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# DISTRIBUTED ENERGY RESOURCES (DERS) FUNDAMENTALS

*What Utilities and Other Power Organizations Need to Know to Adjust Their System Planning*

**April 20-21, 2020**  
**Hilton Anaheim**  
**Anaheim, CA**

“

*“This course contained more information than anticipated and gave me surprising new insight to take back to my business.”*

Analyst, Portland General Electric

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 EUCI is authorized by IACET to offer 1.1 CEUs for the course

# OVERVIEW

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This program on distributed energy resources (DERs) is a primer. It is intended to collect — in one forum — the content necessary for utilities, load-serving entities (LSEs), grid operators, project developers and others to develop their own internal system for evaluating the impact of DG and DER development on their system(s). It is not intended to be an advocacy forum for or against the adoption of these technologies, nor for their implementation. Nor is it intended to offer detailed instruction in the analytical instruments referenced during the program. It will, however, provide a useful cross-disciplinary blueprint for reference, adaptation and refinement.

# LEARNING OUTCOMES

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Through presentations and panel discussions, attendees will have the opportunity at this course to consider the following elements as to how distributed energy resources (DER) are changing utility and power industry norms:

- Evaluate the different types and classes of DERs and their special requirements
- Identify the operational differences between renewable and conventional energy DERs
- Review regulatory matters that determine how DERs are governed on a jurisdictional basis
- Examine long-term planning assessment and analysis that properly incorporates DERs
- Discuss challenges that DERs present to existing utility compacts/business models and what options are available to address these issues
- Assess system data access and transparency requirements to facilitate DERs
- Evaluate operational tools required for real-time DER modeling and forecasting
- Discuss DER interconnection issues at the distribution, sub-transmission and transmission levels

# WHO SHOULD ATTEND

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This program will inform professionals at:

- Utilities (IOUs, Municipal and public power) and local distribution companies (LDCs)
- Solar, wind and other project developers and third-party owners (TPOs)
- Regulators (PUCs)
- Engineering and other consulting firms that support wind, solar and other DER project developers
- Attorneys
- Solar and renewable energy advocates
- Community organizations interested in promoting community and solar gardens
- Integrated resource (IRP) and long-range planning

# AGENDA

MONDAY, APRIL 20, 2020

**7:30 – 8:00 am**      **Registration and Continental Breakfast**

**8:00 – 8:15 am**      **Welcome, Overview and Introductions**

## DER DEFINITION AND POLICY

**8:15 – 9:45 am**      **Foundation Concepts, Types and Characteristics of DERs**

- Types
  - PV
  - Energy storage
  - Electric vehicles
  - Combined heat & power (CHP)
  - Wind energy
  - Microgrids
  - Virtual power plants (VPPs)
  - Demand side management
- Size and Location
  - Proximity/relationship to distribution utility
  - DER locational and temporal factors
- Applicable technologies and resources
  - Renewables
  - Non-renewables
  - Both of the above with and without storage
  - Storage (standalone)
  - DSM
- Classes
  - Customer-developed
  - Utility-developed
  - Continuum of self-supply to grid-supply
  - Behind-the-meter vs utility side-of-the-meter

**9:45 – 10:00 am**      **Morning Break**

**“** *The EUCI DER Fundamentals course exceeded my expectations and was certainly a great learning experience.* **”**

Manager – DER  
Integration & Analysis,  
Arizona Public Service

**“** *Utility-focused and quality content to get you up to speed for the future.* **”**

Team Lead, ENMAX

**“** *This course has helped utilities better prepare for the challenges and opportunities DER technology has to offer, especially around the concepts of hosting capacity, power quality concerns, protection and coordination concerns, and infrastructure offset opportunities.* **”**

Manager – Distribution Planning, EPCOR

# AGENDA

MONDAY, APRIL 20, 2020 (CONTINUED)

10:00 – 11:30 am

## Jurisdictional and Market Design Matters

- DERs operating in wholesale markets
- DERs operating in traditional vertically-integrated (non-markets) utilities' service territories
  - Enabling legislation and state utility oversight governance
  - FERC
  - NERC
  - ISO/RTO
- DERs in public-owned utilities' (non-IOUs) service territories
- Transactive energy concepts

## Challenges to Existing Utility Compact/Business Model

- Reduced system operational transparency
- System stability and protection
- Load (and corresponding revenue) reduction
- Cost / value methodology selection and analysis
- Cost / value application and imposition process
- Cost allocation provisions and measures
- Tariffs and market designs, utility rate structures
- Risk evaluation and planning w/respect to reliability
- Economic and cost-benefit analysis of DERs for regulators

