Center For ENERGY Workforce Development

TOOLKIT

Adding a 17th Career Cluster in Your State

February 2017

get into energy

Energy Career Cluster Step-by-Step

WHY an Energy Career Cluster?

There is a grass roots effort to get an Energy career cluster added at the state level. Energy jobs tend to get hidden in other clusters, such as Architecture & Construction and Manufacturing. With the importance of our country's clean energy future, it's time to have a cluster that focuses on the jobs needed for impending retirements. By integrating an Energy career cluster in the current system, there will be an increased awareness among secondary students of the knowledge and skill sets required for energy jobs, allowing those students adequate time to utilize the recommended program of study. In some states, students would be able to attend a career academy with a concentration in energy.

Step-by-Step

Below is a step-by-step summary for instituting an Energy career cluster at the state level. The processes may be slightly different in your state, since each state's education system varies. If you need assistance or have questions, feel free to contact CEWD Educational Consultant Valerie Taylor at valerie@cewd.org.

STEP 1

Become versed in the career cluster system. CEWD has a toolkit on this topic. It is available to members at http://www.cewd.org/toolkits/clusters/toolkit_careercluster.php. While this focuses on integrating energy into the current career cluster system, it still provides background information and explains how the system works. There are 16 career clusters, so adding Energy would be the 17th.

STEP 2

The next step in instituting a 17th Energy career cluster is to form a state-level team. The team should include energy industry representatives as well as state education representatives, including those who oversee career and technical education and the community college system. This could be a committee within your state consortium.

STEP 3

Host a meeting of the state level team. CEWD has several documents you can use to introduce the why and how of a 17th Energy career cluster. This includes a PowerPoint presentation and a FAQ document. Part of the how is to utilize the current career cluster system that is used nationally and at the state level. CEWD has used the model to produce knowledge and skill statements (based on the Energy Industry Competency Model) and plans of study for the 17th career cluster. All materials mentioned in this step are available at http://www.cewd.org/toolkits/17thcareercluster.php.

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STEP 4

Find out who the decision makers are at the state level in getting an Energy career cluster approved. Set up a meeting date.

STEP 5

Day of Meeting: Use the PowerPoint presentation, FAQ document, knowledge and skills statements, and plans of study document to guide the presentation. Set up follow-up conference call or meeting date.

STEP 6

Align the knowledge and skill statements to state curriculum frameworks for energy-related Career and Technical Education (CTE) programs. An example of how this can be done is in the state of Florida. Their frameworks are available here: http://www.fldoe.org/workforce/dwdframe/energy_cluster_frame12.asp.

STEP 7

Present curriculum frameworks to the state-level decision makers.

STEP 8

Once an energy career cluster is approved, host an orientation (in-person or webinar) for CTE teachers and other stakeholders to go over the knowledge and skill statements, plans of study, and curriculum frameworks.

Center For ENERGY Workforce Development

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Energy Career Cluster Commitment Form

The Center for Energy Workforce Development (CEWD) has initiated a grass roots effort to get an energy career cluster added at the state level. Energy jobs tend to get hidden in other clusters, such as architecture & construction and manufacturing. With the importance of our country's clean energy future, it's time to have a cluster that focuses on the jobs needed for impending retirements. In the next five to ten years, 50% of the energy workforce will retire or leave for other reasons. These jobs are specifically with utilities and nuclear energy companies who focus on the generation, transmission and distribution of electricity and natural gas. Without bringing energy to the forefront of the education system it may be difficult to fill these jobs with qualified candidates. Many states already offer energy career academies, facilitating the addition of the energy career cluster.

In tandem with the establishment of the Energy Career Cluster, a set of cluster knowledge and skill sets has been created by CEWD, based on the Energy Industry Competency Model developed in partnership with the Department of Labor. In addition, a Programs of Study structure has also been developed. These documents are based on the format used in the current career cluster system. Both the knowledge and skill sets and Programs of Study integrate the important areas of Science, Technology, Engineering, and Math (STEM), which are essential for energy careers.

With an Energy Career Clusters being adopted by the state's career and technical education system, students will be able to embark on career pathways in the energy industry. High school students will get a strong base in energy, including fundamentals of the energy industry as well as technical courses that potentially could be a part of career academies. Energy Career Academies exist in several states including Florida and California. With or without career academies these career pathways can lead to employment in the energy industry or to post-secondary education. For the in-demand jobs in the industry that require post-secondary education, this typically leads to an industry-recognized credential or an associate's degree.

Commitment:
The company below recognizes the value of adding an Energy Career Cluster at the state level as a means to build a pipeline of qualified candidates for in-demand energy jobs.

_____ _____

Signature Company Name

Center For
ENERGY
Workforce Development

Industry Solutions–Regional Implementation

Adopting a 17th Energy Career Cluster

Add state energy consortium logo here

Why a 17th Career Cluster in Energy?

- This is a grassroots state by state effort
- Energy jobs hidden among other clusters
- The Nation has a focus on a clean energy economy
- 50% of the energy workforce will retire in the next 5-10 years

Where do in-demand energy careers fall in the current career cluster system?

Clusters

Pathways

Architecture and Construction

Construction
- Boilermaker
- Carpenter
- Control & Valve Installers
- Electrician
- Electrical and Electronics Repairers
- Insulation Worker
- Iron / Metalworker
- Industrial Machinery Mechanics
- Lineworker
- Machinists
- Millwright
- Pipefitter
- Pipeline Installer
- Pipelayer
- Welder

Design and Pre-construction
- Engineer - Civil , Chemical, Electrical, Nuclear, Mechanical, Power Systems, Energy Transmission, Environmental, Industrial
- Electrical & Electronics Engineering Technician
- Mechanical Technician
- Machinists

Maintenance Operations
- Boilermaker
- Carpenter
- Control & Valve Installer
- Corrosion Technician
- Electrician
- Heavy Equipment Operator
- Industrial Machinery Mechanic
- Insulation Worker
- Iron / Metalworker
- Lineworker
- Millwright
- Pipefitter / Pipelayer
- Pipeline Installer
- Substation Mechanic
- Utility Metering & Regulation Technician
- Relay Technician
- Welder

Science, Technology, Engineering and Mathematics

Engineering and Technology
- Electrical Engineer
- Power Systems Engineer
- Mechanical Engineer
- Nuclear Engineer
- Chemical Engineer
- Civil Engineer
- Energy Transmission Engineer
- Procurement Engineer
- Environmental Engineer
- Industrial Engineer

Science and Math
- Nuclear Chemist
- Nuclear Technician
- Materials Scientist
- Radiation Protection Technician
- Health Physicist
- Chemistry Technician

