Solar Request for Proposal

**Disclaimer**

The following template is intended to provide example language for users to consider in the process of assembling a solicitation and ultimately a contract for solar photovoltaic (PV) systems. Users (to include agency contract officers, attorneys, engineers, etc.) are responsible for determining the final content of any solicitation. Updates to the regulations, codes, and standards applicable to solar PV are changing frequently; it is the user’s responsibility to determine which guidelines (and which versions) apply. This template was developed from various publicly available sources.

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**Request for Proposal**

[ORGANISATION] is soliciting proposals from a qualified contractor/vendor to design, fabricate, deliver, install, operate, and maintain a roof mounted utility-interactive solar photovoltaic (PV) system.

The contractor/vendor must demonstrate the ability to perform the work described in the scope of services set forth in this solicitation and have demonstrated experience successfully performing comparable work.

1. Project Identification

**Project**: Roof-Mounted Grid-Tied PV System

**Location**: [LOCATION]

**Size**: Minimum [xx kWp] system with ability to expand up to roof size

1. Tentative Schedules

RFP released/issued ........................................................ [DATE]

Proposals due ................................................................ [DATE]

Proposals evaluated ...................................................... [DATE]

Design and construction ............................................... [DATE]

All inquiries should be directed to:

[CONTACT DETAILS]

1. Background
	1. **Objective.** Contractor shall provide a total “turnkey” project including all necessary equipment, materials, design, manufacturing, and installation services for the installation of a Roof-Mounted Grid-Tied PV System, the initial size is up to [xx kW] with the potential to expand to around [yy kW] depending on roof size / loading. The contractor should prepare a system summary with applicable equipment/size and predicted system energy production (kWh). With regard to any building-mounted system, the contractor shall evaluate roof conditions. See roofing specification for these requirements. The project shall meet all requirements of this statement of work and other specifications included that apply.
	2. **Scope.** The contractor shall perform all professional services as necessary to provide [ORGANISATION] with a complete design package, including the requirements outlined in this statement of work. The contractor shall install the project such that it is operational and compliant with all applicable standards, building codes, Horizon Networks interconnection requirements, and Health and Safety requirements. The contractor shall include specifications, calculations, and drawings in the design package and submit it to [ORGANISATION] for review and approval. After approval by [ORGANISATION] of the final design package, the contractor shall provide all necessary construction services to successfully complete the PV system installation.
		1. **Design Guidelines for Roof Mounted PV.** Contractor shall develop a design for a new PV system at the stated location. It is the responsibility of the Contractor to assess the building’s structural integrity, roof condition, and shading limitations.

See attached drawings indicating available areas for installation and existing roof structure plans. These drawings are meant for informational purposes only and must be field-verified by the contractor.

* The mounting system shall minimize roof penetrations. The mounting system design needs to meet applicable local building code requirements with respect to wind, earthquake and other factors.
* Conduit penetrations shall be minimized.
* The system shall be fixed-tilt mounted with a North facing orientation to maximize annual energy production.
* The system layout shall provide for maintenance access and also expansion.
* Solar panels must meet AS/NZS 5033 standards and must have IEC 61730 certification.
* The inverter of the solar power system must meet AS 4777.1 standards
* The PV system must comply with all relevant New Zealand electrical regulations, including AS/NZS 3000
	+ 1. **Performance Criteria.** The following performance criteria shall be met for all arrays:
* The power provided shall be three-phase compatible with the on-site distribution system. The Contractor will be required to submit mechanical and electrical design drawings (by a licensed professional engineer) prior to starting work.
* The proposal shall provide an estimated energy delivery for each array, for each month of the year, and for the total for the year at the delivered
* The PV array shall mean one or more PV modules having the same orientation and on the same maximum power point tracking (MPPT) system. Every array with differing orientation shall have a separate MPPT system.
* All proposed/implemented PV array locations shall be shade-free from 9 a.m. to 3 p.m. (solar time). The contractor shall provide documentation of shading calculations for exterior extents.
* All PV hardware components shall be either stainless steel or aluminum. PV structural components shall be corrosion-resistant (e.g., galvanized steel, stainless steel, composites, or aluminum).
* The project, including supports and power conductors, shall not interfere with roof drains, water drainage, expansion joints, air intakes, existing electrical and mechanical equipment.
	+ 1. **Production Metering.** The project engineer shall liaise with the buildings Retailer to ensure the correct meter is installed for solar production.
		2. **Construction.** Perform all construction services necessary for the successful installation of the system based upon the design generated from 3.2.2.
	1. **Technical Requirements and Reference Materials**
		1. **Code Compliance.** The installation and equipment shall comply with applicable building, mechanical, fire, seismic, structural, and electrical codes. Only products that are listed, tested, identified for use in New Zealand shall be used as components in the project.

