

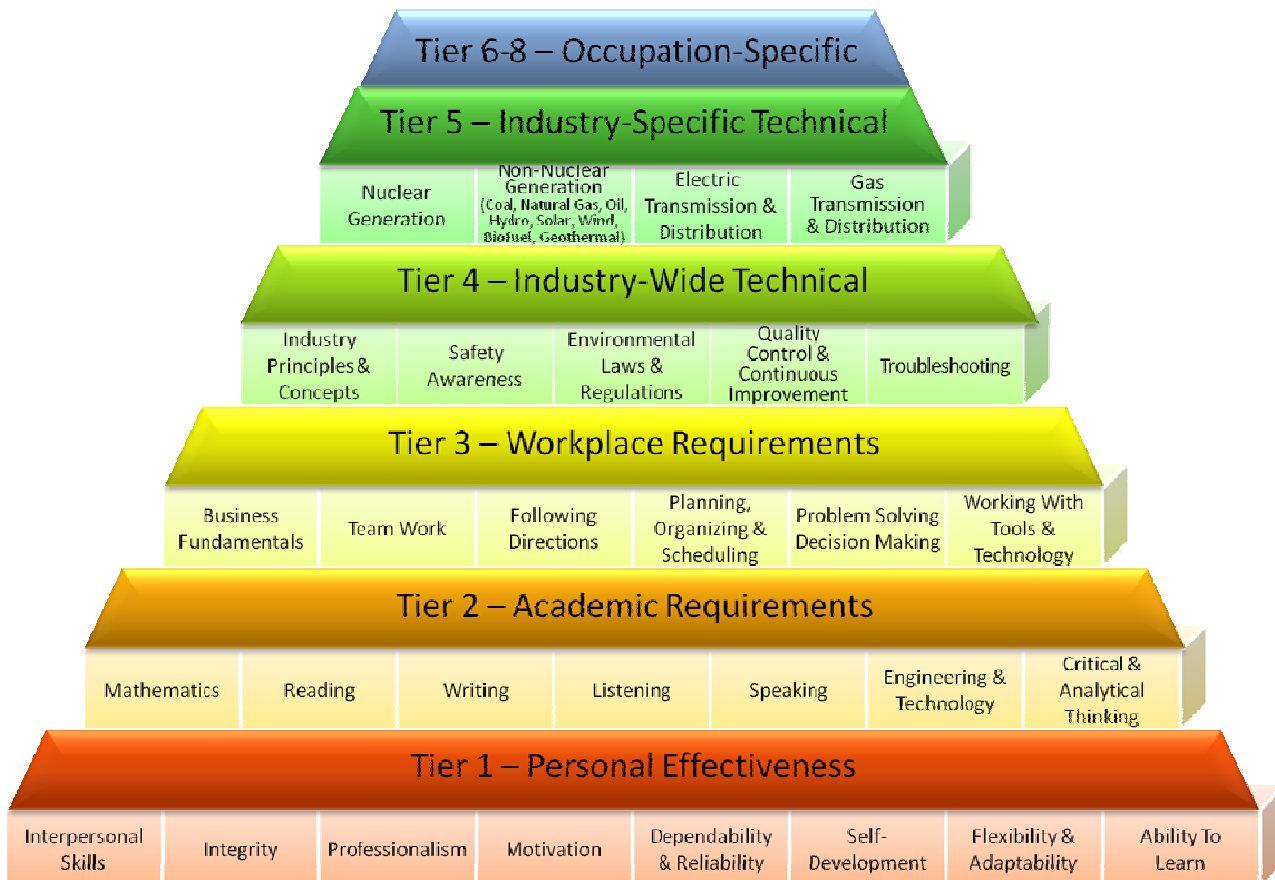
How are these competencies used in the workplace?

One of the difficulties that students have when taking math, English, or science courses is understanding how the course relates to the real world and the jobs that they wish to pursue. Computer skills, problem solving and decision making are key requirements in energy jobs.

- 🔍 **Algebra** – increases problem solving skills which are needed when troubleshooting problems in a power plant station, substation or on a power line.
- 🔍 **Geometry** – using diagrams to install new equipment or wiring requires measuring and understanding dimensions and space.
- 🔍 **Physics** – understanding the basic concepts of physics such as electrons and protons helps in understanding how electricity is generated, moved along power lines, stepped down in voltage and distributed to customers.

