

National Occupational Standard Power System Operator

Electricity Human Resources Canada is a non-profit organization supporting the human resources needs of the Canadian electricity sector.

Our Vision

Keeping the lights on in Canada by preparing and empowering a world-class workforce for the entire electricity industry.

Our Mission

Working to strengthen the ability of the Canadian electricity industry in meeting current and future needs for their workforce—one that is safety-focused, highly skilled, diverse and productive.

Our Values

We are a values-driven organization, committed to the improvement of our sector, the growth of Canada's economy, and the stability of our power grid. Our core values are:

Collaboration

Working with all stakeholders in Canada's electricity sector for our mutual benefit.

Trust

Forging relationships and products built on unwavering integrity.

Innovation

Leading the industry to be future-ready.

National Occupational Standards (NOS)

NOS are voluntary guidelines that have been developed to provide businesses, educators, trainers, and job seekers with practical guidance.

How are NOS used?

Employers, employees, and educational institutions can put NOS to a wide variety of uses supporting effective workforce planning:

- Support personnel certification or accreditation programs.
- Inform curricula for colleges and apprenticeships.
- Assist recruitment by informing job descriptions and providing a benchmark for employee appraisals.
- Identify career paths in order to promote employee retention.
- Help employers evaluate and determine the competencies of potential employees, including Internationally Trained Workers (ITWs).

Electricity Human Resources Canada has developed National Occupational Standards for a range of in-demand occupations.

Visit electricityhr.ca for more information.

Key Terms within the National Occupational Standard:

Major Category	A general functional area within the industry
Competency Area	A specific area of responsibility within a Major Category
Competency Unit	A specific task that contains a description of the knowledge and performance components that are needed for successful, safe and effective completion

Each Competency within the National Occupational Standard is made up of (some or all of) the following elements:

- **Purpose:** A statement that describes what the competency is, and why it is important.
- **Performance:** What a job incumbent must be able to do to perform the competency.
- **Knowledge:** What a job incumbent must know to perform the competency.
- **Glossary:** Definitions for key terms used in the competency.
- **Range of Context:** Specific variables or situations that may impact the way that the competency is performed.
- **Level of Practice:** The level of job incumbent that typically performs the competency.
- **Adapted Bloom's Taxonomy:** The level of cognitive performance required for the competency (of particular interest to trainers/educators).
- **RWATEM:** The Requisite Work Aids, Tools, Equipment and Materials used by job incumbents to perform the competency.

Chart of Competency: Power System Operator

This Chart outlines the competencies (also known as skills and knowledge) that are performed by Power System Operators.

Occupational Definition:

Power System Operators work in control centres to ensure the safe, reliable and efficient operation of the transmission and distribution system through the use of specialized tools and software.

Major Category	Competency Area	Competency Unit					
Transmission and Distribution	Operate Transmission System	Control transmission system	Complete transmission switching				
	Balance Energy in System	Balance load generation and interconnections	Monitor generation and interconnections for balancing area	Dispatch generation	Confirm electrical energy transactions		
	Operate Distribution System	Control distribution system	Monitor reliability of distribution system	Complete distribution switching	Coordinate distribution system operations with connecting systems	Manage distributed energy resources	Provide customer service
	Respond to Energy Emergencies	Respond to energy emergencies					
Safety	Maintain a Safe Working Environment	Follow safe work practices	Participate in safety meetings and emergency drills	Isolate component, equipment or system	Perform lock-out tag-out procedures		
		Use fall arrest equipment					
	Maintain a Sustainable Environment	Follow sustainable work practices					
	Respond to Emergencies	Respond to non-electrical emergencies	Participate in incident and accident investigations				
Security	Follow Security Practices	Follow security practices for physical work environment	Follow cybersecurity procedures				
Organizational Policies and Procedures	Follow Organizational Policies and Procedures	Follow organizational policies and procedures					
Information/Record Management	Complete Information/Record Management Tasks	Maintain technical information and data	Use information/ record management system for generation, transmission and distribution operations				
Information and Communication Technology Foundations	Use Digital Technology	Use communication applications	Use common software applications	Use navigation and mapping applications	Use digital mobile radios		
	Use Organization's ICT System	Use organization's ICT system					
Personal Competencies	Demonstrate Professionalism	Work as a member of a team	Develop professionally	Demonstrate professional and ethical conduct	Mentor/coach others	Manage stress	Manage time
	Communicate Effectively	Use active listening skills	Use speaking skills	Use writing skills	Negotiate with internal and external stakeholders	Conduct meetings and presentations	Exchange information with internal and external stakeholders

Purpose

Controlling the transmission of power in the network is essential to the safe, reliable operation of the bulk electric system in a constantly changing environment that includes challenges due to weather, peak demand times and unplanned events. The priorities of controlling the transmission system are ensuring that energy flows safely, efficiently, economically and goes where it is supposed to.

Performance/Abilities

- P1** Monitor status of equipment, i.e. open or closed, in-service or out-of-service:
- detect equipment failures, line disturbances and outages
- P2** Monitor transfer flows:
- ensure transfer flows are within prescribed limits, e.g. IROL, thermal, stability
 - adjust flows to respect operating limits and schedule changes, e.g. generation re-dispatch, transmission loading relief (TLR), market transactions, transmission reconfiguration
 - monitor congestion
- P3** Monitor voltage profile:
- ensure transmission voltages are within prescribed limits
 - adjust system voltage profile using available reactive resources, e.g. capacitors, reactors, generators
- P4** Coordinate transmission facility outages:
- assess impact of planned and unplanned outages in real time
 - maintain reliable operation of bulk electric system for current day and next day
- P5** Monitor generation dispatch plan over current day and next day:
- coordinate with balancing authority and generation operators connected to control area, as appropriate
- P6** Monitor system frequency:
- ensure frequency is within prescribed limits
 - adjust frequency, when applicable, e.g. time-error correction, area control error (ACE), direct generation control (DGC)
- P7** Conduct contingency analysis:
- identify impact of respected contingencies, e.g. load loss, operating limits
 - plan responses to respected contingencies
 - mitigate negative impacts of contingencies, when possible
 - respond to contingencies as they occur
 - direct transmission switching
- P8** Respond to alarms:
- investigate cause and validity
 - take appropriate corrective action
- P9** Record information:
- update documentation, e.g. switching orders, switch planning sheets, shift-transfer sheets, operations log
 - maintain technical information and data, e.g. update systems status log and system condition log
 - share information as required to other departments, e.g. utility mapping department, design department, planning department

Knowledge

- K1** Reliability criteria and standards of local, regional and continental bodies, e.g. North American Electric Reliability Corporation (NERC)
- K2** Safe work practices, e.g. safe isolation of substation equipment, grounding methods, fault current protection for substations, lockout/tagout
- K3** Communication protocols, e.g. three-way communication
- K4** Principles of electricity and power transmission, e.g. voltage, circuits, amperages, electrical power flow
- K5** System nomenclature, e.g. switching, capacitor banks, static VAR compensator (SVC)
- K6** Digital documentation, e.g. single-line diagrams, schematics, symbols, transmission maps
- K7** Information/record management system
- K8** Types of monitoring equipment, e.g. protection relays, phase monitoring units, thermal line sensors
- K9** Energy management system and integrated applications, e.g. SCADA, RTCA, alarm management, displays, communication
- K10** Components of transmission system, e.g. structural frames, conductor lines, cables, transformers, circuit breakers, switches, monitoring equipment and substations
- K11** Parameters monitored in power grid, e.g. rate and direction of power flow, stability, temperature of hot power lines
- K12** Importance of situational awareness
- K13** Load and generation rejection schemes
- K14** Location and connectivity of transmission networks and distribution lines
- K15** Impact of different types of environmental conditions on grid components and performance, e.g. lightning, heavy rain, wind, extreme heat
- K16** System status, e.g. planned facility outages (generation or transmission) and unplanned facility outages that could impact reliability
- K17** Seasonal ratings of transmission lines
- K18** Acceptable limits for delivery point voltage and frequency
- K19** Interchange reliability operating limits (IROLs)
- K20** Transmission loading relief (TLR) procedures, e.g. parallel flows
- K21** System operating limitations due to:
- system configurations
 - different voltage levels
 - delivery point voltage and frequency
 - contractual
 - maintenance outages
 - unplanned outages

Glossary

- **Contingency plan:** acceptable alternative system arrangements that could be used to serve customers during planned and unplanned events.
- **Electric power grid:** a system of synchronized power providers and consumers connected by transmission and distribution lines and operated by one or more control centers.
- **Interchange reliability operating limits (IROLs):** a system operating limit which, if exceeded, could lead to instability, uncontrolled separation, or cascading outages that adversely impact the reliability of the bulk electric system.
- **Energy management system (EMS):** a collective suite of applications that allows operators to plan, monitor and control electricity generation, transmission and distribution.
- **Load:** the power consumed by a device or a circuit; also describes the total of all electricity consumers in a power system.
- **Load rejection scheme:** in an electric power system is the condition in which there is a sudden load loss in the system which causes the generating equipment to be over-frequency.

- **Load shedding (aka Load Reduction):** is a controlled option to respond to unplanned events to protect the electricity power system from a total blackout.
- **North American Electric Reliability Corporation (NERC):** a not-for-profit international regulatory authority whose mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid.
- **Power quality:** degree to which power supplied by a utility conforms to “pure” sinusoidal waveforms of exactly 60 cycles per second-60 Hz.
- **Reactive power:** a by-product of alternating current; the portion of electricity that establishes and sustains the electric and magnetic fields of alternating-current equipment.
- **Reliability:** a measure of the ability of a system to continue operation and satisfy customer demand even when unexpected equipment failures or other conditions reduce the amount of available power supply; reliability of the bulk electric system is based on its ability to continuously balance electricity supply and demand in real time.
- **Real Time Contingency Analysis (RTCA):** an application used to predict electrical system conditions after simulating specific contingencies (e.g. different types of equipment failures in area and neighboring areas) every few minutes; it alerts operators to potential distribution system problems sooner, which allows them more time to take preventive actions to ensure reliability.
- **Supervisory control and data acquisition (SCADA) system:** a process automation system consisting of software and programmable logic controllers (PLCs) that collects data from instruments and sensors in remote locations (e.g. substations) and transmits it to a control centre for monitoring or controlling purposes.
- **Special protection system (SPS):** an automatic protection system designed to detect abnormal or predetermined system conditions and take corrective actions other than or in addition to the isolation of faulted components to maintain system stability, acceptable voltage and power flows.
- **System operating limits (SOLs):** the value (expressed in MW, MVar, MVA, A, Hz or kV) assigned to a specified system configuration that satisfies the most limiting of the following ratings and limits, both pre- and post-contingency:
 - equipment or facility ratings
 - transient stability limits
 - voltage stability limits
 - system voltage limits

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Digital documentation, e.g. single-line diagrams, schematics, symbols, transmission maps
- Monitoring equipment, e.g. protection relays, phase monitoring units, thermal line sensors
- Emergency management system applications, e.g. Real Time Contingency Analysis (RTCA), alarm management
- Energy management system and integrated applications, for example:
 - Advanced metering infrastructure (AMI)
 - Outage management system (OMS)
 - Interchange distribution calculator (IDC)
 - Real-time contingency analysis (RTCA)
 - Supervisory control and data acquisition (SCADA) system
 - Load flow software
- Communications devices and system, e.g. phones, two-way radios, websites

Contextual Variables

Range of Context

- Work is typically done in a 24/7 environment.
- NERC certification for transmission operations (TOP) is required for performing all transmission operations. NERC certification for reliability and balancing/interchange may also be required for operators who perform these functions within their respective control centres.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom’s Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

Major Category

Transmission and Distribution

Competency Area

Operate Transmission System

Competency Unit

Complete transmission switching

Purpose

Transmission lines are switched in and out of the network to maximize economic efficiency of generation dispatch on a bulk electric network. Utilities control the flow of power under normal and emergency conditions through the use of switching and protection equipment at strategic points on the grid to avoid disruptions in service. Switching may be required to protect equipment or to maintain system reliability. Transmission switching also allows maintenance work to be carried out and system enhancements done to allow improved reliability and load growth.

