

# UTILITY-SCALE SOLAR POWER PLANT FUNDAMENTALS

*Design Optimization, Planning, Procurement & Development*

October 29 – 30, 2024  
Online | Pacific Time



***“Most concise and comprehensive educational program on solar power generation you can get in two days’ time.”***

Senior Transmission/GIS Analyst, Savion, LLC



**EUCI is authorized by IACET to offer 1.4 CEUs for the course**  
As an IACET Accredited Provider, EUCI offers IACET CEUs for its learning events that comply with the ANSI/IACET Continuing Education and Training Standard.



**Course CPE Credits: 17.0**  
There is no prerequisite for this course.  
Program field of study: Specialized Knowledge  
Program Level: Basic  
Delivery Method: Group Internet Based  
Advanced Preparation: None

EUCI is registered with the National Association of State Boards of Accountancy (NASBA) as a sponsor of continuing professional education on the National Registry of CPE Sponsors. State boards of accountancy have final authority on the acceptance of individual courses for CPE credit. Complaints regarding registered sponsors may be submitted to the National Registry of CPE Sponsors through its web site: [www.nasbaregistry.org](http://www.nasbaregistry.org)

# OVERVIEW

This course is designed to familiarize attendees with:

- The key elements of planning solar power plant resources
- Design and development elements
- An understanding of component function and selection
- Site selection
- Operational optimization

Attendees will benefit from a broad review of development and component evaluation considerations – coupled with energy production modeling techniques – that will provide course participants with the basics of cost-of-energy analysis. Solar industry practitioners will also review design and equipment procurement considerations to reduce risk for asset owners, along with how and when to incorporate storage into the project development planning process. And they will discuss how design decisions can impact overall plant economics, as well as operations and maintenance (O&M) costs.

# LEARNING OUTCOMES

Attendees at this course will:

- Discuss the fundamentals of solar utility-scale generation and its distinctive requirements on transmission and distribution systems
- Review fundamental design and system integration requirements of utility-scale and large-scale commercial solar projects
- Assess cost estimating and EPC considerations
- Evaluate independent engineer's (IE) role and functions
- Examine energy modeling fundamentals
- Analyze design optimization considerations
- Evaluate risk assessment, risk allocation, and performance guarantees
- Describe third-party installation review, testing and commissioning
- Identify procurement considerations
- Assess resource planning for solar and technological advances
- Define core financial modeling elements



***“Awesome course! I will use the information I learned today going forward throughout my career.”***

Business Developer,  
Engie Canada



***“This course offers a healthy amount of information on utility-scale solar project development considerations to ask better questions and make more informed recommendations/decisions.”***

Business Development Manager,  
Hawaiian Electric Company

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# AGENDA

TUESDAY, OCTOBER 29, 2024 - PACIFIC TIME

**7:45 – 8:00 am**

**Online Log In**

**8:00 – 8:20 am**

**Overview and Introductions**

**8:20 – 10:30 am**

**Solar Building Blocks**

- History of solar technologies and industry overview
- Line diagram of PV plant
- Photovoltaic solar modules
- DC electrical – string and conductor sizing, protection
- Inverters types and design considerations
- AC collection and system protection
- Transformers
- Power plant control (SCADA) and monitoring
- Other BOS components
- PV math – data sheet on components

**Torrey Graf, Vice President – Engineering, FastGrid LLC**

**10:30 – 10:45 am**

**Morning Break**

**10:45 am – 12:30 pm**

**Power Plant Design & Engineering Component Evaluation/ Specification/Optimization**

- Site studies
- DC design
- AC and medium voltage collection
- High voltage and interconnect
- SCADA and instrumentation
- Spacing design
- GIS
- Inverter loading and tradeoffs
- Row spacing and tradeoffs
- Metrics and myths for evaluating optimal plant designs – lowest cost of energy and AC capacity factors
- Procurement considerations
- Evaluating storage

**Kyle Burns, PV Senior Electrical Engineer, Burns & McDonnell**

**12:30 – 1:15 pm**

**Lunch Break**



***“Very beneficial for people in the renewable energy industry, regardless of experience level.”***

Solar Development,  
E.ON North America



***“My second EUCI event that I experienced deep technical training and in-depth content.”***

CEO, True South Renewables Inc

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# AGENDA

TUESDAY, OCTOBER 29, 2024 - PACIFIC TIME (CONTINUED)

**1:15 – 2:45 pm**

## **Engineering, Testing & Commissioning Process and Timeline**

This presentation will address the elements of an independent (owner's) engineer's role and the related concept of commissioning and how they should be executed:

- Development phase support
- Permitting phase support
- Interconnection request support
- EPC request for proposal (RFP) support
- Construction/commissioning support
- Support during operations
- Verify applicable equipment and systems are installed according to the contract documents, manufacturer's recommendations and industry accepted minimum standards
- Verify contractors perform adequate operation checkout
- Verify, document proper performance of equipment, systems
- Verify that the operations and maintenance (O&M) documentation left on-site is complete
- Verify owner's operating personnel are adequately trained

***Drew Reasor, Design & Construction Project Manager – Solar PV Power Generation, Burns & McDonnell***

**2:45 – 3:00 pm**

## **Afternoon Break**

**3:00 – 4:30 pm**

## **Technical Due Diligence – Essential Data Collection for Successful Development of a Solar Project**

- Typical questions for development
- Key Data Collecting Activities
- Geotechnical Evaluation
  - o Soil tests
  - o Pile testing
  - o Preliminary vs. Final
  - o Report Content
- Land Survey
  - o Topographic survey
  - o Time considerations
  - o ALTA survey
- Site Constraints
  - o Streams/Wetlands
  - o FEMA Floodplain
  - o Environmentally sensitive areas
  - o Site access
  - o Slope Analysis
  - o Standard Setbacks

***J. Tanner Dowell, Senior Civil Engineer, Burns & McDonnell***

**4:30 pm**

## **Program Adjourns for Day**

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# AGENDA

WEDNESDAY, OCTOBER 30, 2024 - PACIFIC TIME

**7:45 – 8:00 am**

**Online Log In**

**8:00 – 9:30 am**

**Energy Modeling Fundamentals**

- Overview of available modeling tools
- Evaluating weather data
- Module mounting and shading
- Overview of modeling losses
- Mechanics of generating an accurate energy model
- Energy tests, capacity tests, and performance guarantees
- Review of energy production inputs
- Overview of operational costs

**Martin Gonzalez, PV Senior Electrical Engineer, Burns & McDonnell**

**9:30 – 9:45 am**

**Morning Break**

**9:45 – 11:00 am**

**Cost Estimating and EPC Considerations**

- Site screening – what makes a cheap solar site?
  - Terrain and soil conditions
  - Hydrological impacts
  - Environmental mitigation
  - Labor and site access
  - Interconnection location
- Site surveys to reduce site risk
- Construction permitting
- Costs associated with the power system
  - Civil works and site preparation
  - Modules and DC collection
  - Inverters and AC collection
  - HV and substation
  - Other balance of system/plant costs
- “Soft” costs
- Supplier considerations
- Module warranty and degradation
- Quality, reliability and testing protocols
- Role of third-party certifications
- Inspection services

**Drew Powers, Section Manager – Construction, Burns & McDonnell**



***“Very informative. Well worth the two days of time spent. Years of experience taught in a few hours.”***

Engineer II, Hawaiian Electric



***“Provided an excellent amount of information and tools to evaluate and plan PV resources.”***

Senior Systems Analyst, Entergy

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# AGENDA

WEDNESDAY, OCTOBER 30, 2024 - PACIFIC TIME (CONTINUED)

**11:00 am – 12:15 pm      Solar + Storage**

- Drivers
- Configurations
  - o AC-coupled
  - o DC-coupled
- Site considerations
- Equipment considerations
  - o Components
  - o Technologies
  - o Electronics
  - o Package solutions
- Solar + storage design and planning sequence

***Ian Bailey, Energy Storage Applications – Power Global Practice, Burns & McDonnell***

**12:15 – 1:00 pm            Lunch Break**

**1:00 – 2:15 pm            Procurement & Supply Chain Considerations**

- Supplier considerations
- Module warranty and degradation
- Quality, reliability and testing protocols
- Role of third-party certifications
- Inspection services
- Crafting the RFP solicitation
- Responding to RFP solicitations
- IRR, NPV and other metrics

***Matt Brinkman, Vice President & Regional Practice Manager – Energy, Burns & McDonnell***

**2:30 – 2:45 pm            Afternoon Break**

**2:45 – 4:15 pm            Thinking with the End in Mind: Linking PV Plant Design Considerations to O&M**

This segment explores linkages between key decisions made during the initial design phase and their impact on life cycle operations and maintenance (O&M) costs to better inform “thinking with the end in mind.” Given the accelerating investment in solar PV by electric utilities — and their emphasis towards holistic costs over the life of the plant, as compared to maximizing return on upfront capital expenditures — this is an increasingly important aspect in optimizing solar power plant design. Yet, sound advice is not always followed. Therefore, the discussion will also consider the consequences on an operating basis of how to deal with plant condition and performance issues when the design and development team didn’t/doesn’t follow O&M team guidance. And, it will examine how the O&M team can effectively communicate its preferences to the design and development team in a fashion that can may circumvent the internal minefields that sometimes bedevil inconvenient truths.