- 🔍 **History/Humanities/Social Sciences** – understanding the experiences of other cultures helps in teamwork, collaboration and problem solving.
- 🔍 **English** – being able to speak, write and read English helps the individual follow directions, ensures a safe job site, prepares reports and talks to the boss, coworkers, and customers.

ENERGY INDUSTRY COMPETENCY MODEL GRAPHIC



Most Frequently Administered Employment Tests at DTE Energy

Test Battery	Components	Affected Critical Jobs
EEI Construction and Skilled Trades (CAST)	Graphic Arithmetic Mathematical Usage Mechanical Concepts Reading for Comprehension	Apprentice Lineman Cable Mechanic Electrical Maintenance Journeyman Substation Operator
EEI Customer Service Representative Test Battery (CSR)	Basic Work Station Customer Order Bill Inquiry Interactive	
EEI Power Plant Maintenance Positions Selection System (MASS)	Assembly/Spatial Ability Mechanical Concepts Reading Comprehension Mathematical Usage - Short Version Background & Opinion Questionnaire (personality and job fit assessment, such as persistence, conscientiousness, ability to work under adverse conditions)	Instrument & Control Technician 'A' Nuclear Maintenance Journeyman
EEI Plant Operator Selection System (POSS)	Assembly/Spatial Ability Mechanical Concepts Reading Comprehension Mathematical Usage - Long Tables and Graphs	Nuclear Operator Power Plant Operator
EEI System Operator/Power Dispatching (SOPD)	Applied Arithmetic Placement Electrical Knowledge Mathematical Usage Numerical Reasoning Verbal Reasoning	System Supervisor I
EEI Technician Occupations Selection System (TECH)	Graphic Problem Solving Interpreting Diagrams Mechanical Concepts Reasoning from Rules	
MichCon Field Service Test (FS)	Mechanical Reasoning Space Relations	General Service Technician (#223 Gas and #799 Technicians only)

Framework of Competencies for the Energy Generation, Transmission and Distribution Industry

Tier 1: Personal Effectiveness

PERSONAL EFFECTIVENESS	
1. Interpersonal Skills: Displaying skills to work with people	
<ul style="list-style-type: none"> ▪ Demonstrates concern for others by being sensitive to their needs and feelings CSR ▪ Shows understanding of others behavior by demonstrating appropriate responses CSR ▪ Demonstrates respect for the opinions, perspectives, customs and individual differences of others by including others in problem solving and decision making ▪ Maintains open communication with others ▪ Recognizes and accurately interprets the verbal and nonverbal behaviors of others CSR ▪ Demonstrates flexibility and open mindedness when dealing with a wide range of people CSR ▪ Listens to and considers others' viewpoints and alters own opinion when it is appropriate CSR 	
2. Integrity: Displaying accepted social and work behaviors	
<ul style="list-style-type: none"> ▪ Treats all in a fair and equitable manner ▪ Behaves ethically through responsible use of company time and property ▪ Reports unethical behavior demonstrated by others to supervision 	
3. Professionalism: Maintaining a professional presence and adhering to ethical standards	
<ul style="list-style-type: none"> ▪ Demonstrates self-control by maintaining composure and keeping emotions in check even in difficult situations CSR ▪ Maintains a professional appearance by dressing appropriately for the job and maintaining personal hygiene ▪ Uses professional language when speaking with supervisor, co-workers and customers CSR ▪ Is free from substance abuse ▪ Maintains a positive attitude ▪ Takes pride in one's work and the work of the organization 	
4. Motivation: Demonstrating a commitment to effective job performance	
<ul style="list-style-type: none"> ▪ Ensures that job is done safely, accurately and completely. ▪ Identifies new and better processes or procedures ▪ Follows instructions and direction from supervisor and co-workers ▪ Takes responsibility for completing one's own work assignment 	
5. Dependability/Reliability: Displaying responsible behaviors at work	
<ul style="list-style-type: none"> ▪ Comes to work when scheduled and on time ▪ Complies with company policies ▪ Does not attend to personal business while on the job ▪ Manages stressful situations effectively ▪ Fulfills obligations of the job 	
6. Self-Development: Demonstrating a commitment to self development and improvement	
<ul style="list-style-type: none"> ▪ Identifies goals and career interests ▪ Demonstrates an interest in learning ▪ Seeks opportunities to learn new skills and tasks ▪ Participates in training to learn new skills and to refine current skills ▪ Adapts quickly to changes in process or technology ▪ Accepts help from supervisors and co-workers 	