Logistics & Inventory Control
- Heavy Materials Technician

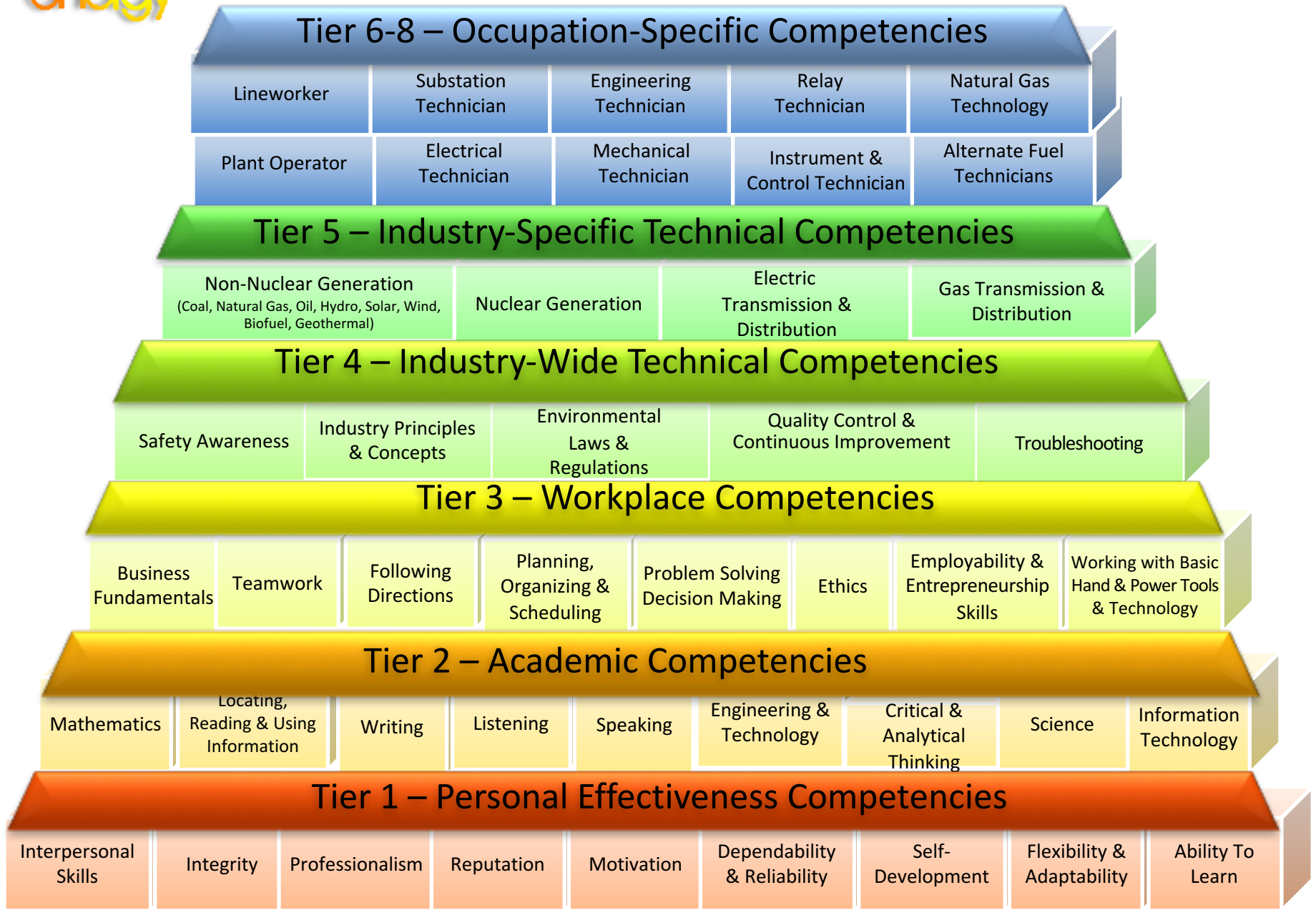
Quality Assurance
- Quality Control Tech
- Quality Assurance Tech

Manufacturing

Manufacturing Production Process Development
- Electrical & Electronics Technician
- Engineering & Related Technician
- Power Plant Operator
- Nuclear Reactor Operator
- Gas Processing and Distribution Plant Operator
- Power Distributor & Dispatcher
- Gas Controller & Dispatcher
- Auxiliary. Equip. Operator

Maintenance, Installation & Repair
- Boilermaker
- Control & Valve Installers
- Corrosion Technician
- Pipefitter / Pipelayer
- Pipeline Installer
- Instrument & Control Tech
- Electrical & Instrumentation Tech
- Elec.. & Electronics Repairer
- Elec. Equipment Installer / Repairer
- Industrial Machinery Mechanic
- Millwright
- Welder

The Energy Industry has a Competency Model (Generation, Transmission & Distribution)



Sample Knowledge and Skill Statements for a 17th Energy Career Cluster

EN04.02	Industry Principles and Concepts: Knowing the basic and emerging principles and concepts that impact the energy industry, including: energy production, energy transmission and alternative energy technologies
EN04.02.01	• Is able to explain the flow of energy from generation through distribution to the customer
EN04.02.02	• Is able to explain the role of regulators and unions in the industry
EN04.02.03	• Discuss the history of the United States energy industry/infrastructure (refer to Energy Information Administration - www.eia.doe.gov)
EN04.02.04	• Identify the role and function of generation, transmission and distribution organizations
EN04.02.05	• Explain the role of regulatory bodies in the energy industry (such as: Federal Energy Regulatory Commission - www.ferc.gov ; State Public Service Commissions) highlighting the concept of "obligation to serve"
EN04.02.06	• Explain the different structures of energy companies, including investor-owned utilities, municipalities (associated utility practices such as water/ wastewater), electric cooperatives, independent power producers and is able to explain the different lines of energy business, including electric and gas
EN04.02.07	• Describe the process of metering and billing for energy consumption
EN04.02.08	• Demonstrate an awareness of alternative and renewable energy technologies, including geothermal energy, solar energy, wind energy, water energy and biofuel

Plan of Study for an Energy Career Cluster

Name _____

Learner ID _____

School/College/University _____

Energy Career Cluster Plan of Study

EDUCATION LEVELS	GRADE	English/ Language Arts	Math	Science	Social Studies/ Sciences	Other Required Courses Other Electives Recommended Electives Learner Activities	Career and Technical Courses	SAMPLE Occupations Relating to This Career Cluster
Interest Inventory Administered and Plan of Study Initiated for all Learners								
SECONDARY	9	English/ Language Arts I	Algebra I	Earth or Life or Physical Science	State History World History Civics or	All plans of study should meet local and state high school graduation requirements and college entrance requirements. Certain local student organization activities such as SkillsUSA are also important including public speaking, record keeping and work-based experiences.	*Energy Industry Fundamentals	► Biomass and Biofuels Technician ► Electrician ► Electrical & Electronics Repairer ► Electrical & Electronics Technician ► Electrical & Instrumentation Technician ► Energy Generation Technician ► Engineering Technician ► Gas Processor & Distribution Plant Operator ► Gas Service Technician ► Generation Technician ► Geothermal Technician ► Hydropower & Marine Energy Technician ► Instrumentation Control Technician ► Metering Technician ► Nuclear Reactor Operator ► Nuclear Technician ► Pipefitter ► Pipelayer ► Pipeline Installer ► Power Distribution Technician ► Power Plant Operator ► Solar Photovoltaic Installer ► Solar Photovoltaic Technician ► Solar Technician ► Welder ► Wind Turbine Technician
	10	English/ Language Arts II	Geometry	Biology	U.S. History		**Introduction to Alternative Energy	
	11	English/ Language Arts III Technical Writing	Algebra II	Physics	Economics Psychology		Continue courses pertinent to occupational specialty	
College Placement Assessments-Academic/Career Advisement Provided							Continue course pertinent to occupational specialty	
	12	English/ Language Arts IV	Trigonometry	Chemistry				
Articulation/Dual Credit Transcripted-Postsecondary courses may be taken/moved to the secondary level for articulation/dual credit purposes.								
POSTSECONDARY	Year 13	English Composition English Literature	*Dependent on chosen occupation*	Physics	American Govt. or History, plus Psychology/ Interpersonal Skills	All plans of study need to meet learner's career goals with regard to required degrees, licenses, certifications or journey worker statuts. Certain local student organization activities may also be important to include.	Continue courses pertinent to the occupation y selected.	
	Year14	Speech/ Oral Communication	*Dependent on chosen occupation*	Environmental Science	Sociology Business Law			
	Year 15	Continue courses in the area of specialization.						
	Year 16							