***Lynsey Tibbs, Vice President – Asset Management, Silicon Ranch***

**4:15 pm                      Course Adjournment**

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# COURSE INSTRUCTORS

**Ian Bailey, Energy Storage Applications Engineer, Burns & McDonnell**

Ian Bailey is an Energy Storage Applications Engineer in Burn & McDonnell's Power Global Practice and currently manages teams for various energy storage system owners engineer projects, as well as leads EPC battery energy storage electrical project designs. Mr. Bailey has more than 7 years of technical design experience and has served in a variety of roles for energy storage projects ranging from detailed design, field engineering, and owners engineer. His responsibilities include electrical storage system design, technical specifications for electrical equipment and construction, sizing electrical equipment/cabling, generating technical deliverables, and performing system studies. His involvement also includes client liaison, project execution, coordination of contracts, scheduling, quality control, design, and support for construction, start up, and operation.

**Matthew Brinkman, Vice President & Regional Practice Manager – Energy, Burns & McDonnell**

Matthew Brinkman is Vice President & Regional Practice Manager for Energy at Burns & McDonnell. In that capacity, starting in 2008, he led the company's entrance into the solar market. His team of nearly 100 multi-disciplinary engineers, has more than 15GW of experience in solar as owners' engineer, detailed design, and integrated EPC execution.

**Kyle Burns, PV Senior Electrical Engineer, Burns & McDonnell**

Kyle Burns is a Senior Electrical Engineer in the Solar Energy Group at Burns & McDonnell. He previously worked an active NASA mission prior to pivoting his focus to renewables, in which he has a decade of experience. Mr. Burns leads the PV electrical design of various solar EPC projects contracted by Burns & McDonnell. In addition, he has been the technical lead for equipment selection and procurement of inverters, DC and MV cable, and DC collection systems for various utility scale PV projects. Mr. Burns's other areas of expertise include detailed electrical PV system design, PV System owners engineering, battery energy storage design, PV plant performance analysis and project management.

**J.Tanner Dowell, Senior Civil Engineer & Solar Civil Design Lead, Burns & McDonnell**

Tanner Dowell is a Senior Civil Engineer & Solar Civil Design Lead with Burns & McDonnell and has worked in the solar industry for more than 15 years. His current role is the solar civil design lead responsible for the planning, oversight, quality, and construction coordination required for integrating the civil design on solar projects and pursuits for the entire company. Mr. Dowell has led the civil design for more than 1 GW of executed solar EPC projects and has supported more than 10GW of solar development as Owners Engineer. He also has extensive experience in early site development, evaluating grading and civil cost impacts of different technologies, and working with municipalities on land use permitting across the country.

**Martin Gonzalez, PV Senior Electrical Engineer, Burns & McDonnell**

Martin Gonzalez is a senior electrical engineer in the Solar Group at Burns & McDonnell. He has nearly two decades of experience in a variety of roles related to the design and construction of PV systems. Mr. Gonzalez has been responsible for the design of residential, commercial, and utility scale PV systems, in addition to various other renewable energy projects. He provides on-site support for the installation, testing, and commissioning of PV systems and PV system monitoring equipment. He has worked on some of the largest and most lauded solar projects in the nation, including serving as the owner's engineer on the large, thermal solar PV project in the United States – the 580 MW Solar Star. Mr. Gonzalez has developed a strong understanding of PV system design and operation, equipment selection, electrical installation best practices. He assists with PV system troubleshooting, testing, and maintenance, in addition to performing design reviews in an owner's engineering role.

**Torrey Graf, Vice President – Engineering, FastGrid LLC**

Torrey Graf is Vice President of Engineering at FastGrid LLC, which he joined in 2022. He has more than a dozen years of electrical engineering experience across both traditional power and utility scale solar generation, as well as deep experience in large scale energy storage. In addition to building and leading multidisciplinary teams at Burns & McDonnell, Mr. Graf has served as engineering and project manager on more than 4GW of solar and 2GW of energy storage projects across the United States. He holds bachelor's and master's degrees in electrical engineering from Arizona State University.

