Smart Electric Power Alliance

Electric System Fundamentals Bootcamp Course Outline

3-Part Course | 7 Hours
Live: March 7th, 8th and 9th, 2023 from 2 - 4:30 PM Eastern
On-Demand: available March 23rd

Session 1: How the electric grid and energy markets function: The basics of electric power delivery, energy markets and the key drivers for change

1. How the electricity industry works: regulated and restructured markets
    a. Vertically integrated utilities
    b. Competitive markets and how they work
        i. Products & prices (capacity, grid balancing services, energy)
        ii. General cost structures
        iii. Regulatory bodies and responsibilities
2. Electric generation assets
    a. Operating characteristics
        i. Nuclear
        ii. Coal
        iii. Gas
        iv. Wind
        v. Solar
        vi. Other resources
    b. Capital versus operating costs and levelized costs of energy
    c. The typical dispatch resource stack – what gets called upon when

Session 2: Address the challenges related to decarbonizing the energy economy: Challenges related to growing the grid, changes in the supply and demand mix, the integration of renewables, and the advent of energy storage

1. Critical issues related to beneficial electrification and the growth of the grid
    a. Drivers for increased electricity consumption
        i. heat pumps
        ii. electric vehicles
        iii. hydrogen
    b. Potential impacts on the future grid
    c. Addressing the inherent planning uncertainties, particularly in light of recent federal subsidy programs
2. The challenge of decarbonization and evolution of the generation fleet
    a. The impact of fracking on power markets and prices
    b. The challenge of integrating renewables
        i. Variability & negative co-variance (too much of a good thing)
3. The growing role for energy storage, both short and long-duration
    a. Various storage technologies and characteristics

4. The increased role for DERs (continued on Day 3)
    a. DER technologies that can aid in decarbonization strategies

Session 3: Planning for the future: The cutting edge business cases in the U.S. and overseas that may point the way to a cleaner and more efficient grid, and discuss prospects for emerging technologies including long-duration energy storage, hydrogen modular nuclear and fusion

1. The growing tension between centralized and distributed resources
    a. Distributed energy resources
        i. Examples and business models pointing the way forward
        ii. Distributed solar and the critical issue of net metering
        iii. Coordination challenges and architectures
        iv. Challenges related to the “electrification of everything”
2. A possible roadmap for the evolution of the grid
    a. Where we stand today
    b. Where we may be by mid-decade
    c. 2030 and beyond: going the last mile to a cleaner grid
    d. Hydrogen
    e. Small modular nuclear
    f. Fusion