Terms of Reference

FOR

CONSULTANCY SERVICES FOR STUDY TO IMPROVE THE RESILIENCE OF DISTRIBUTION SUBSTATIONS

Prepared by:
Belize Electricity Limited
Transmission, Substation System Expansion & Projects Department
2½ Miles Philip Goldson Highway
Belize City, Belize
November 2021

Bidders are asked to submit proposals via email to bidsubmittal@bel.com.bz no later than 3:00 p.m. local time on Wednesday, December 1, 2021 and labelled:

BID #2021-264 – Consultancy Services for the Study to Improve the Resilience of Distribution Substation.

TERMS OF BIDDING AND EVALUATION CRITERIA

GENERAL

1 Background Information

Belize Electricity Limited (BEL) is largely a transmission and distribution utility with 104,000 customer accounts, meeting a peak demand of approximately 102.7 MW (2020) through local Independent Power Producers (IPP), a Power Purchase Arrangement (PPA) with Comisión Federal de Electricidad (CFE) of Mexico and its own emergency backup generation. BEL also operates an off-grid power station with a diesel generation capacity of 2.4 MW that supplies the island of Caye Caulker. Currently, over 85% of the population in Belize has access to electricity from BEL.

BEL's Transmission/Sub-Transmission Grid (connection to generation and to distribution substations) traverses the country of Belize at various voltage levels. The grid consist of a total of 398.91 miles of overhead lines.

A listing of the Substations to be assessed in this study is shown below:

	Substation	Year of Installation
1	Maskall Substation - 10MVA 115/34.5kV	1998
2	San Pedro Substation - 17MVA 34.5/22kV	1998
3	Westlake Substation - 14MVA 115/22kV	1995
4	La Democracia Substation - 30MVA 115/69KV	1998
5	Independence Substation - 14MVA 69/22kV	2005
6	Punta Gorda Substation - 14MVA 69/22kV	2005
7	San Ignacio Substation - 14MVA 115/22kV	1995
8	Camalote 115kV Switchyard	1995

Figure 1: Listing of substations to be assessed

See Annex 1 for geographic map of Belize showing transmission lines and substations.

Belize's geography is characterized as flat and swampy along the coast. The inland terrain is characterized as tropical pine savannah and hardwood forest. There are some major substations which have associated control buildings located at ground level which are below the storm and hurricane flood plain.

Belize has a tropical climate with a distinctive wet and dry season. Most of the rainfall occurs during the period June to November and most of the dry spells occur during the period January to June. The climatic conditions affect the Company's vegetation management practices influencing rapid vegetation growth during the wet season or fires due to dry, parched terrain. The mean temperature varies from 81°F/ 27°C along the coast to 69°F/21°C in the hills. The

coldest month is January while the highest temperatures are experienced during the month of May.

Belize is also in the hurricane path, and a considerable number of hurricanes and tropical storms that traverse across the Caribbean making landfall in Belize before dissipating. Such storms are often accompanied by high winds that can damage infrastructure, significant precipitations that lead to flood damage, or a combination of both. Power transmission system damage during hurricanes is of concern to BEL as such could result in the inability to quickly restore electricity service to customers after a hurricane. The World Bank has produced a paper titled "THE POWER SYSTEM IN THE EYE OF THE STORM: The Call for Energy Resilience and Climate Adaptation in Belize" which gives a full perspective of the impact of hurricanes on the power system infrastructure in Belize. This paper can be found on World Bank's website.

CONSULTANCY OBJECTIVES

2 Scope of Work

2.1 The Consultant shall visit eight (8) substation locations to be able to classify and provide justification for need if the substation control buildings needs i) structural improvements, ii) as being prone to inundation due to floods caused by storms and hurricanes and iii) as needing the battery system to be upgraded due to end of life equipment, obsolete, aging or loading.

2.2 The Consultant shall provide general requirement of substation control building to be used as a standard for the modelling of new control buildings at BEL. The consultant shall include drawings, specifications, BOM and recommendations of building design considering climate change and resiliency.