11:30 am – 12:15 pm

## What Utilities Are Doing Around the Country and Forecasting of DER Customer Adoption

- Importance and elements of forecasting customer adoption of DERs
  - Affects the need for generation, transmission, and distribution investments
  - Dependent factors
  - Upfront cost of the DER
  - Availability and level of incentives
  - Retail rate designs that affect the bill savings from customer-sited DER
- Survey findings of utilities to forecasting DER adoption
- Tradeoffs in balancing transparency vs complexity

12:15 – 1:15 pm

## Group Luncheon

## DER IMPACTS ON UTILITY AND BALANCING SYSTEMS

1:15 – 2:30 pm

## System-Level and Interconnection Aspects

- Standards and jurisdictions
- Criteria for interconnection
- Interconnection practices and rules
- Workflow and customer experience
- Technology and tools
- Load profile analysis
- System layer assessment
- Operational considerations and experience
  - Distribution level
  - Sub-transmission level
  - Transmission level



*“Intensive,  
informative and  
engaging.”*

Senior Economist,  
NYISO

# AGENDA

MONDAY, APRIL 20, 2020 (CONTINUED)

2:30 – 3:30 pm

## Case Study: How One Utility is Dealing with the Impacts of DER

- Types of DERs coming onto the system
- DER growth drivers
- Grid impacts
  - o Generation
  - o Balancing
  - o Transmission
  - o Distribution
  - o Impact on visibility
  - o Voltage variability
- Planning the system
  - o Modeling challenges
  - o Assessing future scenarios
- Enabling DERs
  - o Technologies and projects
  - o Industry engagement and collaboration
- Lessons learned
- Power flow
- Power quality
- Dynamic impacts of DER
- Hosting capacity analysis
- Voltage analysis and management



*“A great balance of big picture and fine detail regarding DERs.”*

Analyst, California Public Utilities Commission

3:30 – 3:45 pm

## Afternoon Break

3:45 – 5:15 pm

## Strategic Impact of DERs

- Strategic considerations of DER
- DER data acquisition
- Locational value of DERs
- Time shifting of DERs
- Smart inverter support
- DER business models
- Aligning DERs to grid value
- Digital DER opportunity

## System Data Access, Transparency and Utilization

- Systems integration and DER data analytics
- Grid impact and optimization
- Customer information and program optimization
- Market strategies development
- Leveraging DER data value
- Load shape
- Valuing locational costs and benefits



*“This course was informative, thorough and well put-together. All speakers were extremely knowledgeable on the topics they presented, which allowed for some very intriguing and thought-provoking discussions to take place.”*

Associate Engineer,  
Lower Colorado River Authority

5:15 pm

## Program Adjourns for Day

# AGENDA

TUESDAY, APRIL 21, 2020

**7:45 – 8:15 am**      **Continental Breakfast**

## DER PLANNING, PREPARATIONS AND UTILIZATION

**8:15 – 10:00 am**      **Long-term Assessment, Analysis and Tools**

- Determining impact studies required
- DER planning and roadmaps
- System power flow modeling
- Hosting capacity requirements and availability
- Mitigation measures identification for protection/safety limit violations
- Valuing locational costs and benefits
- Monitoring and control options and requirements
- Infrastructure requirements for DER
- Revenue impacts from DER

**10:00 – 10:20 am**      **Morning Break**

**10:20 am – 12:00 pm**      **DER Integration — Value Optimization**

- System impacts
- Customer adoption rate
- Relationship of incentives to load shapes
- ADMS systems
- DERMS
- DER integration value stream
- Demand response – load shifting value
- Pricing DERs
- Energy storage as a game changer
- Case Studies

**12:00 pm**      **Course Adjourns**



*“High quality speakers with excellent expertise in DER planning, operations, economic analysis, regulatory and business models and methodology/tools; jam-packed with great content.”*

Manager, Black & Veatch



*“Experts talking to — and with — professionals in a cordial, focused setting.”*

Power Resource Manager,  
Burbank Water & Power



*“This course provided a good overview of the definitions and issues associated with increased DER systems. It also provided a great opportunity to network with experts in the industry.”*

