

# PLANT CONTROLS AND SCADA FOR GRID-SCALE PV & PV STORAGE HYBRID PLANTS

**September 10-11, 2020**  
**Online | Central Time**

## EUCI ONLINE COURSE

EUCI is pleased to offer this course on our online interactive platform. Enjoy a valuable learning experience with a smaller impact on your time and at reduced cost. You will gain new knowledge, skills, and hands-on experience from the comfort of your remote location.

“

*“Great source of information from the most experienced in the industry!”*

O&M Analyst,  
BayWa r.e. Solar Projects LLC



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EUCI is authorized by IACET to offer 1.0 CEUs for the online course

## OVERVIEW

This course will highlight how Plant Controls and Supervisory Control and Data Acquisition (SCADA) systems provide the critical capability to control, monitor, and analyze the performance of solar and solar combined with storage plants. Throughout the day and a half program, attendees will learn everything from PV plant and storage basics, functional requirements of the plants, and how these requirements are implemented in plant controls and SCADA systems.

All attendees will leave the class having a holistic understanding of the plant controls and SCADA systems that pertain to solar plants and solar plus storage plants. It will benefit you whether you're an operator or a professional who needs a detailed understanding of operation, reliability, and stability of a PV and storage plant, or a sales professional who needs a better understanding of the system to better serve customers. The goal by the end of the course is to have all attendees develop a working familiarity with the key concepts related to this topic.

## LEARNING OUTCOMES

- Review the key components of PV plants and PV-Storage plants
- Discuss the functions of PV plants, including energy harvest, regulations, grid disturbance, and frequency response
- Study the architecture, functions, components, data, and instrumentation of plant controls and SCADA systems for PV plants
- Examine the key functions of control system of a PV plant such as active power control, ramp rate controls, voltage and reactive power control, advanced capabilities, and more
- Assess the impact of adding storage to PV plants
- Evaluate the integration between control systems and SCADA including battery management systems, impact on the grid, and dispatch scheduling

## WHO SHOULD ATTEND

- Professionals who are interested in getting a basic understanding of the controls and SCADA system required for grid-scale solar and solar hybrid plants
- Operators who need a detailed understanding of operation and dispatch of PV and PVS plants as well as the factors that can affect operating costs
- Grid professionals who need an understanding of some of the capabilities that PV and PV + Storage (PVS) plants provide supporting bulk power system reliability and stability
- Sales professionals who must understand PV and PVS control functions and considerations to better serve customers



*"I appreciated that EUCI provided valuable training during the COVID-19 situation."*

Senior Electrical Engineer,  
NiSource



*"Second seminar I have attended. Mahesh is excellent. Hopefully he adds other seminars."*

Sr. Project Manager, EDF Renewables

# AGENDA

THURSDAY, SEPTEMBER 10, 2020 - CENTRAL TIME

**8:45 – 9:00 am**

**Log In**

**9:00 am – 4:30 pm**

**Course Timing**

**12:30 – 1:15 pm**

**Lunch Break**

## **Introduction to PV & PV Plus Storage Hybrid Power Plants**

- PV Power Plant Basics
- PV+ Storage Hybrid Plant Basics
- Motivation for PV & Storage (PVS) Plants
- Key PV Plant and PVS Components
  - o PV solar modules
  - o DC system design
  - o Inverters (central and string inverters)
  - o Step-up transformer
  - o Battery storage
  - o Battery management system
  - o Power electronics for storage
  - o AC power control
- Examples of PV and PVS Power Plants

## **Key PV Plant Functions**

- Maximizing Energy Harvest Through DC voltage Control
- Real & Reactive Power Generation
- Voltage Regulation and/or Power Factor Control at POI
- Active Power Control (Ramping, Curtailment)
- Grid Disturbance Ride Through (Voltage and Frequency Excursions)
- Primary Frequency Droop Response
- Short Circuit Duty Control

## **PV Plant SCADA System**

- Plant SCADA Architecture
- Key Functions of PV Plant SCADA System
  - o Real-time monitoring of all plant data
  - o Control of certain plant components (e.g. inverters)
  - o Ability to remotely access the plant SCADA system
  - o Data historian
  - o Alarm monitoring screen
  - o Predefined HMI screens to allow trending of major performance indicators
  - o An HMI screen for trending user selected points
- Key Components of a Typical SCADA System
  - o SCADA Rack
  - o Plant network
  - o Security
  - o Remote Network Architecture
  - o SCADA HMI screens

# AGENDA

THURSDAY, SEPTEMBER 10, 2020 - CENTRAL TIME (CONTINUED)

- Typical PV Plant Data
  - o Plant-level data
  - o Inverter data
  - o Instrumentation data
  - o High frequency voltage and current measurements at POI
  - o Other data
- Plant Instrumentation

## **PV Plant Control System**

- Plant Controls Architecture
- Real & Reactive Power Generation
- Active Power Control (Ramping, Curtailment)
- Voltage Regulation and/or Power Factor Control at POI
- Grid Disturbance Ride Through (Voltage and Frequency Excursions)
- Primary Frequency Droop Response
- Short Circuit Duty Control
- Advanced Capability Including Ancillary Services
  - o AGC (Automated Generation Control)
  - o ADS (Automated Dispatch System)
  - o Flexible operation including regulation reserves

FRIDAY, SEPTEMBER 11, 2020 - CENTRAL TIME

**8:45 – 9:00 am**      **Log In**

**9:00 am – 12:00 pm**      **Course Timing**

## **Adding Storage (BESS) to PV Plant**

- Key Design Characteristics of Storage
- AC-Coupled Solution
- DC-Coupled Solution
- Impact of Storage Sizing
- Power Converters for Storage
- Grid Value Created by Adding Storage
  - o Energy shifting
  - o Peak shaving
  - o Capacity
  - o Ancillary grid services

## **PVS Plant-level Controls and SCADA System**

- Power Plant Controls and Grid Integration Features
- AVR Control
- Battery Management System
- PV & PVS Impact on Grid Services
- Scheduling of Dispatch
- Arbitrage Between PV Generation and BESS Generation
- When to Charge? When to Discharge? How is the Priority Established?
- How Does the Plant Control System Work with Multiple Services?