NCTEF
National Career Technical Education Foundation
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*Energy Industry Fundamentals: The Get Into Energy Industry Fundamentals provides a broad understanding of the Electric and Natural Gas Utility industry and the energy generation, transmission, and distribution infrastructure, commonly called the "largest machine in the world", which forms the backbone for the industry. The curriculum includes business models, regulations, types of energy and their conversion to useable energy such as electric power, how generated power is transmitted and distributed to the point of use, emerging technologies and the connection to careers in the energy industry.

**Introduction to Alternative Energy: Identifies the need for alternative energy development, and the contributions and potential of individual alternative energy sources. The course also covers the present U.S. electrical grid and issues affecting specific alternative energy source tie-in and reliability.

Job Categories for the 17th Cluster

- Biomass and Biofuels Technician
- Electrician
- Electrical & Electronics Repairer
- Electrical & Electronics Technician
- Electrical & Instrumentation Technician
- Energy Generation Technician
- Engineering Technician
- Gas Processor & Distribution Plant Operator
- Gas Service Technician
- Generation Technician
- Geothermal Technician
- Hydropower & Marine Energy Technician

Job Categories for the 17th Cluster

- Instrumentation Control Technician
- Metering Technician
- Nuclear Reactor Operator
- Nuclear Technician
- Pipefitter
- Pipelayer
- Pipeline Installer
- Power Distribution Technician
- Power Plant Operator
- Solar Photovoltaic Installer
- Solar Photovoltaic Technician
- Solar Technician
- Welder
- Wind Turbine Technician

Which states have adopted a 17th career cluster in Energy? (as of March 2012)

- Florida
- Georgia
- In process:
  - California
  - Indiana
  - Virginia

Florida Department of EDUCATION

17th Career Cluster

ENERGY

1st in the Nation!!

Academic Year 2010/2011 Curriculum Frameworks By Career Cluster

- Agriculture, Food & Natural Resources
- Architecture & Construction
- Arts, A/V Technology & Communication
- Business, Management & Administration
- Education & Training
- Energy
- Finance
- Government & Public Administration
- Health Science
- Hospitality & Tourism
- Human Services
- Information Technology
- Law, Public Safety & Security
- Manufacturing
- Marketing, Sales & Service
- Science, Technology, Engineering & Mathematics (STEM)
- Transportation, Distribution & Logistics

Energy Career Cluster

The Energy Career Cluster is a new cluster dedicated to those programs supporting the energy industry and emerging energy-related occupations. A growing number of training opportunities in a variety of energy-related trades and programs are offered throughout the state in school districts, community colleges, and many state universities.

Programs Courses and Standards - (Curriculum Frameworks)

Related Organizations

- Banner Center for Energy (Indian River State College)
- Banner Center for Alternative Energy (University of Central Florida)
- North American Board of Certified Energy Practitioners (NABCEP)
- GBIC - The Green Building Certification Institute (GBIC)
- FEWC - Florida Energy Workforce Consortium (FEWC)

For more information about the Energy Career Cluster, please contact Ken Olsen , at (850) 245-9016.

2012-13 Florida Energy Career Cluster Curriculum Frameworks

Secondary and PSAV Programs/Courses

- Power Distribution Technician (9700100 / X600100) (RTF, 393KB) **New**
- Energy Generation Technician (9700200 / X600200) (RTF, 334KB) **New**
- Solar Energy Technology (8006100 / A600200) (RTF, 444KB) **New**

PSAV Programs Only

- Electrical Line Service and Repair (PSAV - I460303) (RTF, 293KB)
- Solar Thermal System Design, Installation and Maintenance – Entry Level (PSAV - X600300) (RTF, 273KB) **New**

Degree & Certificate Programs/Courses

- Electrical Distribution Technology (AAS/AS - 0615030201) (RTF, 319KB)
  - Electrical Dist Technology Advanced (CCC - 0615030202) (RTF, 304KB)
  - Electrical Dist Technology Basic (CCC - 0615030203) (RTF, 256KB)
- Electrical Power Technology (AAS/AS - 0615030200) (RTF, 320KB)
  - Alternative Energy Engineering Technology (CCC - 0615030204) (RTF, 213KB)

2012-13 Florida Energy Career Cluster Curriculum Frameworks

Applicable Level 6-8

- Fundamentals of Energy (9790300) (RTF, 319KB) **New**
- Introduction to Energy (9709350) (RTF, 224KB) **New**
- Introduction to Energy and Career Planning (9709360) (RTF, 200KB) **New**

Applicable Level 9-12, 30-31

- Energy Cooperative Education-OJT (9700420 / X909999) (RTF, 232KB) **New**
- Energy Directed Study (Secondary - 9701000) (RTF, 292KB) **New**

Sample Energy Career Cluster Adoption for Technical Colleges (from Georgia)

- Being converted to a dual enrollment program
  - Algebraic Concepts
  - Print Reading & Problem Solving
  - Mechanical Laws & Principles
  - History & Structure of the Energy Industry
  - Electrical Power & Natural Gas Generation, Transmission & Distribution

Sample Energy Career Cluster Adoption for Technical Colleges (from Georgia)

- Energy Industry Fundamentals
- Introduction to Alternative Energy
- Basic Circuit Analysis

(Total of 27 credit hours)

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Industry Solutions–Regional Implementation

For more information, contact:

Name
Title

Contact Information

Energy Career Cluster Frequently Asked Questions

Why a Career Cluster in Energy?

Why is a 17th career cluster in energy needed?

The Center for Energy Workforce Development has made an effort to adopt a 17th career cluster on a national basis over the last couple of years, but this has not materialized. Therefore, there is a grass roots effort to get an energy career cluster added at the state level. Energy jobs tend to get hidden in other clusters, such as architecture & construction and manufacturing. With the importance of our country's clean energy future, it's time to have a cluster that focuses on the jobs needed for impending retirements. In the next five to ten years, 50% of the energy workforce will retire. These jobs are specifically with utilities and nuclear energy companies who focus on the generation, transmission, and distribution of electricity and natural gas. Without bringing energy to the forefront of the education system, it may be difficult to fill these jobs with qualified candidates. Many states already offer energy career academies, facilitating the addition of the energy career cluster.

What jobs are included?

The jobs included in the energy career cluster fall under the broad category of Technician. Though jobs in many clusters could potentially be energy jobs (such as accountants or customer service), the focus of the 17th cluster is on those jobs that are the highest priority in needing to be filled, several of which are unique to the energy industry. Examples include lineworker, power plant operator, and nuclear reactor operator.

What are the advantages to states that adopt the 17th cluster?