The contractor shall use project components that are or made of materials that are recyclable, that contain recycled materials, and that are or ENERGY STAR® rated if they are available on the market.

The contractor shall only use project components from suppliers/manufacturers that are not listed on any modern slavery supply chain blacklists.

The publications listed below form a part of this document and are hereby incorporated by reference:

• International Electrotechnical Commission (IEC) 62446 Grid-Connected PV Systems – Minimum Requirements for System Documentation, Commissioning Tests, and Inspections

Other technical codes that shall apply include:

* AS/NZS 5033 standards
* AS 4777.1 standards
* AS/NZS 3000
* The NZ Building Code
	1. **Roles and Responsibilities**
		1. **Contractor.** The contractor is required to provide:
* Conceptual Design Drawings
* Applicable consents and approvals required from local Council / Network Company
* Construction documents and engineering calculations by a licensed architect or professional engineer in the appropriate discipline of the subject design drawings (e.g. architectural, geotechnical, electrical, structural)
* Submittals for materials and products
* Construction materials, equipment, and labour
* Design and construction supervision/contract management
* A safety plan
* Inspections and tests
* Manuals (e.g., design calculations, operation/maintenance, a shop drawing, etc.)
* Commissioning of the project
* Training of building operating staff for operation and maintenance
* Operation and maintenance during the first year and an optional service plan after the first year
* A web-based monitoring system

3.4.2 **[ORGANISATION]** will:

* Provide information and facility site visits per the contractor’s request
* Review for approval design submittals
* Witness inspections to verify attainment of performance requirements
* Make progress payments for design/construction as agreed
1. Proposal Concept Drawings and Specifications Submissions
	1. **Concept Drawings.** The contractor shall provide [ORGANISATION] with conceptual design drawings with the proposal. The conceptual design drawings must indicate the proposed location of the PV array(s) and access points along with a one-line electrical diagram showing inverters, meters, and interconnection locations. All drawings shall be submitted with dimensions shown in English units.
	2. **Conceptual Design Information.** The proposal shall include major equipment information, proposed installation/interconnection information, and performance characteristics of the system. The proposal shall identify an appropriate location for the solar PV inverter equipment and its related components and environmental control systems that will meet the following criteria:
* Ease of maintenance and monitoring
* Efficient operation
* Low operating losses
* Secured location and hardware
* Compatibility with existing facilities
* Avoidance of flood-prone areas

All products shall comply with the technical requirements shown under section 8, “Solar Electric Module Array.” At a minimum, the proposed concept information shall include:

**Equipment Information**

* System description
* Layout of installation
* Selection of key equipment and layout of equipment
* Performance of equipment components and subsystems
* Specifications for equipment procurement and installation
* All engineering associated with structural and mounting details
* Controls, monitors, and instrumentation
* Operation and maintenance service plan

**Installation Interconnection Information**

* Solar electric array orientation (degrees)
* Solar electric module tilt (degrees)
* Electrical grid interconnection requirements
* Integration of solar PV system with other power sources
* System type and mode of operation (utility interactive)

**Performance Characteristics**

* Shading calculation documentation
* Total system output (kWh/year)
* Estimated kWh/month per array (shown over a 12-month period)
* Warranties and guarantees

**Interconnection Agreement**

* Provide confirmation that the PV systems will be designed to comply with applicable Horizon Networks interconnection requirements

**Cost**

* The total price of the project (to include costs expressed in $/kWp) including operation and maintenance for the first year and an optional service plan after the first year
* An indicative price for an installation maximizing the roof space available (to include costs expressed in $/kWp)
1. Design Services

The solar PV system shall be designed and engineered to maximize the solar energy resources, taking into consideration the customer’s electrical demand and load patterns, proposed installation site, available solar resources, existing site conditions, proposed future site improvements, and other relevant factors.

