





















## **ABOUT THIS DOCUMENT**

Secretariat of Fuvahmulah City Council (hereafter “**The Council**”) is planning to use solar energy to power its Council Office Building and Facility Building. The main object of this project is to reduce expenditure on electricity bills and rely on solar panels to generate clean energy required for the buildings.

## **1. ADDITIONAL INFORMATION**

The scope of the contractor is to design, supply, installation and maintenance of the on-grid photovoltaic system.

## **2. GENERAL**

The Contractor shall provide a detail Proposal which consists of the following topics:

### **2.1. TECHNICAL PROPOSAL**

The Technical Proposal shall contain at least the following topics:

#### **A. System Design**

- i. PV System Design
- ii. Single Line Diagrams (including Grid Interconnection)

#### **B. Datasheets and Certifications**

- i. PV Module
- ii. On-Grid Inverters

### **C. Warranty**

- i. PV Modules
- ii. On-Grid Inverter
- iii. Service Warranty

### **2.2. PERMISSIONS**

The Council is responsible for obtaining necessary permissions from Utility Company for grid connection.

The Council is also responsible for providing permission to lay cables if necessary.

### **3. PROJECT SITES**

### **4. TECHNICAL REQUIREMENTS**

The scope of the contractor is to design, supply, installation and maintenance of the on-grid photovoltaic systems. The system design and installation shall comply with the requirements mentioned in this document.

#### **4.1. INTRODUCTION**

- A. The Contractor shall provide a complete design for supply and installation of Solar Photovoltaic (PV) power plants, to the list below

**Masjidul ummul qurra**

**Masjidul Aaisha**

**Masjidul Hidaya**

**Masjidul Noor**

**Masjidul Salaam**

**Masjidul Halaara**

**Masjidul Thaubaa**

**Masjidul Ahvaabu**

**Masjid Al-Ihusaan**

**Masjidul Safwa**

- B. The solar power plant will be grid-connected via net metering with the local electricity distribution company.
- C. The designs, equipment and installation standards shall comply with the local and international regulations and standards. The Vendor shall include all necessary equipment, materials and work practices to comply with the mentioned standards and regulations, even where not precisely specified in this document.

- D. The design plan for the panel installation for the sites where the roof does not provide the space required or does not get enough sunlight hours, contractors can use the available area in the grounds for panel installation. The structure shall blend with the site and shall be of purpose. Eg: walkways.

#### **4.2. MATERIAL CHARACTERISTICS AND STANDARDS**

The material supplied shall comply with the international standard of PV Systems. All equipment must be in accordance with Maldives Energy Authority Codes and Regulations.

#### **4.3. SUPPLY SCOPE**

- A. The solar power plant shall include but is not limited to support structures, foundations and fixings, PV modules, inverters, control systems, circuit combiners, AC distribution boxes, metering equipment and cabling.
- B. The Contractor's complete design shall be submitted after commencement of works. This design shall include all drawings, equipment and material specifications.
- C. The contractor shall provide details of the manufacturer and the technical specifications for each major equipment, (PV Module, Inverter, and Combiner Box etc.) included in the design.
- D. The contractor shall provide technical support/documents which may necessary for obtaining permissions for Net Metering from local power Distribution Company.

#### **4.4. QUALITY ASSURANCE REQUIREMENT**

The Contractor must maintain a quality system that conforms to the National or International Standards.

## **4.5. REQUIREMENTS FOR MAJOR EQUIPMENT**

### **4.5.1. PHOTOVOLTAIC MODULE**

- A. The PV module used must qualify to the latest edition of any of the following IEC PV module qualification test or equivalent to BS Standards.
- B. For the PV modules should be able to survive in a highly corrosive atmosphere throughout their lifetime.
- C. The total power shall be obtained by streams of PV module.
- D. PV modules shall be either mono crystalline or multi crystalline.
- E. PV modules shall be in half-cell layout.
- F. PV modules shall be PID resistant.
- G. PV Modules shall be Aluminum framed with hard face covers.
- H. The PV module selection shall be made from state of the art of the PV technology with the best relation space/production as possible.
- I. PV module brands shall be declared with datasheet and justified.
- J. Stream voltages should be average voltage to avoid losses on low voltage transfer which increases the length of wiring and not too high voltage to avoid magnetic field production with relevant thunder shot possibility.
- K. PV module shall come to the site properly tested.
- L. PV module shall come to the site properly packaged to avoid damaging during shipment.
- M. PV module shall comply with the above, Material characteristics and standards.
- N. PV module shall be guaranteeing 20 years with 90% efficiency.
- O. PV module shall be guaranteeing 10 years against any kind of production defect.

#### 4.5.2. ON-GRID INVERTER

- A. The Contractor shall supply all necessary on-grid inverters for the correct operation of the system, and which allow for future expansion of the PV power plant in phases.
- B. The Council understands the most critical component of a PV System is the Inverter. Therefore, The Council expects the Contractors to propose robust, reliable and low failure rate proven Inverters which can work efficiently for more than 10 years without any major failure in hot and humid environments.
- C. The Contractor shall provide details of the following characteristics for each inverter:
  - i. Max input power
  - ii. Max output power
  - iii. Efficiency rating
  - iv. Protection features
  - v. Voltage, current and power ratings
  - vi. Communication capabilities
  - vii. Operating parameters
  - viii. Controls and displays
  - ix. Standards and certifications
- D. The inverters shall have a efficiency of 97% - 98% or above.
- E. The inverters shall have a DC Isolation Switch.
- F. The inverters shall have surge protection.
- G. The inverters shall have capability to remote monitoring of the system performance through internet.

H. The inverters make/brand must be from one of the European brands such as:

- i. ABB
- ii. Enphase Energy
- iii. Fronius International GmbH
- iv. SMA Solar Technology AG

#### **4.5.3. COMBINER / AC DISTRIBUTION BOX**

The Contractor shall supply all distribution boards and combiner boxes necessary for the protection of the cabling and equipment within the solar power plant. This shall include for all necessary supports, steelworks, concrete etc. to properly complete the installation of these boards and connecting cabling.

#### **4.5.4. EARTHING**

The Contractor shall design and provide installation for a complete earthing & grounding system for the complete solar PV installation. PV Arrays and Inverters must be earthed separately. In addition, the Contractor shall ensure surge protection devices properly installed at both AC and DC ends.

#### **4.5.5. WARRANTY**

- A. PV modules used in solar power plants must be warranted by the manufacturer for output wattage, which should not be less than 90% within the first 10 years and 80% at the end of 25 years.
- B. Inverter must have at least 5 years manufacturer backed warranty.
- C. Contractor must be responsible for Service Warranty at least 2 years from the date of PV Plant commissioning date.



#### **4.5.6. MONITORING SYSTEM**

The Solar Power Plants must have the functionality to monitor over internet. In addition to this requirement, important real-time data such as Current Performance, Daily Yield, Total Yield and CO2 Reduction shall be available as a HTML widget to display on The Council's website for public view.

