

## Workshops on “Solar Resource Assessment”

The United States and India deliver workshops on “Solar Resource Assessment” in the margins of the Indo-U.S. Technology Summit in November 2014 in India.



### Introduction:

The U.S. Department of Energy (DOE) and India’s Ministry of New and Renewable Energy (MNRE) announce three workshops on Solar Resource Assessment and Solar Project Development featuring experts from DOE’s National Renewable Energy Laboratory (NREL) and from research institutions in India. The workshops will be held at the National Institute of Solar Energy (NISE), Gurgaon, the National Institute of Wind Energy (NIWE), Chennai, and the National Centre for Photovoltaic Research and Education (NCPRE), Mumbai. The workshops build on ongoing collaboration in renewable energy between the two countries under the U.S.-India Energy Dialogue.

### Objective:

The workshops are intended to provide solar developers throughout India information on the new solar resource data and training on how to leverage the data in financial analyses to improve assessments of potential solar projects.

The workshops will be held on:

- November 12, 2014 at the National Institute of Wind Energy (formerly CWET) in Chennai
- November 14, 2014 at the National Center for Photovoltaic Research and Education (NCPRE), IITBombay in Mumbai
- November 20 - 21, 2014 at the National Institute of Solar Energy (formerly SEC) in Gurgaon

### Target Audience:

The primary audience is solar project developers in India, including both PV and CSP developers of all-scales (utility-scale, self-supply, rooftop). The workshop at NISE will also be beneficial for financing companies interested in investing in solar projects.

### Course Contents include (full details below in the Program Schedule):

- Solar Measurements Overview
- Solar Modeling Overview
- Project Development & Financing
- Using the Solar Data for Project Development

### Eligibility:

A participant must have a minimum academic qualification of graduation in science or engineering. Participants should be from industry, or be an individual intending to set up a solar company. A very limited number of persons from academic/research institutions will be accepted. Basic knowledge of solar energy is a pre-requisite. Applications will be screened for suitability. Registration will be on a first-come, first-served basis.

### Dates and Locations:

- **At National Institute of Wind Energy, Chennai on November 12, 2014:**  
**NIWE, No.30, Velachery - Tambaram Main Road, Pallikaranai, Chennai 600100**  
Contact Person:  
Mr. R. Sasi Kumar, Consultant, SRRA, NIWE  
email: rsasi47@gmail.com  
Off: 044-22463996  
Res: 044-22474055  
Mobile: 9445798008
- **At National Centre for Photovoltaic Research and Education, Mumbai on November 14, 2014:**  
**NCPRE, IIT Bombay, Victor Menezes Convention Centre, Powai, Mumbai 400076**  
Contact Person:  
Ms. Smita Bhattacharjee  
email: smita98@iitb.ac.in  
Phone: 022-2576 4480
- **At National Institute of Solar Energy, Gurgaon on November 20-21, 2014:**  
**NISE, Institutional Area, Gurgaon-Faridabad Road, Gwalpahari, Gurgaon 122005**  
Contact Person:  
Mr. N.B. Raju, Scientist "E", Director Training  
e-mail: training.nise@gmail.com  
Phone: 0124-2579214

### Course Coordinators:

- At NIWE on November 12, 2014: G. Giridhar, ggiridhar@cwet.res.in, ggd\_cdp@yahoo.co.in
- At NCPRE, IIT Bombay, Mumbai on November 14, 2014: Juzer Vasi, vasi@ee.iitb.ac.in
- At NISE on November 20-21, 2014: O.S. Sastry, training.nise@gmail.com

### Registration Fee:

There is no registration fee for the Workshops, as these are supported by Department of Energy (USA) and Ministry of New and Renewable Energy (India).

### Important Dates:

- Last date for submitting registration form by email: October 31, 2014
- Intimation of acceptance of registration by NISE/NIWE/NCPRE: November 3, 2014
- Last date to receive confirmation of attendance from participants: November 7, 2014

### How to Apply:

Participants should decide which of the Workshops they would like to apply to (NIWE, NCPRE or NISE). The registration form given below should be filled in, and sent by email to the contact person at the location to which application is being made by October 31. Please clearly mention **only one** venue where you would like to attend the course. The profiles of the prospective participants would be reviewed/selected by the course coordinators. Acceptance of registration will be intimated by November 3. Selected participants must confirm their registration by November 7.

Please note that no accommodation will be arranged at any of the locations.



