

1 General

1.1 GENERAL

- .1 The construction, installation, and commissioning of the on-site solar photovoltaic (PV) system will be the responsibility of the solar contractor under the direction of the General Contractor.
- .2 This Performance Specifications delineates the minimum technical and installation specifications required by the Fish Management Satellite Office & Warehouse, located in St. Lewis, NL.
- .3 The installation of the PV shall be ground mounted, with an engineered footing and structural framing system, to suit the specific application.
- .4 The solar contractor is responsible for assessing the proposed site to ensure final location produces optimum balancing and performance of the PV system. Total system to be 30KW with calculated annual production of 30,000 KWH.
- .5 The footprint indicated on the site plan is for bidding purposes and to provide an estimate for items such as conduits, wiring and other accessories between the solar panels and the building. If the final location is different from indicated, the cost of these items can be reviewed by the Departmental Representative and adjusted as required.
- .6 The General Contractor is to provide a separate price for supplying and installing a chain link security fence surrounding the PV panels, complete with a gate of suitable size for a service vehicle.
- .7 The General Contractor is responsible to provide all grubbing and clearing as required, to install the PV Array with all clearances as indicated on the Drawings. This includes topping of adjacent trees which may impact solar collection. Solar Contractor to coordinate extent of grubbing and topping with General Contractor.
- .8 The provision of the proposed PV power system is subject to the approval of the local Authority Having Jurisdiction (AHJ) and NL Hydro.
- .9 The Solar Contractor is to identify any instances where their proposed PV System does not comply with the design intent or PV array performance characteristics as indicated in this Specification or the Drawings. PV System alternates are to be submitted in writing to the Departmental Representative.

1.2 RELATED SECTIONS

- .1 Section 26 05 00 - Common Work Results - Electrical
- .2 Section 26 05 20 - Wire and Box Connectors (0-1000V)
- .3 Section 26 05 21 - Wires and Cables (0-1000V)
- .4 Section 26 05 28 - Grounding - Secondary
- .5 Section 26 05 29 - Hangers and Supports for Electrical Systems
- .6 Section 26 05 31 - Junction and Pull Boxes
- .7 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings
- .8 Section 26 05 43.01 - Installation of Cables in Trenches and in Ducts
- .9 Section 26 28 23 - Disconnect Switches - Non-Fused

1.3 REFERENCES

- .1 The system must be compliant with applicable design guidelines, codes and standards and shall adhere to any and all National Building Code of Canada, Canadian Electrical Code, other applicable codes and standards, applicable Utility regulations, and any and all CEC technical and installation specifications and guidelines.
 - .2 Canadian Standards Association (CSA).
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations, especially Section 64 "Renewable Energy Systems" and Section 84 "Interconnection of Electric Power Production Sources".
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- .2 CSA C22.3 No. 9 - Interconnecting of Distributed Resources and Electrical Supply Systems.
- .3 CSA C22.2 No. 257 - Interconnecting Inverter-based Micro-Distributed Resources to Distribution Systems.
- .3 Institute of Electrical and Electronics Engineers (IEEE).
 - .1 IEEE 929 - Recommended Practice for Utility Interface of Photovoltaic Systems.
 - .2 IEEE 1547-2003 Interconnecting Distributed Resources with Electric Power Systems.
- .4 Underwriters Laboratories of Canada Inc. (ULC).
 - .1 ULC/ORD-C1703-01 Flat Plate Photovoltaic Modules and Panels.
 - .2 UL 1741 - Standard for Inverters, Convertors, Controllers and Interconnection System Equipment for use with Distributed Energy Sources.
- .5 All applicable Utility and Provincial Building Codes and requirements, including but not limited to:
 - .1 Newfoundland Labrador Hydro; Net Metering Interconnection Requirements - Customer Generation Capacity Not Exceeding 100 KW (Version 1).