Performance/Abilities

- P1** Develop switching plan:
- specify permitting process
 - specify parties involved, e.g. neighboring utilities
 - specify communication process with field personnel, i.e. three-way communication
 - coordinate switching with system control center and/or other substations
 - calculate load currents
 - identify protection equipment
 - identify isolation points
 - identify system limitations, e.g. conduct simulation of switching plan to test outcomes
 - confirm switching plan has been verified
- P2** Coordinate switching plans/orders with engineers, planners, field personnel and neighbouring utilities:
- communicate intent and effects with stakeholders, e.g. post effects of outages on OASIS
 - provide or request required permissions and approvals
- P3** Adjust planned transmission facility outages in service area based on current transmission system conditions and unplanned events:
- assess own service area's contingency plans for unplanned events ranging from voltage coordination to full transmission system restoration
 - prepare to implement mitigation strategies as required
- P4** Conduct reliability analysis
- P5** Posture system, e.g. switch capacitor banks, adjust generation
- P6** Execute switching procedure:
- direct field personnel to complete switching procedure
 - execute remote commands
- P7** Monitor transmission facility outage plan and generation dispatch plan
- P8** Document details of switching activities in information/record management system:
- file and share as required
 - maintain technical information and data

Knowledge

- K1** Relevant legislation and standards, e.g. Canadian Standards Association (CSA) standards
- K2** Reliability criteria and standards of local, regional and continental bodies, e.g. North American Electric Reliability Corporation (NERC)

- K3** Standard operating procedures
- K4** Safe work practices, e.g. safe isolation of substation equipment, fault current protection for substations, lockout/tagout
- K5** Principles of electricity and transmission, e.g. voltage, circuits, amperages
- K6** Communication protocol, e.g. three-way communication
- K7** Required digital documents, e.g. single line diagrams
- K8** Information/record management system
- K9** Energy management system and integrated applications, e.g. SCADA, OASIS, displays, communications
- K10** Electrical switching and isolation procedures
- K11** Switching technologies for higher to middle voltages
- K12** Emergency restoration procedures
- K13** Required approvals and permissions
- K14** Equipment and system capabilities and limitations
- K15** Planned transmission facility outages
- K16** Protection equipment

Glossary

- **Open access same-time information system (OASIS):** a public, Internet-based system used for selling, buying and monitoring power transmission services in North America's bulk electrical system.
- **Transmission:** transmission lines and transmission substations operate at high voltage and carry large amounts of electricity from centralized generation plants to lower voltage distribution lines and substations that supply local areas. Transmission lines use poles or structures, have long wire spans between poles and usually traverse fairly straight paths across large distances. Typical transmission voltages include 345-kV and 115 kV and generally all are above 100 kV.
- **Subtransmission:** power lines that typically operate at a voltage of 34,000 to 70,000 volts and are generally below 100 kV.
- **Switching:** controlling the flow of power under normal and emergency conditions through the use of switching and protection equipment that can disconnect or connect a part of the electrical grid network at strategic points; switching is performed to allow for maintenance work, to maximize economic efficiency of generation dispatch, to control the flow of power under normal and emergency conditions, and to compensate for overloaded sections of the grid and shut down certain connections to prevent the spread of disturbances.

Contextual Variables

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Energy management system and integrated applications, e.g. SCADA, OASIS, displays, communications
- Communication devices, e.g. telephones
- Permitting software
- Digital documentation, e.g. single-line diagrams, schematics, symbols, transmission maps

Purpose

Balancing load, generation and interconnections ensures that energy is available to meet demand within the control area and that regulatory requirements are met for the safe, efficient and reliable flow of power.

Performance/Abilities

- P1** Monitor area control error (ACE)
- P2** Perform load forecasting
- P3** Create or approve generation schedule based on forecast, as applicable
- P4** Monitor status of bulk electric system tie lines (open or closed) in balancing authority (BA) area
- P5** Monitor real power flows, including interchange power transfers with other BA areas
- P6** Monitor frequency within the balancing authority area
- P7** Monitor status and capabilities of generators within BA area, e.g. online, offline, output and dispatch availability
- P8** Communicate with other operators, e.g. transmission operators, reliability coordinators, generator operators
- P9** Monitor resources (generators and interruptible loads):
 - develop action plans to ensure balance in real time up to and including shedding of load to maintain balance of generation to load within BA area, e.g. administer demand reponse plan, implement public appeal program
 - dispatch units to meet load
- P10** Monitor status of interchange schedule:
 - identify deviations from schedule and standard operating limits
 - track accumulated inadvertent energy, if deviations occur
- P11** Monitor units on automatic generation control (AGC):
 - adjust bandwidth, as appropriate
- P12** Operate inter- and intra-area interconnections
- P13** Perform generation re-dispatch
- P14** Monitor or control independent power producers (IPPs), if applicable, e.g. solar, energy storage, wind
- P15** Document balancing activities and changes to the system:
 - file and share information as required

Knowledge

- K1** Applicable legislation
- K2** Reliability criteria and standards of local, regional and continental bodies, including North American Electric Reliability Corporation (NERC)
- K3** Standard operating procedures
- K4** Interconnection operations and obligations
- K5** Control performance standards, i.e. CPS 1 and CPS 2, BAL-001
- K6** Principles of electricity and transmission, e.g. voltage, circuits, amperages
- K7** Communication protocols
- K8** Information/record management system

K9 Energy management system and integrated applications, e.g. SCADA, displays, communications

K10 Interchange plans

K11 Generation limitations and transmission constraints due to transmission system configurations, maintenance outages or unplanned line outages

Glossary

- **Area control error (ACE):** difference between the scheduled and actual generation within a control area on the power grid, taking frequency bias into account.
- **Automatic generation control (AGC):** regulates the transmission system's frequency and power interchange between control areas; if AGC signal is positive, indicates that control area is selling too much power or the frequency is too high; the solution is to reduce generation within control area and send "lower" command pulses to all generators; AGC typically sends appropriate command pulses to generators every 1-5 minutes.
- **Balancing authority (BA):** entities, often electric utilities, that have taken on the balancing responsibilities for a specific portion of the bulk electrical system (BES); balancing authorities ensure, in real time, that power system demand and supply are balanced which includes managing transfers of electricity with other balancing authorities; they must comply with reliability standards issued by the North American Electric Reliability Corporation (NERC) and other regulators.
- **Control Performance Standards (CPS):** are indices for evaluating a balancing area's frequency control performance in an interconnected system. They are important for quantifying the frequency control performance of the interconnected system and the relative distribution of frequency control responsibility frequency control among areas.
- **Inadvertent energy:** difference between the scheduled amount of power to be received and the actual power received from other power transmission operations through interconnections, e.g. if own operating system is not generating enough power then it will automatically draw power from neighbouring system.
- **Interconnection (aka interchange):** a component/asset that joins local electricity grids to one another to form larger networks for reliability and commercial purposes; interconnections provide multiple routes for power to flow and allow generators to supply electricity to many load centers.
- **Load:** the power consumed by a device or a circuit; also describes the total of all electricity consumers in a power system.
- **North American Electric Reliability Corporation (NERC):** a not-for-profit international regulatory authority whose mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid.
- **Power quality:** degree to which power supplied by a utility conforms to "pure" sinusoidal waveforms of exactly 60 cycles per second-60 Hz.
- **Re-dispatch:** refers to a short-term change in how a power plant is utilized. This request comes at the behest of a transmission system operator to prevent bottlenecks in the grid.
- **Real power (aka true power):** actual amount of power being used, or dissipated, in a circuit; measured in watts.

Contextual Variables

Range of Context

- Monitoring load, generation and interconnections requires constant monitoring and response by the operator in a 24/7 work environment.
- The increase of renewable energy resources within the balancing area increases the complexity of balancing the system due to their varying generating output, and thereby increasing the critical thinking skills needed of operators.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Energy management system and integrated applications, e.g. SCADA, displays, communications
- Balancing transaction software, e.g. webTrans, OATI
- Communication devices, e.g. telephones

Major Category

Transmission and Distribution

Competency Area

Balance Energy in System

Competency Unit

Monitor generation and interconnections for balancing area

Purpose

The purpose of monitoring generation and interconnections for the balancing area is to ensure that generation and load are balanced, the schedule is not violating limits and operating reserve requirements are met.

Performance/Abilities

- P1** Monitor status and output of generators
- P2** Allow system to maintain scheduled flow on all tie lines between jurisdictions:
 - monitor data that indicates whether generation is sufficient to meet load and schedules
 - monitor data that indicates whether on or off schedule and causing inadvertent energy flow
 - adjust system as necessary to keep area control error (ACE) within balancing authority (BA) limits
 - adjust system as necessary to keep system balanced
 - adjust system as necessary to avoid impacting neighbours and other operating areas
- P3** Create or approve plans to ensure meeting operational reserves and schedules:
 - maintain operational reserves, e.g. dispatch generation, interruptible load, reserve sharing
- P4** Monitor current status of bulk electric system tie lines (open or closed) in own service area
- P5** Monitor real power flows, including interchange power transfers with other BA areas
- P6** Monitor availability of generating operating reserves in real time
- P7** Monitor status of applicable electricity management system applications such as real time contingency analysis and/or alarm management
- P8** Monitor resources (generators and interruptible loads):
 - ensure balance in real time up to and including shedding of load
 - maintain balance of generation to load within own service area
 - reduce voltage at deficient areas to reduce system stress and reduce loads
 - coordinate with power generation operators when units are coming online or offline, or when there is a need to adjust loads
- P9** Monitor weather forecasts:
 - identify potential impacts to generation dispatch plan for current day and next day
- P10** Monitor real-time and forecasted generation levels:
 - initiate appropriate energy emergency alerts when reserve levels are below required minimums compared to loads
- P11** Communicate with other operators, e.g. transmission operators, reliability coordinators, generator operators

Knowledge

- K1** Reliability criteria and standards of local, regional and continental bodies, e.g. North American Electric Reliability Corporation (NERC)
- K2** Standard operating procedures (SOPs)
- K3** Communication protocols, e.g. three-way communication
- K4** Principles of electricity and transmission, e.g. voltage, circuits, amperages
- K5** Electricity management system applications, e.g. real time contingency analysis (RTCA), alarm management

- K6** Generation limitations and transmission constraints due to transmission system configurations, maintenance outages or unplanned line outages
- K7** Standard operating limits

Glossary

- **Inadvertent energy:** difference between the scheduled amount of power to be received and the actual power received from other power transmission operations through interconnections, e.g. if own operating system is not generating enough power then it will automatically draw power from neighbouring system.
- **Energy schedule (aka interchange schedule):** a statement of the pricing format of electricity and the terms and conditions governing its application.
- **Interconnection:** a component/asset that joins local electricity grids to one another to form larger networks for reliability and commercial purposes; interconnections provide multiple routes for power to flow and allow generators to supply electricity to many load centers.
- **Load shedding (aka Load Reduction):** is a controlled option to respond to unplanned events to protect the electricity power system from a total blackout.
- **Operating reserve (aka energy reserves):** extra power in form of generation or demand reduction that allows utilities to manage situations where actual demand is greater than forecast and/or unexpected generation reduction.
- **Real time contingency analysis (RTCA):** an application used to predict electrical system conditions after simulating specific contingencies (e.g. different types of equipment failures in area and neighboring areas) every few minutes; it alerts operators to potential distribution system problems sooner, which allows them more time to take preventive actions to ensure reliability.
- **Standard operating limits:** the value (such as MW, MVar, Amperes, Frequency or Volts) that satisfies the most limiting (emphasis added) of the prescribed operating criteria for a specified system configuration to ensure operation within acceptable reliability criteria.
- **Tie lines:** are circuits that connects two or more balancing authorities or transmission zones of an electric system.