Energy careers typically are not on students' radars, yet are some of the most exciting and stable careers available. Once teachers know more about these careers, they can get the students interested in energy and the prospect of choosing a career path to be a part of this vital industry.

Who should be at the table in discussing the addition of the energy career cluster?

From discussions with states who have adopted the 17th career cluster, it comes across loud and clear that relationship-building is essential. At the table for discussions about career clusters should be the state energy workforce consortium, the state department of education, including the director of career & technical education, and the technical/community college system.

Are there knowledge and skill sets and plans of study associated with the cluster?

Yes. The cluster knowledge and skill sets are based on the Energy Industry Competency Model, developed in partnership with the Department of Labor. There are not multiple pathways since the focus jobs fall under the Energy Technician umbrella, where all occupations have the first five tiers of the Competency Model in common.

How does my state tie the cluster to career and technical education curriculum?

CEWD realizes that each state's curriculum requirements vary. However, there are sample frameworks developed by the Florida Energy Workforce Consortium (FEWC) and adopted by the state. These can be found at http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/curriculum-frameworks/2016-17-frameworks/.

Which states have adopted a 17th career cluster in energy?

As of February 2017, a 17th energy career cluster has been adopted by the states of Florida, Georgia, Michigan, and Colorado.

Energy Career Cluster

Cluster Knowledge and Skill Statements

CLUSTER TOPIC	KNOWLEDGE AND SKILL STATEMENTS
EN01	**PERSONAL EFFECTIVENESS**
EN01.01	***Interpersonal Skills*: Displaying skills to work with people**
EN01.01.01	• Demonstrate concern for others by being sensitive to their needs and feelings
EN01.01.02	• Show understanding of others behavior by demonstrating appropriate responses
EN01.01.03	• Demonstrate respect for the opinions, perspectives, customs and individual differences of others by including others in problem solving and decision making
EN01.01.04	• Maintain open communication with others
EN01.01.05	• Recognize and accurately interprets the verbal and nonverbal behaviors of others
EN01.01.06	• Demonstrate flexibility and open mindedness when dealing with a wide range of people
EN01.01.07	• Listen to and considers others' viewpoints and alters own opinion when it is appropriate
EN01.02	***Integrity*: Displaying accepted social and work behaviors**
EN01.02.01	• Treat all in a fair and equitable manner
EN01.02.02	• Behave ethically through responsible use of company time and property
EN01.02.03	• Report unethical behavior demonstrated by others
EN01.03	***Professionalism*: Maintaining a professional presence and adhering to ethical standards**
EN01.03.01	• Demonstrate self-control by maintaining composure and keeping emotions in check even in difficult situations
EN01.03.02	• Maintain a professional appearance by dressing appropriately for the job and maintaining personal hygiene
EN01.03.03	• Use professional language when speaking with others
EN01.03.04	• Maintain a positive attitude
EN01.03.05	• Take pride in one's work and the work of the organization
EN01.04	***Reputation*: Maintaining a high degree of personal ethics and behaviors**
EN01.04.01	• Is free from substance abuse
EN01.04.02	• Demonstrate financial responsibility
EN01.04.03	• Maintain an acceptable grade point average in school
EN01.04.04	• Has not embarrassed oneself through internet postings
EN01.04.05	• Maintain a good driving record
EN01.05	***Motivation*: Demonstrating a commitment to effective job performance**
EN01.05.01	• Ensure that the job is done safely, accurately and completely
EN01.05.02	• Identify new and better processes or procedures
EN01.05.03	• Follow instructions and direction from others
EN01.05.04	• Take responsibility for completing one's own work assignment
EN01.06	***Dependability/Reliability*: Displaying responsible behaviors at work**
EN01.06.01	• Come to work when scheduled and on-time
EN01.06.02	• Comply with company policies

EN01.06.03 EN01.06.04 EN01.06.05	• Does not attend to personal business while on the job • Manage stressful situations effectively • Fulfill obligations of the job
EN01.07	***Self-Development*: Demonstrating a commitment to self-development and improvement**
EN01.07.01 EN01.07.02 EN01.07.03 EN01.07.04 EN01.07.05	• Identify goals and career interests • Demonstrate an interest in learning • Seek opportunities to learn new skills and tasks and to refine current skills • Adapt quickly to changes in process or technology • Accept help from others
EN01.08	***Flexibility & Adaptability*: Adjusting to changing work requirements**
EN01.08.01 EN01.08.02 EN01.08.03 EN01.08.04 EN01.08.05 EN01.08.06	• Adjust to changing priorities • Identify logical stopping points in work • Refocus attention to new assignment quickly • Quickly learns new assignments • Shift gears and change direction when working on multiple projects • Anticipate and accept changes in work
EN01.09	***Ability to Learn*: Incorporating classroom and on the job training into work performance**
EN01.09.01 EN01.09.02 EN01.09.03	• Understand and use material taught in the classroom and on the job training in work situations • Apply information provided in training to work tasks • Has a desire and show willingness to learn new assignments, procedures and technologies
EN02	**ACADEMIC COMPETENCIES**
EN02.01	***Mathematics*: Using mathematics to solve problems**
EN02.01.01 EN02.01.02 EN02.01.03 EN02.01.04 EN02.01.05 EN02.01.06 EN02.01.07 EN02.01.08 EN02.01.09	• Add, subtract, multiply and divide with whole numbers, fractions, decimals and percent's; calculate averages, ratios, proportions and rates • Read and understand tables and graphs • Take measurement of time, temperature, distance, length, width, height, perimeter, etc • Correctly converts from one measurement to another • Translate practical problems into useful mathematical expressions and uses appropriate mathematical formulas and techniques • Solve simple algebraic equations • Is able to determine slope, midpoint and distance • Calculate perimeters, areas and volumes of basic shapes and solids • Read, track and calculate gauge measurements
EN02.02	***Locating, Reading and Using Information*: Knowing how to find information and identifying essential information**
EN02.02.01 EN02.02.02 EN02.02.03 EN02.02.04 EN02.02.05 EN02.02.06	• Is able to read and understand written material • Sort through distracting information • Scan written material for subject of interest • Is able to identify main ideas in written material • Correctly interprets written material • Integrate what is learned from written materials with prior knowledge

