TERMS OF REFERENCE

Consultancy : Renewable Energy (RE) and Efficient Energy (EE) Market Research and Assessment

Unit : Project Management Unit (PMU)

Duration : 8 person-weeks (2 months)

Duty Station **:** Department of Energy office (DoE)

Project Title: **Barrier Removal for Achieving the National Energy Road Map Target of Vanuatu (BRANTV)**

1. Background

The Department of Energy (DoE) with support from the United Nations Development Programme (UNDP) are currently implementing a Global Environment Facility (GEF 6) funded project referred to as the Barrier Removal for Achieving National Energy Road Map Target of Vanuatu (BRANTV) Project for the Vanuatu Government to address the National Energy Road Map (NERM) rollout. The project is managed by the Project Management Unit (PMU) which sits under the DoE.

The project's objective is to enable the achievement of the energy access, sustainable energy, and green growth targets of Vanuatu, as represented in the country's National Energy Road Map (NERM). Central to the approach is BRANTV's implementation of Vanuatu's Rural Off-Grid and EE Promotion Program which includes demonstrations[1] on: pico-/micro hydropower mini-grid system,; pico-/micro hydro PV hybrid mini-grid system , community-scale solar PV systems, family compound-scale PV nano solar systems; and applications of EE cook stoves, and productive, livelihood-enhancing uses of RE and EE.

The PMU with the support of the Department of Energy and Government agencies and private sectors have identified 40 communities to demonstrate the RE and EE technologies. The selection panel takes into consideration meeting the criteria of technical and economic viability of the demonstration of RE-based energy generation system. The baseline

[1] Demonstrations are actual hardware implementations. There are 4 different demonstrations of which 19 are either Pico or Micro hydroelectric systems with its mini-grid, 1 hybrid system which is made up of a Pico hydro and solar, community based standalone solar system approximately 5 to 6 kW without any grid and compound based Nano grid system usually ranging from 700W to 2 kW designed to connect up to 5 households through its mini-grid.

information was important for the purpose of co-financing the incremental features. Further the household data was critical towards the sustainability of the systems.

To support with sourcing of low cost, best quality and supply of the RE systems, the PMU seeks hiring of an International Consultant with the expertise of the job and a local counter-part to undertake a Market Research and Assessment on the sourcing, costing and local/international supply of equipment for pico-/ small micro-hyrdo, Photovoltaic (PV) systems including village-scale community PV, family compound-scale PV nano-grids, household-scale SHSs and pico-PV ("plug-and-play") systems. The research will also cover sourcing the most effective and appropriate EE cook stove and EE drying technology for fabrication within Vanuatu.

2. Scope of Work:

Under the direct supervision of the Director Department of Energy and Manager Electrification, Principal Scientific Officer and the PMU Project Manager, the consultant is expected to conduct the market research on supply, distribution, sourcing and costing of pico-/small micro hydro mini-grids, village community PV systems, family compound-scale PV nano-grids and energy efficient cook stove fabrication.

The expected outcome of the research is to report on (sourcing) a viable (technical and economic) sustainable energy and low carbon (RE and EE) techniques and practices recommended to be adopted and implemented in the energy, public, private, and residential sectors of Vanuatu.

3. Key products and services:

Under this contract, the consultant will do the following:

a. Research, liaison and provide technical support to assess the availability of high quality, low cost sourcing of equipment and accessories for installation of pico-/ micro-hydro mini-grids and transparent best cost pricing for all aspects of pico-/ micro-hydro mini-grid development. This activity entails the following tasks:
    i. Sourcing support - Identification of high quality equipment for pico-/small micro-hydro at good prices for Vanuatu market and liaison work to ensure viability of best sourcing channels.
    ii. Costing guidance and transparency - Development and documentation of best price break-down of costing for pico-/small micro-hydro mini-grids in Vanuatu (covering various required equipment and parts, civil works, installation, design work, etc.) and widespread dissemination of this costing info. The information disseminated will also include sourcing channels.
    iii. Local supply of parts - Liaison with and technical and marketing support for commercial outlets in Vanuatu for stocking and supplying, at high quality and low price, needed parts for pico-/ small micro-hydro systems and mini-grids in Vanuatu, resulting in an in-country inventory of replacement parts.
b. Sourcing, best price costing, and local parts supply work for:
    i. village community PV systems (with or without mini-grid);
    ii. family compound-scale PV nano-grids of up to 700 W; and,
    iii. household-scale SHSs and plug-and-play PV systems.
c. Provide technical guidance to fabricators in sourcing of parts (at best price for quality parts) for energy efficient cook stove fabrication. This will involve determination of lowest cost for quality materials, reasonable margins for artisans, and appropriate selling price for energy efficient cook stoves.

4. Duration of the Work

The duration of the contract will be 40 working days spread over two months. The contract is expected to start sooner.

5. Location

- Inputs and deliverables for this contract will be home-based, with travel to Port Vila and field locations when required.

6. Administrative and logistical requirements

- Selected Consultant will be responsible for arranging for a lowest economic fare for her/his international travels to and from Port Vila. Costs will be met by the PMU.
- She/he will also arrange for her/his accommodation in Port Vila with the assistance from the PMU.
- PMU will assist to arrange in-country duty travel.