7. Flexibility & Adaptability: Adjusting to changing work requirements

- Adjusts to changing priorities
- Identifies logical stopping points in work
- Refocuses attention to new assignment quickly
- Quickly learns new assignments
- Shifts gears and changes direction when working on multiple projects
- Anticipates and accepts changes in work

8. Ability to Learn: Incorporating classroom and on the job training into work performance

- Uses material taught in classroom and on the job training in work situations
- Applies information provided in training to work tasks
- Desires, shows willingness to learn new assignments, procedures and technologies

Tier 2: Academic Competencies

ACADEMIC COMPETENCIES

1. Mathematics: Using mathematics to solve problems

- Adds, subtracts, multiplies and divides with whole numbers, fractions, decimals and percents; calculates averages, ratios, proportions and rates **CAST, CSR, MASS, POSS, SOPD, TECH**
- Takes measurement of time, temperature, distance, length, width, height, perimeter, etc
- Correctly converts from one measurement to another **CAST, CSR, MASS, POSS, SOPD,**
- Translates practical problems into useful mathematical expressions and uses appropriate mathematical formulas and techniques **CAST, CSR, MASS, POSS, SOPD, TECH**
- Solves simple algebraic equations **CAST, CSR, MASS, POSS, SOPD, TECH**
- Is able to determine slope, midpoint, and distance
- Calculates perimeters, areas and volumes of basic shapes and solids
- Reads, tracks, and calculates gauge measurements

2. Locating, Reading and Using Information: Knowing how to find information and identifying essential information

- Sorts through distracting information **CAST, CSR, MASS, POSS**
- Scans written material for subject of interest **CAST, CSR, MASS, POSS, TECH**
- Is able to identify main ideas in written material **CAST, MASS, POSS, SOPD, TECH**
- Correctly interprets written material **CAST, MASS, POSS, SOPD, TECH**
- Integrates what is learned from written materials with prior knowledge
- Applies what is learned from the written material to complete specific tasks **CSR**

3. Writing: Using standard business English to write messages to co-workers and reports to managers and associates

- Creates documents such as work orders or memos
- Uses standard syntax and sentence structure, correct spelling, punctuation and capitalization and appropriate grammar
- Writes clearly and concisely in a professional and courteous manner
- Writes effective for a variety of audiences
- Communicates thoughts, ideas, information which may contain technical material in a logical, organized and coherent manner
- Clearly develops ideas and elaborates on them with relevant supporting examples and specific details
- Shows insight, perception and depth in writing

4. Listening: Listening carefully in order to incorporate information into work activities

- Listens carefully to others **CSR**
- Correctly interprets information provided by others **CSR**

<ul style="list-style-type: none"> ▪ Is able to incorporate information into actions
5. Speaking: Communicating in spoken English well enough to be understood by supervisors, co-workers and customers
<ul style="list-style-type: none"> ▪ Uses standard sentence structure and appropriate grammar CSR ▪ Speaks clearly, in precise language and in a logical organized and coherent manner CSR ▪ Keeps language simple and appropriate for the audience's level of knowledge of the subject CSR
6. Engineering and Technology: Possessing an appropriate mastery of knowledge, techniques, skills, modern tools and advanced technology
<ul style="list-style-type: none"> ▪ Applies basic engineering principles CAST, MASS, POSS, TECH, FS ▪ Applies the appropriate technical solution CAST, MASS, POSS, SOPD, TECH, FS ▪ Applies principles of engineering science and technology, techniques, procedures and equipment to the design and production of various goods and services CAST, MASS, POSS, SOPD, TECH, FS ▪ Applies the basics of electricity SOPD ▪ Identifies and selects the appropriate hand or small electric tools or diagnostic equipment for the work ▪ Solves problems where a variety of mechanical, electrical, thermal or fluid faults could be the reason for the problem CAST, MASS, POSS, TECH, FS
7. Critical and Analytical Thinking: Using logical thought processes to analyze information and draw conclusions
<ul style="list-style-type: none"> ▪ Identifies inconsistent or missing information CSR, SOPD, TECH ▪ Critically reviews, analyzes, synthesizes, compares and interprets information; CSR, SOPD, TECH ▪ Draws conclusions from relevant and/or missing information CSR, SOPD, TECH ▪ Tests possible hypotheses to ensure the problem is correctly diagnosed and the best solution is found

