

## **TERMS OF REFERENCE**

### **Individual Contractor**

#### **1. Assignment Information**

|                                  |   |
|----------------------------------|---|
| <b>Assignment Title:</b>         | Consultancy on off-grid solar energy project(s) development for rural communities of Cambodia |
| <b>Cluster/Project:</b>          | BESD project  |
| <b>Post Level:</b>               | National Specialist   |
| <b>Contract Type:</b>            | Individual Contractor (IC)  |
| <b>Duty Station:</b>             | Home-based  |
| <b>Expected Place of Travel:</b> | Rural areas in Cambodia, exact location to be determined                                      |
| <b>Contract Duration:</b>        | 27 days over the period of 6 months   |

#### **2. Project Description**

Cambodia is endowed with one of the strongest levels of solar radiation in the world, averaging an estimated 5.8 hours of peak sunlight a day. The abundance of solar resources in the country remains an untapped opportunity to meet the rapidly growing electricity demand, which is predicted to increase at an annual average of 15% up to 2030.<sup>1</sup> There has been a widespread recognition of this opportunity, and the Royal Government of Cambodia (RGC) prioritized an uptake in the use of solar energy in the Rectangular Strategy Phase-IV.

Over the last decade or so, the RGC has made remarkable progress on expanding grid electrification, going from 26.8% in 2007 to 71.5% by 2017. However, reliability of access remains a challenge as nearly two thirds of households connected to the grid experience frequent power shortages. Moreover, there are remote communities that are located too far for the grid to ever reach without incurring significant economic losses.

As the price of solar energy continues to fall year-over-year, it continues to become a valuable component in bringing reliable electricity access to the most remote communities in Cambodia. Today, more than half of Cambodia's off-grid households use solar home systems (SHS) as one of their primary sources of electricity.<sup>2</sup> Yet there remains a gap between the level of basic energy access that current SHS products can provide and standards for reliable 'grid-quality' electricity. When coupled with new technologies and innovative business models, solar energy has the opportunity to provide strong and reliable access to power for households in remote communities. The RGC has targeted to electrify 70% of households with grid quality electricity by 2030.

To support a project focused on rural electrification, UNDP is looking for a national consultant to help identify potential suitable location(s) for the installation of solar systems, particularly solar micro/mini-grids, solar battery charging stations and/or connected solar home systems.

#### **3. Scope of Work**

Under the project "Building an Enabling Environment for Sustainable Development in Cambodia", the scope of the consultancy entails:

- Solar PV for basic energy needs and productive uses such as solar home systems (could be standalone

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<sup>1</sup> Ministry of Mines and Energy, 2017

<sup>2</sup> World bank 2018

or connected), solar battery charging stations (SBCS); solar mini-grid (could be alternating or direct currents (AD/DC)), or solar (and other renewable energy technologies (RET)) hybrids;

- The analysis will be limited to capacities relevant to the size of the typical off-grid communities. This probably implies capacities well below 100 kW.
- Many studies and documents on this subject are already available, such as the SREP Rural Electrification Plan Final Report (2011) and spatially explicit maps and database on rural electrification status maintained by Electricity Authority of Cambodia (EAC) or Electricite du Cambodge (EdC). The consultants should exert best efforts to collect all such available references to avoid repeating data gathering or analysis already done by others.

There are four main activities for this consultancy:

**Activity 1: Site identification and selection. Target: identification of at least 3 potential villages (estimated 8 days)**

- Review existing studies/documents/maps and/or database to identify potential sites where (national and neighbouring) grid expansion is not likely to reach <5 years with consideration of i) average distance to existing grid (or planned grid expansion, if known), ii) availability of land and solar energy, iii) affordability of the end-users (where possible), iv) jurisdiction and distribution coverage of REEs;
- Engage with MME, EAC and EdC on sites identified in previous efforts to determine appropriate locations for off-grid solar applications;
- Conduct a site visit to the sites identified to gather required basic socio-economic data and assess the need for access to clean energy by the local communities, including estimating the number of beneficiaries for each proposed site;
- Propose and seek confirmations from the General Department of Energy of MME, local offices of MME and/or EAC and EdC that the selected areas (at least 3 villages) will not be grid-connected.

**Activity 2: Resource assessment and technology selection (estimated 8 days)**

- Conduct assessment of solar energy potential and demand profile in the 3 selected villages
- Assess/compare innovative approaches with conventional practices:
  - Solar technologies: e.g. standalone versus connected solar systems; AC vs. DC;
  - Business models: e.g. retail, pay-as-you-go (PAYG) model; energy as a service;
  - Productive uses: e.g. linking energy use with income generating activities or access to safe water;
- Engage community participation (on-site visits) in the design process, for example, intended use by community/ individuals or vulnerable groups (for example, kids, female-headed households, people with disabilities, diverse ethnic groups, etc.) as well as gender mainstreaming;

- Estimate the total costs for each site, including taking into consideration the relative difficulties for accessing the sites.
- Present findings and recommendations to MME and UNDP and decide on preferred locations and technologies for the installation (based on available budget for construction)

**Activity 3: Engineering, Support Procurement and Advisory for the off-grid solar projects (estimated 5 days)**

- Propose basic design based on the above dimensions (as well as suggestions from UNDP and GDE) and develop term of reference for Request for Proposal (RfP), technical specifications, applicable technical standards for bidding purposes;
- Support UNDP and GDE in the tender management process including, but not limited to review technical design by bidders and evaluation of bids.<sup>3</sup>
- Supervise selected bidder during planning, design, commissioning and capacity building stages and provide corrective actions as appropriate;
- Ensure that a feasible long-term plan and arrangements are in place for maintenance and operations of system;
- Together with the contractor, provide awareness raising and capacity building on operation and maintenance to the dedicated community member;
- Conduct quality check on installed equipment according to specification and RFP and make recommendations to UNDP and GDE;

