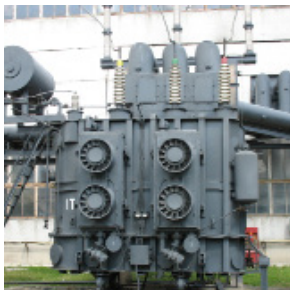




Course length: One day
Prerequisites: None
CPE credits: 8

An overview of the basic principles of electricity and the components of the physical system that delivers it

The electric grid continues to evolve with the growth of gas generation, renewables, distributed resources, and storage. A basic understanding of the electric delivery system is essential for all who work in the electric industry especially during this time of technological transformation. Electric System Fundamentals: From Generation to the Meter presents a high-level overview of the electrical system and is ideal for those new to the industry as well as veterans who were never fully exposed to the physical aspects of the electric business. Participants take a guided tour of the electric delivery system as power moves from generation to transmission to distribution and arrives at the customer meter.



WHO WILL BENEFIT FROM THIS SEMINAR?

- Entry-level engineers without a power background
- New hires at a utility, transmission company, generation company, system operator, energy marketer, renewable firm, technology vendor, or any company providing services to the electric industry
- Employees with industry experience in business areas who need a better understanding of the physical system
- Employees with customer contact, sales, or marketing responsibilities
- Regulatory employees who need to understand physical system opportunities and constraints
- Professionals in the legal, finance, accounting, PR, and communications fields who provide services to the electric industry
- Virtually any energy employee with limited experience in how electric systems are designed and operated

WHAT PARTICIPANTS WILL LEARN

- Electric industry jargon and basic electrical principles
- Generation types and sources and their advantages and disadvantages
- The purpose, function, and components of the transmission system
- The purpose, function, and components of the distribution system
- How service connections are provided to customer facilities
- How electricity is delivered into and metered at the consumer's facility
- How the physical system is structured and operated to deliver electricity
- How the physical system impacts costs and services to customers

COURSE AGENDA

Electrical Definitions

- Electricity, volts, amps, watts, kilowatts, kilowatt-hours, kilovolt-amperes
- Conductors and insulators
- Voltage (volts), resistance (amps)
- Direct current (DC) and alternating current (AC)
- Basic electrical relationships (Ohms Law, Watts Law)
- Circuits (functions and types)
- Real power, apparent power, reactive power
- Power factor
- Calculation examples

Generating Electricity

- The electrical system
- Types and sources of generation
- Advantages/disadvantages/costs of each generation type
- Single vs. three phase power
- Station transformers and switchyards
- Functions of power control
- Load forecasting
- How units are dispatched
- The role of storage in supply

The Transmission System

- Purpose and function
- Components (substations, transformers, switchyard, transmission lines)
- Interconnections
- North American electrical grids
- Power flow and control





- NERC regions, RTOs, ISOs, Transcos
- The evolution of transmission operations with the growth in renewables

The Distribution System

- Purpose and function
- Components (substations, distribution lines, lightning arrestors, voltage regulators, fuses, reclosers, capacitor banks)
- Distribution circuits (types and voltages)
- Lines (wye and delta; overhead and underground)
- Primary and secondary distribution

Electric Services to Customers

- Services (overhead and underground, single phase and three phase, voltage)
- Components (service transformer, service drop, meter loop, meter, main disconnect, service/breaker panel, branch circuits)
- The smart grid

Meters and Metering

- Types of meters
- Current transformers (CTs) and potential transformers (PTs)
- Location of meters
- Registers
- Smart meters and automatic meter reading (AMR)

The Future

- How the electric grid is evolving with gas generation, renewables, storage, and distributed resources
- Key issues for the future