Tier 3: Workplace Competencies

WORKPLACE COMPETENCIES
1. Business Fundamentals: Knowledge of business and management principles The knowledge and skills that enable individuals to understand the relationship between own job and goals and operations of company and industry
<ul style="list-style-type: none"> ▪ Is able to articulate the organization's mission and functions and its position in the marketplace ▪ Recognizes one's role in the functioning of the company ▪ Applies interpersonal skills to work environment ▪ Complies with applicable laws and rules governing work and reports loss, waste or theft of company property to appropriate personnel ▪ Acts in the best interest of the company, community and environment
2. Teamwork: Developed capacities used to work with others
<ul style="list-style-type: none"> ▪ Accepts membership in the team ▪ Identifies with the goals, norms, values and customers of the team ▪ Uses a group approach to identify problems and develop solutions based on group consensus ▪ Effectively communicates with all members of the team to achieve goals ▪ Develops constructive and cooperative working relationships with others ▪ Shows sensitivity to the thoughts and opinions of others ▪ Responds appropriately to positive and negative feedback ▪ Encourages others to express their ideas and opinions ▪ Learns from other team members ▪ Applies interpersonal skills to help team achieve goals ▪ Gives 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 ▪ Keeps all parties informed of progress and all relevant changes to project timelines ▪ Demonstrates loyalty to the team

3. Following Directions: Receiving, understanding and carrying out assignments with minimal supervision

- Receives, interprets, understands and responds to verbal messages and other cues
- Picks out important information in verbal messages
- Interprets complex instructions and their relevance to the work assignment
- Asks questions to clarify unclear directions
- Acts upon the instruction to complete an assignment

4. Planning/Organizing/Scheduling: Demonstrating the ability to work within a schedule using prescribed procedures

- Prioritizes various competing tasks and performs them quickly and efficiently according to their urgency
- Finds new ways of organizing work area or planning work to accomplish work more efficiently
- Estimates resources needed for project completion; allocates time and resources effectively
- Anticipates obstacles to project completion and develops contingency plans to address them; takes necessary corrective action when projects go off-track
- Plans and schedules tasks so that work is completed on time
- Makes arrangements that fulfill all requirements as efficiently and economically as possible
- Responds to the schedules of others affected by arrangements; informs others of arrangements, giving them complete, accurate and timely information
- Keeps track of details to ensure work is performed accurately and completely
- Takes steps to verify all arrangements; recognizes problems, generates effective alternatives and takes corrective action
- Effectively coordinates the transition of employees at the beginning and end of each work shift; disseminates crucial information in an organized manner to rapidly bring employees up to speed at the start of their shifts

5. Problem Solving/Decision-Making: Applying problem-solving and critical-thinking skills to help grow the business and/or to resolve workplace conflict

- Anticipates or recognizes the existence of a problem
- Identifies the true nature of the problem by analyzing its component parts CSR
- Effectively uses both internal and external resources to locate and gather information; examines information obtained for relevance and completeness; recognizes important gaps in existing information and takes steps to eliminate those gaps; recalls previously learned information that is relevant to the problem; organizes information as appropriate to gain a better understanding of the problem
- Integrates previously learned and externally obtained information to generate a variety of high quality alternative approaches to the problem; skillfully uses logic and analysis to identify the strengths and weaknesses, the costs and benefits and the short and long-term consequences of different approaches
- Skillfully uses logic and analysis to identify the strengths and weaknesses, the costs and benefits and the short and long-term consequences of different approaches
- Decisively chooses the best solution after contemplating available approaches to the problem; makes difficult decisions even in highly ambiguous or ill-defined situations; quickly chooses an effective solution without assistance when appropriate
- Commits to a solution in a timely manner and develops a realistic approach for implementing the chosen solution; observes and evaluates the outcomes of implementing the solution to assess the need for alternative approaches and to identify lessons learned
- Uses scientific rules and methods to solve problems

6. Working with Basic Hand and Power Tools and Technology: Having capability to operate and troubleshoot electric and electronic equipment, mechanical and electrical products

- Selects and applies appropriate tools or technological solutions to frequently encountered problems
- Carefully considers which tools or technological solutions are appropriate for a given job and consistently chooses the best tool or technological solution for the problem at hand
- Demonstrates an interest in learning about new and emerging tools and technologies; seeks out opportunities to improve knowledge of tools and technologies that may assist in streamlining work and improving productivity
- Knows how to maintain and troubleshoot tools and technologies

- Uses basic computer technology to receive work orders, report progress and maintain records.

