**Energy Career Cluster**

Cluster Knowledge and Skill Statements

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| **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 |
| EN01.02.01EN01.02.02EN01.02.03 | * Treat all in a fair and equitable manner
* Behave ethically through responsible use of company time and property
* 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 |
| EN01.04.01EN01.04.02EN01.04.03EN01.04.04EN01.04.05 | * Is free from substance abuse
* Demonstrate financial responsibility
* Maintain an acceptable grade point average in school
* Has not embarrassed oneself through internet postings
* Maintain a good driving record
 |
| **EN01.05** | *Motivation*: Demonstrating a commitment to effective job performance |
| EN01.05.01EN01.05.02EN01.05.03EN01.05.04 | * Ensure that the job is done safely, accurately and completely
* Identify new and better processes or procedures
* Follow instructions and direction from others
* Take responsibility for completing one's own work assignment
 |
| **EN01.06** | *Dependability/Reliability*: Displaying responsible behaviors at work  |
| EN01.06.01EN01.06.02EN01.06.03EN01.06.04EN01.06.05 | * Come to work when scheduled and on-time
* Comply with company policies
* 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 |
| EN01.07.01EN01.07.02EN01.07.03EN01.07.04EN01.07.05 | * 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 |
| EN01.08.01EN01.08.02EN01.08.03EN01.08.04EN01.08.05EN01.08.06 | * 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 | * Understand and use material taught in the classroom and on the job training in work situations
 |
| EN01.09.02 | * Apply information provided in training to work tasks
 |
| EN01.09.03 | * 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 | * Add, subtract, multiply and divide with whole numbers, fractions, decimals and percent’s; calculate averages, ratios, proportions and rates
 |
| EN02.01.02 | * Read and understand tables and graphs
 |
| EN02.01.03 | * Take measurement of time, temperature, distance, length, width, height, perimeter, etc
 |
| EN02.01.04 | * Correctly converts from one measurement to another
 |
| EN02.01.05 | * Translate practical problems into useful mathematical expressions and uses appropriate mathematical formulas and techniques
 |
| EN02.01.06 | * Solve simple algebraic equations
 |
| EN02.01.07 | * Is able to determine slope, midpoint and distance
 |
| EN02.01.08 | * Calculate perimeters, areas and volumes of basic shapes and solids
 |
| EN02.01.09 | * Read, track and calculate gauge measurements
 |
| **EN02.02** | *Locating, Reading and Using Information*: Knowing how to find information and identifying essential information |
| EN02.02.01EN02.02.02EN02.02.03EN02.02.04EN02.02.05EN02.02.06EN02.02.07 | * 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
* 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 |
| EN02.04.01EN02.04.02EN02.04.03 | * Listen carefully to others
* Correctly interprets information provided by others
* 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](http://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](http://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:
	+ basic electrical circuits such as series and parallel, series-parallel combinations
	+ conductors and insulators
	+ direct current (DC) theory and DC sources (such as ideal voltage and current, non-ideal voltage and current)
	+ electrical laws (such as Ohm's law, Kirchhoff's voltage and current laws)
	+ electron theory
	+ units of electrical measurement (such as ohms, volts, amps, watts, coulombs, joules)
	+ voltage, current, resistance and power
 |
| EN05.01.05 | * Apply alternating current (AC) concepts and laws; 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 and inductors
	+ single-phase versus three-phase
	+ 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 H2, O2 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 | * Explain the principles associated with thermodynamics and combustion
 |
| EN05.01.22 | * Is knowledgeable of hazardous and safety procedures
 |
| EN05.01.23 | * Is able to calibrate and certify tools
 |
| EN05.01.24 | * Is able to plan and organize relevant materials and tools prior to job site work
 |
|  | **Computer Skills:** |
| EN05.01.25 | * + Is knowledgeable of procedures to access, file and use record-keeping logs
 |
| EN05.01.26 | * + Understand computer operation, utilize integrated/multiple software and networks
 |
| EN05.01.27 | * + 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 | * Explain and use the fundamental concepts associated with electricity (e.g., electric charge, electric current)
 |
| EN05.02.02 | * Understand the components of electrical systems including switchyard construction, transformers, relays, circuit breakers and motors
 |
|  | Reactor Theory and Operations: |
| EN05.02.03 | * Explain the general design overview of the basic reactor types
 |
| EN05.02.04 | * Demonstrate understanding of reactor startup and shutdown procedures
 |
| EN05.02.05 | * Explain the fission process including the construction of fission product barriers
 |
|  | Operations and Repair: |
| EN05.02.06 | * Comply with the procedures necessary to ensure a safe and healthy work environment
 |
| EN05.02.07 | * Operate, repair and test machines, devices and equipment based on electrical or mechanical principles in order to diagnose machine malfunctions
 |
| EN05.02.08 | * Operate basic hand and small electric tools and equipment
 |
| EN05.02.09 | * Conduct tests and inspections of products, services or processes to evaluate quality or performance
 |
| EN05.02.10 | * Determine the kind of tools and equipment needed to do a job
 |
| EN05.02.11 | * Watch gauges, dials or other indicators to make sure a machine is working properly
 |
| EN05.02.12 | * 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 | * 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)
 |
| EN05.02.14 | * 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:
	+ basic electrical circuits such as series and parallel, series-parallel combinations
	+ conductors and insulators
	+ direct current (DC) theory and DC sources (such as ideal voltage and current, non-ideal voltage and current)
	+ electrical laws (such as Ohm's law, Kirchhoff's voltage and current laws)
	+ electron theory
	+ units of electrical measurement (such as ohms, volts, amps, watts, coulombs, joules)
	+ voltage, current, resistance and power
 |
| EN05.03.03 | * 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 and inductors
	+ single-phase versus three-phase
	+ 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:
	+ basic electrical circuits such as series and parallel, series-parallel combinations
	+ conductors and insulators
	+ direct current (DC) theory and DC sources (such as ideal voltage and current, non-ideal voltage and current)
	+ electrical laws (such as Ohm's law, Kirchhoff's voltage and current laws)
	+ electron theory
	+ units of electrical measurement (such as ohms, volts, amps, watts, coulombs, joules)
	+ 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
 |