Design services provided include:

* 1. **Timeline/Project Schedule.** The contractor shall provide an estimate of the project timeline and schedule.
	2. **Specifications.** A full set of specifications shall not be required for this project. However, specifications that express all information and demonstrate sufficient detail so as to direct the construction work outlined in this statement of work shall be required. The specifications package shall be coherent enough that any contractor not familiar with the project would be able to construct the project design. The specifications shall include all equipment information, proposed installation and interconnection information, and performance characteristics of the system.
		1. All drawings, estimates, calculations, and specifications shall be in English units.
		2. The contract shall take into account a construction plan producing a minimum disruption of day-to-day activities, utilities, services, etc.
	3. **Construction Drawings**
		1. Provide drawings for each discipline required (architectural, structural, electrical, etc.), with separate plans for new work and demolition as well as special types of drawings where necessary, such as enlarged plans, equipment curbing and flashing details, roof penetration details, etc. Drawings shall clearly distinguish between new and existing work.
		2. At a minimum, the following drawings are required:
* Site plan including utility locations and connections – showing staging and phasing requirements
* Electrical plans – including single line diagram and utility interconnection
* Electrical details
* Roof plan – showing the full layout of the system and detailing any obstacles that must be permanently or temporarily removed or relocated
* Array support and mounting details
* Any drawings that may be required to install a complete project
* Waterproofing details
	+ 1. The contract documents shall sufficiently define the statement of work and shall stand on their own.
		2. Specifically address the means to keep the existing building accessible and operational by means of relocation and/or phasing.
	1. **Calculations.** The contractor will provide the following calculations:
		1. System Electrical Calculations.
* Solar panel to inverter loading to optimize design
* System energy production calculation showing estimated monthly and yearly energy output for each array
	+ 1. Roof structural loading calculations. These calculations shall specifically address roof loading from the PV array and confirmation that the loading does not exceed existing roof framing capacity as determined by the analysis.
1. Utility Interconnection Agreement
	1. The contractor shall coordinate with Horizon Networks to ensure that the project satisfies all Horizon Networks criteria for interconnection of the project to the Horizon Networks distribution system. This includes coordinating all negotiations, meeting with Horizon Networks, conducting design reviews, and participating in any needed interaction between Horizon Networks and [ORGANISATION].
	2. The contractor shall manage the interconnection and start-up of the project in coordination with the site and Horizon Networks. The contractor shall at its own expense pay any interconnection, processing, and other fees and expenses as may be required by Horizon Networks for interconnection and operation of the project.
2. Solar Electric Module Array
	1. **Photovoltaic Modules**

PV modules shall be a commercial, off-the-shelf product with preference given to suppliers who produce their solar panel wafers using highly renewable sources.

* + 1. System wiring shall be installed in accordance with the provisions of AS/NZS 3000.
		2. All modules installed in a series string shall be installed in the same plane/orientation.
		3. Panel installation design shall allow for the best ventilation possible of panels to avoid adverse performance impacts.
		4. Provide a panel manufacturer’s warranty as a minimum: No module will generate less than 90% of its specified minimum power when purchased. PV modules shall have a 25-year limited warranty guaranteeing a minimum performance of at least 80% of the original power for at least 25 years (with preference given to panels that exceed this). Measurement made under actual installation and temperature will be normalized to standard test conditions using the temperature and coefficients published in the module specifications. PV modules that do not satisfy this warranty condition shall be replaced.
	1. **Inverter and Controls**
		1. Each inverter and associated controls shall be properly installed according to the manufacturer’s instructions.
		2. Inverters shall be a commercial off-the-shelf product, that comply with AS 4777.1.