Tier 4: Industry-wide Technical Competencies

INDUSTRY-WIDE TECHNICAL COMPETENCIES

1. **Safety Awareness: Compliance with the procedures necessary to ensure a safe and healthy work environment**

- Is cognizant of the environment and potential hazards
- Follows established safety procedures
- Evaluates changes in the environment with respect to their impact on safety of self and others
- Promotes effective local, state or national security operations for the protection of people, data, property and institutions
- Complies with safety procedures and proper ways to perform work
- Understands potential threats created by deviation from safety procedures and improper use of tools and equipment
- Follows safety procedures and uses safety equipment as specified by user manuals and safety training
- Uses personal protection equipment including safety glasses, work boots, hard hats
- Keeps personal safety equipment in good working order
- Uses tools and equipment in compliance with user manuals and training
- Calls attention to potential and actual hazardous conditions as they arise
- Alerts co-workers and supervisory personnel to hazardous conditions and deviations from safety procedures in a timely manner
- Maintains appropriate certification and is knowledgeable in first aid or first response procedures
- Demonstrates knowledge of lock/tag out practices
- Notifies person in charge and/or co-workers of unsafe work conditions
- Stops the job if there are unsafe working conditions

2. **Industry Principles and Concepts: Knowledge of the basic and emerging principles and concepts that impact the energy industry, including: energy production, energy transmission and alternative energy technologies**

- Is able to explain the flow of energy from generation through distribution to the customer
- Is able to explain the role of regulators and unions in the industry
- Demonstrates an awareness of alternative and renewable energy technologies, including geothermal energy, solar energy, wind energy, water energy and biofuel

3. **Environmental Laws and Regulations: Compliance with relevant local, state, and federal environmental laws and regulations that impact the energy industry**

- Demonstrates professional responsibility for maintaining all policies and standards for health, safety and the environment
- Complies with all relevant environmental laws issued by federal agencies, including EPA
- Follows energy standards produced by industry organizations, such as ANSI, API, NACE, and NFPA
- Identifies appropriate jurisdiction for local, state, and federal regulatory agencies as they pertain to the energy industry.
- Maintains current knowledge of regulatory procedures governing operations

4. **Quality Control/Continuous Improvement: Demonstrates the ability to design, analyze and effectively use systems, components and methods with a framework of quality and continuous improvement**

- Conducts tests and inspections of products, services or processes to evaluate quality or performance
- Incorporates new information into both current and future problem solving and decision making
- Monitors/assesses performance of self, other individuals or organizations to make improvements or take corrective action
- Determines how a system should work and how changes in conditions, operations and the environment will affect outcomes
- Uses logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or

approaches to problems

5. Troubleshooting: Diagnoses and corrects abnormalities and malfunctions in equipment and production processes

- Monitors equipment to ensure maintenance schedules are adhered to
- Demonstrates 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
- Determines causes of operating errors, decides what to do about them and knows when to notify more senior personnel

Tier 5: Industry-Specific Technical Competencies | Energy Generation, Transmission and Distribution

INDUSTRY-SECTOR TECHNICAL COMPETENCIES | ENERGY GENERATION, TRANSMISSION AND DISTRIBUTION

1. Non-Nuclear Generation: Technical skills and knowledge necessary for gas, oil, coal or hydro power plant personnel

Electrical Science:

- Explains and uses the fundamental concepts associated with electricity (e.g., electric charge, electric current).
- Explains the components of electrical systems including switchyard construction, transformers, relays, circuit breakers, motors
- Explains the differences and similarities of power generation, including use of different fuel types, different plant uses (i.e., peaking, load following)

Equipment Operation, Maintenance and Repair:

- Complies with the procedures necessary to ensure a safe and healthy work environment
- Operates, repairs and tests machines, devices and equipment based on electrical or mechanical principles in order to diagnose machine malfunctions
- Operates basic hand and small electric tools and equipment
- Conducts tests and inspections of products, services or processes to evaluate quality or performance
- Determines the kind of tools and equipment needed to do a job
- Watches 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 including engineering drawings, diagrams and schematics - documentation diagrams, single line diagrams

Problem Solving and Decision Making:

- Observes, obtains and analyzes information to identify and solve problems
- Diagnoses malfunctioning systems apparatus and components using test equipment and hand tools to locate the cause of a breakdown and correct the problem
- Uses computers to enter and analyze data and provide reports to supervision

Teamwork:

- Displays a good natured cooperative attitude with crew members on the job
- Maintains composure controlling anger and avoiding aggressive behavior