EN02.02.07	• Apply what is learned from the written material to complete specific tasks
EN02.03	***Writing*: Using standard business English to write messages to co-workers and reports to managers and associates**
EN02.03.01	• Create documents such as work orders or memos
EN02.03.02	• Use standard syntax and sentence structure, correct spelling, punctuation and capitalization and appropriate grammar
EN02.03.03	• Write clearly and concisely in a professional and courteous manner
EN02.03.04	• Write effectively for a variety of audiences
EN02.03.05	• Communicate thoughts, ideas and information which may contain technical material in a logical, organized and coherent manner
EN02.03.06	• Clearly develops ideas and elaborates on them with relevant supporting examples and specific details
EN02.03.07	• Show insight, perception and depth in writing
EN02.04	***Listening*: Listening carefully in order to incorporate information into work activities**
EN02.04.01	• Listen carefully to others
EN02.04.02	• Correctly interprets information provided by others
EN02.04.03	• Is able to incorporate information into actions
EN02.05	***Speaking*: Communicating in spoken English well enough to be understood by supervisors, co-workers and customers**
EN02.05.01	• Use standard sentence structure and appropriate grammar
EN02.05.02	• Speak clearly, in precise language and in a logical organized and coherent manner
EN02.05.03	• Keep language simple and appropriate for the audience's level of knowledge of the subject
EN02.06	***Engineering and Technology*: Possessing an appropriate mastery of knowledge, techniques, skills, modern tools and advanced technology**
EN02.06.01	• Apply basic engineering principles
EN02.06.02	• Apply the appropriate technical solution
EN02.06.03	• Apply principles of engineering science and technology, techniques, procedures and equipment to the design and production of various goods and services
EN02.06.04	• Apply the basics of electricity
EN02.06.05	• Identify and selects the appropriate hand or small electric tools or diagnostic equipment for the work
EN02.06.06	• Solve problems where a variety of mechanical, electrical, thermal or fluid faults could be the reason for the problem
EN02.07	***Science:* Using scientific rules and methods to solve problems**
EN02.07.01	• Discuss the role of creativity in constructing scientific questions, methods and explanations
EN02.07.02	• Formulate scientifically investigable questions, constructs investigations, collects and evaluates data and develops scientific recommendations based on findings
EN02.07.03	• Understand physical principles such as force, friction and energy
EN02.07.04	• Understand weight and mass and how it relates to rigging, wind and structure supports

EN02.07.05	• Understand and evaluate the characteristics and hazards of electricity
EN02.07.06	• Recognize and understand the interactions of compatible and incompatible substances
EN02.07.07	• Apply basic scientific principles and technology to solve problems and complete tasks
EN02.08	***Information Technology*: Demonstrating basic IT skills for workplace efficiency and work flow**
EN02.08.01	• Use Personal Information Management (PIM) applications to increase workplace efficiency
EN02.08.02	• Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email and internet applications
EN02.08.03	• Employ computer operations applications to access, create, manage, integrate and store information
EN02.08.04	• Employ collaborative/groupware applications to facilitate group work
EN02.09	***Critical and Analytical Thinking*: Using logical thought processes to analyze information and draw conclusions**
EN02.09.01	• Identify inconsistent or missing information
EN02.09.02	• Critically review, analyze, synthesize, compare and interpret information
EN02.09.03	• Draw conclusions from relevant and/or missing information
EN02.09.04	• Test possible hypotheses to ensure the problem is correctly diagnosed and the best solution is found
EN02.09.05	• Perceive and understand relationships appropriate to the task
EN03	**WORKPLACE COMPETENCIES**
EN03.01	***Business Fundamentals*: Understanding the relationship between an individual's own job and the goals and operations of company and industry**
EN03.01.01	• Is able to articulate the organization's mission and functions and its position in the marketplace
EN03.01.02	• Recognize one's role in the functioning of the company
EN03.01.03	• Comply with applicable laws and rules governing work and reports loss, waste or theft of company property to appropriate personnel
EN03.01.04	• Act in the best interest of the company, community and environment
EN03.02	***Teamwork*: Developing capacities used to work with others**
EN03.02.01	• Accept membership in the team
EN03.02.02	• Identify with the goals, norms, values and customers of the team
EN03.02.03	• Use a group approach to identify problems and develop solutions based on group consensus
EN03.02.04	• Effectively communicates with all members of the team to achieve goals
EN03.02.05	• Develop constructive and cooperative working relationships with others
EN03.02.06	• Show sensitivity to the thoughts and opinions of others
EN03.02.07	• Respond appropriately to positive and constructive feedback
EN03.02.08	• Encourage others to express their ideas and opinions
EN03.02.09	• Learn from other team members
EN03.02.10	• Apply interpersonal skills to help team achieve goals

EN03.02.11	• Give full attention to what others are saying, taking time to understand the points being made, asking questions as appropriate and not interrupting at inappropriate times
EN03.02.12	• Keep all parties informed of progress and all relevant changes to project timelines
EN03.02.13	• Demonstrate loyalty to the team
EN03.03	***Following Directions*: Receiving, understanding and carrying out assignments with minimal supervision**
EN03.03.01	• Receive, interpret, understand and respond to verbal messages and other cues
EN03.03.02	• Pick out important information in verbal messages
EN03.03.03	• Interpret complex instructions and their relevance to the work assignment
EN03.03.04	• Ask questions to clarify unclear directions
EN03.03.05	• Act upon the instruction to complete an assignment
EN03.04	***Planning/Organizing/Scheduling*: Demonstrating the ability to work within a schedule using prescribed procedures**
EN03.04.01	• Prioritize various competing tasks and performs them quickly and efficiently according to their urgency
EN03.04.02	• Find new ways of organizing work area or planning work to accomplish work more efficiently
EN03.04.03	• Estimate resources needed for project completion; allocate time and resources effectively
EN03.04.04	• Anticipate obstacles to project completion and develop contingency plans to address them; take necessary corrective action when projects go off-track
EN03.04.05	• Plan and schedule tasks so that work is completed on time
EN03.04.06	• Make arrangements that fulfill all requirements as efficiently and economically as possible
EN03.04.07	• Respond to the schedules of others affected by arrangements; inform others of arrangements, giving them complete, accurate and timely information
EN03.04.08	• Keep track of details to ensure work is performed accurately and completely
EN03.04.09	• Take steps to verify all arrangements; recognize problems, generate effective alternatives and take corrective action
EN03.04.10	• Effectively coordinate the transition of employees at the beginning and end of each work shift; disseminate crucial information in an organized manner to rapidly bring employees up to speed at the start of their shifts
EN03.05	***Problem Solving/Decision-Making*: Applying problem-solving and critical-thinking skills to help grow the business and/or to resolve workplace conflict**
EN03.05.01	• Anticipate or recognize the existence of a problem
EN03.05.02	• Identify the true nature of the problem by analyzing its component parts
EN03.05.03	• Effectively use both internal and external resources to locate and gather information; examine information obtained for relevance and completeness; recognize important gaps in existing information and take steps to eliminate those gaps; recall previously learned information that is relevant to the problem; organize information as appropriate to gain a better understanding of the problem
EN03.05.04	• Integrate previously learned and externally obtained information to generate a variety of high quality alternative approaches to the problem