2.3 Conduct an engineering study to evaluate the structural state of those substation control rooms identified in Item 2.1 above and produce recommendations for reinforcement of existing buildings if required. The consultant shall also make recommendations as to the structural improvements to be done and prepare detailed specifications, bill of materials (BOMs) with cost estimates and labour cost estimates for the works recommended for each of the substation control rooms where enhancements are recommended. The consultant shall base their assessment and recommendations on applicable civil construction design standards which have been developed and applied to the construction of buildings to allow them to withstand category 4 hurricane wind forces.

2.4 For the substation control rooms that the Consultant deems prone to inundation, the Consultant shall design a special room adjacent to the existing control room for the relocation of substation batteries and charger systems. The design shall also ensure that the batteries and chargers will be installed at a higher elevation in the new room to ensure that such equipment does not get inundated by floods during or after storms and hurricanes. The consultants shall prepare detailed

specifications, BOMs with cost estimates and labour cost estimates for the works recommended for each of the substation control rooms as prone to inundation. The consultant shall base their recommendations for buildings on applicable civil construction design standards which have been developed and applied to the construction of buildings to allow them to withstand category 4 hurricane wind forces.

2.5 Conduct an engineering study to redesign the battery/charger systems for the control rooms which have been designated by consultant as needing the battery system to be upgraded to cater for additional equipment supply. The consultant shall also design a special room adjacent to the existing control room for the installation of the new larger substation batteries and charger system. The consultants shall prepare detailed specifications, BOMs with cost estimates and labour cost estimates for the works recommended for each of the substation control rooms designated by BEL as needing upgrade to larger systems. The consultant shall base their recommendations for buildings on applicable civil construction design standards which have been developed and applied to the construction of buildings to allow them to withstand category 4 hurricane wind forces. The new battery system shall be designed such that when charged to 80% capacity can supply the nominal DC load of the substation control room for 24 hours with the charger turned off. The DC load voltage shall not drop below 90% of nominal during use of the battery system to supply the equipment in the control room. Consideration shall be given to house the new batteries and chargers in a naturally aspirated environment with an AC system installed only as a backup when conditions may require a controlled air environment.

2.6 The consultant shall make recommendations as to the most optimal type of batteries to be used by BEL in substation control rooms. Such analysis should consider the most modern batteries available for substation control rooms DC supplies to supply relays, control equipment, meters, SCADA and communication equipment.

MAIN ACTIVITIES

1. Visits sites and review drawings, specifications and DC load estimates for the BEL substation control rooms designated for review by items 2.4, 2.5 and 2.6. Site visit to be made to all designated substations.

2. Conduct battery studies and provide recommendations as required for item 2.6 above.

3. Visit site and conduct studies and provide recommendations as required for items 2.3, 2.4 and 2.5.

ROLES AND RESPONSIBILITIES

The roles and responsibilities for the Project Management Unit (PMU) are defined as follows:

1. The Project Manager, ERCAP, Planning and Engineering and Substations Maintenance personnel shall ensure the Consultant receives logistic support as required, including equipment, personnel, devices and transportation.

2. The Assistant Project Manager for the BEL/World Bank-GEF ERCAP will be responsible for supervision and coordination of study, and for the review and approval of budgets, approval of products and approval of payments.

3. The Manager BEL (Planning &Engineering) will provide support and guidance in clarifying the objectives within the Terms of Reference (TOR); all reports produced by the Consultant will also be reviewed by, presented to and discussed with the Manager BEL (Planning &Engineering and other relevant BEL staff).

4. The Consultant will provide deliverables/products included in the Terms of Reference. The Consultant will report to the Assistant Project Manager for the BEL/World Bank-GEF ERCAP Project and will submit all reports to him as required by the Terms of Reference.

PRODUCTS

All the reports must be presented in English. All submissions must be done electronically. The Products of this consultancy are the following:

1. **Work Plan:** to be presented 30 days after signing the contract, describing the main activities, required support from BEL, the methodology and the tentative timetable.

2. **Final Report:** the first draft report will comprise of items 2.1 to 2.6 as described in the above activities, and will be submitted within five (5) months after signing of the contract. A final version will incorporate all revisions required by BEL and will be submitted within four (4) weeks from the receipt of comments on the initial version. The report will be presented and discussed with BEL's Senior Management.

LENGTH AND PLACE OF THE CONSULTANCY

It is envisaged that the study will require a total of 5-man months of consultancy.

