



ENERGY CAREER ACADEMY FRAMEWORK GRADE 11

THEME: Energy Industry Fundamentals

CREDENTIALS: Energy Industry Fundamentals Certificate

Curriculum Source: CEWD

- Please contact Julie Strzempko at julie@cewd.org to find out how to become an Approved Course Provider and receive instructor and student guides.
- Dual or articulated credit is recommended.

Total Instructional Time: 130 hours

MODULE 1: Basic & Emerging Principles & Concepts Impacting the Energy Industry

- 1) Explain the flow of energy from generation through distribution to the customer.
- 2) Discuss the history of the United States energy industry and energy infrastructure (refer to [Energy Information Administration](#)).
- 3) Identify the role and function of generation, transmission and distribution organizations.
- 4) Explain the role of regulatory bodies in the energy industry.
- 5) Discuss environmental laws and regulations that impact the energy industry (local, state, and federal), and explain importance of proper documentation to ensure compliance.
- 6) Explain the different structures of energy companies. This includes investor-owned utilities, municipalities (and associated utility practices such as water/wastewater), electric cooperatives, independent power producers. Also, explain the different lines of energy business, including electric and gas.
- 7) Describe the process of electric metering and billing for energy consumption.
- 8) Discuss the importance and role of unions and contractors in the industry.

MODULE 2: Compliance with Procedures Necessary to Ensure a Safe and Healthy Work Environment

- 1) Review the role of the U.S. Department of Labor/Occupational Safety and Health Administration in work place safety (refer to compliance.egs.com).
- 2) Identify both potential hazards and accident scenarios in the work environment.
- 3) Comply with established OSHA regulations and utility safety procedures.
- 4) Evaluate changes in the environment with respect to their impact on safety of self and others.
- 5) Promote effective local, state, and national security operations for the protection of people, data, property, and institutions.
- 6) Comply with energy industry safety procedures and proper ways to perform work.

- 7) Name potential threats created by deviation from safety procedures and improper use of tools and equipment.
- 8) Use safety equipment as specified by user manuals and safety training.
- 9) Use Personal Protective Equipment (PPE) including safety glasses, hearing protection, gloves, work boots, and hard hats.
- 10) Keep personal safety equipment in good working order.
- 11) Use tools and equipment in compliance with user manuals and training.
- 12) Call attention to potential and actual hazardous conditions as they arise.
- 13) Alert coworkers and supervisory personnel to hazardous conditions and deviations from safety procedures in a timely manner.
- 14) Maintain appropriate certification and is knowledgeable in first aid and/or first response procedures.
- 15) Demonstrate understanding and knowledge of lock/tag out practices in the work place.
- 16) Notify person in charge and/or coworkers of unsafe work conditions.
- 17) Stop the job if there are unsafe working conditions.

MODULE 3: Electric Power Generation

- 1) Explain the conventional electric power generation systems and process. This includes coal, gas, hydroelectric, and nuclear.
- 2) Identify electric power generation equipment and systems.
- 3) Identify various conventional electric power generation fuel sources and the cost, efficiency, and environmental issues associated with each.

This includes:

- Explain how oil was created and list its advantages and disadvantages.
 - Explain how coal was created and list its advantages and disadvantages.
 - Explain how natural gas was created and list its advantages and disadvantage.
 - Explain how water is used in hydroelectric power generation and list its advantages and disadvantages.
 - Explain how uranium is created and list its advantages and disadvantages.
- 4) Discuss emerging and alternative electric power generation technologies and fuel sources.
 - 5) Explain how solar energy is used to produce electricity in photovoltaic systems and what are its advantages and disadvantages.
 - 6) Explain how solar energy is used to produce electric energy using steam and what are its advantages and disadvantages.
 - 7) Explain how wind energy is used to produce electric energy and what are its advantages and disadvantages.
 - 8) Explain how geothermal energy is used to produce electric energy and what are its advantages and disadvantages.
 - 9) Explain how biomass energy is used to produce electric energy and what are its advantages and disadvantages.
 - 10) Explain how ocean wave energy is used to produce electric energy and what are its advantages and disadvantages.

- 11) Discuss the pros and cons of various energy producing technologies and fuels in the electrical infrastructure. This includes fossil, nuclear and emerging alternative energy systems.

MODULE 4: Electric Power Transmission

- 1) Explain the electric power transmission process.
- 2) Discuss the application of different electric power transmission principles, including AC vs. DC.
- 3) Name electric power transmission equipment and systems.
- 4) Discuss the emerging technologies in electric power transmission, including SmartGrid.
- 5) Explain ownership/governance of the electric transmission system.

MODULE 5: Electric Power & Natural Gas Distribution

- 1) Explain the electric power distribution process.
- 2) Discuss the need for electric distribution systems and how they are designed to operate.
- 3) Name electric power distribution system equipment and describe what the various components do.
- 4) Discuss the emerging technologies in electric power distribution. This includes automation and SmartGrid systems.
- 5) Explain the fundamental concepts of natural gas.
- 6) Identify the components and working of the gas transmission and distribution network. This includes metering and regulating stations.

MODULE 6: Careers in Energy and Entry Requirements

- 1) Describe entry-level careers available in energy generation, transmission, distribution, and the education and experience requirements for entry into those positions. Also, describe the career development and advancement opportunities from those positions.
- 2) Identify entry-level careers available in the business and corporate support functions of the energy industry. Describes the education and experience requirements for entry into those positions, and career advancement opportunities from those positions.
- 3) Describe general wage, salary, benefits, and other advantages of careers in the energy industry.
- 4) Explain the educational pathways available to gain training necessary for entry into energy careers at secondary and post-secondary levels (Partner to create Energy Education Portal).

MODULE 7: Evaluate and Analyze. Energy “Hot Topics”

- 1) Identify Energy “Hot Topics.”
- 2) Describe energy efficiency and energy conservation.
- 3) Describe alternative energy. This includes wind, solar, biomass, and geothermal.
- 4) Describe emerging technologies. This includes wave, algae, IGCC, Clean Coal, and more!
- 5) Describe SmartGrid and Time of Use technologies.
- 6) Describe key energy topics. This includes regulatory issues, like cap-and-trade, efficiency issues, and cost issues.