**Drew Powers, EPC Section Construction Manager, Burns & McDonnell**

Drew Powers serves as EPC Section Construction Manager with the Power global practice at Burns & McDonnell. Since 2011, he has overseen for the firm EPC execution of more than 1GW of solar across the county, as well as thermal generation facilities, substation and gen-tie facilities across the US and Canada. He earned a BS degree in Construction Management at the University of Central Missouri.

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# COURSE INSTRUCTORS

## **Drew Reasor, Design & Construction Project Manager, Burns & McDonnell**

Drew Reasor is a Design & Construction Project Manager for Solar PV Power Generation at Burns & McDonnell. He began his career in structural engineering in the telecommunications industry before transitioning to the power generation industry. He has more than 8 years of experience in structural design as well as project and engineering management for both natural gas and renewable power generation projects. Mr. Reasor's experience in the energy industry also includes serving as field engineer during the construction of a portion of the Moss Landing Energy Storage Facility. He has served as the engineering manager for multiple concurrent EPC solar photovoltaic projects, leading multidisciplinary design teams which are comprised of local and non-local Burns & McDonnell staff. Mr. Reasor coordinates engineering with construction and procurement throughout the construction, commissioning, and performance testing process. He is a graduate of Barrett, The Honors College at Arizona State University, where he earned a bachelor's degree in civil engineering and a master's degree in structural engineering.

## **Lynsey Tibbs, Senior Director of Key Accounts & Asset Management, Urban Grid**

Lynsey Tibbs is Senior Director of Key Accounts & Asset Management at Urban Grid. Before joining the organization in 2024, she served as Vice President of Asset Management at Silicon Ranch. She has nearly two decades experience as an engineer in the energy sector with skills in power generation and a focus on solar energy, specifically managing nearly a gigawatt of installed solar. Ms. Tibbs is versed in project and contractor management having overseen one-half billion dollars of solar installations. Previously, Ms. Tibbs was Solar Operations Project Manager at Southern Power Company and its parent Southern Company as a solar project engineer, forecast analyst and in solar project implementation. She earned bachelor and master's degrees in industrial engineering from the University of Alabama.



***“Presenters conveyed strong subject matter expertise.”***

Director – Generation & Optimization, Brookfield Renewable



***“The content and speakers were excellent and very applicable to my role.”***

VP, Asset Management, NC Electric Cooperative



***“Excellent program to provide decision-makers the right level of knowledge to ask critical questions and arrive at well-informed decisions.”***

Director, Bear Valley Electric Service

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# REGISTRATION & ATTENDANCE CRITERIA

This course is open to utilities, power and energy industry operating companies (see above), software vendors, consumer groups, and regulators only. Registrations that do not meet this criteria or that may be construed as a competitive conflict will be evaluated on a case-by-case basis and may not qualify for attendance. Any determination as to the fulfillment of a registration to attend this program shall reside solely with EUCI. Questions re: the application of this restriction can be addressed to [scoury@euci.com](mailto:scoury@euci.com).

# INSTRUCTIONAL METHODS

This program will use PowerPoint presentations, case studies and group discussions.

# IACET CREDITS



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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# CPE CREDITS



**Course CPE Credits: 17.0**

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# ONLINE DELIVERY & PARTICIPATION DETAILS

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 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.

- Microsoft recommends downloading and installing the Teams app if possible. You may also use the Edge browser or Chrome.
- You will receive a separate email with a unique link to a personalized landing page which will include links to join all sessions of this event.
- 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 course. We encourage you to connect as early as possible in case you experience any unforeseen problems.

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# PLEASE SELECT

# REGISTRATION INFO

**UTILITY-SCALE SOLAR POWER PLANT FUNDAMENTALS ONLINE COURSE**  
 OCTOBER 29 – 30, 2024 | ONLINE: US \$1495 (Single Attendee)

- PACK OF 5 ATTENDEES:** US \$ 5,980 (20% Discount)
- PACK OF 10 ATTENDEES:** US \$10,465 (30% Discount)
- PACK OF 20 ATTENDEES:** US \$17,940 (40% Discount)

**Mail Directly To:**  
 EUCI  
 6400 S Fiddlers Green Cir., Suite 1600  
 Greenwood Village, CO 80111  
 OR, scan and email to: [conferences@euci.com](mailto:conferences@euci.com)

**WWW.EUCI.COM**  
**p: 303-770-8800 | f: 303-741-0849**

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 September 27, 2024 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 at 303-770-8800. EUCI reserves the right to alter this program without prior notice.