It is estimated that the consultant (1 person) will spend a total of 1 month in Belize collecting data and any other relevant information.

Tentatively, BEL will provide the following facilities to assist carrying out of the study:

1. Suitable counterpart staff.

2. Data collection assistance including technical data for Belize Electricity Limited.

QUALIFICATIONS

The consultant team must, at least, include professionals with the following expertise and certifications:

- Substation design specialist or similar
- Substation controls specialist or similar
- Substation battery system design specialist or similar
- Local civil/structural engineer (for international firms)

PAYMENTS

The payments will be done as follows (negotiable in accordance with deliverables):

- Thirty percent (30%) upon BEL's approval of the Work Plan
- Seventy percent (70%) upon BEL's approval of the First Report

SUPERVISION AND COORDINATION

The supervision and coordination will be carried out by Mr. Kareem Thimbrel (kareem.thimbrel@bel.com.bz) of BEL, Assistant Project Coordinator for the BEL/World Bank-GEF ERCAP Project, who will be responsible for the product approval.

SUBMISSION AND PROPOSALS

Analysis of the information to be submitted to Belize Electricity Limited (BEL) including the economic proposal will determine the best Consultant who will be chosen to conduct the study as laid out in the Terms of Reference (TOR). The successful Consultant shall be required to sign a Contract with BEL to provide the services as identified in this TOR whereby the Contract shall be reviewed and approved by the World Bank prior to execution. Information to be provided to BEL by Consultants in their bid submission shall be as follows:

1. **Scope of Works**: complete document detailing all works that will be completed to meet the TOR.
2. **Economic Proposal**: applicable rates and fees to allow the Consultant to carry out the scope of works as described above.

3. **Methodology:** the Consultant will specify the methods that will be applied to meet the objectives of the TOR. The methodology must include devices or equipment that will be used to complete the project.

4. **Work Plan:** the Consultant will submit a work plan outlining how the study will be conducted in a systematic and thorough manner. The work plan must outline all aspects including factors that may impact the project and how they will be addressed.

5. **Deliverable Items:** the deliverables/products must provide all documents to be submitted to BEL during the project. All documentation must be submitted in English to BEL and will be the sole property of BEL. The deliverables will include all reports as required and described by the section above "Products".

6. **Personnel Qualification:** the Consultant must submit a personal resume and resumes of any other persons who will be assigned to the project. The Consultant must possess the skills needed to complete the project. The Consultant must meet the expectations of BEL and once a contract has been signed, it cannot be awarded to another personnel without approval from BEL.

7. **Schedule:** the schedule submitted must include a timeline for meetings, survey, data collection and analysis and completion of all reports. The project must stay within the schedule and any changes must be mutually agreed upon without affecting the cost of the project.

8. **Qualification:** the Company or Firm seeking to undertake this project must submit background experiences associated with similar projects for implementing sound vegetation management programs with success stories attached. Likewise, individual Consultants are not linked to a larger organization must submit proof of conducting similar projects with positive results.

9. **References:** references from previous clients where similar projects have been completed must be submitted electronically with complete name, address and telephone number along with proposal to the email address listed in the Request for Expression of Interest

10. **Exceptions and Clarifications:** the Consultant must clearly outline all concerns and exceptions to the TOR that may contribute to not fully meeting requirements within the TOR.

11. **Additional Information:** the Consultant must include all additional information that must be provided by BEL to carry out the scope of works.

ANNEX 1


Corozal F4
BVA-30L Tx
BVA-31L Tx
OWK Main Tx
OWK F4 Tx
BELCOGEN
SPR Tx 2
SPR Tx1
Maskall Main Tx
Boca Del Rio Tx
Caye Caulker
Ladyville
Gas Turbine Tx
WST Main Tx
Belize City Main Tx
Pallotti Tx
Democracia Tx
BMP 22-11 Tx
BMP Sub Tx F4
BMP Old Main Tx
SIG Main Tx
Mullins River Main Tx
Vaca Tx
Mollejon Tx
Dangriga Main Tx
Chalillo Tx
BAPCOL
Independence
Hydro Maya Tx
PGA Main Tx
MEXICO
BELIZE
ORANGE WALK
CAYO
STANN CREEK
GUATEMALA
BELIZE