Contextual Variables

Level of Practice

- Frontline
- Supervisor
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Adapted Bloom's Taxonomy

- Recall, Remember
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- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Electricity management system applications, e.g. real time contingency analysis (RTCA), alarm management
- Balancing transaction software, e.g. webTrans, OATI
- Communication devices, e.g. telephones

Major Category

Transmission and Distribution

Competency Area

Balance Energy in System

Competency Unit

Dispatch generation

Purpose

Dispatching ensures the network has generated enough power to meet demand and reserve requirements for real time and next day's needs.

Performance/Abilities

- P1** Create or approve generation dispatch plan
- P2** Follow generation dispatch plan's forecasted load for real time and next day:
 - regulate reserves to meet generating operating reserve requirements
 - adjust dispatch plan to meet load profile based on varying factors, as needed, e.g. reliability, contracts, costs
 - monitor generation dispatch levels based on real time system conditions
 - identify generation constraints, e.g. derating
 - reassess generation dispatch plan based on loss of generation or transmission resources
- P3** Dispatch generation using data obtained from instruments or computers:
 - monitor status of flow, circuits and connections
 - monitor special protection systems (SPS)
 - manage real power
 - maintain acceptable voltage profile, as required
 - keep line flows within limits, e.g. ratings, stability, voltage
- P4** Initiate alerts when reserve levels are below required minimums, e.g. emergency energy alerts
- P5** Communicate with other stakeholders, e.g. operators, marketers:
 - follow NERC Reliability Coordinator Standards of Conduct when sharing information
 - use most efficient mode of communication, e.g. discuss adjustments on phone
- P6** Document details of dispatching activities:
 - use information/record management system
 - file and share information as required

Knowledge

- K1** Reliability criteria and standards of local, regional and continental bodies, e.g. North American Electric Reliability Corporation (NERC)
- K2** NERC Reliability Coordinator Standards of Conduct
- K3** Procedure for mitigating loss of organization's largest generating resource
- K4** Principles of electricity and transmission, e.g. voltage, circuits, amperages
- K5** Energy management system and integrated applications, e.g. supervisory control and data acquisition (SCADA), communications system, real-time contingency analysis (RTCA), alarm management
- K6** Generation limitations and transmission constraints due to transmission system configurations, maintenance outages and unplanned line outages
- K7** Reserves available to replace loss of generating resources in real time
- K8** Real time dispatch plan

Glossary

- **Derating:** operating a system or component below its normal operating limit to increase average strength, decrease average stress and decrease stress variation; derating extends components' life and enhances reliability; commonly done where operating temperatures are high.
- **Dispatch plan:** a plan for the distribution of power from one or more generation units based on the units' capabilities and contract requirements.
- **Open Access Same-time Information System (OASIS):** a public, Internet-based system used for selling, buying and monitoring power transmission services in North America's bulk electrical system.
- **Real power (aka true power):** actual amount of power being used, or dissipated, in a circuit; measured in watts.
- **Special Protection System:** an automatic protection system designed to detect abnormal or predetermined system conditions and take corrective actions other than or in addition to the isolation of faulted components to maintain system stability, acceptable voltage and power flows.

Contextual Variables

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Energy management system and integrated applications, e.g. supervisory control and data acquisition (SCADA), communications system, real-time contingency analysis (RTCA), alarm management
- Communication devices, e.g. telephone
- Real time dispatch plan

Major Category

Transmission and Distribution

Competency Area

Balance Energy in System

Competency Unit

Confirm electrical energy transactions

Purpose

Confirming electrical energy transactions allows the scheduling of power flow between different balancing authority (BA) areas.

Performance/Abilities

- P1** Monitor transmission reservations, if applicable
- P2** Manage e-tags and energy transaction schedules:
 - create, approve, deny or curtail e-tags as appropriate
 - implement energy schedules
- P3** Request or implement emergency energy, if needed
- P4** Schedule or implement energy reserves for emergencies
- P5** Record transactions:
 - share data with appropriate parties
 - file information, as required

Knowledge

- K1** Reliability criteria and standards of local, regional and continental bodies, e.g. North American Electric Reliability Corporation (NERC)
- K2** Principles of electricity and transmission, e.g. voltage, circuits, amperages
- K3** E-tagging procedures
- K4** Energy transaction schedules
- K5** Energy reserve requirements

Glossary

- **E-tag (aka NERC tag):** registration of electricity market transactions performed by software systems; contributes to system reliability; e-tags also allow transactions to be metered.
- **Constrained economic dispatch (aka economic load dispatch):** economic scheduling of power generating units to guarantee the optimum combination of units connected to the system to supply the load demand.
- **Energy schedule:** a statement of the pricing format of electricity and the terms and conditions governing its application.
- **Energy reserves:** estimated quantity of energy source (such as coal, gas, or oil) known with reasonable certainty to exist, and which can be recovered with presently available technology at an economically viable cost.
- **Transmission reservations (aka Transmission Service Request):** is an application requesting a transmission-owning utility to allocate physical capacity in the form of Transmission Service Rights (TSRs) for the transmission of electric power.

Contextual Variables

Range of Context

- Organizational software used for energy transactions will vary, e.g. eTags, proprietary software and applications.
- Industry is moving toward a 15-minute schedule as opposed to the standard 1-hour schedule, creating increased workload for the operator.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Organizational software used for energy transactions, e.g. eTags, proprietary software and applications
- Communications devices, e.g. telephone
- Transaction software, e.g. webTrans, OATI

Major Category

Transmission and Distribution

Competency Area

Operate Distribution System

Competency Unit

Control distribution system

Purpose

Monitoring and controlling electrical power in distribution networks is essential to the delivery of quality and reliable power to industrial, commercial and residential customers. Controlling distribution ensures that energy flows safely, efficiently, economically and goes where it is supposed to.

Performance/Abilities

- P1** Monitor status of distribution system
- P2** Monitor factors that can affect distribution system status, e.g. weather, planned outages
- P3** Compare status and future possibilities (i.e. perform contingency analysis) to system capabilities and limitation, for example:
 - distribution ratings
 - load limits
 - contractual limits
 - voltage limits/constraints
- P4** Coordinate system operations through appropriate ongoing communications with others, for example:
 - operations and maintenance teams, e.g. operational engineering, line crews, trouble trucks
 - other utilities, regional electricity authority (REAs), independent power producers (IPP) and major customer interfaces, transmission utilities
 - customers, e.g. no-power calls, estimated time of restoration
 - first-responders, e.g. police and fire calls
- P5** Control system:
 - respond to planned and unplanned outages
 - maintain line flows within limits
 - adjust equipment settings, e.g. regulators, switches, transformers
 - respond to metering values, e.g. voltage, amps, megawatts
 - use load flow software system to identify loading, system and equipment constraints
 - respond to load flow analysis
 - implement requests from transmission operators, e.g. load shed, device operation, load restoration
 - monitor load, generation, and interconnections
 - operate feeder and load transfers according to regional and local reliability criteria
 - operate at appropriate voltage levels, i.e. maintain acceptable voltage profile
 - interact with protection systems and schemes for equipment, e.g. busses, transformers, lines
 - adjust equipment settings based on work processes, e.g. apply tags, disable feeder automation
- P6** Record information using digital management system, e.g. digital management system (DMS), systems status log (SSL), outage management system (OMS), SCADA system:
 - review voltage profiles and load profiles from SCADA system
 - update documentation, e.g. switching orders, switch planning sheets, shift-transfer sheets, customer outage information
 - maintain technical information and data, e.g. update systems status log, system condition log
 - share information with others as required, e.g. utility mapping department, design department

Knowledge

- K1** Relevant legislation, e.g. privacy regulations, occupational health and safety regulations
- K2** Local and regional reliability criteria and standards, e.g. voltage standards, operating limitations
- K3** Interconnection agreements
- K4** Standard operating procedures, e.g. work permit requirements, work protection/lockout, tagout procedures
- K5** Safe work practices, e.g. safe isolation of overhead and underground power lines and substation equipment, fault current protection for substations, lockout/tagout
- K6** Communication protocols, e.g. three-way communication
- K7** Digital documentation, e.g. single-line diagrams, schematics, symbols, distribution maps, geographical information systems (GIS)
- K8** Information/record management system, e.g. system status log, shift-transfer sheets
- K9** Energy management system and integrated applications, e.g. distribution management system (DMS), supervisory control and data acquisition (SCADA), communications system, real-time contingency analysis (RTCA)
- K10** Principles of electricity and power distribution, e.g. voltage, circuits, amperages, electrical power flow, how electricity is distributed from source to load
- K11** Types of distribution systems, i.e. overhead, underground (radial, loop, network)
- K12** Components of distribution system and their function, e.g. lines, substations, transformers, capacitors, circuit breakers, reclosers, substation batteries, fuses, poles, insulators, cables, duct systems, disconnects, switches
- K13** Parameters monitored in power grid, e.g. rate and direction of power flow, stability, temperature of hot power lines
- K14** Factors affecting power quality, e.g. voltage, frequency, amperage
- K15** System limitations and capabilities, e.g. delivery point voltage, fuse rating, cable ampacity, frequency, relay settings
- K16** Importance of situational awareness
- K17** Peak demand periods
- K18** Load shedding, e.g. automatic and manual load shedding
- K19** Distribution protection and control systems (e.g. line protective devices) and implications of compromising them
- K20** Causes of unplanned outages, e.g. lightning, high winds, faulty equipment, construction activities, trees
- K21** Appropriate responses to different types of situations which threaten to affect or do affect reliability of distribution system

Glossary

- **Distribution management system (DMS):** a collection of applications designed to monitor and control a distribution network in order to reduce outages, minimize outage time, and maintain acceptable frequency and voltage levels.
- **Distribution protection systems (DPS):** equipment used to protect distribution network including overcurrent relays, reclosers, sectionalizers and fuses; the main objectives of DPS are to minimize the duration of a fault and to minimize number of customers affected by a fault.
- **Distribution system:** distribution lines and substations that operate at lower voltage than transmission systems that feed them; they carry electricity from the transmission system to local customers; distribution systems typically operate in a voltage range of 4KV to 46KV.
- **Energy management system (EMS):** a collective suite of applications that allows operators to plan, monitor and control electricity generation, transmission and distribution.
- **Feeder:** line coming out of a substation.
- **Independent power producers (IPP) (aka non-utility generators):** private entities that build facilities to generate energy for the own use and as a revenue source by selling extra power to a utility, a central government buyer and/or end users.
- **Load rejection scheme:** recovery plan for sudden load loss which causes generating equipment to be over-frequency.
- **Major customer interfaces:** any customer that takes service at distribution primary voltages.
- **North American Electric Reliability Corporation (NERC):** a not-for-profit international regulatory authority

whose mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid.

