

## Curriculum Framework for Energy Industry Fundamentals Certificate Program

The Energy Industry Fundamentals course content focuses on understanding various types of energy and their conversion to useable energy such as electrical power. How generated electrical power is transmitted and distributed to the point of use.

### 01.0 Demonstrate knowledge of the basic and emerging principles and concepts that impact the energy industry-- the student will be able to:.

- 01.01 Explain the flow of energy from generation through distribution to the customer.
- 01.02 Discuss the history of the United States energy industry/infrastructure (refer to Energy Information Administration [www.eia.doe.gov](http://www.eia.doe.gov) ).
- 01.03 Identify the role and function of generation, transmission and distribution organizations.
- 01.04 Explains the role of regulatory bodies in the energy industry (Federal Energy Regulatory Commission [www.ferc.gov](http://www.ferc.gov) ; Public Service Commission of the State of Florida [www.psc.state.fl.us](http://www.psc.state.fl.us) ) (highlight “obligation to serve”).
- 01.05 Discuss environmental laws and regulations that impact the energy industry (local, state, and federal) and explain importance of proper documentation to ensure compliance.
- 01.06 Explain the different structures of energy companies, including investor-owned utilities, municipalities (and associated utility practices such as water/wastewater), electric cooperatives, independent power producers and can explain the different lines of energy business, including electric and gas.
- 01.07 Describe the process of electric metering and billing for energy consumption.

### 02.0 Apply compliance with procedures necessary to ensure a safe and healthy work environment-- the student will be able to:

- 02.01 Review the role of the U.S. Department of Labor/ Occupational Safety and Health Administration in work place safety.  
(<http://www.complianceregs.com/29cfr/1910/subR/1910-269.html>)
- 02.02 Identify both potential hazards and accident scenarios in the work environment.
- 02.03 Follow established safety procedures (OSHA regulations and utility company procedures).
- 02.04 Evaluate changes in the environment with respect to their impact on safety of self and others.
- 02.05 Promote effective local, state, and national security operations for the protection of people, data, property and institutions.
- 02.06 Comply with energy industry safety procedures and proper ways to perform work.
- 02.07 Name potential threats created by deviation from safety procedures and improper use of tools and equipment.
- 02.08 Use safety equipment as specified by user manuals and safety training.

- 02.09 Use Personal Protective Equipment (PPE) including safety glasses, hearing protection, gloves, work boots, and hard hats.
- 02.10 Keep personal safety equipment in good working order.
- 02.11 Use tools and equipment in compliance with user manuals and training.
- 02.12 Call attention to potential and actual hazardous conditions as they arise.
- 02.13 Alert coworkers and supervisory personnel to hazardous conditions and deviations from safety procedures in a timely manner.
- 02.14 Maintain appropriate certification and is knowledgeable in first aid or first response procedures.
- 02.15 Demonstrate understanding and knowledge of lock/tag out practices in the work place.
- 02.16 Notify person in charge and/or coworkers of unsafe work conditions.
- 02.17 Stop the job if there are unsafe working conditions.

03.0 Understand electric power generation-- the student will be able to:

- 03.01 Explain the conventional electric power generation systems and process (coal, gas, hydroelectric, and nuclear).
- 03.02 Identify electric power generation equipment and systems.
- 03.03 Identify various conventional electric power generation fuel sources and the cost/ efficiency/environmental issues associated with each:
  - a. Explain how oil was created and list its advantages and disadvantages.
  - b. Explain how coal was created and what are its advantages and disadvantages.
  - c. Explain how natural gas was created and what are its advantages and disadvantages.
  - d. Explain how water is used in hydroelectric power generation and what are its advantages and disadvantages.
  - e. Explain how uranium is created and what are its advantages and disadvantages.
- 03.04 Discuss emerging and alternative electric power generation technologies and fuel sources.
- 03.05 Explain how solar energy is used to produce electricity in photovoltaic systems and what are its advantages and disadvantages.
- 03.06 Explain how solar energy is used to produce electric energy using steam and what are its advantages and disadvantages.
- 03.07 Explain how wind energy is used to produce electric energy and what are its advantages and disadvantages.
- 03.08 Explain how geothermal energy is used to produce electric energy and what are its advantages and disadvantages.
- 03.09 Explain how biomass energy is used to produce electric energy and what are its advantages and disadvantages.
- 03.10 Explain how ocean wave energy is used to produce electric energy and what are its advantages and disadvantages.
- 03.11 Discuss pros and cons of various energy producing technologies and fuels in the electrical infrastructure (including fossil, nuclear and emerging alternative energy systems).

04.0 Understand electric power transmission-- the student will be able to:

- 04.01 Explain the electric power transmission process.
  - 04.02 Discuss the application of different electric power transmission principles (including AC vs. DC).
  - 04.03 Name electric power transmission equipment and systems.
  - 04.04 Discuss the emerging technologies in electric power transmission (including Smart Grid).
  - 04.05 Explain ownership/governance of the electric transmission system.
- 05.0 Understand electric power distribution-- the student will be able to:
- 05.01 Explain the electric power distribution process.
  - 05.02 Discuss the need for electric distribution systems and how they are designed to operate.
  - 05.03 Name electric power distribution system equipment and-what the various components do.
  - 05.04 Discuss the emerging technologies in electric power distribution, including distribution automation and SmartGrid systems.
- 06.0 Identify and describe careers and entry requirements-- the student will be able to:.
- 06.01 Describe entry-level careers available in energy generation, transmission, distribution and the education/experience requirements for entry into those positions, along with career development and advancement opportunities from those positions.
  - 06.02 Identify entry-level careers available in business and corporate support functions of the energy industry; describes the education/experience requirements for entry into those positions, and career advancement opportunities from those positions.
  - 06.03 Describe general wage/salary, benefits, and other advantages of careers in the energy industry.
  - 06.04 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).
- 07.0 Evaluate and analyze energy 'hot topics'-- the student will be able to:
- 07.01 Discuss the major sources of biomass.
  - 07.02 Define biofuels (e. g. ethanol, biodiesel, and methanol).
  - 07.03 Outline the pyramid energy flow including the different trophic levels.
  - 07.04 Describe the major sources, scale, and impacts of biomass energy.
  - 07.05 Draw and label a diagram of biomass plantations.
  - 07.06 List the advantages and disadvantages of using biomass for energy (e.g. CO<sub>2</sub> emissions, photosynthetic efficiency, cost, etc.).

NOTE: HOT TOPICS WILL VARY BY STATE. THE ABOVE HOT TOPICS ARE FOR THE STATE OF FLORIDA.