7. Institutional Arrangements

The expert will work closely with the Project Manager and the Manager Electrification and report to the Director of DoE, Ministry of Climate Change.

8. Evaluation criteria

Evaluation of Technical Component

Only proposals obtaining the 70% score from the Technical Evaluation will be subject to the Financial Evaluation.

The detailed technical evaluation criteria and possible scores for each are as follows:

Major Criteria	Details & Sub-Criteria	Possible Score
Consultant's general expertise in similar assignments	Minimum 7 years of proven track record in conducting technical Reports for Energy Planning or Energy Project Management	10
Qualifications of expert (please refer to the TOR for detailed requirements)	Master's degree or above in energy studies, electrical engineering, mechanical engineering or similar fields	10
Experience (please refer to 2) and 3) for detailed requirements)	Experience carrying out market assessment, technical reports including feasibility studies on RE & EE in the Pacific region and/or Vanuatu in the past 5 years.	50
Methodology (please refer to the 2) and 3) for detailed requirements)	• General approach including understanding and incorporation of the requirements of the assignment in the Proposal • Knowledge of stakeholders and responsiveness to the terms of reference • Methodology for carrying out the work, showing step by step, how the team members will work together and with the key stakeholders to complete the work within the required timeframe • Comments and suggestions on the TOR and identification of bottlenecks/project risks and possible solutions/mitigation strategies • Timetable, showing tasks, meetings as required in the TOR, deliverables and clearly explaining contributions of team members • Total number of person-days and appropriate allocation of person-days with respect to each expert	30
Total Possible Technical Score		**100**

Evaluation of Financial Component

The maximum score for the financial component is 30 points. The maximum score shall be allocated to the lowest priced Proposal. All other Proposals shall receive points in inverse proportion according to the following formula:

$$p = y * (x / z)$$

where:

p = points for the financial Proposal being evaluated.

y = maximum number of points for the financial Proposal.

x = price of the lowest priced Proposal.

z = price of the Proposal being evaluated.

Evaluation of Technical and Financial components for total scoring

The score for the technical component is added to the score for the financial component to arrive at the total score for a Proposal. The Proposal with the overall highest score after this is the best Proposal. The other Proposals will be ranked in descending numerical order based on the total score.

9. Recommended Presentation of Offer

- Letter of confirmation of interest and availability.
- Updated personal CV indicating all past experience of similar assignments, including details of three references.
- (if necessary) Certificates and accreditation, business license, information about business
- Financial proposal:
  - ✓ Financial proposal must be expressed on the basis of "a daily fee" in USD;
  - ✓ Travel and living expenses in Vanuatu will be paid by PMU, as indicated under Para 7: 'Administrative and logistical requirements' and should not be included in the price proposal.

Any interested candidate can obtain a full detail of the Terms of Reference from the receptionist at the Department of Energy, Ministry of Climate Change, Number 2 Area or email: BRANTV Project Manager, Doreen Leona on dleona@vanuatu.gov.vu

Application close before COB Monday 2nd September, 2019 (Vanuatu time) address to:

Anthony Garae
Director
Department of Energy
Ministry of Climate Change
PMB 9067

Send e-copy of your application to Email:
gantony@vanuatu.gov.vu or dleona@vanuatu.gov.vu

Appendix 1

Pico-/micro hydro & mini-grid components

Materials	Specifications
Single phase (50Hz) pico-/micro hydroelectric turbine and generator.	0kW to 20kW, high/low head turbines, variable output, AC/DC turbines, electronic load controller (ELC), warranty
Penstock	Pressurized poly-pipe, connectors
Penstock Valves	Gate valves, pressure gauge, reducers.
Single phase 50Hz Transformer	0 – 25 kVA Step-up, step-down transformer, pole mounted, ground mounted, weather resistant, warranty.
Transmission and Distribution cables	6mm-25mm, underground and overhead, cables accessories (arial to underground connector, heat shrink, connectors).
Single Phase Transmission feeder box	0 – 50 Amp, pole mount, ground mount, weather resistant, warranty.
Single Phase Voltage Regulator (Distribution)	230V – 240V, outdoor, warranty.
Distribution Block	0 - 10 Amps, enclosed and secured, multiple connections (2,5 to 10 connection points), mountable,

Appendix 2

Solar Installation Components.

Materials	Specifications
PV Moodle	Refer to appendix 3
Moodle connectors	Refer to appendix 3
Batteries	Refer to appendix 3
Controller	Refer to appendix 3
Inverter	Refer to appendix 3
cable	AS:NZS3000 standards

Appendix 3

Vanuatu Rural Electrification Program (VREP), Subsidy Implementation Manual (SIM), Section 8.2. (SIM also provided)

8.2 Specific Equipment Standards

Quality products in the solar energy industry are typically tested and certified against standards developed by the International Electrotechnical Commission (IEC) or Underwriters Laboratory (UL) or in some cases European Standards (EN). Many products such as solar modules, batteries and sometimes inverters and controllers are tested and certified to both sets of standards. However, some USA manufactured inverters are tested against the UL standard for the USA versions and then have the CE (Conform European) marking meaning that they conform to European Requirements. As the industry has been progressing very quickly there are instances when some of the balance of system equipment used in the industry do not have IEC or UL standards available but other standard organisations like European Standards (EN) or specific country standards are developed.