1.4 SUBMITTALS

- .1 Include with tender documents, shop drawings and data for the proposed system in accordance with Division 01 - General Requirements. Drawings to include a schematic showing the layout and interconnections specific to this solar PV system. Documents shall include, but not be limited to:
 - .1 Site plan showing infrastructure layout and PV arrays location, orientation, tilt angle and total area to be cleared for servicing and access.
 - .2 Riser diagram showing connection to utility, conduits, power and communications wires, combiners, disconnects, inverters, meters, etc.
 - .3 PV System power production calculations on a projected daily, monthly & annual basis and total system rating, complete with expected losses.
 - .4 PV system interconnection diagram showing AC and DC wiring, conduit fills, sizes, and types, wiring sizes and types, voltage rise, combiner box schedule (if applicable), and bill of materials.
 - .5 Layout of PV solar equipment to be installed in the electrical room, including elevations and equipment dimensions.
 - .6 Assembly details including array attachment details, support spacing dimensions, module to module wiring diagrams, DC wire tray and combiner mounting details and grounding details.
 - .7 Details for all required warning signs.
 - .8 Product specifications, installation and maintenance instructions.
 - .9 A list of recommended spare parts with pricing for the Departmental Representative's use in keeping the PV system downtime to a minimum.
 - .10 A set of engineered structural drawings for the specific PV Array and Footing system accounting for all snow, wind and site considerations specific to this application. Stamping Engineer to have a valid license to practice in the Province of Newfoundland & Labrador.
 - .2 The solar contractor shall also submit all of the above details for final review and modifications during the shop drawing review phase.
 - .3 The Departmental Representative will take into consideration the performance, efficiency and suitability of proposed solar photovoltaic systems, as well as the price, when evaluating and selecting the best overall system for the Fish Management Satellite Office & Warehouse project, located in St. Lewis, NL.
 - .4 The solar contractor will be responsible for providing operation and maintenance manuals for the solar PV system.
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- .5 Essential spare parts: Supply sufficient spare parts for the first 5 years of operation. Spare parts are to be provided in kit form for storage in appropriate quantities at the facility.

1.5 QUALITY ASSURANCE

- .1 All electrical work to be carried out by qualified, licenses electricians or apprentices licensed by the Newfoundland & Labrador. The electrical contractor must have a valid contractor license issued by the Province of Newfoundland & Labrador.
- .2 Contractor shall have experience installing systems of similar size, location and complexity.
- .3 Installer shall maintain a fully equipped service organization capable of furnishing repair service to the equipment. The service branch for the Solar System, is to have a manufacturer certified technician on call during and outside normal business hours and be capable of providing on site service no greater than one (1) week from time of service call.
- .4 Installer shall submit certification from the equipment manufacturer indicating that installer is an authorized representative for the equipment manufacturer and is trained on the installations of the specified PV system products.
- .5 Material and equipment shall be new and CSA certified.
- .6 System components shall operate reliably in accordance with industry standards.

1.6 WARRANTY

- .1 Provide a minimum comprehensive warranty on the photovoltaic modules and associated system components (other than PV modules) against defects in materials, fabrication and execution for a minimum of one (1) year in accordance with Division 01 - General Requirements.

1.7 TRAINING

- .1 Arrange, pay for, and schedule on-site lectures and demonstrations by manufacturer's certified technician to train designated personnel in the use and maintenance of the solar PV system.
- .2 Training shall cover instruction, theory, and expose the trainees to system's features, components, architecture, operations, programming, report generation, communications, and any other pertinent information required for the operations and maintenance of the system.

2 Products

2.1 ELECTRIC POWER REQUIREMENTS

- .1 Power provided must be compatible with the existing onsite 240V, single phase distribution system. If required, a transformer may be used to step down the voltage. But spatial considerations of the existing site and facility must be considered, and modifications required to accommodate system equipment will not be considered as a change of extra to the Contract.
 - .2 Power capacity should be measured at the inverter AC output using the PVUSA Test Conditions (PTC), i.e. 1,000 Watts/m² irradiance, 20 degree C ambient temperature and wind speed equivalent of 1 m/s.
 - .3 The System must include all the hardware needed for the solar PV, including, but not limited to, disconnects, inverters, combiners, surge suppression, line filters, phase couplers, communications gateways, and all grounding and mounting hardware.
 - .4 The solar array is to be capable of sustaining the maximum load of 30 kW active power for a total annual production of 30,000 KWH.
 - .5 All systems must be installed in accordance with all applicable requirements of local
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- electrical codes and the Canadian Electrical Code (CEC).
- .6 Systems must be designed and installed using CSA or ULC listed components, including mounting systems.
 - .7 Inverters are to be micro inverters or optimized inverters type that comply with IEEE 929, UL1741, and be a certified product under CSA 22.2 107.1.
 - .8 All system components including wiring, component, wiring, conduits, and connections must be suited for conditions for which they are to be installed.
 - .9 Interconnection must comply with local Utility and the Authority Having Jurisdiction (AHJ) requirements.
 - .10 The solar contractor will assist the Departmental Representative in preparing and submitting appropriate interconnection agreements with local Utility. This shall be done at no cost or liability to the Owner. The local Utility has been made aware and understands the scope of the PV where associated with this project.

