels on required equipment (where applicable)
7. Fire suppression and Fire alarm systems calculation, schematic and layout drawing

12.9 Others

1. Document Distribution Transmittal log
2. Identification and marking of battery limits on the drawings
3. Construction Quality Assurance and Quality Control including procedures for each discipline
4. Design Activities schedule
5. Projected cash flow and Construction Schedule.
6. Progress reports
7. Any other relevant documentation required to implement the project.