8.2.1 Testing Laboratories

Testing and verification that the product has met the relevant standard shall be undertaken by a Testing Laboratory accredited to ISO/IEC 17025:**2017 General Requirements for the Competence of Testing and Calibration Laboratories.**

The test laboratory shall have accreditation for the particular standard relevant to the product being tested.

Prior to approving any product the DoE could request copies of all the relevant accreditation certifications from the Test laboratory.

8.2.2 Modules

Solar modules shall meet either

- One of the following design qualification and type approval standards
  - IEC 61215 Crystalline silicon terrestrial photovoltaic (PV) modules—Design qualification and type approval
  - IEC 61646 Thin-film terrestrial photovoltaic (PV) modules—Design qualification and type approval

and

- IEC 61730 Photovoltaic (PV) module safety qualification
  - IEC61730-1 Part 1: Requirements for construction
  - IEC61730-2 Part 2: Requirements for testing

or

- UL Standard 1701: Flat Plat Photovoltaic Modules and Panels

For modules with IEC certification they must be certified as Application Class A per IEC 61730.

Each module shall be marked with a serial number with the purpose of providing traceability to the manufacturer's name, factory and date of manufacture.

The module label must show the correct Certifier Mark (logo) corresponding to that on the test certificate supplied at the time of approval.

If the certificate on which the listing was based becomes invalid then the Vendor must supply a new certificate for the module or cease using that module in the Product and the Product will be removed from the Product catalogue.

If a business wishes to sell modules that are manufactured by another company under their own brand name, then this business must obtain a co-licence certificate in their own name, which shows their own model numbers.

8.2.3 Module connectors

The connectors used to interconnect modules or to connect modules to other pieces of equipment shall meet the following standard:

EN50521 Connectors for photovoltaic systems—Safety requirements and tests

Connectors for photovoltaic systems—Safety requirements and tests

8.2.4 Batteries

Solar Home Systems

The batteries being supplied in a solar home system shall meet one of the following standards:

- IEC 61427 Secondary Cells and Batteries for Solar Photovoltaic Energy Systems - General Requirements and Methods of Test
- IEC 62619 Secondary cells and batteries containing alkaline or other non-acid electrolytes—Safety requirements for secondary lithium cells and batteries, for use in industrial applications
- IEC 60896 Stationary lead-acid batteries (series)
- UL 1973 Standard for Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications
- UL1989 Standby Batteries
- UL 1642 Standard for Lithium Batteries

or

- A standard submitted by a Vendor that is approved by DoE

Micro-Grid Systems

The batteries being supplied in a micro-grid shall meet one of the following standards:

- IEC 61427 Secondary Cells and Batteries for Solar Photovoltaic Energy Systems - General Requirements and Methods of Test
- IEC 62619 Secondary cells and batteries containing alkaline or other non-acid electrolytes—Safety requirements for secondary lithium cells and batteries, for use in industrial applications
- UL 1973 Standard for Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications
- UL 1642 Standard for Lithium Batteries

or

- A standard submitted by a Vendor that is approved by DoE

Requirements for Batteries supplied to either solar home systems or micro-grid systems

Each battery shall be marked with a serial number with the purpose of providing traceability to the manufacturer name, factory and date of manufacture.

For lead acid type batteries only valve regulated sealed batteries shall be supplied. (That is wet batteries with liquid electrolyte are excluded).

Lithium Ion type batteries must be supplied with a manufacturer's approved Battery Management System (BMS)

8.2.5 Controllers

The controllers shall meet one of the following standards:

- IEC 62509 Battery charge controllers for photovoltaic systems - Performance and functioning
- IEC 62109 Safety of power converters for use in photovoltaic power systems
  - IEC 62109-1 Part 1: General requirements
- UL Standard 1741: Standard for Inverter, converters, Controllers and Interconnection System Equipment for use with Distributed Energy Resources

or

- A standard submitted by a Vendor that is approved by DoE

Each controller shall be marked with a serial number with the purpose of providing traceability to the manufacturer name, factory and date of manufacture.

8.2.6 Inverters

The inverters shall meet one of the following standards:

- IEC 62109 Safety of power converters for use in photovoltaic power systems
  - IEC 62109-1 Part 1: General requirements
  - IEC 62109-2 Part 2: Particular requirements for inverters
- UL Standard 1741: Standard for Inverter, converters, Controllers and Interconnection System Equipment for use with Distributed Energy Resources

or

- A standard submitted by a Vendor that is approved by DoE

Note: Some inverters manufactured in accordance with the UL standards will have the CE mark for their European (230V, 50Hz) models.

Each Inverter shall be marked with a serial number with the purpose of providing traceability to the manufacturer name, factory and date of manufacture.

The inverters shall meet the requirements of simple isolation between the DC and AC. Isolation is provided by a transformer.