2.2 MODULES

- .1 PV solar modules must be manufactured in Canada with a minimum of 16% efficiency and demonstrated reliability.
- .2 PV solar modules must meet CSA22.2 61730-1-2 or ULC/ORD-C1703-01
- .3 System must comply with IEEE 1262 "Recommended Practice for Qualifications of Photovoltaic Modules", CSA, CEC.
- .4 Design for temperature range from -40 to +40 degrees.

2.3 REMOTE MONITORING

- .1 Supplier will provide Interval Data Recording (IDR) meters and all associated interface software for communication across the local network. IP addressing and network programming for remote PV Array monitoring to be coordinated with SSC and the Departmental Representative. New remote solar network to be completely independent from existing SSC network.
- .2 Supplier will provide connection to a new and completely dedicated network for the purposes of remote metering, monitoring and data collection of solar production.
- .3 Meters must connect to a monitoring/data collection recording solar production through Time of Use (TOU) increments applicable to the local utility standards, with a minimum 15 minute intervals.

2.4 INVERTERS AND OPTIMIZERS

- .1 The system is to be a completed with micro inverter and or power optimizer technology. System arrangement to be such that a single point of failure on the system will impact no more than 50% of the entire generating capacity of the system.
- .2 Given the remote nature of the site, system arrangement and components to be modular, easily maintained and where possible renewable parts, that are able to be replaced by a local skilled trades person.
- .3 Inverters to be complete with integrated arc fault protection and rapid shutdown to NEC 2017, Article 690.11 and 680.12 with grid connection to IEEE 1547. Ground fault detection reverse polarity detection and voltage, phase monitoring and flickering regulation to CSA and NL Hydro requirements.
- .4 RS485, Ethernet and optional cellular interface for remote monitoring.
- .5 99% efficient at 240V output with natural connection cooling for an operating temperature of -25°C to 60°C.

2.5 STRUCTURAL REQUIREMENTS

- .1 All structures, structural elements including array structures and foundations shall be designed in accordance with the National Building Code of Canada and applicable standards pertaining to the erection of such structures.
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- .2 All structural components, including array structures, shall be designed in a manner commensurate with attaining a minimum 30 year design life. Particular attention shall be given to the prevention of corrosion at the connections between dissimilar metals.
- .3 The structural design should provide for easy and cost effective repair or replacement of the components.
- .4 The solar contractor shall provide structural calculations, stamped by a licensed professional structural engineer in good standing with the Professional Engineers & Geoscientists of Newfoundland.
- .5 Racking for the PV arrays shall be capable of a single seasonal manual adjustment to the tilt angle of the PV Panels.

3 Execution

3.1 INSTALLATION

- .1 Install solar PV system to manufacturer's recommendations, CSA, CEC and IEEE standards.
- .2 The system shall be grounded and bonded as per CEC sections 10, 64 and 84.
- .3 Install components securely, properly aligned and in locations shown on reviewed shop drawings.
- .4 Provide and install warning labels as per CSA C22.1-18, 64-072, 64-074, 64-112, 64-200, 84-024-1(i), and 84-030.

3.2 TESTING

- .1 Provide tests in accordance with 26 05 00 - Common Work Results - Electrical. Tests shall include:
 - .1 System response, reliable data logging and transmission, and performance.
 - .2 Network system connectivity, and remote monitoring.
 - .3 System features and components under normal operation.
 - .4 System shutdown from utility override switches.
 - .5 Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity impedance to ground, and cable (megger) insulation.
 - .6 Provide Departmental Representative with operational report and signed verification report, by a certified manufacturer's technician, indicating that entire system has been installed in accordance with the manufacturer's requirements and is generating, and the trend date indicates it will annually produce to the minimum performance requirements.

3.3 CLEANING

- .1 Remove dirt, debris or soiling from PV solar modules in accordance with Section 01 74 00 - Cleaning.
- .2 Leave work area clean at the end of each day.
- .3 On completion and verification of performance of installation, remove surplus materials, rubbish, tools and equipment.

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by photovoltaic systems installation.

END OF SECTION