**Registration Form:**

Name: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

Designation: \_\_\_\_\_

Email and Mobile Phone No.: \_\_\_\_\_

Background, Experience and Qualifications:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Years of project development / experience: (1) \_\_\_\_ (2) \_\_\_\_ (3) \_\_\_\_ (4) \_\_\_\_ (5+) \_\_\_\_

Workshop you would like to attend (mark **only one** with a “✓”):

\_\_\_\_\_ At NIWE, Chennai on November 12, 2014

\_\_\_\_\_ At NCPRE, IIT Bombay, Mumbai on November 14, 2014

\_\_\_\_\_ At NISE, Gurgaon on November 20-21, 2014

Please send the completed registration form by email the Contact Person of the tick-marked location on or before October 31, 2014.

## Program Schedule:

The workshops at NIWE and NCPRE will be a one-day format and the workshop at NISE will be a two-day format. The schedule for the workshops is given below.

### Schedule: Workshop 1: NIWE, Chennai, November 12, 2014

*Speakers: Manajit Sengupta, Michael Elchinger*

TIME	DESCRIPTION
8:30 – 9:00	<b>Registration, Welcome Drink &amp; Networking</b>
9:00 – 9:15	<b>Introduction</b>
9:15 – 11:45	<b>Solar Modelling Overview</b> This session will focus on solar resource modelling with satellites. Topics that would be covered include <ul style="list-style-type: none"><li>• Introduction to Satellite Resource Assessment</li><li>• Datasets for India</li><li>• Validation using ground station data</li><li>• Dissemination and uses</li></ul> <b>Solar Measurements Overview</b> This session will focus on familiarizing the audience with ground measurements. Topics that would be covered include <ul style="list-style-type: none"><li>• Measuring Solar Radiation</li><li>• Calibration</li><li>• Quality Assessment</li><li>• Siting and Maintenance</li></ul>
11:45-12:00	<b>Morning Drink &amp; Networking</b>
12:00 - 1:30	<b>Project Development &amp; Financing</b> This session will focus on analysing the value of solar projects, focusing on the information needed to demonstrate that a project is financeable. <ul style="list-style-type: none"><li>• Solar Power Market – Establishing Value</li><li>• Project Development Process and Framework</li></ul> <b>Using the Solar Data for Project Development</b> This session will focus on ways in which the solar resource data can be accessed and include a discussion on the data needs for solar project developers. <ul style="list-style-type: none"><li>• Accessing the data (GIS data, time series data, maps)</li><li>• Pro Forma Tool – PV Project Pro Forma</li><li>• Sensitivity Analysis</li><li>• PVWatts, SAM case study</li><li>• Discussion: Developer data needs</li></ul>
1:30 - 2:00	<b>Lunch</b>
2:00 – 5:00	<b>Site visit to Solar Radiation Resource Assessment Station, Calibration facility and Advanced Measurement Station at Centre for Assessment of Solar Energy</b>

## Draft Agenda: Workshop 2: NCPRE, IIT Bombay, Mumbai, November 14, 2014

Speakers: Manajit Sengupta, Michael Elchinger

TIME	DESCRIPTION
8:30 – 9:00	<b>Registration, Welcome Drink&amp; Networking</b>
9:00 – 9:15	<b>Introductions</b>
9:15 – 10:15	<b>Solar Modelling Overview</b> This session will focus on solar resource modelling with satellites. Topics that would be covered include <ul style="list-style-type: none"><li>• Introduction to Satellite Resource Assessment</li><li>• Datasets for India</li><li>• Validation using ground stations</li><li>• Dissemination and uses</li></ul>
10:15-10:30	<b>Morning Drink&amp; Networking</b>
10:30-12:00	<b>Solar Measurements Overview</b> This session will focus on the familiarizing the audience with ground measurements. Topics that would be covered include <ul style="list-style-type: none"><li>• Measuring Solar Radiation</li><li>• Calibration</li><li>• Quality Assessment</li><li>• Siting and Maintenance</li></ul>
12:00 – 12:30	<b>Lunch &amp; Networking</b>
1:00 – 1:45	<b>Remarks by NCPRE</b>
1:45 – 2:45	<b>Project Development &amp; Financing</b> This session will focus on analysing the value of solar projects, focusing on the information needed to demonstrate that a project is financeable. <ul style="list-style-type: none"><li>• Solar Power Market – Establishing Value</li><li>• Project Development Process and Framework</li></ul>
2:45 – 3:00	<b>Afternoon Drink&amp; Networking</b>
3:00 – 4:00	<b>Using the Solar Data for Project Development</b> This session will focus on ways in which the solar resource data can be accessed and include a discussion on the data needs for solar project developers. <ul style="list-style-type: none"><li>• Accessing the data (GIS data, time series data, maps)</li><li>• Pro Forma Tool – PV Project Pro Forma</li><li>• Sensitivity Analysis</li><li>• PVWatts India</li><li>• SAM case study</li><li>• Discussion: Developer data needs</li></ul>
4:00 – 4:30	<b>Concluding Remarks and Discussion</b>

