**Work Package 2:**

**Technical Tender Specifications for Leguan 0.6MWp Solar PV Farm 13.8kV Interconnecting Line & LV Distribution Upgrade**

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**Project: Renewable Energy Solutions for the Hinterland - Leguan**

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**Site: Leguan, Region 3 – Upper Essequibo Islands, Guyana**

This document provides the technical specifications for the Supply and construction of a 1.2 km, 13.8kV three (3) wire transmission line inclusive of upgrades to the LV distribution network and an Optical Ground Wire (OPGW) communication link for the interconnection of the proposed 0.6MWp Leguan Solar Farm to GPL’s existing power plant. This document is an Annex of the Bidding package prepared by Guyana Energy Agency with IDB procurement templates.

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# Scope of Work

## This scope of work describes the requirements for the Leguan 0.6MWp Solar PV Farm 13.8kV Interconnecting Line and LV Distribution Upgrade as follows:

### Supply all materials, specialized equipment and construct an approximately 1.2km long, 13.8 kilovolts, three wire (3W), three phase, bare conductor, for the extension of the existing overhead medium voltage F1 East feeder as shown in Annex 1.6. This overhead distribution network extension will interconnect a 0.6MWp, Solar PV Farm to power GPL’s existing primary distribution network on Leguan Island.

### The design, supply and construction of the Transmission Line must comply with the **National Grid Code** which can be found in Annex 3.

### The following civil works must be provided by the Contractor: Site Clearance and Land Preparation, and Foundations as required:

### Survey right of way of line, identify pole locations and mark pole position in accordance with line design drawing provided in Annex 1.6 Leguan Solar PV Interconnecting Line;

### Trim trees and clear vegetation that are within the right-of-way of the interconnecting line and work area that will be used to construct said line;

### The Contractor shall provide a Quality Control Plan, a Health and Safety Plan and Environmental and Social Management Plan and follow the procedure for the Fauna Rescue and Redistribution Plan as proposed in the Environmental and Social Analysis Report (ESAR). All works must comply with the mentioned plans.

### Special attention must be paid to the tropical, high humidity environment with regard to the selection of the materials to be used and supporting structures.

## This scope of work describes the requirements for the Leguan 0.6MWp Solar PV Farm OPGW communication link:

### Supply all materials, specialized equipment and install a 4.0 km long OPGW cable, to be installed overhead utilizing the same poles structure as the 13.8kV transmission line between Leguan’s diesel power plant and the new solar PV power plant.

### The OPGW cable to be installed shall be capable of withstanding the rigors of outdoor installation for a lifetime of up to 20 years.

### The cable must have a wide operating-temperature range, be resistant to sunlight and moisture, and have sufficient tensile strength for long pull distances.

### The cable structure must isolate the glass fibers from the mechanical stresses that can be induced throughout the cable's service life.

# Technical Specifications – General

### Overhead transmission line:

### All designs, materials, installations and services under this tender shall comply with the following:

* Relevant standards and publications of the International Electrotechnical Commission (IEC) for electrical equipment.
* NESC and confirm to standard overhead line construction guidelines and practices;
* Sag and Tension of Tulip (AAC) conductor must confirm to standard overhead line construction guidelines and practices;
* All poles must be treated Wallaba type;
* All crossarms must be treated Purpleheart type;
* All medium voltage power cable must be copper conductor;
* All works will be subjected to inspections by MPL’s Authorized Personnel; and
* GPL´s National Grid Code
* EPA’s Permitting Requirements for transmission line (if applicable).
* Approved Contractor must have previous experience in construction of Overhead Distribution Lines.

### OPGW – Communication link.

### All designs, materials, installations and services under this tender shall comply with the following:

### Relevant standards and publications of the International Electrotechnical Commission (IEC) for optical telecommunication cables, commonly with single-mode fibres used primarily in overhead power lines applications electrical equipment (IEC 60794-4-20:2018)

### ANSI/ICEA S-87-640 - Optical Fiber Outside Plant Communications Cable

* Approved Contractor must have previous experience in the installation of overhead OPGW cables.

## Quality Assurance

### To ensure that the Works are in accordance with the outlined specification, regulations and authorised international standards, the Contractor shall have in place suitable Quality Assurance Programs and Procedures.

### The Contractor must demonstrate that all equipment are from manufacturers using technology that have been proven to work reliably.

### The Contractor must submit a Provisional Quality Assurance Plan in the Bid. The final Quality Assurance plan shall be approved by the contracting agency before signing of Contract.