- **Power quality:** degree to which power supplied by a utility conforms to “pure” sinusoidal waveforms of exactly 60 cycles per second-60 Hz.
- **Primary voltages:** distribution lines with voltages ranging from 2,300 to 39,000 volts; common primary voltages are 2,300, 4,160, 12,470 and 13,800.
- **Real-time contingency analysis (RTCA):** an application used to predict electrical system conditions after simulating specific contingencies (e.g. different types of equipment failures in area and neighboring areas) every few minutes; it alerts operators to potential distribution system problems sooner, which allows them more time to take preventive actions to ensure reliability.
- **Regional electricity authorities (REAs):** provincial entities in Canada with the authority to monitor and enforce NERC reliability standards.
- **Reliability:** a measure of the ability of a system to continue operation and satisfy customer demand even when unexpected equipment failures or other conditions reduce the amount of available power supply; reliability of the bulk electric system is based on its ability to continuously balance electricity supply and demand in real time.
- **Supervisory control and data acquisition (SCADA) system:** a process automation system consisting of software and programmable logic controllers (PLCs) that collects data from instruments and sensors in remote locations (e.g. substations) and transmits it to a control centre for monitoring or controlling purposes.

Contextual Variables

Range of Context

- Work is typically done in a 24/7 environment.
- Many systems operate with equipment that is not connected into SCADA and therefore requires operators to analyze information from multiple sources, e.g. field staff and customers.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom’s Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Digital documentation, e.g. single-line diagrams, schematics, symbols, distribution maps
- Standard Operating Procedures (SOPs)
- Communication devices and systems, e.g. mobile phones, two-way radio, websites
- Standards, e.g. live-line standards, 25 kV switching standards, worker protection code
- Energy management system and integrated applications, for example:
 - Advanced distribution management system (ADMS)
 - Advanced metering infrastructure (AMI)
 - Distribution management system (DMS)
 - Outage management system (OMS)
 - Real-time contingency analysis (RTCA)
 - Supervisory control and data acquisition (SCADA) system
 - Load flow software

Purpose

Monitoring the reliability of the distribution system is to minimize the frequency and duration of outages and thereby to provide commercial, industrial and residential users with a consistent power supply. This goal is important because users have crucial functions (e.g. heating, cooling, lighting, processing) that depend on electricity. In addition, power networks are highly integrated and a failure in one part of the system can cause service interruptions in other parts.

Performance/Abilities

- P1** Perform contingency analysis
- P2** Respond to situations with appropriate actions, for example:
- investigate abnormalities
 - request required switching plans and permits
 - direct appropriate authority to respond to outages, e.g. line crews
 - switch loads to other parts of system with care not to overload them
 - initiate remedial action including repair and replacement of systems as necessary
- P3** Use reporting system:
- maintain technical information and data, e.g. record operational data such as meter readings and power demands
 - provide accurate data to asset management team to assist their efforts to minimize frequency and duration of outages
- P4** Analyze response to planned and unplanned power outages with field staff to improve restoration practices

Knowledge

- K1** Relevant legislation
- K2** Reliability criteria and standards of local, regional and continental bodies, e.g. North American Electric Reliability Corporation (NERC)
- K3** Principles of electricity, e.g. voltage, circuits
- K4** Importance of situational awareness
- K5** Digital documentation, e.g. single-line diagrams, schematics, symbols, transmission maps
- K6** Energy management system and integrated applications, e.g. distribution management system (DMS), supervisory control and data acquisition (SCADA), communications system, real-time contingency analysis (RTCA), alarm management, displays
- K7** Parameters monitored in power grid, e.g. rate and direction of power flow, stability, temperature of hot power lines
- K8** System limitations and capabilities, e.g. delivery point voltage and frequency
- K9** System operating limits (SOLs) and interchange reliability operating limits (IROLs)
- K10** Causes of unplanned outages, e.g. lightning, high winds, faulty equipment, construction activities, trees
- K11** Distribution protection systems and implications of compromising them
- K12** Safe work practices, e.g. safe isolation of substation equipment, appropriate testing equipment, grounding methods, fault current protection for substations, lockout/tagout
- K13** Communication protocol, e.g. three-way communication
- K14** Reporting system

Glossary

- Contingency analysis:** determining alternative system arrangements that can be used to serve customers during planned and unplanned events; often performed using real time contingency analysis (RTCA) application.
- Distribution systems:** distribution lines and substations operate at lower voltage than the transmission systems that feed them; they carry electricity from the transmission system to local customers and typically operate in a voltage range of 4KV to 46KV.
- Distribution management system (DMS):** a collection of applications designed to monitor and control a distribution network in order to reduce outages, minimize outage time, and maintain acceptable frequency and voltage levels.
- Energy management system (EMS):** a collective suite of applications that allows operators to plan, monitor and control electricity generation, transmission and distribution.
- Reliability:** a measure of the ability of a system to continue operation and satisfy customer demand while under stress, e.g. lines or generators are out of service.
- Real time contingency analysis (RTCA):** an application used to predict electrical system conditions after simulating specific contingencies (e.g. different types of equipment failures in area and neighboring areas) every few minutes; it alerts operators to potential transmission system problems sooner, which allows them more time to take preventive actions to ensure reliability.
- SCADA (supervisory control and data acquisition) system:** a process automation system consisting of software and programmable logic controllers (PLCs) that collects data from instruments and sensors in remote locations (e.g. substations) and transmits it to a control centre for monitoring or controlling purposes.

Contextual Variables

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Digital documentation, e.g. single-line diagrams, schematics, symbols, transmission maps
- Energy management system and integrated applications, e.g. distribution management system (DMS), supervisory control and data acquisition (SCADA), communications system, real-time contingency analysis (RTCA), alarm management, displays

Purpose

Switching is carried out in distribution systems to allow for maintenance, construction, commissioning and restoration activities on lines and substations. Switching also protects substations against potential fault conditions and allows protective devices to be used for switching purposes. The key to successful switching is to do the right things, in the right order, with the devices that have the right capabilities.

Performance/Abilities

- P1** Prepare switching plan:
- use maps and drawings (e.g. within SCADA system) to confirm system status
 - identify circuits involved
 - identify system limitations, e.g. conduct simulation of switching plan to test outcomes
 - specify steps for substation switching operation, e.g. operate reclosers, switches and fused disconnects in sequence
 - specify steps required for restoration
 - ensure specific switching standards have been met
 - confirm switching plan has been verified
- P2** Communicate intent and effects with stakeholders, e.g. power station generators, major customers:
- use commonly accepted terms to ensure understanding of directions given and actions taken
 - avoid slang and casual conversation
- P3** Dispatch field crew
- P4** Conduct periodic communication checks with field crew to ensure reliable communication
- P5** Communicate with field crew throughout process, including when:
- crew is requesting permits and switching plans
 - dispatching crew
 - switch is being executed
 - responding to inadvertent outcomes
 - initial switch is completed
 - just before system is switched back to normal
 - after switching is completed and permits surrendered
- P6** Provide required permits and authorizations
- P7** Posture system, e.g. make tap adjustments
- P8** Execute switching procedure:
- follow safe work practices
 - use three-way communication
 - direct switching for isolation and restoration
 - operate equipment
 - apply virtual tags in energy management system (EMS)
 - respond to inadvertent events
- P9** Verify completion of switching operations
- P10** Document details of switching activities in information/record management system:
- file and share as required

- maintain technical information and data
- complete incident reports for unexpected events, human error

Knowledge

- K1** Relevant legislation and standards, e.g. Canadian Standards Association (CSA) standards, Occupational Health and Safety regulations
- K2** Local and regional reliability criteria and standards
- K3** Standard work protection code (WPC)
- K4** Standard operating procedures, e.g. work permits required
- K5** Safe work practices, e.g. safe isolation of substation equipment, appropriate testing equipment, grounding methods, fault current protection for substations, lockout/tagout
- K6** Principles of electricity and power distribution, e.g. voltage, circuits, amperages, electrical power flow, how electricity is distributed from source to load
- K7** Communication protocols, e.g. three-way communication
- K8** Digital documentation, e.g. single-line diagrams, schematics, symbols, distribution maps
- K9** Information/record management system
- K10** Energy management system and integrated applications, e.g. distribution management system (DMS), supervisory control and data acquisition (SCADA), communications system, real-time contingency analysis (RTCA), alarm management
- K11** Components of distribution system and their function, e.g. substations, lines, transformers, capacitors, circuit breakers, reclosers, substation batteries, fuses, poles, insulators, cables, duct systems, disconnects, switches
- K12** Switching procedure for middle to lower voltages, e.g. sequence for isolating, testing and inspection of substation breakers

Glossary

- **Distribution system:** distribution lines and substations that operate at lower voltage than transmission systems that feed them; they carry electricity from the transmission system to local customers; distribution systems typically operate in a voltage range of 4KV to 46KV.
- **Distribution management system (DMS):** a collection of applications designed to monitor and control a distribution network in order to reduce outages, minimize outage time, and maintain acceptable frequency and voltage levels.
- **Energy management system (EMS):** a collective suite of applications that allows operators to plan, monitor and control electricity generation, transmission and distribution.
- **Real-time contingency analysis (RCA):** an application used to predict electrical system conditions after simulating specific contingencies (e.g. different types of equipment failures in area and neighboring areas) every few minutes; it alerts operators to potential distribution system problems sooner, which allows them more time to take preventive actions to ensure reliability.
- **Stakeholders:** individuals and groups who are impacted by the activities or decisions of others; the individuals and groups could be within (internal) or outside (external) of the organization or project, e.g. co-workers, supervisors, contractors, customers, the public, government, union, shareholders.
- **Supervisory control and data acquisition (SCADA) system:** a process automation system consisting of software and programmable logic controllers (PLCs) that collects data from instruments and sensors in remote locations (e.g. substations) and transmits it to a control centre for monitoring or controlling purposes.
- **Three-way communication:** sharing a message in three steps: 1. sender states message, 2. receiver repeats message, 3. sender confirms that receiver has repeated message correctly or corrects any misunderstandings.

Contextual Variables

Range of Context

- Operators may control switching from the control centre or direct field worker through switching plan while tracking worker's progress on EMS screen.
- EMS may provide information to operators about whether proposed switching plan will work or not.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Digital documentation, e.g. single-line diagrams, schematics, symbols, distribution maps, standards
- Communication devices and systems, e.g. mobile phones, two-way radio, websites
- Energy management system and integrated applications, for example:
 - Advanced distribution management system (ADMS)
 - Advanced metering infrastructure (AMI)
 - Distribution management system (DMS)
 - Outage management system (OMS)
 - Real-time contingency analysis (RTCA)
 - Supervisory control and data acquisition (SCADA) system
 - Load flow software

Major Category

Transmission and Distribution

Competency Area

Operate Distribution System

Competency Unit

Coordinate distribution system operations with connecting systems

Purpose

Coordinating distribution operations with connecting systems allows utilities to meet customer demands, restore systems after outages, make repairs, and distribute power. Coordination among control centres overseeing connected service areas and shared elements (e.g. substation transformers) is essential as an event in one service area can impact one or many other service areas in the grid.

