Terms of Reference
5-Day Training Course for Solar PV Installers

The Cabinet of the Kingdom of Bahrain approved a Net Metering Resolution in December 2017. This legislation allows any consumer connected to the national electricity grid to install solar photovoltaic power plants on their premises, connect the plant to the national grid and benefit from the renewable energy generated, including individuals, commercial and industrial entities.

In order to ensure the safety of all stakeholders and support companies in the solar field, the Sustainable Energy Unit organizes periodic trainings for solar PV installers. In January 2018, the first 5-day training for Solar PV Installers Course took place. The second training is scheduled for early May 2018.

SEU is seeking qualified companies with experience in delivering solar PV trainings to deliver the future trainings for Solar PV installers. The purpose of the training course is to equip the participants with enough knowledge to safely design, build and commission (grid connection) a typical solar PV plant on a residential or commercial rooftop or even ground mounted PV plants. The participants are pre-screened and are generally of an electrical background with work experience in the electrical field.

Course duration: 5 consecutive days

Style: Lectures combined with practical demonstrations and workshops.

Typical topics to be covered:

1. Basics of solar energy such as concepts of direct, diffuse, global irradiation, shading analysis methods etc., including descriptions of typical tools used in the industry such as inclinometers, pyranometers, solar pathfinders and sun path diagrams etc. The trainers should demonstrate some of these tools in the practical demonstration sessions.

2. Basics of solar PV system components (Modules, Inverters, Mounting structures, Interface Protection devices (required in Bahrain for plants over 11kW, otherwise auxiliary components such as combiner boxes etc.)

3. Solar PV engineering design principles, including:
    a. site visit including shading analysis, mounting structure options, wiring runs, current conditions etc.
    b. manual solar PV plant sizing, string and array design and layout options, inverter selection, wiring runs including protection breakers, fuses, combiner boxes etc. earthing requirements, lightening protection schemes etc.

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c. build process for a typical solar PV plant
d. using typical software tools to design and simulate a PV plant including a brief discussion on the types of outputs available from such tools
e. settings for inverters and/or protection interface (details of the grid code, authorised equipment and other technical specifications can be found under the Renewable Energy tab of the EWA web site www.ewa.bh.)

4. Example of designing a hypothetical solar PV plant from site visit to commissioning.

5. Grid connection process for solar PV plants of various sizes, from small rooftop to utility scale.

6. Error detection and testing routines for completed solar PV plant.

7. Maintenance routine for completed plant.

8. Safety in the construction of solar PV plants (working at heights, DC voltages, emergency response considerations in case of problems with the structure the plant is attached to or problems with the plant itself etc.) Ideally this could be backed up with practical case studies or examples.

9. Case studies of best practices in design, build, testing, error detection, maintenance and the types of tools that can make the above easier, automated and interactive.

10. Brief outline of possible monitoring tools and loggers to bring enhanced management capability to the PV plant.

11. A practical demonstration of mounting and connecting a two or three module string to an inverter complete with protection devices, circuit breakers, correct connector handling and treatment of wiring in the construction phase. The same cycle will be repeated by the participants, this time under the supervision of the trainers, for them to get a taste of the actual work of assembling a solar PV plant (materials will be provided at the training centre).

12. Design and conduct end of course testing as a multiple-choice question paper of about 14-20 questions to be answered a maximum of 90 minutes. It may be that certain questions will be mandatory to be answered correctly to pass the exam.

13. Grade the exam papers and share full details of the exam, grading and results with the SEU and EWA Training staff. The documents including answered question papers become the property of the SEU and will be given to the SEU after the grading is complete.

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The above is not an exhaustive list, but serves as a guide on the types of materials that we would expect to see in the course. Responders can suggest modifications and additions to the above.

The training day will typically run from 8 am through to 4 pm with two 20 minute coffee breaks and a 45 minute lunch break. It is envisaged that the training will take place in a proper training facility which will be made available for the training. Please indicate what specific materials will be required, such as projectors and screens, white boards and markers, PA systems with wireless microphones etc.

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Annex 2

FORM FOR SUBMITTING SUPPLIER'S QUOTATION[1]

(This Form must be submitted only using the Supplier's Official Letterhead/Stationery[2])

We, the undersigned, hereby accept in full the UNDP General Terms and Conditions, and hereby offer to supply the items listed below in conformity with the specification and requirements of UNDP as per RFQ Reference No. _____:

TABLE 1 : Offer to Supply Goods Compliant with Technical Specifications and Requirements

Item No.	Description	Quantity	Latest Delivery Date	Unit Price (USD)	Total Price per Item
1	Delivery of 5-day full course curriculum covering all course topics	1	To be agreed		
2	Delivery of 4 of the 5 days of training*	1	To be agreed		
3	Delivery of 3 of the 5 days of training*	1	To be agreed		
4	Delivery of 2 of the 5 days of training*	1	To be agreed		
5	Delivery of 1 of the 5 days of training*	1	To be agreed		
6	Daily rate for other trainings related to Solar PV (not related to the curriculum of 5-days training course)	1	To be agreed		
	Total Prices				
	Total Final and All-Inclusive Price Quotation				

[1] *This serves as a guide to the Supplier in preparing the quotation and price schedule.*
[2] *Official Letterhead/Stationery must indicate contact details – addresses, email, phone and fax numbers – for verification purposes*

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*N.B. Delivery of other course days might be performed by SEU or EWA.

TABLE 3 : Offer to Comply with Other Conditions and Related Requirements

Other Information pertaining to our Quotation are as follows :	**Your Responses**		
	Yes, we will comply	***No, we cannot comply***	***If you cannot comply, pls. indicate counter proposal***
Services as per attached TOR			
Validity of Quotation (60 days)			
All Provisions of the UNDP General Terms and Conditions			
Other requirements *[pls. specify]*			

All other information that we have not provided automatically implies our full compliance with the requirements, terms and conditions of the RFQ.

[Name and Signature of the Supplier's Authorized Person]
[Designation]
[Date]

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