**Activity 4: Support in system transfer and knowledge management (estimated 6 days)**

- Provide a 1-day training to MME, EAC, EDC, MEF and interested partners (min. 15 participants) on off-grid solar energy project(s) development for rural communities;
- Support UNDP during system handover by the GDE to the communities;
- Gather operational and performance data of the system, including number of (female) beneficiaries
- Gather technical feedback and lessons learned in a note (+/- 5 pages);

**4. Expected Outputs and Deliverables**

| No | Deliverables/Outputs  | Target Due Dates              | Review and Approvals Required |
|----|---|-------------------------------|-------------------------------|
| 1. | Detailed work and mission plan submitted to UNDP for endorsement                                  | 1 week after contract signed  | Technical Advisor on Energy   |
| 2. | A complete set of all collected data (in word and excel format), GIS mapping data (in KML format) | 5 weeks after contract signed | Technical Advisor on Energy   |

<sup>3</sup> When comparing various energy system designs offered by bidders, it is desired if IC performs an economic evaluation that determines the total cost of owning and operating a facility over period of time. There are established methods to do this, one of which is called Life-Cycle Cost Analysis (LCCA).

|    |  |                                       |                             |
|----|--|---------------------------------------|-----------------------------|
|    | (Activity 1)   |                                       |                             |
| 3. | Selection of locations and technologies for the installation (activity 2)  | 8 weeks after <i>contract signed</i>  | Technical Advisor on Energy |
| 4. | Basic system design and plan and presentation to GDE/UNDP, final selection of EPC contractor (activity 3)  | 12 weeks after <i>contract signed</i> | Technical Advisor on Energy |
| 5. | -Progress report on systems EPC and knowledge management (completed training and hand-over of system by the GDE to communities)<br>-Final report incorporating comments from government, stakeholders, and UNDP (Activity 4) | Not later than Jan 2020               | Technical Advisor on Energy |

### 5. Institutional Arrangement

The consultant will be performed under the supervision of the Technical Advisor on Energy, UNDP Cambodia. S/he will also liaise with other experts from UNDP and the GDE.

### 6. Duration of the Work

The assignment is expected to be performed in the period from October 2018 to January 2019. During the assignment, the consultant will be expected to travel to rural areas in the country. Cost of this travel shall be included in the offer price.

### 7. Duty Station

The duty station of this assignment is a combination of home-based with travel to rural areas in Cambodia.

### 8. Minimum Qualifications of the Individual Contractor

|                      |  |
|----------------------|--|
| <b>Education:</b>    | <ul style="list-style-type: none"> <li>▪ Bachelor of electrical science, renewable energy engineering or related field</li> </ul>  |
| <b>Experience:</b>   | <ul style="list-style-type: none"> <li>▪ At least 5-year experience in design of renewable energy system / electrical systems (especially for energy access and renewable energy), particularly small solar systems, such as SHS, solar mini-grids</li> <li>▪ Experience with assessing feasibility of rural solar energy systems (SHS, solar mini-grids, etc.) in Cambodia</li> </ul> |
| <b>Competencies:</b> | <ul style="list-style-type: none"> <li>▪ Experience working with MME and/or UNDP or other UN agencies will be an advantage.</li> <li>▪ Strong analytical skills and exceptional ability in communication and networking and negotiations.</li> </ul>   |

|                              |  |
|------------------------------|--|
|                              | Flexibility and ability to operate in different cultural settings and with a variety of stakeholders; culturally and gender sensitive. |
| <b>Language Requirement:</b> | ▪ Good command of English and Khmer  |

## 9. Criteria for Evaluation of Level of Technical Compliance of Individual Contractor

| <b>Technical Evaluation Criteria</b>  | <b>Obtainable Score</b> |
|---|-------------------------|
| Bachelor of electrical science, renewable energy engineering or related field   | 20                      |
| At least 5-year experience in design of renewable energy system / electrical systems (especially for energy access and renewable energy), particularly small solar systems, such as SHS, solar mini-grids | 40                      |
| Experience with assessing feasibility of rural solar energy systems (SHS, solar mini-grids, etc.) in Cambodia   | 30                      |
| Experience working with MME and/or UNDP or other UN agencies will be an advantage.  | 10                      |
| <b>Total Obtainable Score:</b>  | <b>100</b>              |

## 10. Payment Milestones

The consultant will be paid on a lump sum basis under the following installments. The consultant will be responsible for the travel expenses for local travel in Phnom Penh and rural/remote villages/communities of Cambodia.

| <b>No</b> | <b>Outputs/Deliveries</b>  | <b>Payment Schedule</b>  | <b>Payment Amount</b> |
|-----------|--|--|-----------------------|
| 1.        | Detailed work and mission plan submitted to UNDP for endorsement   | Detailed work and mission plan submitted to UNDP for endorsement   | 20%                   |
| 2.        | A complete set of all collected data (in word and excel format), GIS mapping data (in KML format) (Activity 1)   | First synthesis of the co-designed session on solar energy   | 20%                   |
| 3.        | Selection of locations and technologies for the installation (activity 2)  | Second synthesis of the co-designed session on solar energy  | 20%                   |
| 4.        | Basic system design and plan and presentation to GDE/UNDP, final selection of EPC contractor (activity 3)  | Draft Policy option paper on solar energy  | 20%                   |
| 5.        | -Progress report on systems EPC and knowledge management (completed training and hand-over of system by the GDE to communities)<br>-Final report incorporating comments from government, stakeholders, and UNDP (Activity 4) | Final policy option paper on solar energy incorporating comments from government, stakeholders, and UNDP | 20%                   |