**SCOPE OF SERVICES**

**FOR**

**ROOFTOP PV SOLAR SYSTEM DESIGN, INSTALLATION AND MAINTENANCE**

**AT THE FOLLOWING VARIOUS BUILDINGS:**

**GENERAL POST OFFICE (GPO)**

56 CHURCH STREET HAMILTON HM12

BUILDING #0371

**GOVERNMENT ADMINISTRATION BUILDING (GAB)**

30 PARLIAMENT STREET HAMILTON, HM11

BUILDING #0372

**TRANSPORT CONTROL DEPARTMENT (TCD)**

11 NORTH STREET CITY OF HAMILTON HM17

BUILDING #0773

**FORT LANGTON BUS DEPOT (PTB)**

GARAGE BUILDING

26 PALMETTO ROAD DEVONSHIRE DV05

BUILDING #0434,

**SCOPE OF WORKS FOR ROOFTOP PV SOLAR SYSTEM DESIGN, INSTALLATION AND MAINTENANCE AT THE FOLLOWING VARIOUS BUILDINGS:**

1. **General Post Office (GPO). Building: 56 Church Street, Hamilton HM 12 Building #0371.**
2. **Government Administration (GAB). Building: 30 Parliament Street, Hamilton HM 11, Building #0372.**
3. **Transport Control Department (TCD). 11 North Street, City of Hamilton, HM 17, Building #0773.**
4. **Fort Langton Bus Depot (PTB). Garage Building, 26 Palmetto Road, Devonshire DV 05, Building #0434.**

**Objective**

**The Government of Bermuda’s interest in pursuing solar photovoltaic projects reflects the following prioritized goals;**

1. **Reduce grid electricity/maximize savings on electricity bills**
2. **Meet company sustainability goals/minimize company impact on the environment**

**SECTION I**

## SCOPE OF SERVICES

The Supplier should use the following guidelines in respect of the Project for the System.

* 1. **Rooftop Solar**

The Supplier shall develop a design for a new photovoltaic system. It is the responsibility of the Supplier to assess the buildings structural integrity, roof condition and shading limitations.

* 1. The Supplier shall cause the following:
* The System shall comprise of waterproof and anchored mechanical fasteners. Mounting System design needs to meet applicable local building code requirements with respect to wind factors. Solar system installation should not void the roof warranty.
* Conduit penetrations shall be minimized.
* System shall be fixed tilt with an orientation that maximizes annual savings.
* All roof access points for the System shall be securely locked at the end of each day.
* System layout shall meet local fire department, code and ordinances required for roof access.
  1. **Design, Engineering and Permitting**
     + - 1. Design and engineer the System to occupy the available roof areas to the building footprints as detailed on the site plans.
         2. The System solar arrays shall not exceed the dimensions of the areas provided. All proposals should provide the exact dimensions of the installed arrays so that it is clear the arrays will not exceed the allotted space. No Exceptions. The system should also be designed taking into consideration the electrical demand and load patterns, the illustrated installation location, available solar resources, existing site conditions, and other relevant factors.
         3. The design of the System will be subject to final approval by our electrical engineer (“**Engineer**”).
         4. The Supplier may not proceed with construction until designs have received final approval and the Engineer has issued a formal construction Notice to Proceed.
         5. The Supplier shall maintain a set of drawings for the System and related Service, with all (Engineer approved) design changes made during construction.
         6. Upon completion of construction, the Supplier shall submit final design documents, including, at a minimum, drawings that are updated to reflect all changes, with details of PV system structural support, all roof penetrations, electrical single-line diagrams, and complete product literature for review by the Engineer. A structural professional engineer shall sign and stamp the structural drawings, and a professional electrical engineer shall sign and stamp the electrical drawings. Three hard copies shall be submitted, as well as a CD with electronic copies of all documents.
  2. Supplier should provide design documents that provide the following minimum information:

1. Timeline/Project Schedule.
2. System description.
3. Key equipment details and description.
4. Layout of the installation.
5. Detailed one-line diagram based on specific recommended equipment.
6. Layout of supporting equipment.
7. Specifications for equipment procurement and installation.
8. Solar Panel Power production Warranty documentation.
9. Solar Panel Workmanship Warranty documentation.
10. All engineering associated with structural and mounting details.
11. Performance of equipment components, and subsystems including the efficiency rating of the proposed solar PV panels.
12. Integration of solar PV system with other power sources.
13. Electrical grid interconnection requirements.
14. Controls, monitors, and instrumentation.
15. System performance monitoring.
16. Estimated production simulation, including all factors and assumptions applied to model output.
    1. The Supplier should identify the area for the solar PV inverter equipment and its related components and environmental control systems that will meet the following criteria:
17. Meet local Planning requirements.
18. Meet local Building Code requirements.
19. Meet international National Electric Code (NEC)
20. Meet the Bermuda Fire and Rescue Service requirements.
21. Ease of maintenance and monitoring.
22. All PV hardware, rack components and mountings/fixings shall be of corrosion-proof materials, high grade stainless steel, aluminum, hot-dipped galvanized steel.
23. Efficient operation.
24. Low operating losses.
25. Secured location and hardware.
26. Compatibility with existing facilities.
27. Visual harmony (where applicable).
28. System Modules shall be UL1703 listed and CEC – listed
29. Inverters shall be UL1741 listed and must be CEC- listed with a minimum efficiency of 95%
    1. The Supplier proposal shall provide evidence that the proposed technology and equipment would meet or exceed all currently applicable and proposed safety and interconnection standards. All equipment must be UL certified and meet existing facility structural and fire safety requirements.
    2. The Supplier will secure from Statutory agencies and BELCO all required rights, permits, approvals, and interconnection agreements at no additional cost to us. We will become the signatory on applications, permits, and utility agreements only where necessary and at our sole discretion.
30. **Installation** 
    1. The Supplier will be required to supply all equipment, materials and labor necessary for the Project to install the System and integrate it with other power sources. Installation includes, but is not limited to, the following:
    * Mechanical Equipment and Installation
    * Furnish and install all mounting equipment for deploying modules on the roof. The Supplier is to coordinate with us ensuring that the System is placed on our Premises in accordance with the limitations presented. Furnish and install all solar modules, inverters and other conditioning equipment and other required materials in order to have a complete and whole System.
    * Where roof penetrations are made they shall be properly sealed and waterproofed. The number and design of all roof penetrations and attachments, including the waterproofing of the same is subject to final approval by our Structural Engineer.
    * The GAB and GPO Buildings are comprised of TPO roof coverings applied over Plycem onto the existing flat concrete roofs. These roofs are still under warranty by the roofing supplier: **J. W. Gray and Co. Ltd.** and the Supplier will be expected to sub-contract to J. W. Gray and Co. Ltd. to ensure water tightness of all new roof penetrations and to maintain the balance of the existing roof warranty at the completion of the project. All mountings are therefore to be waterproofed by J. W. Gray and Co. Ltd.
    * The Supplier shall design the system for the minimal building penetrations necessary to meet the wind loading of the System.
    * The Fort Langton Bus Depot roof is comprised of a pitched corrugated metal roof covering supported by a steel frame.
    * The Transport Control Department Roof is comprised of a pitched corrugated metal roof and a pitched Plycem SKB roof all supported by a steel frame.
    * Raise all necessary materials to be mounted on the roof.
    * Inspect and survey the structural materials and solar panels for manufacturing flaws and defects before installing.
    * Inspect and survey the structure.
    * Clean the work area at the job site upon completion.
    1. **Electrical Equipment and Installation**
31. Include all necessary equipment installation and wiring for a complete and whole system.
32. Furnish and install transition boxes at the end of each source circuit to transition from exterior wire on panels to conduit.
33. Furnish and install equipment necessary for proper grounding and arching.
34. Field wire the solar panels, arrays, etc. and install to identified sources.
35. Mount power conditioning equipment which includes all inverters, meters, and transformers as required for a complete and whole system.
    1. **Start up and System Testing**
36. Start‐up and test the System I accordance with the acceptance testing criteria set out in this Agreement, subsequent to demonstration to us.
37. Provide demonstration of System operation to us.
38. Provide training to our staff in accordance with the Appendix 5.
    1. Any installation such as, but not limited to, roof penetrations as well as roof loading must be preapproved by us and must not void any existing warranties of any of oursystems or Service.
39. **Electrical Interconnections**
    1. Supply and install all equipment required to interconnect the solar PV system to the Electrical distribution system.
    2. The Supplier will fulfill all applications, studies, and testing to complete the interconnection process for the System. All costs and expenses (including legal expenses) associated with utility interconnection shall be borne by the Supplier with the exclusion of any licensing requirements of the Regulatory Authority.
40. **Commissioning & Acceptance Testing**

During the installation of the System, we and/or our Engineer of consultant, shall observe and verify each System performance. Required commissioning and acceptance test include:

1. Installing and starting up each System until it achieves the optimum performance requirements
2. Conducting the performance testing over a consecutive twenty-four (24) hour period.
3. Conducting the successful delivery of power within thirty (30) days following completion of the system, meeting each benchmark.
4. **Operation and Maintenance Manuals and As-Built Drawings**
5. The Supplier will provide three (3) sets of operation, maintenance, and parts manuals for the System as PDF files. The manual shall cover all components, options, and accessories supplied. It shall include maintenance, trouble-shooting, and safety precautions specific to the supplied equipment. It shall also delineate responsibilities of both parties, during the term of any agreement that may be agreed to.
6. Provide three (3) sets of as-built drawings as CAD and PDF files. These requirements shall be delivered prior to acceptance of the System.
7. **Monitoring**

The solar system should be fitted with monitoring equipment capable of monitoring, analyzing, and displaying historical and live solar electricity generation data. The regularly collected data should reflect, but not be limited to, the following:

1. System performance
2. System availability
3. Average and accumulated output
4. Capacity factor
5. Degradation
6. Cost avoidance
7. **Operation and Maintenance** 
   1. All respondents must be able to perform all required maintenance activities, including warranty repair work and equipment replacement including, but not limited to, inverter replacement in order to keep the system operational and performing to production guarantees.
   2. All respondents must offer a comprehensive onsite operation and maintenance service program for the PV system operations, safety and maintenance activities. The operations and maintenance service program should provide the following minimum requirements:
   3. Annual on-site system inspection, (time stamped photos are required to be provided) including:
8. System testing (operating current of each electrical string).
9. Routine preventive maintenance.
10. Repair and/or replacement of defective parts (including equipment and labor).
11. Cleaning of System PV panels.
    1. Daily system monitoring by Supplier, including:
12. Prompt reporting of problems to our Buildings Manager.
13. Prompt dispatch of resources for expeditious resolution of problems.