Performance/Abilities

- P1** Schedule station and substation power loads and line voltages:
 - coordinate activities with other entities to ensure system capacity, availability and stability
 - coordinate activities related to safe work permits, e.g. receive/give supporting guarantee, permissions or advice
- P2** Communicate with other control centres and field personnel:
 - communicate shared-outage information to increase overall system reliability
 - seek required work permits to make change in system, e.g. to take load off one substation and move to another, seek approval from transmission and substation control centres
 - if denied, change work permit to accommodate impacted service areas and elements:
 - identify contingencies, e.g. change date and time of work, increase load on another transformer
 - if approved, carry out system change as specified in permit
- P3** Continue communicating with other control centres and field workers until work permit tasks are completed:
 - use three-way communication
 - use commonly accepted terms to ensure understanding of directions given and actions taken
 - avoid slang and casual conversation

Knowledge

- K1** Local and regional reliability criteria and standards
- K2** Standard operating procedures, e.g. work permit requirements, lockout/tagout
- K3** Safe work practices, e.g. safe isolation of substation equipment, grounding methods, fault current protection for substations, lockout/tagout
- K4** Principles of electricity and power distribution, e.g. voltage, circuits, amperages, electrical power flow
- K5** System nomenclature, e.g. switching, capacitor banks, static VAR compensator (SVC)
- K6** Communication protocols
- K7** Information/record management system, e.g. system status log, shift-transfer sheets
- K8** Energy management system and integrated applications, e.g. distribution management system (DMS), supervisory control and data acquisition (SCADA), communications system, real-time contingency analysis (RTCA), alarm management
- K9** System limitations and capabilities, e.g. delivery point voltage, fuse rating, cable ampacity, frequency, relay settings
- K10** Distribution protection systems and implications of compromising them
- K11** Interconnection operations and obligations

Glossary

- **Distribution system:** distribution lines and substations that operate at lower voltage than transmission systems that feed them; they carry electricity from the transmission system to local customers; distribution systems typically operate in a voltage range of 4KV to 46KV.
- **Distribution management system (DMS):** a collection of applications designed to monitor and control a distribution network in order to reduce outages, minimize outage time, and maintain acceptable frequency and voltage levels.
- **Energy management system (EMS):** a collective suite of applications that allows operators to plan, monitor and control electricity generation, transmission and distribution.
- **Protection philosophies:** setting up a protection system so its performance is predictable using multiple methods, e.g. coordinated protection, fuse saving schemes, cable saving schemes.
- **Protective equipment:** equipment in a distribution system (e.g. protective relays, cutout switches, disconnect switches, lightning arresters, and fuses) that work in concert to open circuits whenever a circuit shorts, lightning strikes or another disruptive event occurs.
- **Real-time contingency analysis (RCTA):** an application used to predict electrical system conditions after simulating specific contingencies (e.g. different types of equipment failures in area and neighboring areas) every few minutes; it alerts operators to potential distribution system problems sooner, which allows them more time to take preventive actions to ensure reliability.
- **Three-way communication:** sharing a message in three steps: 1. sender states message, 2. receiver repeats message, 3. sender confirms that receiver has repeated message correctly or corrects any misunderstandings.

Contextual Variables

Range of Context

- Absence of operating agreements between connecting systems leads to a lack of direct communication between parties.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Digital documentation, e.g. single-line diagrams, schematics, symbols, distribution maps, standards
- Interconnection agreements
- Communication devices and systems, e.g. mobile phones, two-way radio, websites
- Energy management system and integrated applications, for example:
 - Advanced distribution management system (ADMS)
 - Advanced metering infrastructure (AMI)
 - Distribution management system (DMS)
 - Outage management system (OMS)
 - Real-time contingency analysis (RTCA)
 - Supervisory control and data acquisition (SCADA) system
 - Load flow software

Major Category

Transmission and Distribution

Competency Area

Operate Distribution System

Competency Unit

Manage distributed energy resources

Purpose

Distributed energy resources produce their own power, typically using renewable resources such as wind and sun that are inconsistent. These resources typically have varying levels of visibility on the system and therefore require monitoring, coordinating and specialized protection schemes to avoid equipment overloads and power quality issues.

Performance/Abilities

- P1** Ensure system is capable of handling distributed generation when it is available and capable of compensating for it when offline:
 - identify alternate feed scenarios when distributed energy resources are generating versus when not generating
 - monitor power draw or feed of distributed energy resources, if applicable
 - adjust system as needed, for example:
 - remove distributed energy resources while performing emergency or planned work
 - change regulator settings
 - adjust to multiple changes in direction of flow throughout day
- P2** Communicate outage requirements with distributed energy resource (DER) or transmission control centre (TCC)
- P3** Record changes made to system:
 - track information, as required
 - share data with appropriate parties

Knowledge

- K1** Relevant legislation and standards, e.g. operating limitations, voltage standards
- K2** Local and regional reliability criteria and standards
- K3** Safe work practices, e.g. safe isolation of substation equipment, grounding methods, fault current protection for substations, lockout/tagout
- K4** Principles of electricity and power distribution, e.g. voltage, circuits, amperages, electrical power flow
- K5** Communication protocols
- K6** Information/record management system, e.g. system status log, shift-transfer sheets
- K7** Digital documentation, e.g. single-line diagrams, schematics, symbols, distribution maps
- K8** Service/interconnection agreement between distributed energy resource and utility
- K9** Energy management system and integrated applications, e.g. advanced distribution management system (ADMS), distribution management system (DMS)
- K10** Characteristics of customer-owned distributed generation in service area, for example:
 - location
 - type of resource used
 - when active and not active
 - special protection schemes (SPS)
- K11** Impact of distributed generation on system

Glossary

- **Advanced distribution management system (ADMS):** is the software platform that supports the full suite of distribution management and optimization. An ADMS includes functions that automate outage restoration and optimize the performance of the distribution grid.
- **Advanced metering infrastructure (AMI):** is an integrated system of smart meters, communications networks, and data management systems that enables two-way communication between utilities and customers.
- **Distribution system:** distribution lines and substations that operate at lower voltage than transmission systems that feed them; they carry electricity from the transmission system to local customers; distribution systems typically operate in a voltage range of 4KV to 46KV.
- **Distribution management system (DMS):** a collection of applications designed to monitor and control a distribution network in order to reduce outages, minimize outage time, and maintain acceptable frequency and voltage levels.
- **Distributed energy resources (DER):** power generating equipment (e.g. solar panels, combined heat and power plants, small natural gas-fuelled generators) installed by private companies or citizens to offset their electricity costs or power reliability; typically DERs have smaller power generating capabilities than independent power producers.
- **Energy management system (EMS):** a collective suite of applications that allows operators to plan, monitor and control electricity generation, transmission and distribution.
- **Real-time contingency analysis (RCTA):** an application used to predict electrical system conditions after simulating specific contingencies (e.g. different types of equipment failures in area and neighboring areas) every few minutes; it alerts operators to potential distribution system problems sooner, which allows them more time to take preventive actions to ensure reliability.
- **Supervisory control and data acquisition (SCADA) system:** a process automation system consisting of software and programmable logic controllers (PLCs) that collects data from instruments and sensors in remote locations (e.g. substations) and transmits it to a control centre for monitoring or controlling purposes.

Contextual Variables

Range of Context

- The amount and capabilities of distributed energy resources will continue to increase and evolve, requiring operators to adapt to changing systems and practices for monitoring and controlling.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Digital documentation, e.g. single-line diagrams, schematics, symbols, distribution maps, standards
- Communication devices and systems, e.g. mobile phones, two-way radio, websites
- Energy management system and integrated applications, for example:
 - Advanced distribution management system (ADMS)
 - Advanced metering infrastructure (AMI)
 - Distribution management system (DMS)
 - Outage management system (OMS)
 - Real-time contingency analysis (RTCA)
 - Supervisory control and data acquisition (SCADA) system
 - Load flow software

Major Category

Transmission and Distribution

Competency Area

Operate Distribution System

Competency Unit

Provide customer service

Purpose

Along with safe, reliable and affordable power, distribution organizations strive to provide good customer service through courteous and timely communication and effective problem solving.

Performance/Abilities

- P1** Receive information about outages and hazards from customers:
 - take calls or review digital messages from customers reporting outages or hazards to system, e.g. overhanging tree
- P2** Obtain data from system or dispatch field staff to find problem:
 - assist with troubleshooting
- P3** Communicate with customers, for example:
 - send message through interactive voice response (IVR) system
 - select appropriate outage description within system
 - update outage map to reflect system outage location
 - update customers on action being taken for outage and estimated restoration time
- P4** Confirm with customers that problem is solved and power has been restored:
 - follow up with appropriate parties
 - if problem is not resolved, re-assess situation and continue troubleshooting
- P5** Document service issues and action taken:
 - communicate/file information, as required

Knowledge

- K1** Local and regional reliability criteria and standards, e.g. voltage standards, operating limitations
- K2** Factors affecting power quality, e.g. voltage, frequency, amperage
- K3** Communication protocol
- K4** Information/record management system
- K5** Digital documents, e.g. single-line diagrams, schematics, symbols, distribution maps
- K6** Energy management system and integrated applications, e.g. distribution management system (DMS), supervisory control and data acquisition (SCADA), communications system, real-time contingency analysis (RTCA), alarm management, displays
- K7** Impact of insufficient reliability and power quality on industrial, commercial and residential customers
- K8** Importance of customer service
- K9** Conflict resolution skills

Glossary

- **Distribution system:** distribution lines and substations that operate at lower voltage than transmission systems that feed them; they carry electricity from the transmission system to local customers; distribution systems typically operate in a voltage range of 4KV to 46KV.

- **Distribution management system (DMS):** a collection of applications designed to monitor and control a distribution network in order to reduce outages, minimize outage time, and maintain acceptable frequency and voltage levels.
- **Energy management system (EMS):** a collective suite of applications that allows operators to plan, monitor and control electricity generation, transmission and distribution.
- **Real-time contingency analysis (RCTA):** an application used to predict electrical system conditions after simulating specific contingencies (e.g. different types of equipment failures in area and neighboring areas) every few minutes; it alerts operators to potential distribution system problems sooner, which allows them more time to take preventive actions to ensure reliability.
- **Supervisory control and data acquisition (SCADA) system:** a process automation system consisting of software and programmable logic controllers (PLCs) that collects data from instruments and sensors in remote locations (e.g. substations) and transmits it to a control centre for monitoring or controlling purposes.

Contextual Variables

Range of Context

- Many distribution system operators do not have direct contact with customers, or may deal with customers during non-business hours only.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Digital documentation, e.g. single-line diagrams, schematics, symbols, distribution maps, standards
- Organizational policies and procedures, e.g. outage communication procedures
- Communication devices and systems, e.g. mobile phones, two-way radio, websites
- Energy management system and integrated applications, for example:
 - Advanced distribution management system (ADMS)
 - Advanced metering infrastructure (AMI)
 - Distribution management system (DMS)
 - Outage management system (OMS)
 - Real-time contingency analysis (RTCA)
 - Supervisory control and data acquisition (SCADA) system
 - Load flow software

Major Category

Transmission and Distribution

Competency Area

Respond to Energy Emergencies

Competency Unit

Respond to energy emergencies

Purpose

Transmission and distribution organizations are prepared to respond to energy emergencies to eliminate or minimize their negative impacts. They need to respond to any type of unplanned event to protect the safety of people and the environment, and to minimize damage to power grid assets.

