



## **Terms of Reference for Battery Storage Consultant**

**Project Name:** Battery Energy Storage System (BESS) advisor

**Contract Objective :** To provide on-site commissioning support and consultation for technical specifications for equipment, materials, and controls for the battery storage component of BESS projects in RMI Islands project portfolio.

### **Scope of Work**

RMI is seeking to engage the services of a consultant with technical expertise in energy storage for microgrids to prepare technical specifications for all equipment, materials, and controls hardware and software for the battery storage components of projects across the Caribbean. In addition to commissioning support services.

The consultant will be responsible for preparing a set of detailed specifications for the following:

- a. Batteries
- b. Battery racking
- c. Battery cabling including lugs, clamps, nuts and bolts
- d. Power conversion equipment
- e. AC cabling between the battery storage system and the Mayreau Power Station busbar
- f. Supervisory monitoring and control system including hardware and software
- g. Fire protection system
- h. Containerized housing including environmental control systems
- i. Any other equipment or materials necessary for the proper functioning of the battery storage system



## **Work Schedule & Deliverables**

The assignment under Master Contract shall commence on 15 May 2020 and be open for specific Work Orders completed no later than 30 June 2021.

Some examples of Deliverables :

1. Draft Battery System Specifications: draft battery system specifications document to be included in a RFP. This document would be reviewed with comments to be provided within 10 days of receipt.
2. Final Battery System Specifications: The final specifications document shall be provided within one week of submission of comments by RMI, and partner utility.
3. RFP Addendum: Q & A from the short list of bidders. Deliverable(s) in the form of Clarification Addendum(s).
4. EPC Bid review and contract negotiations: allocation of hours for EPC bid reviews and final EPC contract negotiations. Deliverable in the form of a brief battery storage system bid evaluation report.
5. BESS Commissioning Oversight and Final Report: Consultant would provide third party commissioning and energization support to the RMI and Utility teams – with a final commissioning report outlines performance vs. RFP Specifications and the EPC contract terms.

## **Payment Schedule**

The consultant would be paid through specific Work Orders under Time and Materials terms.

## **Consultant's Work Place**

The consultant is expected to carry out the assignment at their normal place of work. Travel when required will be pre-approved by RMI under RMI Travel Policy.

## **Consultant Qualifications, Knowledge and Skills**

### Qualifications

- A bachelor's degree in electrical engineering or similar area of study
- A minimum of five years of experience in the design, specification and/or installation of battery storage for grid-connected solar PV systems



## Required Knowledge

1. An understanding of various energy storage technologies including:
  - a. Electrochemical
  - b. Electric field
  - c. Mechanical
  
2. Energy storage applications, particularly with regards to microgrids, such as:
  - a. Integration of high penetration renewable energy generation
  - b. Time shifting
  - c. Frequency response
  - d. Voltage support
  - e. Capacity response
  - f. Black start (grid forming)
  - g. Dual use BESS – grid services primary and islanded energy secondary
  
3. Performance of various storage technology types in the following areas:
  - a. Power
  - b. Energy
  - c. Response time
  - d. Round trip efficiency (RTE)
  - e. Depth of discharge (DoD)
  - f. Energy density
  - g. Parasitic loads
  
4. Design, installation, and commissioning of energy storage systems in terms of:
  - a. Proper sizing to grid and load served:
    - i. Maximum and recommended DoD
    - ii. Cycling and impact on life
    - iii. The impact of temperature on performance
  - b. Pros and cons of technologies:
    - i. Energy density and space requirements
    - ii. Transportation/Logistics
    - iii. RTE
    - iv. Cell degradation
    - v. State of Charge (SoC)
    - vi. Maximum cycles
  - c. Inverter/Charge controller:
    - i. Matching to load
    - ii. Bi-directional operation
    - iii. Grid forming
    - iv. Protection settings
    - v. DC-DC Converters
  - d. System optimization
  - e. Siting
    - i. Urban or Rural
    - ii. Geotechnical considerations



- iii. Environmental considerations (flora, fauna, wetland)
  - f. Pairing with renewable energy resources
    - i. Wind
    - ii. Solar
  - g. Pairing with other energy source
    - i. Fossil fuel generators
    - ii. Hydro
    - iii. Combined heat and power
  - h. Matching technology to application
  - i. Power and Energy / Power or Energy
  - j. Proper siting, energy density and effect on footprint
  - k. AC or DC coupled systems
  - l. Grid interconnection
  - m. Acceptance testing
5. Operations, maintenance, and warranty considerations for:
- a. System control (remote, local)
  - b. Microgrid controllers
  - c. Data acquisition
  - d. State of Charge (SoC)
  - e. Load following
  - f. Cycle charging
  - g. Software
  - h. Integration of digital control system to analog grids
  - i. Operator training
6. Financial modelling in terms of:
- a. Levelised Cost of Energy (LCOE)
  - b. Net Present Cost (NPC)
  - c. Replacement Costs (Life Cycle)
  - d. Operations and Maintenance Costs
  - e. Turn-key construction costs
  - f. Equipment Lease Agreement
  - g. Financial stability of manufacturer
  - h. Financial stability of EPC/Developer/Warranty Holder
  - i. Insurance implications
7. Environmental considerations in terms of:
- a. Emissions
  - b. End of life recycling
  - c. Chemistries and disposal
  - d. Vibration
  - e. Noise
  - f. Local conditions
    - i. Temperature
    - ii. Water/Salt
    - iii. Seismic activity



8. Safety in terms of:
  - a. Fire suppression
  - b. Cyber security
  - c. Health and Safety requirements for installation and operation
  - d. Protective devices
  - e. Certification of system operators
  
9. Relevant codes and standards including:
  - a. FERC
  - b. NERC
  - c. IEEE
  - d. Entso-a
  - e. BS7671
  - f. Utility interconnection requirements

#### Other Skills

- Fluency in English both written and verbal
- Excellent report writing skills

#### **Proposal Submission**

Proposals for the assignment should be submitted including hourly rate(s), relevant resume/CV, and description of relevant microgrid/battery storage system experience by 11:59pm EDT via email to [cburgess@rmi.org](mailto:cburgess@rmi.org) by 11:59pm EDT via email to [cburgess@rmi.org](mailto:cburgess@rmi.org)