2. Nuclear Generation: Technical skills and knowledge necessary for nuclear power plant personnel

Electrical Science:

- Explains and uses the fundamental concepts associated with electricity (e.g., electric charge, electric current).
- Understands the components of electrical systems including switchyard construction, transformers, relays, circuit breakers, motors

Reactor Theory and Operations:

- Explains the general design overview of the basic reactor types
- Demonstrates understanding of reactor startup and shutdown procedures
- Explains the fission process including the construction of fission product barriers

Operations and Repair:

- Complies with the procedures necessary to ensure a safe and healthy work environment

- Operates, repairs and tests machines, devices and equipment based on electrical or mechanical principles in order to diagnose machine malfunctions
- Operates basic hand and small electric tools and equipment
- Conducts tests and inspections of products, services or processes to evaluate quality or performance
- Determines the kind of tools and equipment needed to do a job
- Watches 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 including engineering drawings, diagrams and schematics - documentation diagrams, single line diagrams

Additional Academic Requirements:

- Physics – Explains and uses 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 - Explains 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
- Chemistry – Explains the chemistry terms, units, definitions and basic concepts and applies 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
- Mathematics – Has experience and knowledge in scientific notation, dimensional analysis, geometry, trigonometry, graphs and control charts, relational charts, exponents and logarithms and basic statistics

3. *Electric Transmission and Distribution: Knowledge and skills necessary for the transmission and distribution of electricity from the power plant to the end customer*

Electrical Science:

- Explains and uses the fundamental concepts associated with electricity (e.g., electric charge, electric current).
- Understands the components of electrical systems including but not limited to substations, transformers, relays, circuit breakers, motors, transmission facilities, and distribution facilities (i.e. regulators, capacitors, reclosers).

Operations and Repair:

- Complies with the procedures necessary to ensure a safe and healthy work environment
- Is able to climb poles and towers
- Constructs new electrical distribution and transmission systems including setting poles, installing conduit, cable, wire and related equipment such as transformers, circuit breakers and switches
- Maintains and repairs electrical distribution and transmission systems, including conduits, cables, wires and related equipment such as transformers, circuit breakers and switches
- Inspects and tests power lines and auxiliary equipment to locate and identify problems, using reading and testing instruments
- Is able to read, interpret and create basic prints used in the design, operation and maintenance of electrical networks including engineering drawings, diagrams and schematics - documentation diagrams, single line diagrams.

Teamwork:

- Displays a good natured cooperative attitude with crew members on the job
- Maintains composure controlling anger and avoiding aggressive behavior

Customer Focus:

- Interacts directly with the public listening to and understanding customer needs and concerns
- Knows when to contact the person in charge to resolve a customer issue
- Keeps the public informed of work and disruptions

4. *Gas Transmission and Distribution: Knowledge and skills necessary for the transmission and distribution of natural gas from the refinery to the end customer*

Fundamentals of Natural Gas:

- Understands and applies the fundamental concepts of natural gas
- Understands the components and workings of the gas transmission and distribution network, including metering and regulating stations

Operations and Repair:

- Complies with the procedures necessary to ensure a safe and healthy work environment
- Lays out, assembles, installs and maintains pipe systems and pipe supports for use in the transmission and distribution of natural gas
- Reads, understands and creates basic prints used in the design, operation and maintenance of gas networks including engineering drawings, diagrams and schematics
- Selects pipe sizes and types and related materials, such as supports, hangers and hydraulic cylinders according to specification
- Assembles and secures pipes, tubes, fittings and related equipment according to specification by welding, brazing cementing, soldering or threading joints
- Inspects, examines and tests installed systems and pipe lines using pressure gauges, hydrostatic testing, observation and other methods
- Digs trenches to desired or required depths by hand or using trenching tools
- Grades and levels trench bases using tamping machines or hand tools

Customer Focus:

- Interacts directly with the public listening to and understanding customer needs and determining how to address them
- Keeps the public informed of work and disruptions

Tier 6 Industry-Specific Job Specific Competencies | Energy Generation, Transmission and Distribution

INDUSTRY-SECTOR JOB SPECIFIC COMPETENCIES | ENERGY GENERATION, TRANSMISSION AND DISTRIBUTION

The following are available references or resources that focus on the competencies required for specific jobs in the energy industry. These jobs include power plant operator, mechanical and electrical technicians, welders, line workers and pipefitters and pipe layers.