Performance/Abilities

- P1** Identify energy emergencies, for example:
 - monitor SCADA and alarms, e.g. fault recorder, SER
 - receive calls from parties reporting abnormal conditions that could result in energy emergencies, e.g. first responders, generator operators, emergency response coordinators
- P2** Evaluate extent of energy emergency or disturbance
- P3** Communicate energy emergencies to relevant parties or appropriate authority (e.g. other operators, reliability coordinator, other balancing authority), for example:
 - maintain continuous communication throughout energy emergency response
 - coordinate incident command structure, if required
 - use communication devices and systems, e.g. telephone, messaging system/software
- P4** Coordinate efforts of field crew to restore service:
 - dispatch field crew and equipment for restoration, if applicable
 - direct maintenance and technical personnel to locate and isolate system problems
 - direct switching for isolation and restoration of system components
 - coordinate system operations and switching with other utilities, regional electricity authorities and independent power producers
 - analyze planned and unplanned outages with field crew to aid in restoration practices
- P5** Apply contingency and system restoration procedures to manage large-scale energy emergencies
- P6** Perform operating capacity shortfall procedures, including voltage reduction and load shedding
- P7** Monitor system for instability:
 - take corrective action to stabilize system, e.g. perform load shedding
- P8** Operate under islanded systems:
 - follow black start procedures
 - inform effected parties, e.g. distribution operators, generation operators
 - adjust to ensure reliability, power quality and island stability
- P9** Synchronize islanded systems:
 - adjust load and generation balance to control frequency
 - adjust voltage
 - ensure both systems are within frequency and voltage limits
 - use approved synchronizing facilities, tools and breakers
- P10** Return system to reliable state:
 - perform restoration procedures
 - apply sectionalizing techniques
- P11** Document issues and action taken in information/record management system

- P12** Maintain and update technical information related to energy emergency response
- P13** Participate in updating and refining contingency plans for energy emergencies based on lessons learned

Knowledge

- K1** Reliability criteria and standards of local, regional and continental bodies, e.g. North American Electric Reliability Corporation (NERC)
- K2** Safe work practices
- K3** Communication protocols, e.g. three-way communication, incident command system
- K4** Information/record management system
- K5** Energy management system
- K6** Types of potential energy emergencies, e.g. loss of supervisory control, black out, islanding
- K7** Risk level designations for electrical supply issues, e.g. energy emergency alert levels (EEAs)
- K8** Contingency plans
- K9** Available emergency response services and their contact information
- K10** Emergency response plan and procedures, e.g. contingency, system restoration, evacuation, black start
- K11** Importance of efficient and effective system restoration

Glossary

- **Incident command system:** a standardized onsite management system designed to enable effective and efficient incident management by integrating a combination of facilities, equipment, personnel, procedures and communications operating within a common organizational structure; can be used for unplanned and planned events.
- **Islanding:** condition in which a distributed generator continues to power a location even though the electrical grid power is no longer present.
- **Three-way communication:** sharing a message in three steps: 1. sender states message, 2. receiver repeats message, 3. sender confirms that receiver has repeated message correctly or corrects any misunderstandings.
- **Unplanned events:** situations that pose a threat or cause loss of power to customers, or situations that threaten the safety of people, the environment, or components of the power generation, transmission and distribution systems; unplanned events that pose a high level of risk to safety, the environment, or production are treated as emergencies.

Contextual Variables

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Energy management system, e.g. SCADA
- Communication devices and systems, e.g. telephone, messaging system/software
- Policies and procedures, e.g. restoration, incident command

Major Category

Safety

Competency Area

Maintain a Safe Working Environment

Competency Unit

Follow safe work practices

Purpose

Following safe work practices is critical to protect employees, contractors, customers and the general public against injury or death, and to protect the organization and its assets from loss and liability.

Performance/Abilities

- P1** Participate in safety orientations and training
- P2** Complete safety certifications, as required, e.g. confined space
- P3** Identify locations of:
 - first aid kit
 - emergency equipment
 - emergency access routes
- P4** Participate in daily safety meeting/tail-board meetings
- P5** Follow safety policies and procedures on site, e.g. limits of approach
- P6** Respect physical limitations of self and others
- P7** Use protection systems, as required, e.g. lock-out tag-out, card system
- P8** Inspect safety systems, as required, e.g. guards, emergency stops
- P9** Perform tests, as required, e.g. test voltage level
- P10** Establish exclusion zones, when required, e.g. around open trench or working heavy equipment:
 - place barriers and/or signage
- P11** Identify hazards on site, e.g. personal safety, work site, environmental:
 - monitor weather conditions, as necessary
- P12** Minimize or remove hazards, as necessary, for example:
 - protect self from weather-related conditions, e.g. wear sunscreen and sunglasses, keep hydrated, wear warm clothing
- P13** Use equipment only as intended/classified:
 - ensure equipment is appropriate for work site conditions
- P14** Maintain clean, orderly work area
- P15** Dispose of waste materials, as required:
 - dispose of hazardous materials (e.g. chemicals, batteries) according to legislation and organizational policies
- P16** Store materials and equipment in designated areas
- P17** Communicate issues to relevant personnel, e.g. co-workers, project manager:
 - document work safety issues, as required

Knowledge

- K1** Relevant legislation, including Occupational Health and Safety (OH&S)
- K2** Safety Management Plan
- K3** Organizational safety policies and procedures, including OH&S
- K4** Workplace Hazardous Materials Information System (WHMIS)
- K5** Required training and certifications for specific work, e.g. confined space

- K6** Required personal protective equipment (PPE)
- K7** Types of safety hazards on site
- K8** Available emergency response services and their contact information
- K9** Available equipment on worksite/in vehicles, e.g. first aid, containment equipment
- K10** Procedures for safe excavation, if required
- K11** Safety reporting procedures

Major Category	Safety
Competency Area	Maintain a Safe Working Environment
Competency Unit	Participate in safety meetings and emergency drills

CONTEXTUAL VARIABLES

Range of Context

- Quantity and type of safety hazards varies with type of work and work location.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- | | |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input type="checkbox"/> Analyze |
| <input type="checkbox"/> Understand | <input type="checkbox"/> Evaluate |
| <input checked="" type="checkbox"/> Apply | <input type="checkbox"/> Create/Transform |

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- First aid kits
- Safety equipment, e.g. spill kit, fire extinguisher
- Safety features on equipment
- Personal protective equipment (PPE)
- Rated tools, e.g. screwdriver rated for particular voltage

Purpose

Participating in safety meetings and emergency drills is important to ensure employees, contractors and customers work in a safe manner and are prepared for unexpected events. This also protects the organization and its assets against loss and liability.

Performance/Abilities

- P1** Attend meetings and drills at scheduled times
- P2** Identify role of self and team members in meetings and drills
- P3** Share knowledge and skills with co-workers
- P4** Communicate work issues to the group
- P5** Participate in emergency drills, e.g. evacuation, fire, environmental, sabotage/terrorist/bomb threat, electrical restoration
- P6** Debrief drills and exercises:
 - provide feedback
- P7** Take notes, if applicable

Knowledge

- K1** Relevant legislation
- K2** Organizational safety policies and procedures, including communication protocols
- K3** Own and others' roles and responsibilities during emergencies
- K4** Contact information for emergency services
- K5** Types of safety hazards on site

CONTEXTUAL VARIABLES

Range of Context

- Types of meetings and emergency drills will vary with organization, type of work and work location.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- | | |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input type="checkbox"/> Analyze |
| <input type="checkbox"/> Understand | <input type="checkbox"/> Evaluate |
| <input checked="" type="checkbox"/> Apply | <input type="checkbox"/> Create/Transform |

Major Category

Safety

Competency Area

Maintain a Safe Working Environment

Competency Unit

Isolate component, equipment or system

Purpose

Isolation procedures must be performed correctly to protect self and others (e.g. other employees, contractors, customers and the public) in preparation for work on powered components, equipment or systems. Performing this task incorrectly can lead to serious injury or death. This task also protects the organization and its assets against loss and liability.

Performance/Abilities

- P1** Identify all sources of hazardous energy that may be encountered when performing work on component, equipment or system
- P2** Disconnect each hazardous energy source in component, equipment or system, e.g. disconnect linkages, open breakers, open disconnect switch
- P3** De-energize component, equipment or system, if required:
 - release stored or residual energy, for example:
 - ground electrical devices, e.g. capacitors, batteries/UPS, accumulators
 - release hydraulic liquid
 - vent air pressure
 - brake mechanical movement
- P4** Perform lock-out tag-out procedures
- P5** Verify isolation using one of following methods:
 - activate controls to ensure no response:
 - complete visual inspection, ensure electrical connections are open
 - test component, equipment or system to ensure zero potential energy, for example:
 - test circuitry
 - check pressure gauges to ensure energy removed
 - check temperature gauges to ensure thermal energy discharged
- P6** Document, as required
- P7** Return component, equipment or system to normal configuration
- P8** Ensure component, equipment or system can be safely re-energized, e.g. phase testing, Megger testing
- P9** Re-energize component, equipment or system, if no other locks on equipment or system:
 - coordinate re-energization with controlling authority
- P10** Test component, equipment or system to ensure operating properly
- P11** Document, as required

Knowledge

- K1** Relevant regulations, e.g. work protection, grounding and bonding code
- K2** Organization's policies and procedures, e.g. electrical safety, arc-flash policies, hazard assessment, lock-out tag-out procedures
- K3** Type and rating of PPE required for isolation
- K4** Testing procedures

- K5** Electrical and mechanical principles, e.g. AC and DC, pressure
- K6** Primary energy sources (i.e. electrical, mechanical, hydraulic, chemical, thermal and gravitational) in components, equipment and systems
- K7** Safety tests to ensure zero energy state
- K8** Electrical and mechanical control systems and components, e.g. SCADA, program logic controllers (PLC), breakers, fuses, disconnects

Glossary

- **De-energize (aka depressurize):** a process used to remove residual or stored energy from isolated component, equipment or system to eliminate the chance that residual or stored energy could accidentally harm workers.
- **Isolate:** a process used to disconnect component, equipment or system from a primary source of energy to eliminate the chance that the primary source of energy in component, equipment or system could accidentally harm workers.
- **Lock-out tag-out (LOTO):** a safety procedure used to ensure that components, equipment or systems are locked off and not able to be started up again prior to the completion of maintenance or repair work. It requires that hazardous energy sources be isolated and rendered inoperative before work is started on the component, equipment or system in question.
- **Tag-out:** a labelling process that is always used when lock-out is required; the process involves attaching or using an information tag or indicator (typically a standardized label) that includes tag #, name of component, equipment or system that has been isolated or re-configured, why lockout is required, the time of application, and the name of the authorized person who attached lock and tag.