EN03.05.05	• Skillfully use logic and analysis to identify the strengths and weaknesses, the costs and benefits and the short and long-term consequences of different approaches
EN03.05.06	• Decisively choose the best solution after contemplating available approaches to the problem; make difficult decisions even in highly ambiguous or ill-defined situations; quickly choose an effective solution without assistance when appropriate
EN03.05.07	• Commit to a solution in a timely manner and develop a realistic approach for implementing the chosen solution; observe and evaluate the outcomes of implementing the solution to assess the need for alternative approaches and to identify lessons learned
EN03.05.08	• Use scientific rules and methods to solve problems
EN03.06	***Ethics*: Describing the importance of personal ethics and legal responsibility**
EN03.06.01	• Anticipate or recognize the existence of a problem
EN03.06.02	• Evaluate and justify decisions based on ethical reasoning
EN03.06.03	• Evaluate alternative responses to workplace situations based on personal, professional, ethical and legal responsibilities and employer policies
EN03.06.04	• Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace
EN03.06.05	• Interpret and explain written organizational policies and procedures
EN03.07	***Employability and Entrepreneurship Skills:* Defining ongoing career development**
EN03.07.01	• Identify and demonstrate positive work behaviors needed to be employable
EN03.07.02	• Develop a personal career plan that includes goals, objectives and strategies
EN03.07.03	• Examine licensing, certification and industry credentialing requirements
EN03.07.04	• Maintain a career portfolio to document knowledge, skills and experience
EN03.07.05	• Evaluate and compare employment opportunities that match career goals
EN03.07.06	• Identify and exhibit traits for retaining employment
EN03.07.07	• Identify opportunities and research requirements for career advancement
EN03.07.08	• Research the benefits of ongoing professional development
EN03.07.09	• Examine and describe entrepreneurship opportunities as a career planning option
EN03.08	***Working with Basic Hand and Power Tools and Technology*: Having capability to operate and troubleshoot electric and electronic equipment, mechanical and electrical products**
EN03.08.01	• Select and apply appropriate tools or technological solutions to frequently encountered problems
EN03.08.02	• Carefully consider which tools or technological solutions are appropriate for a given job and consistently choose the best tool or technological solution for the problem at hand
EN03.08.03	• Demonstrate an interest in learning about new and emerging tools and technologies; seek out opportunities to improve knowledge of tools and technologies that may assist in streamlining work and improving productivity
EN03.08.04	• Know how to maintain and troubleshoot tools and technologies
EN03.08.05	• Use basic computer technology to receive work orders, report progress and maintain records

EN04	INDUSTRY-WIDE TECHNICAL COMPETENCIES
EN04.01	***Safety Awareness*: Complying with the procedures necessary to ensure a safe and healthy work environment**
EN04.01.01	• Is cognizant of the environment and potential hazards
EN04.01.02	• Follow established safety procedures
EN04.01.03	• Evaluate changes in the environment with respect to their impact on safety of self and others
EN04.01.04	• Promote effective local, state or national security operations for the protection of people, data, property and institutions
EN04.01.05	• Comply with safety procedures and proper ways to perform work
EN04.01.06	• Understand potential threats created by deviation from safety procedures and improper use of tools and equipment
EN04.01.07	• Follow safety procedures and use safety equipment as specified by user manuals and safety training
EN04.01.08	• Use personal protection equipment including safety glasses, work boots and hard hats
EN04.01.09	• Keep personal safety equipment in good working order
EN04.01.10	• Use tools and equipment in compliance with user manuals and training
EN04.01.11	• Call attention to potential and actual hazardous conditions as they arise
EN04.01.12	• Alert co-workers and supervisory personnel to hazardous conditions and deviations from safety procedures in a timely manner
EN04.01.13	• Maintain appropriate certification and is knowledgeable in first aid or first response procedures
EN04.01.14	• Demonstrate knowledge of lock out/tag out practices
EN04.01.15	• Notify person in charge and/or co-workers of unsafe work conditions
EN04.01.16	• Stop the job if there are unsafe working conditions
EN04.02	***Industry Principles and Concepts*: Knowing the basic and emerging principles and concepts that impact the energy industry, including: energy production, energy transmission and alternative energy technologies**
EN04.02.01	• Is able to explain the flow of energy from generation through distribution to the customer
EN04.02.02	• Is able to explain the role of regulators and unions in the industry
EN04.02.03	• Discuss the history of the United States energy industry/infrastructure (refer to Energy Information Administration - www.eia.doe.gov)
EN04.02.04	• Identify the role and function of generation, transmission and distribution organizations
EN04.02.05	• Explain the role of regulatory bodies in the energy industry (such as: Federal Energy Regulatory Commission - www.ferc.gov ; State Public Service Commissions) highlighting the concept of "obligation to serve"
EN04.02.06	• Explain the different structures of energy companies, including investor-owned utilities, municipalities (associated utility practices such as water/ wastewater), electric cooperatives, independent power producers and is able to explain the different lines of energy business, including electric and gas
EN04.02.07	• Describe the process of metering and billing for energy consumption

EN04.02.08	• Demonstrate an awareness of alternative and renewable energy technologies, including geothermal energy, solar energy, wind energy, water energy and biofuel
EN04.03	***Environmental Laws and Regulations*: Complying with relevant local, state, and federal environmental laws and regulations that impact the energy industry**
EN04.03.01	• Discuss environmental laws and regulations that impact the energy industry (local, state and federal) and explain the importance of proper documentation to ensure compliance
EN04.03.02	• Demonstrate professional responsibility for maintaining all policies and standards for health, safety and the environment
EN04.03.03	• Comply with all relevant environmental laws issued by federal agencies, including EPA
EN04.03.04	• Follow energy standards produced by industry organizations, such as ANSI, API, NACE and NFPA
EN04.03.05	• Identify appropriate jurisdiction for local, state and federal regulatory agencies as they pertain to the energy industry
EN04.03.06	• Maintain current knowledge of regulatory procedures governing operations
EN04.04	***Quality Control/Continuous Improvement*: Demonstrating the ability to design, analyze and effectively use systems, components and methods with a framework of quality and continuous improvement**
EN04.04.01	• Conduct tests and inspections of products, services or processes to evaluate quality or performance
EN04.04.02	• Incorporate new information into both current and future problem solving and decision making
EN04.04.03	• Monitor/assess performance of self, other individuals or organizations to make improvements or take corrective action
EN04.04.04	• Determine how a system should work and how changes in conditions, operations and the environment will affect outcomes
EN04.04.05	• Use logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems
EN04.05	***Troubleshooting*: Diagnosing and correcting abnormalities and malfunctions in equipment and production processes**
EN04.05.01	• Monitor equipment to ensure maintenance schedules are adhered to
EN04.05.02	• Demonstrate knowledge of normal equipment operation (how the individual pieces of equipment relate to each other) in order to spot potential equipment problems before they occur
EN04.05.03	• Determine causes of operating errors, decide what to do about them and know when to notify more senior personnel
EN05	**INDUSTRY-SECTOR TECHNICAL COMPETENCIES | ENERGY GENERATION, TRANSMISSION AND DISTRIBUTION**
EN05.01	***Non-Nuclear Generation*: Technical skills and knowledge necessary for gas, oil, coal, hydro, solar, wind, biofuel or geothermal power plant personnel**
	Science and Engineering Theory and Concepts:

EN05.01.01	• Is able to define and explain the differences and similarities of power generation, including the use of different fuel types (fossil fuels – gas and oil, hydro and marine, alternative fuels – solar, wind, biofuel and geothermal) and different plant uses (i.e., peaking, load following, base load)
EN05.01.02	• Is able to explain the advantages and disadvantages of alternative energy sources
EN05.01.03	• Understand the behavior of matter
EN05.01.04	• Apply direct current (DC) concepts and laws; perform calculations and measurements including the following: o basic electrical circuits such as series and parallel, series-parallel combinations o conductors and insulators o direct current (DC) theory and DC sources (such as ideal voltage and current, non-ideal voltage and current) o electrical laws (such as Ohm's law, Kirchhoff's voltage and current laws) o electron theory o units of electrical measurement (such as ohms, volts, amps, watts, coulombs, joules) o voltage, current, resistance and power
EN05.01.05	• Apply alternating current (AC) concepts and laws; perform calculations and measurements including the following: o alternating current (AC) theory and AC sources (such as ideal voltage and current, non-ideal voltage and current) o basic electrical circuits such as series and parallel o units of electrical measurement (such as henries, farads, reactance, impedance) o passive components, capacitors and inductors o single-phase versus three-phase o voltage, current, impedance, real, reactive, apparent power and power factor relationships
EN05.01.06	• Has basic knowledge of water and general chemistry
	Basic Components Knowledge:
EN05.01.07	• Is knowledgeable of the location of equipment in the plant, how the equipment operates and normal operating parameters
EN05.01.08	• Is able to use tools such as hand tools, power tools and meters
EN05.01.09	• Describe the theory, construction and application of the mechanical components such as air compressors, heat exchangers, steam condensers, steam generators, pumps, ejectors, strainers, filters and traps, steam traps, steam turbines and valves
EN05.01.10	• Describe the theory, construction and application of diesel engines including main structural components, main moving components, principles of operations, failure mechanisms and systems and accessories and support systems
EN05.01.11	• Describe the theory, construction and application of air conditioning, heating and ventilation systems, including refrigeration machines and the basic refrigeration cycle