### The Contracting Agency is entitled to supervise or to have supervised the Quality assurance Plan of the Contractor with respect to the Works in all phases of the project (design, engineering, material handling, manufacturing, testing, inspection, construction and erection, commissioning). When required by the Contracting Agency, the Contractor must facilitate all requested tests, inspections and sample submissions.

### The Quality Assurance Plan must contain the procedure, schedule and considerations for the realization, review and approval of the design. The considerations must comply with the requirements of the Contract. Considerations may include calculations, tests or certificates. The Quality Assurance Plan must outline the relevant considerations.

### In cases where test results or other characteristics of similar components or parts deviate significantly from each other, the Contracting Agency is entitled to reject them.

## Health and Safety Plan

### The Contractor shall comply with the Occupational Safety and Health Act of the Contracting Agency and Guyana. The OSHA of Guyana can be found in Annex 4: Occupational Safety and Health Act of Guyana**.**

### The Contractor shall submit their own Health and Safety (H&S) plan with mitigation measures in the Bid. During the design stage, the final H&S plan shall be shared with the Contracting Agency together with the final design of the system.

### All contractors, staff and third party shall be well informed and trained on all H&S issues at the site. All facilities shall be designed to enhance safety planning. All activities shall be executed within the confines of the relevant legislation as well as stakeholders’ interests. All project activities shall be properly managed through careful planning and the application of relevant safety policies such as:

### Environmental Operation Permit

### H&S meetings before embarking on a job

### Use of appropriate personal protective equipment (PPE)

### Prohibition of alcohol in the project area

### Proper journey management

### Regular emergency drills

### Use of appropriate caution signs

### Control of Atmospheric Emissions

## Environmental and Social Management Plan (ESMP)

### The Contractor shall comply with the Environmental and Social Analysis Report prepared for Solar PV Farms in Leguan, Lethem and Bartica. The report can be found on the IDB’s website (<http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=EZSHARE-1460553615-30>) as well as in Annex 5: Environmental and Social Analysis Report.

### The Contractor shall be responsible for ensuring that all areas of the site are left in the same conditions as prior to the commencement of the works.

### All site clearance works shall be carried out within defined perimeters and only when necessary. The maximum permissible time lapse between site clearing and initiation of construction operations shall be reduced to the bare minimum. Clearing of vegetation shall be kept to the barest minimum necessary to permit safe operations. Trees felled from the project site shall be made available to the host communities for re-use prior to decision on the disposal of the materials at the authorized landfill.

### Dirt roads and exposed construction areas shall be moisturized during the dry season to prevent and minimize dust emissions. Construction equipment shall be well maintained to minimize exhaust emissions into the atmosphere.

### Noise levels shall comply with relevant regulations. The personnel, as well as the environment that shall be affected by any established noise source, shall be provided or equipped with an appropriate protective or corrective device to ameliorate noise effect.

### Adequate waste management shall be integrated into the implementation of this interconnection system. The principle of waste reduction, recycling, recovery and re-using shall be practised whenever possible. All wastes, which cannot be reused, will be managed and disposed of in accordance with the regulatory standards. Some of the waste management options and waste disposal systems that will be considered for this project are:

### Segregate components such as wood, plastic and paper shall be recycled or reused whenever possible, with preference for reusing and recycling given to interested stakeholder(s), principally the local community for their benefit.

### Reduce packaging wastes such as paper and plastic using bulk handling systems

### Dispose of all wastes at approved municipal dumps

### Refilling and reusing of containers

### Appropriate mobile septic tanks/sanitary facilities shall be provided during installation/pre-construction and construction phases. Construction of permanent septic tank system shall be included in the facilities design. Septage during the pre-construction, construction and operation phases shall be collected by EPA approved Contractors.

### Hazardous waste can be generated during construction due to accidental spills of fuel for the operation of construction equipment. It is recommended that waste from any fuel clean-up activities be stored on site in closed and clearly labelled containers and disposed of through an EPA approved Contractor.

### All debris, spoilt materials, rubbish and other waste, shall be cleared from the site during construction and disposed of accordingly at the Government’s designated dump/landfill sites for such wastes. The burning of any type of waste shall be strictly prohibited. Waste disposal records shall be kept and shall include as a minimum the following information:

### Date of dispatch

### Description of waste

### Waste quantity/container type

### Designated disposal site and method

### Consignee /driver name and means of transportation

### Confirmation of actual disposal (time and date)

### The Environmental and Social Analysis Report mentioned in *Item 3.4.1*, provides recommended mitigation measures to comply with the environmental and social specifications. The Contractor shall provide his/her own measures and its breakdown cost in the submission of this Bid.

