

# USAID/Sri Lanka Energy Program

## Technical Consultant : Development of a Microgrid Project at Udagaldebokka

### A. Overview

Sri Lanka has envisaged in generating 70% of country's total electricity requirement using renewable energy sources by 2030. To address the need to progress with this vision, Sri Lanka Energy Program is envisaging on a list of tasks, studies, and pilot projects to achieve the following specific objectives:

- Increase the deployment of renewable energy and improve power management systems.
- Improve demand-side management and adopt energy efficiency practices.
- Deploy advanced energy technologies in generation, transmission, distribution, and consumption to support the transformation and modernization of the power sector; and
- Align the cost and price of electricity tariffs and improve the technical and financial performance of the power sector.

Sri Lanka Sustainable Energy Authority has identified three villages that lack access to electricity within the Knuckles conservation area. Due to the sensitive environmental nature of the area, grid extensions have not been carried out, yet can be electrified using solar power and storage systems. The provision of electricity will not only improve the quality of life for the villagers but will also facilitate their contribution toward regional and national economic development.

USAID Sri Lanka Energy Program is collaborating with Sri Lanka Sustainable Energy Authority to design and implement a microgrid project to electrify one of the selected villages whilst piloting few emerging technologies that can be replicated even in grid connected low voltage distribution networks.

The project seeks the expertise of a technical expert in development of this microgrid project that facilitates piloting of other replicable smart grid technologies.

### B. Objectives

- Optimize use of microgrids for electrification of consumers in areas where grid access is not available.
- Pilot the use of emerging energy sharing and storage optimization technologies that can be replicated in the distribution network.
- Study the practical implementation of Demand Response in a residential microgrid that can be replicated in both off grid and on grid contexts.
- Study the effective use of smart appliances to increase intake of renewable energy in electricity distribution networks.
- Pilot the concept of energy marketplace in an electricity distribution network with predominantly residential loads.

### C. Specific Tasks / Responsibilities

1. Visit the site to understand the ground level requirements, practical constraints and challenges of implementing a microgrid system at Udagaldebokka.
2. Submit an inception report that includes but not limited to:
  - a. Data requirements for designing a microgrid system that includes solar PV and battery energy storage technologies.
  - b. Proposed project framework with provision to pilot the following concepts.
    - i. Optimization of decentralized energy storage.
    - ii. Demand response for residential consumers.
    - iii. Energy market within a microgrid community.
    - iv. Contribution of decentralized storage to ensure grid stability of a LV network.
    - v. Identifying the communication requirements.
    - vi. Prepaid metering and other relevant metering concepts.
    - vii. Dynamic pricing based on RE generation forecasts, demand variations and availability of storage.
    - viii. Identifying the basic requirements and propose a conceptual solution with necessary diagrams.
3. Conduct surveys and studies at the site to collect required data for designing the microgrid system as identified in item 2.
4. Develop the design drawings including single line diagrams, layout drawings, communication topology for each household and the entire system.
5. Develop BOQs and specifications for procurement of the microgrid including supply, installation, commissioning and maintenance of the system.
6. Provide an engineering estimate for development of the proposed microgrid project in line with the specifications and BOQs developed.
7. Prepare a report on how this concept that is being piloted could be replicated in both grid-connected and off-grid scenarios.
  - a. This shall include a cost benefit analysis quantifying the benefits to the consumers, utility and the country in terms of demand response, distribution loss reduction, power quality enhancement and other grid services that can be provided by a similar project under both grid connected and off grid scenarios.
8. Participate in tender evaluation meetings and provide recommendations on the proposed solutions.
9. Visit the site during implementation and ensure the system installation is in accordance with the approved design, meet related standards and is in line with overall project objectives and requirements.
10. Carry out post installation measurement and verification to verify the system is complying with project specifications and is capable of delivering the intended outputs.

### C. Deliverables

No.	Deliverable Name	Details of Deliverables	Deadline (Weeks from contract Award)
1.	Submit project inception report with project framework and data requirement	Submit an inception report that includes but not limited to : a. Data requirements for designing a Microgrid system that includes solar PV and battery energy storage technologies. b. Proposed project framework with provision to pilot the following concepts.  i. Optimization of decentralized energy storage ii. Demand response for residential consumers iii. Energy market within a microgrid community iv. Contribution of decentralized storage to ensure grid stability of a LV network v. Identifying the communication requirements vi. Prepaid metering and other relevant metering concepts vii. Dynamic pricing based on RE generation forecasts, demand variations and availability of storage viii. Identifying the basic requirements and propose a conceptual solution with necessary diagrams	04
2.	Develop and submit design drawings	Develop the design drawings including single line diagrams, layout drawings, communication topology for each household and the entire system	8
3.	Develop and submit BOQs and specifications	Develop BOQs and specifications for procurement of the microgrid including supply, installation, commissioning and maintenance of the system.	10
4.	Submit an engineering estimate for development of the proposed microgrid project	Study the RE generation forecasting technologies to identify potential integration of DR programs effective utilization of RE in selected feeders	10
5.	Submit a report on how this concept that is being piloted could be replicated in both grid-connected and off-grid scenarios	Prepare a report on how this concept that is being piloted could be replicated in both grid-connected and off-grid scenarios.  a) This shall include a cost benefit analysis quantifying the benefits to the consumers, utility and the country in terms of demand response, distribution loss reduction, power quality enhancement and other grid services that can be provided by a similar project under both grid connected and off grid scenarios	12
6.	Provide recommendations on the proposed solutions	Participate in tender evaluation meetings and provide a report with recommendations on the submitted proposals	16
7.	Provide biweekly project progress reports	Visit the site during implementation and ensure the system installation is in accordance with the approved design, meet related standards and is in line with overall project objectives and requirements. Submit biweekly progress reports	32
8.	Provide a measurement and verification report to verify the system is functioning as per the design	Carry out post installation measurement and verification to verify the system is complying with project specifications and is capable of delivering the intended outputs	36

### D. Required Skills and Qualifications

1. A PhD in Electrical Engineering or a related discipline with at least 10 years' post experience.
2. Prior experience in design and development of microgrids
3. Experience in carrying out studies/research related to microgrids, demand response, renewable energy and smart grid.

### E. Period of Performance and estimated level-of-effort

The estimated period of performance for this assignment is on/about May 08, 2023, to on/about January 31, 2024, with an estimated level of effort of 50 days.

### F. Location of Assignment

The locations of the assignment are Colombo and Udagaldebokka (Hasalaka), Sri Lanka. Certain tasks can also be carried out remotely through online means.

### G. Supervision and Reporting

The Technical Consultant will report to the Residential/Appliance Energy Efficiency Specialist of the USAID Sri Lanka Energy Program.

Please upload your CV using the link <https://bit.ly/MicrogridTA> and provide the necessary details requested **before 5 pm on April 28, 2023**. No telephone inquiries please. Chemonics will contact finalists.