EN05.01.12	• Describe the theory, construction and application of structural and auxiliary equipment such as boilers, elevators, fire barriers, hangers and snubbers for support and restraint and hoists and cranes
EN05.01.13	• Describe the theory, construction and application of rotating equipment including generators, motors and motor-generators
EN05.01.14	• Describe the theory, construction and application of resistive electrical equipment including heaters and heat tracing
EN05.01.15	• Describe the theory, construction and application of electrical supply components including the following: ○ batteries and chargers ○ circuit breakers (such as protection) ○ inverters and uninterruptible power supplies ○ switchgear, load centers and motor control centers (such as protective relaying and schematics of a basic system from high voltage to lower voltage) ○ transformers (such as step-up transformers and step-down transformers)
EN05.01.16	• Describe the theory, construction and application of electrical control components including cables, control circuits, meters and relays
EN05.01.17	• Describe the theory, construction and application of valve actuator types (such as motors, pneumatic, hydraulic)
EN05.01.18	• Describe the theory and application of electronic equipment including the following: ○ analyzers (such as H_2, O_2 and chemical) ○ signal converters
EN05.01.19	• Explain the principles associated with instrumentation and control and describe the following: ○ basic control circuits (such as proportional, integral, derivative and a combination of the three; saturation cutoff, steady-state error, limiters, effects of disturbances) ○ pneumatic devices (such as actuators) ○ sensors (such as types of sensors, for example, pressure, flow, temperature) ○ hydraulic controls (such as actuators)
EN05.01.20	• Explain bearing design and lubrication principles associated with the following: ○ determination of oil levels and requirements and the addition of correct oil to plant components ○ environmental hazards ○ factors that affect lubrication ○ friction and wear ○ fluid lubrication ○ lubricant types and characteristics ○ purpose and necessity ○ storage and transfer ○ symptoms and problems associated with improper lubrication ○ safety hazards

EN05.01.21 EN05.01.22 EN05.01.23 EN05.01.24	• Explain the principles associated with thermodynamics and combustion • Is knowledgeable of hazardous and safety procedures • Is able to calibrate and certify tools • Is able to plan and organize relevant materials and tools prior to job site work
	Computer Skills:
EN05.01.25 EN05.01.26 EN05.01.27	• Is knowledgeable of procedures to access, file and use record-keeping logs • Understand computer operation, utilize integrated/multiple software and networks • Is able to use Microsoft Office (or equivalent) software to prepare spreadsheets for data analysis and reports for management review and approval
EN05.02	***Nuclear Generation*: Technical skills and knowledge necessary for nuclear power plant personnel**
	Electrical Science:
EN05.02.01 EN05.02.02	• Explain and use the fundamental concepts associated with electricity (e.g., electric charge, electric current) • Understand the components of electrical systems including switchyard construction, transformers, relays, circuit breakers and motors
	Reactor Theory and Operations:
EN05.02.03 EN05.02.04 EN05.02.05	• Explain the general design overview of the basic reactor types • Demonstrate understanding of reactor startup and shutdown procedures • Explain the fission process including the construction of fission product barriers
	Operations and Repair:
EN05.02.06 EN05.02.07 EN05.02.08 EN05.02.09 EN05.02.10 EN05.02.11 EN05.02.12	• Comply with the procedures necessary to ensure a safe and healthy work environment • Operate, repair and test machines, devices and equipment based on electrical or mechanical principles in order to diagnose machine malfunctions • Operate basic hand and small electric tools and equipment • Conduct tests and inspections of products, services or processes to evaluate quality or performance • Determine the kind of tools and equipment needed to do a job • Watch gauges, dials or other indicators to make sure a machine is working properly • Is able to read, interpret and create basic prints used in the design, operation and maintenance of electrical systems including engineering drawings, diagrams and schematics - documentation diagrams, single line diagrams
	Additional Academic Requirements:
EN05.02.13 EN05.02.14	• Physics – Explain and use physics terms, units, definitions and basic concepts including mechanical principles (laws of motion, energy, conditions of equilibrium) and units (pressure, temperature, flow, volume) • Basic Atomic & Nuclear Physics - Explain the basic atomic and nuclear physics terms, unit, definitions and basic concepts including atomic structure, nuclear interactions and reactions, sources of residual heat/decay heat and reactor operation

EN05.02.15	• Chemistry – Explain the chemistry terms, units, definitions and basic concepts and apply the concepts successfully on the job, including fundamentals of chemistry (molecules, mixtures, solutions and compounds, corrosion control), water chemistry control, reactor water chemistry and the corrosion process
EN05.02.16	• Mathematics – Has experience and knowledge in scientific notation, dimensional analysis, geometry, trigonometry, graphs and control charts, relational charts, exponents and logarithms and basic statistics
EN05.03	***Electric Transmission and Distribution*: Knowledge and skills necessary for the transmission and distribution of electricity from the generation source to the end customer**
	Science and Technology:
EN05.03.01	• Understand the components and workings of the electric transmission and distribution network
EN05.03.02	• Apply direct current (DC) concepts and laws and perform calculation and measurements including the following: o basic electrical circuits such as series and parallel, series-parallel combinations o conductors and insulators o direct current (DC) theory and DC sources (such as ideal voltage and current, non-ideal voltage and current) o electrical laws (such as Ohm's law, Kirchhoff's voltage and current laws) o electron theory o units of electrical measurement (such as ohms, volts, amps, watts, coulombs, joules) o voltage, current, resistance and power
EN05.03.03	• Apply alternating current (AC) concepts and laws and perform calculations and measurements including the following: o alternating current (AC) theory and AC sources (such as ideal voltage and current, non-ideal voltage and current) o basic electrical circuits such as series and parallel o units of electrical measurement (such as henries, farads, reactance, impedance) o passive components, capacitors and inductors o single-phase versus three-phase o voltage, current, impedance, real, reactive, apparent power and power factor relationships
EN05.03.04	• Understand how electrical current moves through a circuit or a system and how electricity affects a circuit or system. Understand how to control current and resistance.
EN05.03.05	• Understand the way solid things move and how leverage, force, friction and momentum affect that motion and is able to solve problems with simple machines, complex machines and mechanical systems
EN05.03.06	• Understand the way fluids (liquids and gases such as water and air) act as conductors or insulators
EN05.03.07	• Understand the movement of heat, specifically which substances warm up quickly when heated and which ones warm up more slowly