## Site Visit

### The Contractor is advised to visit and examine the route where the transmission line is to be installed/constructed, its surroundings and the road/path access and obtain for itself and on its own responsibility all information that may be necessary for preparing the Bid. The cost of visiting the site shall be at the Contractor’s expense.

## Civil works

### The Contractor shall design and provide the following civil works:

### All site clearance and land preparatory works shall be carried out within defined perimeters and only when necessary. The maximum permissible time lapse between site clearing and initiation of construction operations shall be reduced to the bare minimum. Clearing of vegetation shall be kept to the barest minimum necessary to permit safe operations.

### Lines passing through the village shall not disrupt any existing drainage system. A suitable drainage system shall be constructed and connected to the existing drainage for route cleared to accommodate the transmission lines.

### Removal of temporary construction facilities and completion of restoration works.

### The Contractor shall include in the civil works the necessary works to prepare the road/footpath for delivery of the equipment.

### The Contractor shall prepare the land, including but not limited to cutting and disposal of the trees in a designated area by the Contracting Agency within Leguan.

## Security

### The Contractor shall be responsible for the security of the all material delivered and installed before official handover.

## Taxes

### The Contractor shall pay all applicable taxes as it relates to the equipment and services accordingly to the current Laws of Guyana.

## Transport

### This Project includes all transportation and installation/construction of the 1.27 km transmission line and a 4.0 km OPGW communication link in Leguan (located approx. 500 km from Georgetown).

### All transportation up to the construction site shall be included in the Contractor’s scope of supply, including, but not limited to, insurance, storage, demurrage, handling and fork-lift truck.

### Road alone or road and river transport from Georgetown are to be considered. The Contractor should also take into account the transport routes of heavy equipment to the site, which can/will take place on sand roads or paved roads with a limited axle load capacity.

### The Contractor is fully responsible for organizing and guaranteeing timely delivery and transport of the equipment and material to the site.

## Identification

### All supporting structures for the transmission line shall be provided with unique codes. The Contractor shall determine the assignment of codes in consultation with MPL/GEA.

### All labelling should be weather resistant.

### Labels must be attached permanently on a clearly visible spot of the supporting structure.

## Documentation

### All engineering documents, specification and drawings shall be sent to MPL/GEA for review, prior to the construction of the transmission line.

### During the design and engineering phase, the Contractor shall submit a draft Operation and Maintenance Manual.

### After the completion of the installation, the Contractor shall submit the AS-BUILT drawings and any other document that has changed from the design phase.

### The manual must contain at least the following information:

### Description of the installation

### Construction and assembly instructions

### Design considerations

### Operational procedures for all possible normal and abnormal conditions, including failure assessment and fault identification/interpretation

### Maintenance schemes and instructions

### Data sheet and specifications

### Test certificates

### Design drawings

### Manufacturer, type, rating, serial number and test reports of each part of the installation

### Complete commissioning manual

### Parts manual

### Address of components deliverers or manufacturers

### Startup and commissioning spares, critical and operational spares.

### All requested information must be in **English**. All manuals and diagrams must also be supplied in digital form in CAD or other standard software formats (Microsoft Project, Microsoft Excel and Microsoft Word), in addition to all documents in PDF.

# Technical Specifications – Particular

## Overhead 13. 8 kV, three wire (3W) transmission line

### This tender document is for the supply of all materials, specialized equipment and construction of a 1.27 km, 13.8 kV, three wire (3W), three phase, bare conductor, overhead transmission line between Leguan 0.6 MWp Solar PV Farm and Leguan Diesel Power Plant.

### Supply and erect 7 – 13.5 metre Concrete poles and 11 - 14 metre Wallaba poles as per overhead distribution line design provided in Annex 1.6;

### Supply and build pole structures by installing wallaba and concrete crossarms (type – Precast), insulators, machine bolts and other necessary line hardware for the following:

### Nine (9) 3 Wire Primary Intermediate/Light Angle Structure on wallaba poles

### Four (4) 3 Wire Primary Intermediate/Light Angle Structure on concrete poles

### Three (3) 3 Wire Primary Heavy Angle Pole Structure on wallaba poles

### Three (3) 3 Wire Primary Heavy Angle Pole Structure on concrete poles

### Supply and install 3,720 metres of bare aluminium conductor, codename – Tulip (AAC), equivalent size 336. MCM for the medium voltage interconnecting line.