The inverter shall have at a minimum the following features:

* String inverter preferred
* Peak efficiency of 96% or higher
* Operational indicators of performance and built-in data acquisition and remote monitoring
* Open-source industry protocols for communicating with a building management or similar system
* Capable of parallel operation with the existing AC power and the ability to automatically synchronize its output waveform with that of the utility upon restoration of utility power
* Volt Watt mode and Volt/Var shall be enabled and set to AS4777.2 or Horizon Network's requested settings
	+ 1. Warning labels shall be posted on the control panels and junction boxes indicating that the circuits are energized by an alternate power source independent of utility-provided power.
		2. Operating instructions shall be posted on or near the system and on file with facilities operation and maintenance documents.
		3. Provide detailed lock-out/tag-out instructions for all equipment.
		4. Power provided shall be compatible with on-site electric distribution systems.
* Install inverters and control panels in most optimum locations with appropriate environmental protection. Roofs may be used if structurally sufficient. If inverters are mounted outside they shall be shaded from direct sun and be able to be secured.

7.2.7 A minimum 10-year manufacturer’ s warranty shall be provided.

* 1. **Control Panel to Solar Electric Array Wire Runs**
		1. Areas where wiring passes through ceilings, walls, or other areas of the building shall be properly restored, booted, sealed, and returned to their original condition.
		2. Thermal insulation in areas where wiring is installed shall be replaced to “as found or better condition.” Access doors to these areas shall be properly sealed and gasketed.
		3. All field electrical devices shall have the capability to be locked as appropriate.
	2. **Photovoltaic Monitoring**
		1. The PV systems installed shall include a monitoring system for use by the [ORGANISATION] and the general public on a vendor-provided website. The public site is intended for education and outreach regarding renewable energy production and information on avoided greenhouse gas production. The system must have a web api to enable system to system communication, and may include direct protocols such as modbus.
		2. Monitor by an Internet Protocol (IP)-addressable device and display graphically in a user-friendly manner the following parameters:
* AC energy flow
* Solar irradiance
* status of all equipment
* electrical one-line diagram showing operation and performance of all equipment

Data including metered information shall be available both in real time and in archived 30-minute averages. All monitoring hardware and monitoring equipment over and above a typical PC shall be provided by the contractor.

The system shall also include metering for remote data collection and display on the vendor-provided web site of system performance. System performance shall allow display during different monitoring periods from 1 hour to 1 year.

* + 1. Provide networking equipment, engineering, programming, wiring, and software to allow remote connection by [ORGANISATION] to the local area network.
		2. Any load monitoring Meters shall be installed in the main distribution panel (MDP) when possible.
	1. **Structural Requirements**
		1. All structures, including array structures, shall be designed in accordance with all applicable codes and standards.
		2. The contractor shall provide structural calculations by a licensed professional structural engineer.
		3. All structural components shall be noncorrosive (galvanized steel, stainless steel, or aluminum). All hardware shall be stainless steel or aluminum. All components shall be designed to obtain a minimum 40-year design life.
		4. All roof penetrations shall be designed and constructed to meet building standards, insurance and roofing material manufacturer’s requirements. The number and size of the penetrations necessary to extend the power and control cable into the building must be kept to a minimum and grouped in a single location when practicable. All roof installations and weather proofing of penetrations shall not compromise the roof warranty, or if the roof has no warranty, accepted best practices. The roof penetrations and roof connections shall be warranted for weather tightness for 10 years from the installer, including parts and labor.
		5. Rooftop installations where there is no parapet, or the parapet is less than 1m, a 2m safety zone from the roof edge to the PV system shall be maintained. A 1m clear path of travel shall be maintained to and around all rooftop equipment. Design shall address access for maintenance and replacement of the equipment. Appropriate fall protection or temporary platforms shall be incorporated into the design to allow for this maintenance and replacement work. If the inverters are mounted on the roof, this equipment shall have permanent access walkways installed to facilitate monitoring and maintenance.
	2. **Attachment to Roof**
		1. The system shall be mounted using the best means practicable, such as direct attachment or a fully ballasted system. All penetrations and structural connections

associated with supports and conduit shall be kept to a minimum and shall be waterproof.