EN05.03.08	• Understand how specific heat works, including how different materials hold heat for different amounts of time
EN05.03.09	• Understand and apply tag out/lock out procedures
	Basic Components Knowledge:
EN05.03.10	• Is knowledgeable of design techniques, tools and principles involved in production of precision technical plans, blueprints, drawings and models
EN05.03.11	• Is knowledgeable of machines and tools, including their designs, uses, repair and maintenance
EN05.03.12	• Is able to work with electrical instruments such as voltmeters, ammeters, fault locators, etc.
EN05.03.13	• Understand the application of hosts, tackle and knots used in construction and maintenance work
EN05.03.14	• Understand the interrelationships among components of systems in order to understand how such components affect each other, act together, fit together, etc.
EN05.03.15	• Is able to identify "unusual" sounds or vibrations from among competing, "normal" sounds or vibrations
EN05.03.16	• Is able to detect deviations or exceptions from normal operating conditions
	Customer Focus:
EN05.03.17	• Interact directly with the public listening to and understanding customer needs and determining how to address them
EN05.03.18	• Interact with customers regarding the termination and restoration of electric service, which is required as a result of maintenance and construction work
EN05.04	***Gas Transmission and Distribution*: Knowledge and skills necessary for the transmission and distribution of natural gas from the refinery to the end customer**
	Science and Technology:
EN05.04.01	• Understand and apply the fundamental concepts of natural gas
EN05.04.02	• Understand the components and workings of the gas transmission and distribution network, including metering and regulating stations
EN05.04.03	• Apply direct current (DC) concepts and laws and perform calculation and measurements including the following: o basic electrical circuits such as series and parallel, series-parallel combinations o conductors and insulators o direct current (DC) theory and DC sources (such as ideal voltage and current, non-ideal voltage and current) o electrical laws (such as Ohm's law, Kirchhoff's voltage and current laws) o electron theory o units of electrical measurement (such as ohms, volts, amps, watts, coulombs, joules) o voltage, current, resistance and power

EN05.04.04	• Apply alternating current (AC) concepts and laws and perform calculations and measurements including the following: ○ alternating current (AC) theory and AC sources (such as ideal voltage and current, non-ideal voltage and current) ○ basic electrical circuits such as series and parallel ○ units of electrical measurement (such as henries, farads, reactance, impedance) ○ passive components, capacitors, inductors ○ single-phase versus three-phase ○ voltage, current, impedance, real, reactive, apparent power and power factor relationships
EN05.04.05	• Understand the way solid things move and how leverage, force, friction, and momentum affect that motion and is able to solve problems with simple machines, complex machines and mechanical systems
EN05.04.06	• Understand the way fluids (liquids and gases such as water and air) move through systems and is able to solve problems with plumbing, hydraulics or pneumatics (compressed gas)
EN05.04.07	• Understand the movement of heat, specifically which substances warm up quickly when heated and which ones warm up more slowly
EN05.04.08	• Understand how specific heat works, including how different materials hold heat for different amounts of time
	Basic Components Knowledge:
EN05.04.09	• Is knowledgeable of design techniques, tools and principles involved in the production of precision technical plans, blueprints, drawings and models
EN05.04.10	• Is knowledgeable of machines and tools, including their designs, uses, repair and maintenance
	Customer Focus:
EN05.04.11	• Interact directly with the public listening to and understanding customer needs and determining how to address them
EN05.04.12	• Interact with customers regarding the termination and restoration of gas service, which is required as a result of maintenance and construction work

Name _____

Learner ID _____

School/College/University _____

Energy Career Cluster Plan of Study

EDUCATION LEVELS	GRADE	English/ Language Arts	Math	Science	Social Studies/ Sciences	Other Required Courses Other Electives Recommended Electives Learner Activities	Career and Technical Courses	SAMPLE Occupations Relating to This Career Cluster
	Interest Inventory Administered and Plan of Study Initiated for all Learners							
SECONDARY	9	English/ Language Arts I	Algebra I	Earth or Life or Physical Science	State History Civics or World History	All plans of study should meet local and state high school graduation requirements and college entrance requirements. Certain local student organization activities such as SkillsUSA are also important including public speaking, record keeping and work-based experiences.	**Energy Industry Fundamentals*	►Biomass and Biofuels Technician ►Electrician ► Electrical & Electronics Repairer ► Electrical & Electronics Technician ► Electrical & Instrumentation Technician ► Energy Generation Technician ► Engineering Technician ► Gas Processor & Distribution Plant Operator ► Gas Service Technician ► Generation Technician ► Geothermal Technician ► Hydropower & Marine Energy Technician ► Instrumentation Control Technician ► Metering Technician ► Nuclear Reactor Operator ► Nuclear Technician ► Pipefitter ► Pipelayer ► Pipeline Installer ► Power Distribution Technician ► Power Plant Operator ► Solar Photovoltaic Installer ► Solar Photovoltaic Technician ► Solar Technician ► Welder ► Wind Turbine Technician
SECONDARY	10	English/ Language Arts II	Geometry	Biology	U.S. History		***Introduction to Alternative Energy*	
SECONDARY	11	English/ Language Arts III Technical Writing	Algebra II	Physics	Economics Psychology		Continue courses pertinent to occupational specialty	
	College Placement Assessments-Academic/Career Advisement Provided							
SECONDARY	12	English/ Language Arts IV	Trigonometry	Chemistry			Contineu course pertinent to occupational specialty	
	Articulation/Dual Credit Transcripted-Postsecondary courses may be taken/moved to the secondary level for articulation/dual credit purposes.							
POSTSECONDARY	Year 13	English Composition English Literature	*Dependent on chosen occupation*	Physics	American Govt. or History, plus Psychology/ Interpersonal Skills	All plans of study need to meet learner's career goals with regard to required degrees, licenses, certifications or journey worker statuts. Certain local student organization activities may also be important to include.	Continue courses pertinent to the occupation y selected.	
POSTSECONDARY	Year1 4	Speech/ Oral Communication	*Dependent on chosen occupation*	Environmental Science	Sociology Business Law			
POSTSECONDARY	Year 15	Continue courses in the area of specialization.						
POSTSECONDARY	Year 16							

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*Energy Industry Fundamentals: The Get Into Energy Industry Fundamentals provides a broad understanding of the Electric and Natural Gas Utility industry and the energy generation, transmission, and distribution infrastructure, commonly called the "largest machine in the world", which forms the backbone for the industry. The curriculum includes business models, regulations, types of energy and their conversion to useable energy such as electric power, how generated power is transmitted and distributed to the point of use, emerging technologies and the connection to careers in the energy industry.

**Introduction to Alternative Energy: Identifies the need for alternative energy development. and the contributions and potential of individual alternative energy sources. The course also covers the present U.S. electrical grid and issues affecting specific alternative energy source tie-in and reliability.

Formed in March 2006, the Center for Energy Workforce Development (CEWD) is a non-profit consortium of electric natural gas and nuclear utilities and their associations —Edison Electric Institute, American Gas Association, Nuclear Energy Institute, and National Rural Electric Cooperative Association. CEWD was formed to help utilities work together to develop solutions to the coming workforce shortage in the utility industry. It is the first partnership between utilities, their associations, contractors and unions to focus on the need to build a skilled workforce pipeline that will meet future industry needs.

Center For
ENERGY
Workforce Development

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