

Annex -1-

Terms of Reference (TOR)

Project Name: Small Decentralized Renewable Energy Power Generation (DREG) - 00086064

Reference Number: DREG/2/2016

Subject: International Technical Consultant for Earthing and Lightning Protection of PV systems: Technical seminar and development of design and installation guidelines for Lebanese PV designers and installers on earthing and lightning protection.

1. Background

The Project:

The Small Decentralized Renewable Energy Power Generation Project, also known as DREG or the DREG Project, is funded by the Global Environment Facility (GEF) and implemented by the United Nations Development Programme (UNDP). The project is nationally executed by the Ministry of Energy and Water (MoEW) with the Lebanese Center for Energy Conservation (LCEC).

The project's objective is to reduce greenhouse gas emissions by the removal of barriers to widespread application of decentralized renewable energy (RE) power generation, and to catalyse the development of the small, decentralized, grid-connected renewable energy power generation market in Lebanon.

In the absence of a Lebanese electrical safety code with compulsory regulations to adhere by, earthing and lightning protection are not subjects that are well-addressed and embraced in Lebanon, especially for PV systems, hence the importance of shedding light on these subjects so that PV designers and installers incorporate these electrical safety measures in their projects according to international standards and best practices.

2. Scope of Work, Responsibilities and Description of the Proposed Analytical Work

The Consultant shall perform all the services/work as necessary to fulfill the objectives of the consultancy contract.

The objective of the required work is the technical training of Lebanese photovoltaic (PV) system designers and installers in the area of earthing and lightning protection.

As such, the selected individual will be responsible for providing the services outlined below:

TASK 1. Prepare and present a technical workshop on earthing and lightning protection for PV systems

- 1.1. Gather basic background knowledge on the PV industry in Lebanon and the general status of the electrical grid (DREG's technical staff can help in knowledge gathering by sharing their practical experience with the Lebanese grid and its characteristics).
- 1.2. Prepare a technical presentation that includes, but is not limited to, the following topics according to international standards and common best practices:
 - General overview and basic concepts of earthing (i.e. reasons behind and purpose of earthing systems, difference between TT, TN-S, TN-C...) and lightning protection (i.e. classes of LPS, air termination systems, calculation methods...) and their main components
 - Earthing of PV systems (risks and solutions, main components...)
 - Lightning protection of PV systems (risks and solutions, main components...)
 - Residual and leakage currents protection for PV systems (types of RCDs, proper installation and selection, ...)
 - Surge and overvoltage protection for PV systems (types of surge protection devices, proper installation and selection, ...)
 - International best practice and case studies to represent best practices
- 1.3. The most important aspect of the presentation should be dedicated to the application of the above to the Lebanese case, taking into consideration that PV designers and installers are implementing many PV projects for (older) existing facilities that often do not have any earthing or lightning protection systems in place.
- 1.4. Prepare for and hold a workshop/training in Lebanon to present the above information. The training should include real case studies and an interactive Q&A session.

TASK 2. Develop the Document titled "Technical Guidelines and Recommended Best Practices for Earthing & Lightning Protection of PV Systems in Lebanon"

- 2.1 Based on the Consultant's experience, the workshop's content, and in light of the Q&A and conclusions drawn from the workshop, a document titled "Technical Guidelines

and Recommended Best Practices for Earthing & Lightning Protection for PV Systems in Lebanon” is to be developed by the Consultant.

- 2.2 The document should include internationally recognized design and installation best practices and their application to the Lebanese case.
- 2.3 Diagrams, illustrations, case studies, and examples are to be included in the document as well.
- 2.4 A “Frequently Asked Questions” section based on the workshop’s Q&A and other recurrent queries should also be included at the end of the document.

3. Qualifications Required

The Individual Consultant should possess the following minimum qualifications:

a. Academic Qualifications:

- Advanced university degree (Master or above) in electrical engineering or related field. Major or specialization in power grids, renewable energy, electrical safety or related fields is required.

b. Years of Experience:

- Relevant experience of not less than 10 years including experience in working and collaborating with various government agencies or interdisciplinary teams
- Previous experience in the fields of lightning and earthing protection for PV systems is an asset
- Previous trainings and workshops in this field are highly desirable
- Electrical and construction experience in developing countries with grid-related issues similar to Lebanon is highly desired and will be considered as an asset

c. Competencies:

- Advanced level of communication skills including proficiency in the English language
- Strong analytical and report-writing skills
- Excellent interpersonal and communication skills
- Emphasis on delivery of results and reacts well to constructive criticism

4. Duration of Contract

The contract is 14 man-days spread out over a period of 1.5 months and includes a 3-day (tentative period) mission to Beirut.

5. Schedule of Implementation

ID	Task Name	Duration	Month	1				2	
			Week	1	2	3	4	5	6
1	Content outline and approach/methodology	2 days		X					
2	Elaboration of workshop and guidelines content	5 days			X	X			
3	Workshop (mission to Beirut, Lebanon)	2 days					X		
4	Draft Guidelines	3 days						X	
5	Final Guidelines	2 days							X

6. Deliverables

All deliverables, including the presentation and the technical document, should be written in English and submitted in one original and one copy including one soft copy on CD.

- Content outline and approach/methodology
- Technical workshop with power point presentation
- Draft Guidelines Document
- Final Guidelines Document

The project management unit shall subsequently have fifteen (15) working days within which to forward all comments, required modifications and adjustments to the consultant. The approval of the submitted deliverables will be based on a comprehensive review by the project. The project manager reserves the right to request additional evaluation time if other information or clarification is further needed. Payments will be issued upon satisfactory completion of the required outputs.

7. Payment Terms/Schedule

Task	Payment	Deliverables	Potential dates
1	10%	Satisfactory delivery of content outline and approach/methodology	One week after contract signature
2	50%	Satisfactory delivery of technical workshop	Four weeks after contract signature
4	40%	Satisfactory delivery of final guidelines document	Six weeks after contract signature

Note: For international consultants' applications, the total cost for the 3-day mission to Beirut (including estimated international travel, terminal expenses, local costs, and per diem/DSA) is to be included in the financial offer.