Course Outline
DER Fundamentals

Smart Electric Power Alliance ONLINE LEARNING

3-Part Course | 7 Hours

Live: July 19th, 20th, and 21st, 2022 from 2 - 4:20 PM Eastern

On-Demand: available August 4th

Outline:

Session 1: Making a Case for Distributed Energy Resources

1. Setting the context – the dispatch curve (for both competitive markets andvertically integrated)
    a. Concept of marginal costs, and characterization by resource
        i. Dispatchable resources
        ii. Variable renewable resources
        iii. Energy Storage
2. Products in competitive markets – what gets bought and sold
    a. Energy – Day Ahead and Real Time
        i. How those markets work
    b. Capacity/Resource Adequacy
        i. i.A brief review of capacity markets
    c. Ancillary Services
        i. How priced
        ii. Participants
    d. Frequency Regulation
        i. How priced
        ii. Participants
3. The distribution grid – current inefficiencies, reliability issues, and constraints
    a. Issues relating to meeting peak demand (load factor)
    b. Regulatory models, (e.g. NY REV, MA SMART)
    c. Tension between bulk power systems and distribution companies and thegrowing need for coordination
4. The customer view
    a. Customer cost management/flexibility, including management ofdemand charges and peak monthly fees
    b. The ability to meet growing reliability and resilience considerations
5. The challenge of integrating intermittent renewable resources and decarbonizingthe grid
    a. Production curve solar
    b. Production curve wind
    c. Cycling of conventional resources and associated costs and emissions
6. Initial distributed energy resources use cases
    a. Brooklyn Queens Demand Management
    b. Hawaii Water Heater Program
    c. SunRun, Sonnen, Sunnova, and Swell Virtual Power Plant

Session 2: Identifying and Qualifying the Resources

1. The technologies
    a. a. Commercial
        i. HVAC controls
        ii. On-site generation
        iii. Thermal storage (ice and other media)
        iv. Batteries v. Smart EV chargers
        v. Bi-directional EV chargers
    b. Residential
        i. Smart thermostats
        ii. Controllable air conditioners i
        iii. Water heaters
        iv. Pool pumps
        v. Smart EV chargers
        vi. Bi-directional EV chargers
        vii. Solar installations (& inverters)
        viii. Batteries (& inverters) Water heaters
2. Qualifying the resources
    a. The example of pool pumps in California
3. Aggregation
    a. Communication and coordination among various assets from multiple vendors
    b. Remote monitoring and state of readiness
    c. Dispatch and portfolio management – vendor control vs utility control
4. Cyber-security concerns
    a. The risk of connecting IT to operational technology/SCADA – lessons from the Ukraine and other warnings
    b. The risk of large populations of distributed assets to the distribution and bulk power system
        i. Sunspec Alliance
        ii. California Rule 21 – inverter focused approach

Session 3: Resource Planning and Optimization

1. Assigning value to DERS in the resource planning process
    a. The increasing value of optionality in a rapidly evolving ecosystem
    b. Determining desired levels and valuations across a time horizon
    c. Understanding limitations and creating portfolio approaches
    d. The need for thorough modeling
2. Best planning practices for incorporating renewables and DERS
    a. Understanding potential and limitations
    b. Costs and performance considerations
    c. The necessity – and challenge - of communication and cooperation between grid operators and distribution companies
3. Effective program design
    a. Motivating customer participation in DER programs
    b. Effectively program design with pricing and technology
    c. Evaluating appropriate technologies (and quantities) to achieve targeted outcomes
    d. The critical need for timely, accurate, and granular market-based locational information

4. Policy and rate structures
    a. The importance of the policy and regulatory landscape
    b. Federal policy drivers (e.g., FERC 841 and 2222)
    c. Tax incentives and other subsidies d. State and local policy drivers (RECs, RPS)
5. The increasing need for an evolving and secure grid architecture
    a. The challenge of growing bi-direction flows/transactive power
    b. Monitoring and power quality concerns