## Draft Agenda: Workshop 3: NISE, Gurgaon, November 20-21, 2014

Speakers: Manajit Sengupta, Michael Elchinger

### Day 1

TIME	DESCRIPTION
9:00 – 9:45	<b>Registration, Welcome Drink &amp; Networking</b>
9:45 – 10:00	<b>Introductions</b>
10:00 – 12:00	<b>Solar Modelling Overview</b> This session will focus on solar resource modelling with satellites. Topics that would be covered include <ul style="list-style-type: none"><li>• Introduction to Satellite Resource Assessment</li><li>• Datasets for India</li><li>• Validation using ground stations</li><li>• Dissemination and uses</li></ul>
12:00 – 1:00	<b>Lunch &amp; Networking</b>
1:00 – 2:00	<b>Discussion: Stakeholder Experience</b> This session will provide the audience an opportunity for discussion and to share their experience regarding deployment and use of solar measurement
2:00 – 3:30	<b>Solar Measurements Overview</b> This session will focus on the familiarizing the audience with ground measurements. Topics that would be covered include <ul style="list-style-type: none"><li>• Measuring Solar Radiation</li><li>• Calibration</li><li>• Quality Assessment</li><li>• Siting and Maintenance</li></ul>
3:30 – 3:45	<b>Afternoon Drink &amp; Networking</b>
3:45 – 4:50	<b>Remarks by NISE</b>
4:50 – 5:00	<b>Concluding Remarks for Day 1</b>

### Day 2

TIME	DESCRIPTION
9:00 – 10:45	<b>Project Development &amp; Financing</b> This session will focus on analysing the value of solar projects, focusing on the information needed to demonstrate that a project is financeable. <ul style="list-style-type: none"><li>• Solar Power Market – Establishing Value</li><li>• Project Development Process and Framework</li></ul>
10:45 – 11:00	<b>Morning Drink &amp; Networking</b>
11:00 – 12:00	<b>Case Study</b> This session will walk through a case study evaluating a hypothetical solar project using the pro forma tools and solar resource data previously discussed <ul style="list-style-type: none"><li>• Pro Forma Tool – PV Project Pro Forma</li><li>• Sensitivity Analysis</li></ul>

12:00 – 1:00	<b>Lunch &amp; Networking</b>
1:00 – 2:30	<b>Visit to outdoor monitoring station and calibration facility at NISE, Gurgaon</b>
2:30 – 2:45	<b>Afternoon Drink &amp; Networking</b>
2:45 – 4:45	<b>Financing Panel Discussion</b> This session will discuss availability of and barriers to financing for solar projects in India, and will include representatives from IREDA and representatives from Indian financial institutions.
4:45 – 5:00	<b>Concluding Remarks</b>



## Speaker Biographies:



### **Dr. Manajit Sengupta — Senior Scientist and Manager**

Resource Assessment and Forecasting  
National Renewable Energy Lab, Golden, CO

Dr. Manajit Sengupta currently leads the Resource Assessment and Forecasting (RAF) group at NREL. The RAF group maintains expertise in solar and atmospheric resource measurement, modeling, and forecasting for renewable energy applications. Manajit is an expert in solar resource modeling, forecasting, and remote sensing with nearly 20 years of research experience. He is internationally recognized in his field with numerous publications on satellite-based resource assessment, PV variability, and measurement uncertainty analysis. Before joining NREL, Manajit was a researcher at Colorado State University and the Pacific National Northwest Laboratory. His research areas have included cloud and solar radiation modeling for future satellites and the impact of clouds on climate change. Dr. Sengupta earned his Ph.D. in Meteorology from the Pennsylvania State University.



### **Michael Elchinger – Project Leader**

Project Development and Finance Advisory  
National Renewable Energy Lab, Golden, CO

Mike Elchinger is a Project Leader in the Project Development and Finance Advisory Group at NREL. He is currently Project Manager for work aimed at increasing loan volume for residential solar PV installations with an FHA-insured loan product called PowerSaver. Prior to this work, Mike built economic models to evaluate the impact of renewable energy projects in Indonesia for the Millennium Challenge Corporation. He also served as country lead for USAID's Enhancing Capacity for Low Emission Development Strategies (EC-LEDS) in Indonesia, Bangladesh, Ethiopia and Nigeria. Additionally, he provides project development and financial guidance to various projects through the Federal Energy Management Program, and performed due diligence and analysis on projects applying for the Treasury 1603 Cash Grant program. Mike came to NREL from the University of Michigan where he earned his Master of Business Administration with a focus in Finance and Strategy and a Master of Science in Sustainable Systems. Prior to graduate school, he earned a Bachelor's degree in Economics from the University of Virginia.