Contextual Variables

Range of Context

- A multi-point isolation procedure requires more than one lock and may need more than one worker to execute.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- PPE, e.g. arc flash protection equipment, safety glasses, steel-toed boots, hard hats
- Lock-out tag-out devices, e.g. breaker lock, multi-lock, lock box, tag, hold cards
- Energy testing equipment, e.g. voltmeters, pressure gauges
- Energy removal devices, e.g. ground straps
- Locking devices, e.g. rotor pins

Major Category

Safety

Competency Area

Maintain a Safe Working Environment

Competency Unit

Perform lock-out tag-out procedures

Purpose

Lock-out tag-out procedures are performed for self-protection and as part of work protection procedures. These safety procedures eliminate the chance that equipment or systems could harm people through the unintended release of energy or the unintended start-up or motion of equipment or components. Not following proper lock-out tag-out procedures can lead to serious injury or death. These procedures also protect the organization and its assets against loss and liability.

Performance/Abilities

- P1** Ensure required training is up to date
- P2** Plan lock-out tag-out with relevant personnel:
 - clarify scope of work to be done
 - identify potential energy sources that must be controlled
 - identify equipment and/or system to be locked-out tagged-out:
 - refer to panel schedules, drawings, single-line diagrams, cable and equipment tags
 - confirm details:
 - when lock-out tag-out will begin
 - how long it will continue
 - authorized person responsible for applying locks and tags
 - affected persons to inform of lock-out tag-out
- P3** Inform affected persons of lock-out tag-out
- P4** Select appropriate PPE
- P5** Isolate component, equipment or system:
 - de-energize component, equipment or system, if required
 - coordinate with controlling authority, if required
- P6** Apply locking mechanisms or approved devices (e.g. locking pins, rotor locks), on component, equipment or system, as required
- P7** Apply approved tag with required information, including:
 - tag number
 - name of component, equipment or system that is locked out
 - why lock-out is required
 - time component, equipment or system was locked out
 - name of authorized person who attached tag and lock
- P8** Verify component, equipment or system is locked out and tagged out properly:
 - conduct visual inspection, e.g. tag filled out correctly
- P9** Remove lock-out devices and tags when maintenance or repair activities are completed

Knowledge

- K1** Organizational safety policies and procedures, including lock-out tag-out procedures
- K2** Relevant legislation

- K3** Training renewal requirements for lock-out tag-out
- K4** Hazards associated with lock-out tag-out
- K5** Energy potential in components, equipment and systems
- K6** Procedures for potential energy testing
- K7** Safety checks to ensure zero energy state
- K8** Types of lock-out procedures, e.g. individual, group, and complex
- K9** Types of locking devices and their applications
- K10** Types of tags and their applications

Glossary

- **De-energize (aka depressurize):** a process used to remove residual or stored energy from isolated component, equipment or system to eliminate the chance that residual or stored energy could accidentally harm workers.
- **Isolate:** a process used to disconnect component, equipment or system from a primary source of energy to eliminate the chance that the primary source of energy in component, equipment or system could accidentally harm workers.
- **Lock-out tag-out (LOTO):** a safety procedure used to ensure that components, equipment or systems are locked off and not able to be started up again prior to the completion of maintenance or repair work. It requires that hazardous energy sources be isolated and rendered inoperative before work is started on the component, equipment or system in question.
- **Tag-out:** a labelling process that is always used when lock-out is required; the process involves attaching or using an information tag or indicator (typically a standardized label) that includes tag #, name of component, equipment or system that has been isolated or re-configured, why lock-out is required, the time of application, and the name of the authorized person who attached lock and tag.

CONTEXTUAL VARIABLES

Range of Context

- Types of systems that may be locked out vary, e.g. electrical, mechanical, hydraulic, pneumatic.
- Approved devices used to lock-out equipment/systems vary depending on the types of energy involved.
- Types of approved devices and voltage-rated equipment used to perform this task vary.
- A multi-point isolation procedure requires more than one lock and may need more than one worker to execute.
- The procedures for lock-out and tag-out may vary when provided as part of work protection.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Locking mechanisms or devices, e.g. locking pins, rotor locks, bars, cribbing, chains
- Tag devices, e.g. test and operate cards, hold cards
- Approved safety devices, e.g. arc flash protection equipment, energy removal devices, PPE
- Potential energy testing equipment, e.g. voltmeters, pressure gauges

Major Category

Safety

Competency Area

Maintain a Sustainable Environment

Competency Unit

Follow sustainable work practices

Purpose

Following sustainable work practices is critical to protect the environment and to protect employees, contractors and the general public against personal injury. It creates a positive public impression of the organization and its commitment to social responsibility, and protects the organization from loss and liability.

Performance/Abilities

- P1** Ensure required training is up to date, e.g. WHMIS
- P2** Identify potential environmental hazards, including:
 - contaminants of water, air and soil
 - hazardous materials
- P3** Identify locations of:
 - first aid kit
 - spill kits
 - emergency access routes and personnel
 - Safety Data Sheets (SDS)
- P4** Monitor weather conditions, as necessary, e.g. consider direction of chemical drift
- P5** Follow waste management practices:
 - sort waste by type
 - place waste in correct disposal container or area
- P6** Use recycled products and materials when possible
- P7** Store hazardous materials and equipment in designated areas
- P8** Dispose of hazardous materials (e.g. chemicals, batteries) according to legislation and organizational policies
- P9** Communicate issues to relevant personnel, e.g. co-workers, supervisor:
 - document issues, as required

Knowledge

- K1** Relevant legislation, including Occupational Health and Safety (OH&S)
- K2** Organizational safety policies and procedures, including OH&S
- K3** Sustainability plan and practices, e.g. energy and water conservation, commitment to low-carbon energy
- K4** Importance of sustainable practices, e.g. controlled use of ozone depleting substances
- K5** Safety Management Plan
- K6** Workplace Hazardous Materials Information System (WHMIS)
- K7** Types of hazardous materials associated with specific work activities
- K8** Available emergency response services and their contact information
- K9** Available equipment on site or in vehicles, e.g. first aid, containment equipment
- K10** Procedures for safe evacuation, if required
- K11** Procedures for containment, if required
- K12** Safety reporting procedures

CONTEXTUAL VARIABLES

Range of Context

- Quantity and type of hazards vary with type of work and work location.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- First aid kits
- Spill kit
- Personal protective equipment
- Safety Data Sheets (SDS)

Major Category	Safety
Competency Area	Respond to Emergencies
Competency Unit	Respond to non-electrical emergencies

Purpose

Responding quickly and correctly to non-electrical emergencies reduces the chance of injury or death to employees, contractors, customers and the public as well as minimizes damage to the environment. It also protects the organization and its assets against loss and liability.

Performance/Abilities

- P1** Remain calm
- P2** Initiate Emergency Response Plan for type of risk, if required, for example:
 - notify internal and external authorities
 - evacuate
 - follow direction of emergency authority
 - assist emergency authorities
 - secure area
- P3** Assess level of hazard:
 - determine what is exposed to risk, e.g. unit, station, site, field operations
- P4** Record details of emergency, for example:
 - date and time
 - nature of emergency
 - time authorities were contacted
 - time authorities arrived
 - action taken
 - names and contact information for witnesses
- P5** Follow up, as required, for example:
 - take action to prevent recurrence

Knowledge

- K1** Relevant legislation
- K2** Emergency Response Plan
- K3** Organizational safety policies and procedures, including Occupational Health & Safety (OH&S)
- K4** Workplace Hazardous Materials Information System (WHMIS)
- K5** Available emergency response services and their contact information
- K6** Procedures for safe evacuation, if required
- K7** Emergency reporting procedures

CONTEXTUAL VARIABLES

Range of Context

- Type of emergencies encountered will vary, e.g. bomb threat, sabotage threat, natural disaster.
- Severity of emergency situation will vary.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Communication equipment
- Emergency response equipment, e.g. first aid kits, fire extinguishers
- Notebook

Major Category	Safety
Competency Area	Respond to Emergencies
Competency Unit	Participate in incident and accident investigations

Purpose

Participating in the investigation of an incident or accident will help to determine what happened, why it occurred, and how to prevent similar events from occurring in the future.

Performance/Abilities

- P1** Survey scene, as required:
 - make the scene safe
 - secure the scene, as necessary
 - tag relevant equipment or materials
 - photograph environment, as necessary
- P2** Gather information, as required, for example:
 - people directly and indirectly involved
 - relevant equipment or material
 - site
 - process, i.e. work procedures, instructions, training, safety records
- P3** Participate in interviews with relevant parties, e.g. emergency authority, Worker's Compensation Board (WCB), supervisor:
 - describe events in own words
- P4** Document events, as necessary, e.g. write witness report
- P5** Participate in root-cause analysis, as required

Knowledge

- K1** Relevant legislation
- K2** Safe work procedures
- K3** Incident investigation and reporting requirements
- K4** Types of safety hazards on site

Glossary

- **Accident:** an accident is an unplanned, unwanted event that disrupts the orderly flow of the work process. It involves the motion of people, objects or substances.
- **Incident:** an accident or other occurrence which resulted in or had the potential to cause injury or occupational disease. The term incident includes "close-call" or "near-miss" events.
- **Worker's Compensation Board (WCB):** WCB is an insurance program that covers injuries in the workplace. It covers wage replacement for injured workers, healthcare costs and rehabilitation costs. It is paid for by employers and is no fault.

CONTEXTUAL VARIABLES

Range of Context

- Complexity of investigation and required reports will depend upon the accident/incident, type of work and work location.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Camera
- Notebook
- Computer software
- Legal forms related to incident/accident reporting
- Personal protective equipment (PPE)

Major Category	Security
Competency Area	Follow Security Practices
Competency Unit	Follow security practices for physical work environment

Major Category	Security
Competency Area	Follow Security Practices
Competency Unit	Follow cybersecurity procedures

Purpose

Following practices to protect the physical work environment is critical to protect project/organizational assets, employees, contractors, customers and the general public.

Performance/Abilities

- P1** Adhere to security procedures, including:
 - participate in NERC training, as required
 - use tools and equipment, e.g. access cards
 - identify situations that may cause security issues, e.g. door propped open, gate access point unmanned
- P2** Update procedures/tools on regular basis, as required, e.g. use new codes
- P3** Report unsafe or suspicious activity, e.g. unauthorized visitors, equipment being removed from site unexpectedly
- P4** Document work security issues

Knowledge

- K1** Relevant legislation
- K2** NERC Standards
- K3** Organizational/project security policies and procedures
- K4** Types of security hazards on site
- K5** Authorized access systems and their use

CONTEXTUAL VARIABLES

Range of Context

- Quantity and type of security hazards varies with type of work and work location.

Level of Practice

Adapted Bloom's Taxonomy

- | | | |
|---|---|---|
| <input checked="" type="checkbox"/> Frontline | <input type="checkbox"/> Recall, Remember | <input checked="" type="checkbox"/> Analyze |
| <input checked="" type="checkbox"/> Supervisor | <input type="checkbox"/> Understand | <input type="checkbox"/> Evaluate |
| <input checked="" type="checkbox"/> Manager/Executive | <input type="checkbox"/> Apply | <input type="checkbox"/> Create/Transform |

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Access tools and equipment, e.g. key cards, identification cards

Purpose

Along with Information and Communication Technology (ICT) security functions that are built into an organization's computer system, it is essential for users to follow cybersecurity protocols to prevent intentional damage to an organization through cyberattacks. Users following security protocols are another layer of protection from external threats.