Research Associate,  
National Renewable Energy Laboratory

# INSTRUCTORS



## Daniel Haughton

**Manager – Distribution Engineering and DER Interconnections, Arizona Public Service (APS)**

Daniel Haughton is Manager of Distribution Engineering and DER Interconnections at Arizona Public Service (APS). He manages teams that plan the future distribution infrastructure for the rapidly growing state of AZ, as well as residential and commercial renewable technology integration. He has worked at Arizona Public Service (APS) since 2012 in various engineering and technical leadership roles, including Transmission Planning, Transmission Operations Engineering, and Distributed Energy Resource (DER) Engineering. Dr. Haughton is also an advisor to EPRI and NREL Technical Advisory Committees on DER Interconnection practices and Distribution Planning Modernization. Before joining APS, he served in various roles at Tampa Electric, CAISO, Intel Corp and Belize Electricity Limited. He is an adjunct professor of electrical engineering at Arizona State University.



## Aram Shumavon

**CEO, Kevala, Inc.**

Aram Shumavon is co-founder and CEO at Kevala Analytics. He has more than 15 years of experience in regulated energy markets, with a focus on high penetration distributed and renewable energy resources. Prior to forming Kevala, he was the founder and executive director of the non-profit organization, Distributed Energy Consumer Advocates. He has helped develop state and federal policy, managed the development of regulatory strategies, and created innovative market infrastructure and policy analysis tools. Mr. Shumavon’s work includes more than a decade as a senior analyst at the California Public Utilities Commission where he headed the state’s analysis of key wholesale electricity market design and environmental compliance efforts and led long-term procurement and planning efforts focused on California’s high renewables penetration future and renewables integration strategies.



## Mike Coddington

**Principal Engineer, National Renewable Energy Laboratory (NREL) invited**

Michael Coddington is a Principal Engineer with the Integrated Devices and Systems Group at the National Renewable Energy Laboratory (NREL) - a Department of Energy owned laboratory in Colorado. Before coming to NREL nearly 10 years ago, he worked as a Distribution Planning and network Engineer, System Planning Engineer, Key Account Executive, and numerous other roles at two electric utility companies. His work at NREL focuses on the integration of photovoltaic systems (and other distributed generation systems) to the electric distribution system, with a focus on high penetration PV concerns and solutions. Mr. Coddington has authored and collaborated on dozens of technical reports and papers focusing on integrating distributed generation systems onto the grid in a safe, reliable and cost-effective manner. He is active in standards and codes development, is a Senior Member of the IEEE, was Secretary of IEEE 1547.6, and is a voting member of the UL1741 Standards Technical Panel (STP). He received his electrical engineering degree from Colorado State University, is a licensed Master Electrician and licensed Electrical Contractor in the State of Colorado, and is a licensed commercial electrical inspector.



***“A must for utilities entering into the game-changing world DERs present.”***

Manager, Distribution Planning, ATCO Electric

## REQUIREMENTS FOR SUCCESSFUL COMPLETION OF PROGRAM

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Participants must sign in/out each day and be in attendance for the entirety of the course to be eligible for continuing education credit.

## INSTRUCTIONAL METHODS

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Case studies and PowerPoint presentations will be used in this program.

## 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.

**EUCI is authorized by IACET to offer 1.1 CEUs for the course.**

## EVENT LOCATION

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A room block has been reserved at the **Hilton Anaheim**, 777 W Convention Way, Anaheim, CA 92802, for the nights of April 19-20, 2020. Room rates are \$269 plus applicable tax. Call **1-714-750-4321** for reservations and mention the EUCI event to get the group rate. The cutoff date to receive the group rate is March 29, 2020 but as there are a limited number of rooms available at this rate, the room block may close sooner. ***Please make your reservations early.***

## REGISTER 3, SEND THE 4TH FREE

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Any organization wishing to send multiple attendees to this course may send 1 FREE for every 3 delegates registered. Please note that all registrations must be made at the same time to qualify.



To Register Click Here, or

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## ENERGIZE WEEKLY

Energize Weekly is EUCI's free weekly newsletter, delivered to your inbox every Wednesday. We provide you with the latest industry news as well as in-depth analysis from our own team of experts. Subscribers also receive free downloadable presentations from our past events.

Sign me up for Energize Weekly

## PLEASE REGISTER

### FUNDAMENTALS OF DISTRIBUTED RESOURCE (DER) SYSTEM PLANNING COURSE

APRIL 20-21, 2020: US \$1495

Early bird on or before April 3, 2020: US \$1295

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

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### CREDIT CARD INFORMATION

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

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**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 March 20, 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.