### Supply and install nine (9) complete Down Guy Sets including guy wire, guy strain insulator, anchor rod and other associated materials on pole structures that require guying.

### Supply and install three (3) complete Overhead Guy Sets including 9m Wallaba pole, guy wire, guy strain insulator, anchor rod and other associated materials on pole structures that require overhead guying.

### Test and commission completed overhead distribution network after construction.

### Supply and install 6 Single Pole Disconnects (SPD), 3 each on the two (2) take-off structures (at both ends of the interconnecting line);

### Supply and install 20 complete Guy Sets including guy wire, guy strain insulator, anchor rod and other associated materials on pole structures that require guying;

### Supply and install 5 complete Earth Sets including copper conductor, ground rod, ground wire connector and other associated materials on line equipment that require earthing; and

### Test and commission completed 13.8 kV interconnecting line after construction.

## Distribution Voltage Upgrade

### Remove the following distribution transformers in the quantities specified below:

### 2-10KVA 4.16kV – 120V/240V transformers

### 4-15KVA 4.16kV – 120V/240V transformers

### 27-25KVA 4.16kV – 120V/240V transformers

### 3-37.5KVA 4.16kV – 120V/240V transformers

### 13-50KVA 4.16kV – 120V/240V transformers

### 3-75KVA 4.16kV – 120V/240V transformers

### Dismantle fourteen (14) transformer structures and remove fourteen (14) -14m bad wallaba poles.

### Supply and Install the following pole mounted distribution transformers in the quantities specifies:

### 2-10KVA 13.8kV – 120V/240V transformers

### 4-15KVA 13.8kV – 120V/240V transformers

### 19-25KVA 13.8kV – 120V/240V transformers

### 3-37.5KVA 13.8kV – 120V/240V transformers

### 9-50KVA 13.8kV – 120V/240V transformers

### 3-75KVA 13.8kV – 120V/240V transformers

### Supply and build pole structures by installing wallaba crossarms, insulators, machine bolts and other necessary line hardware for the following:

### Three (3) 100 KVA transformer structures on wallaba poles

### Forty-One (41) 50 KVA transformer structures on wallaba poles

### Supply and install eighty-eight (88) complete Earth Sets including copper conductor, ground rod, ground wire connector and other associated materials on line equipment that require earthing.

## Power Station Upgrade

### Supply and erect five 5 – 13.5 metres concrete poles as per overhead distribution line design provided.

### Supply and Install three **(3) 750 kVA, 480V-13.8kV, 60 Hz** Step-up Pad Mounted, Three Phase Transformer with associated concrete plinth and cables for both low voltage side from the generating plants and medium voltage side to the 13.8 kV take-off structure.

### Supply, install and terminate 180 metres - 2kV Class single core 535.3 MCM EPDM/CPE non-armored Cables (inclusive of lugs at both ends) between generators and secondary side of the 750kVA 3 phase pad mounted transformers.

### Supply, terminate and Install 90 metres - **3x35 mm square** XLPE MV power cable between three 3 -13.8 kV take-off structure and three 3-750 kVA 3 phase pad mounted transformer.

### Supply and install two (2) Gang Air Break (G.A.B) / LA Arrestor, Combination Type **(100amp) 15kV** Class - including Earth, as per line design to allow for protection and isolation of the Solar PV Plant in case of faults and maintenance on the overhead distribution network.

### Supply and install nine (9) Single Pole Disconnects (S.P.D) as per line design to allow for protection and isolation of the **750 kVA, 480V-13.8kV, 60 Hz** Step-up transformers from the overhead bus in case of maintenance on the overhead distribution network.

### Supply and install one (1) Auto- recloser on the east feeder including Earth, as per line design to allow for protection and isolation of the Solar PV Plant in case of faults and maintenance on the overhead distribution network.

### Contractor shall be guided by *Annex 1.4b and 1c* Leguan Diesel Plant SLD-Existing, and Leguan Diesel Plant SLD-Proposed respectively as it relates to the works under these requirements.

## Interconnection

### The interconnection of the transmission lines will be done in close coordination with GPL.

## Commissioning

### Commissioning refers to inspection and testing the transmission line after installation and certifying that it operates as expected and is installed in accordance with the engineering and design plans and complies with all the regulations and standards specified.

### The Contractor shall submit to the Contracting Agency the test procedures and protocols four (4) weeks before testing.