# INSTRUCTOR



## Mahesh Morjaria, Ph.D.

**CEO, RE PlantSolutions**

Over the past decade, Dr. Mahesh Morjaria has established himself as an industry-recognized leader in the area of solar generation and in addressing challenges associated with integrating solar into the power grid. He led the development of plant-level controls that enabled utility-scale plants to provide grid-friendly capability required to support bulk power system stability and reliability. He has also led a number of pioneering demonstrations that have increased value of solar through reliability services and flexibility. Dr. Morjaria previously worked at GE for twenty years where he held various leadership positions including a significant role in wind energy. His academic credits include B.Tech from IIT Bombay and M.S. & Ph.D. from Cornell University.



*“Excellent speaker. As a non-engineer, I really appreciated how he spent time going over the fundamentals to build up to the more complex concepts.”*

Energy Industry Analyst, FERC



*“Mahesh is very knowledgeable and did a great job at providing explanation to questions. I would definitely take another conference with him as the speaker.”*

PE & PMP, Georgia Power



*“Mahesh was very knowledgeable and a great speaker, taking time to answer questions and/or clarify anything that was not well understood.”*

IT Solutions Architect, APS



*“Mahesh was very knowledgeable and was very accommodating.”*

Senior Electrical Engineer, NiSource

## INSTRUCTIONAL METHODS

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PowerPoint presentations, interactive group exercise, and group discussion will be used during this online course.

## REQUIREMENTS FOR SUCCESSFUL COMPLETION

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You must be logged in for the entire presentation and send in the evaluation after the online course is completed.

## IACET CREDITS

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EUCI has been accredited as an Authorized Provider by the International Association for Continuing Education and Training (IACET). In obtaining this accreditation, EUCI has demonstrated that it complies with the ANSI/IACET Standard which is recognized internationally as a standard of good practice. As a result of their Authorized Provider status, EUCI is authorized to offer IACET CEUs for its programs that qualify under the ANSI/IACET Standard.

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## ONLINE COURSE DELIVERY & PARTICIPATION DETAILS

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We will be using Microsoft Teams to facilitate your participation in the upcoming event. You do not need to have an existing Teams account in order to participate in the broadcast – the online course will play in your browser and you will have the option of using a microphone to speak with the room and ask questions, or type any questions in via the chat window and our on-site representative will relay your question to the instructor.

- You will receive a meeting invitation which will include a link to join the meeting.
- Separate meeting invitations will be sent for the morning and afternoon sessions of the online course.
  - You will need to join the appropriate meeting at the appropriate time.
- If you are using a microphone, please ensure that it is muted until such time as you need to ask a question.
- The remote meeting connection will be open approximately 30 minutes before the start of the online course. We encourage you to connect as early as possible in case you experience any unforeseen problems.

## COURSE RECORDING

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A recording of this program will be available for three days from either the end of the program (or three days from the date of purchase, if you purchase the recording after the session ends). It is presented in four-hour sessions and can be watched an unlimited number of times for three days (for the registrant). There is no additional cost beyond the registration fee.

To Register Click Here, or

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# ENERGIZE WEEKLY

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## PLEASE SELECT

**PLANT CONTROLS AND SCADA FOR GRID-SCALE PV & PV STORAGE HYBRID PLANTS ONLINE COURSE:**  
SEPTEMBER 10-11, 2020: US \$1195 (Single Connection)

**PACK OF 5 CONNECTIONS:** US \$5,375

**PACK OF 10 CONNECTIONS:** US \$8,965

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### Online Course Delivery & Participation Details

See page 6 for information

How did you hear about this event? (direct e-mail, colleague, speaker(s), etc.)

Print Name

Job Title

Company

Address

City

State/Province

Zip/Postal Code

Country

Phone

Email

### CREDIT CARD INFORMATION

Name on Card

Billing Address

Account Number

Billing City

Billing State

Exp. Date

Security Code (last 3 digits on the back of Visa and MC or 4 digits on front of AmEx)

Billing Zip Code/Postal Code

**OR** Enclosed is a check for \$ \_\_\_\_\_ to cover \_\_\_\_\_ registrations.

#### Substitutions & Cancellations

Your registration may be transferred to a member of your organization up to 24 hours in advance of the event. Cancellations must be received on or before July 17, 2020 in order to be refunded and will be subject to a US \$195.00 processing fee per registrant. No refunds will be made after this date. Cancellations received after this date will create a credit of the tuition (less processing fee) good toward any other EUCI event. This credit will be good for six months from the cancellation date. In the event of non-attendance, all registration fees will be forfeited. In case of course cancellation, EUCI's liability is limited to refund of the event registration fee only. For more information regarding administrative policies, such as complaints and refunds, please contact our offices. EUCI reserves the right to alter this program without prior notice.