* 1. **Lightning Protection.** Provide surge protection on all electrical systems.
	2. **Photovoltaic System Installation Warranty.** The PV systems shall carry a 5-year workmanship warranty by the installer, including parts and labour.
1. Shop Drawings / Product Data
	1. **Submissions.** The contractor shall submit shop drawings and product data/submittals, catalog cuts, etc., as stipulated herein. Shop drawing/product data submissions to [ORGANISATION] shall be made after review and approval by the contractor. All approved product data and shop drawings shall be delivered to [ORGANISATION] in one submission electronically.

The contractor shall combine all product data submission material into hard copy manuals for reference during all phases of construction. Shop drawings shall be bound with product data.

* 1. **Reviews.** Reviews of shop drawings and product data by [ORGANISATION] are not to be interpreted as an approval of the contractor’s product selections. The contractor shall remain completely responsible for constructing the PV system in accordance with all contract performance requirements.
	2. **Products for Submission.** The contractor shall provide shop drawings and product data for all systems, equipment, and materials.
1. Inspections and Tests
	1. **General.** The contractor shall perform inspections and tests throughout the construction process, including: existing conditions/needs assessments, construction installation placement/qualification measurements, and final inspections/tests performance certification.
	2. **Final Inspections and Tests.** An inspection by a licensed electrical inspector is mandatory after construction is complete. Unless otherwise identified, manufacturer recommendations shall be followed for all inspection and test procedures.

Tests shall include a commissioning of the array. Commissioning shall be performed for the entire PV system. This data shall be used to confirm proper performance of the PV system.

* 1. **Documentation.** The contractor shall provide documents containing all test reports/findings. Test results shall typically include: item/system tested, location, date of test, test parameters/measured data, state of construction completion, operating mode, contractor inspector/[ORGANISATION] witness, test equipment description, and measurement technique.
1. Project Closeout
	1. **Preparation for Final Inspection and Tests.** The below steps shall be taken to ensure the project is in a condition to receive inspections and tests.

Finalize record drawings and manuals, indicating all as-built conditions.

* 1. **Record Drawings**. The contractor shall maintain on-site the working record drawings of all changes/deviations from the original design.
	2. **As-Built Drawings and Specifications.** The contractor shall provide as-built drawings and documents based upon actual site installation. Should [ORGANISATION] determine that variations exist between finished construction and the as-built drawings, the contractor shall correct drawings to the satisfaction of [ORGANISATION].
	3. **Warranties and Guarantees.** Submit specific warranties and guarantees, final certifications, and similar documents to [ORGANISATION] upon substantial completion and prior to final payment. Include copies with the operation and maintenance manual. All warranties shall be signed by a principal of the contractor’s firm and sealed if a corporation.
	4. **Maintenance Manual.** Provide a detailed operation and maintenance manual including a diagram of system components; a description of normal operation; a description of operational indicators and the normal status of each; a table of modes of operation, safety considerations, preventive maintenance requirements, troubleshooting, and corrective actions; sources of spare parts; etc. Submit to [ORGANISATION].
	5. **Spare Parts.** The contractor shall provide a recommended list of spare parts.
	6. **Demonstration and Training.** Provide [ORGANISATION] with approved training for designated personnel in the operation of the entire PV energy system, including the operation and maintenance of inverter(s). Provide [ORGANISATION] with written instructions and procedures for shutdown and start-up activities for all components of the system.
1. Operation and Maintenance Service

Provide operation and maintenance of the solar array systems for 1 year. Work shall include all manufacturer recommended maintenance as well as a 12-month performance commissioning. A maintenance log shall be maintained to note dates, equipment, and issues being resolved. The contractor should be available within 48 hours to respond to natural disasters (e.g., extreme storm, hail, wind events, etc.) to inspect the array for damage.