### The commissioning shall include at a minimum:

### Complete integrity checks and visual inspection.

### No load test for duration of a minimum of 48 hrs.

## Overhead Fiber Optic Communication Link

### This tender document is also for the Supply all materials, specialized equipment to install a 4.0 km Optical Grown Wire (OPGW), and associated line support hardware, at the top of all poles of the 13.8kV transmission line. The OPGW shall provide the function of communication and lightning protection of the interconnecting line between Leguan’s diesel power plant and the new solar PV power plant.

### The OPGW cable must be selected to effectively provide communication and lightning protection of the interconnecting line between GPL’s diesel power plant and the new solar PV power plant and must comply with the following specifications:

|  |  |
| --- | --- |
| OPGW Cable Type | OPGW-12B1-60 |
| No. of Fiber Strands | 12 (6 Pairs) |
| Sectional Area | 61.1 mm2 |
| Diameter | 10.8 mm |
| Weight | 430.9 kg/km |
| Rated Tensile Strength | 73.7 kN |
| DC Resistance (20 oC) | 1.389 Ω/km |
| Short-circuit Capacity | 18.3 kA2.s (40oC -200oC, 1s) |
| Elasticity Modulus | 162 kN/mm2 |
| Thermal Expansion Coefficient | 13 x 10-6 (1/oC) |
| Minimum Bending Radius (Construction) | 216 mm |
| Minimum Bending Radius (Run) | 162 mm |
| Fiber No. | 12B1 |
| Fiber Type | G.652 Single-mode fiber |

### The fiber optic cable shall be of single mode 12 strand type.

### The cable structure must isolate the fiber optic cable from the mechanical stresses that can be induced throughout the cable's service life, also the cable shall be installed utilizing only approved/certified hardware.

### The cable shall be a single run, with special attention to maximum allowable bend radius for cable type.

### Cable shall be installed with adequate sag to allow for thermal expansion and contraction, and not to exceed the mechanical properties of the cable

### Cable should have a minimum height of 1.2 metres to a maximum 1.8 metres above the current carrying conductor.

### Preformed armoured rod (Plats) must be used for cable attachment and suspension along the cable route. Cable should be supported with the appropriate suspension kit for intermediate structures; appropriate tension kit for the angle structures; and appropriate remaining cable shelf and joint boxes, where splicing of the cable is required. Each support kit shall include pole band attachment, clevis, grounding cable, lag screws, clamps, clips, bolt and nuts etc.

### Cable route must be anchored where cable direction changes and with the absence of same on the existing route.

### Supply and install two (2) 4U wall mount rack enclosures, one at the Bartica diesel power plant and one at the solar PV plant. Specific locations shall be decided upon in consultation with the contractor responsible for the solar PV plant, GPL and the employer (GEA).

### Supply and install two (2) rack mounted 12-port (SC UPC) 1U optical distribution frame (ODF) patch panel, one at the Bartica diesel power plant and one at the solar PV plant in the enclosures mentioned in section 4.2.5. The contractor shall be responsible for the termination/splicing of the fiber optic cable to each ODF installed.

### Full tube fusion splicing to be completed at both ends of the fiber cable (all strands). Contractor is responsible for providing all materials and equipment for this activity.

### Supply and install two (2) ethernet router / switch (full duplex) with at least two (2) SC ports (1000 Base-X) and at least 4 1000 Base-T ports at both sites. The router / switch must be capable of routing or switching at least 1Gbps of traffic.

### The installation of the OPGW cable must be done at the top of all poles of the 13.8kV transmission line.

### All materials, equipment, and hardware proposed must be accompanied by a detail manufacturer specification/data sheet

### The specification/data sheet must indicate the country of origin for all materials, equipment and hardware proposed and shall comply with Section III ’Eligible Countries’ of the Standard Bidding Document.

### Testing

* All testing must be performed in the presence of the employer.
* The test plan must include tests for continuity, length, anomalies, and attenuation on all strands of fibre that are planned to be used.
* After all splices have been completed, a single-direction OTDR test at 1310 nm and 1550nm, of all spliced fibers in all buffer tubes and recorded.
* End-to-end testing using a laser source and power meter must be done. Measurements of loss and power level at 1310 nm and 1550nm, must be recorded.

### Maximum acceptable loss criteria

* Attenuation:
  + @ 1310nm = 0.50 dB/km
  + @ 1550nm = 0.40 dB/km
* Anomalies: no event shall exceed 0.30 dB
* Splice Loss reading from OTDR test: 0.30 dB
* Connector Loss: 0.60dB

The total optical fiber loss must not exceed the summation of all the above stated criteria for the given segment distance.

## Economic evaluation of Bid submission

### The Bidder is required to submit a detailed bill of quantities indicating costs for materials/hardware, services and transportation