Performance/Abilities

- P1** Follow system log-in/out protocols:
 - log out of system when work is completed
- P2** Participate in organization's cybersecurity training
- P3** Use passwords:
 - change passwords when requested or required by organization's ICT procedures
 - do not share passwords with others
 - do not write passwords down in a visible place
 - use a mix of characters, letters and numbers for passwords
- P4** Operate organization's computer system in a secure manner, for example:
 - use computers and smart mobile devices approved by organization
 - do not leave computer equipment unattended, e.g. computer, smart phone, tablet, flash drives, hard drives
 - do not plug unauthorized flash drives or smart phones into computer
 - use organization's sites and applications for field devices
 - comply with assigned permissions and access limits
 - upload security updates as directed, and use newest versions of application software
- P5** Carry out work on organization's computer system securely, for example:
 - use approved web browsers and search engines
 - check all URLs for indications of a phishing site, e.g. spelling errors, complete "https://" on secure sites
 - avoid using links, when possible, even on secure websites
 - do not download from unknown websites
 - do not work using unsecured internet connections or public computers
- P6** Use communication applications in a secure manner:
 - do not accept or open mail or attachments from unknown senders
 - use approved communication channels and protocols, especially when communicating with other organizations
 - do not provide confidential work information to an unknown email source/caller:
- P7** Do not upload personal applications or access personal websites on organization's devices
- P8** Do not post unauthorized work information on social networks
- P9** Back up files to specified drives and at specified times, as directed
- P10** Contact ICT immediately when:
 - computer device is unresponsive or is operating in odd manner
 - windows or communications open with unusual messages, demands, or instructions, especially when system will not respond
 - there are frequent information or data disruptions, misconfigurations, and gaps or unexplained changes

Knowledge

- K1** Organization's cybersecurity protocols
- K2** Approved applications
- K3** Personal password for access to system
- K4** Access permissions and restrictions
- K5** Indicators of data corruption
- K6** Potential risks to system, e.g. viruses, malware, ransomware
- K7** Normal application operations
- K8** Indicators of unsecured or fraudulent websites

Glossary

- **Cybersecurity:** the practice of protecting systems, networks, and programs from digital attacks that interrupt normal business operations. Digital or cyberattacks try to:
 - access confidential and/or sensitive information to use for illegal purposes, e.g. identity theft;
 - destroy or change confidential and/or sensitive information to disrupt business operations; or,
 - extort money from users by holding their systems hostage until some form of payment is received.
- **Malware:** software that is specifically designed to access and/or damage a computer without owner of the computer being aware of what is happening, e.g. viruses, worms, spyware.
- **Ransomware:** software that prevents users from accessing their own data until the user pays a ransom.
- **Phishing:** a scam to obtain personal information to commit fraud, often involving social engineering, e.g. email or phone calls from distant relative requesting money, phony websites with sign up forms, message from bank requiring confirmation of account information.
- **Social engineering:** attempts to obtain personal or confidential information or to get the user to perform certain tasks by what appears to be a legitimate source or person; a component of phishing.

CONTEXTUAL VARIABLES

Range of Context

- While many cybersecurity safeguards are built into the design of the system software, users working from home, working remotely in the field, or on personal devices, e.g. smart phones, may change the performance of this skill.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Analyze
- Understand
- Evaluate
- Apply
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Passwords
- Computers, mobile devices
- Cybersecurity software
- Key fob, e.g. RSA SecurID token

Major Category

Organizational Policies and Procedures

Competency Area

Follow Organizational Policies and Procedures

Competency Unit

Follow organizational policies and procedures

Purpose

Following policies and procedures is important to create a consistent work environment for employees and to provide consistent service delivery to internal/external customers.

Performance/Abilities

- P1** Review organizational policies and procedures
- P2** Participate in orientation and on-the-job training
- P3** Complete all work-related tasks according to organizational policies and procedures
- P4** Identify opportunities for improvement to policies and procedures:
 - communicate to team members and supervisors, as appropriate
- P5** Keep up to date with changes to policies and procedures, e.g. access online library for updates

Knowledge

- K1** Organization policies, procedures and plans, e.g. occupational health and safety, workplace health and wellness
- K2** Organization/project goals, vision and status
- K3** Organizational document management system, e.g. where to find latest policies and communication documents

CONTEXTUAL VARIABLES

Range of Context

- Number of policies and procedures to be followed will vary.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Analyze
- Understand
- Evaluate
- Apply
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Organizational policies and procedures manual
- Documents associated with organizational policies and procedures, including forms, checklists

Major Category	Information/Record Management
Competency Area	Complete Information/Record Management Tasks
Competency Unit	Maintain technical information and data

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- CAD software
- Mobile workforce technology

Purpose

Maintaining technical information and data is important so that critical and up to date information is available. This data is the basis for setting goals and objectives for the short-, medium- and long-term. It also ensures that legislative requirements are met.

Performance/Abilities

- P1** Identify types of information/records that are required, for example:
- operations and maintenance manual
 - bill of material parts
 - asset related information, e.g. type of equipment, location
 - event and call logs
 - drawings
 - test results
- P2** Provide information as required, e.g. fill out online or paper forms:
- ensure information is provided/records are completed within required timelines, e.g. daily, weekly, monthly
- P3** Ensure information recorded is accurate and complete
- P4** Complete field mark-ups, as required
- P5** Verify that drawing revisions match field wiring, as required
- P6** Update drawings or ensure drawings are sent for update, as required
- P7** File revised drawings according to information/record management protocols

Knowledge

- K1** Legislation, e.g. NERC Standards
- K2** Organization policies, procedures and plans
- K3** Organization/project goals, vision and status
- K4** Organizational document management system
- K5** Use of relevant software, e.g. CAD, GIS

CONTEXTUAL VARIABLES

Range of Context

- Work environment can make this skill challenging to perform, e.g. outdoors.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

Major Category	Information/Record Management
Competency Area	Complete Information/Record Management Tasks
Competency Unit	Use information/record management system for generation, transmission and distribution operations

Purpose

Using the information/record management system keeps oneself and others up to date on the condition of equipment, systems and auxiliaries. The information/record management system provides information for operating decisions, compliance requirements, and allows for smooth shift changes. It also serves as an organizational record of information and instructions for managing protection, energy storage, generation, transmission, distribution and dispatch. In addition, the reporting system provides a history of operating events for post-fault analysis and reflects the long-term efficiency of power generation, transmission and distribution systems.

Performance/Abilities

- P1** Review information recorded during previous shift(s):
- analyze information relevant to shift tasks, e.g. outstanding authorizations, unresolved faults, generation status, abnormal circuit or plant configurations, imposed load constraints, shift-transfer sheets, customer outage information
 - determine action required, e.g. how to resolve faults depending on type and frequency, follow-up with engineering groups
- P2** Record information during shift in required format and timeframe:
- record status of systems including abnormalities and corrections made
 - record information immediately upon receipt
 - note information source, e.g. other operators, SCADA, contractors, members of public, operating forms, industry codes
 - use abbreviations and terminology according to industry and organizational practice
 - use 24-hour clock when recording times
 - consider time zones for reporting energy transactions, if required
 - keep operating log up to date throughout shift
 - sign or initial log entries at beginning and end of shift
 - ensure regulatory logging requirements are met
- P3** Keep uncompleted actions in view for supervision:
- communicate status updates and other important information (verbally and/or in documents) to co-workers at shift change

Knowledge

- K1** Applicable regulations, e.g. reporting requirements, privacy, security
- K2** Reliability criteria and standards of local, regional and continental bodies, e.g. North American Electric Reliability Corporation (NERC)
- K3** Reporting system procedures, e.g. access, use, filing, distribution, turnover, information security
- K4** Types of information documented in information/record management, for example:
- operating events
 - relevant non-operating events, e.g. lightning, bird strikes, accidents, unauthorized entries into restricted areas
 - changes in status and abnormal conditions
 - corrective actions

- exact time of sending or receiving operational instructions and messages
- energy storage, generation, transmission, distribution and dispatch
- asset management activities
- switching instructions
- operation of circuit breakers and disconnectors
- auto-reclose operations
- work orders
- relay flaggings
- protection limitations
- incidents reported to the control centre
- switching schedules, shift handover information, operational constraints

K5 Shift change procedures, e.g. report abnormal situations, complete shift change report

K6 Types of reporting documents and their purpose, e.g. fault logs, status reports, shift change reports, asset management

K7 Industry terminology and abbreviations

K8 24-hour clock

K9 Time zones

Glossary

- Information/record management system:** collection of manual or electronic logs, sheets, completed authorization forms and other records, which together form a complete record of operating events in a station or operating area.

CONTEXTUAL VARIABLES

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Required documents, e.g. fault logs, status reports, shift change reports
- Shift reporting software and applications
- Electronic job order system
- Voice logs

Purpose

Communication applications allow efficiencies when sending and receiving messages. This includes combinations of visual and audio communication and document sharing over distance which in turn allow for virtual meetings, educational webinars, and other communication formats that can save time and money.

Performance/Abilities

- P1** Open desired communication application on system, online, or on cell phone e.g. email, text messaging
- P2** Verify message before sending
- P3** Select communication recipients:
- verify who will receive message, e.g. only include relevant parties
- P4** Use email:
- follow email etiquette, e.g. do not use all uppercase, keep message professional in tone
 - include purpose of message in subject line
 - create concise and clear message
 - add attachments following email application protocols, e.g. drop and click, select file using paperclip icon:
 - follow application instructions to make attachment smaller or use alternative document sharing applications if attachment is too large
 - close message with appropriate salutation and sign-off, e.g. organization logo and contact information
 - proofread message before sending
 - manage mailboxes:
 - use settings to designate type of mail, if appropriate, e.g. check junk mail regularly, check auto rules to ensure up to date and correct
 - delete messages in trash and junk mail periodically
- P5** Use text messaging:
- keep messages brief
 - do not use texting abbreviations, e.g. lol, btw
 - do not use emojis and animated images, e.g. GIFs
- P6** Use conferencing applications authorized by organization:
- ensure appropriate documents are open and screen background is appropriate when screen sharing
 - ensure quiet environment when using audio
 - mute microphone when not speaking
 - consider lag time when speaking and sharing documents
 - announce name when entering conference and before speaking, if appropriate

Knowledge

- K1** Organization's policies and procedures, e.g. cybersecurity, logging into applications
- K2** Application functions and icons, e.g. trash can, flags, reply
- K3** Purpose of communication
- K4** Audience
- K5** Writing protocols for email and text messages
- K6** Communication considerations, e.g. background noise, time lag, pitch of voice

Glossary

- **Cybersecurity:** the practice of protecting systems, networks, and programs from digital attacks that interrupt normal business operations. Digital or cyberattacks try to:
 - access confidential and/or sensitive information to use for illegal purposes, e.g. identity theft;
 - destroy or change confidential and/or sensitive information to disrupt business operations; or,
 - extort money from users by holding their systems hostage until some form of payment is received.
- **Emoji:** a small digital icon used to express a feeling or idea.
- **GIF:** series of images encoded to automatically replay back as an animated sequence.

CONTEXTUAL VARIABLES

Range of Context

- Communication applications on mobile devices may differ from desktop system and clarity of communication may vary.
- Communication applications differ depending on system and device being used.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Computer
- Tablet
- Cell phone
- Communication software applications
- Headsets

Major Category	Information and Communication Technology Foundations
Competency Area	Use Digital Technology
Competency Unit	Use common software applications

Purpose

Common computer software applications for word processing, data spreadsheets, and presentations help to increase the productivity and efficiency of the organization.

Performance/Abilities

- P1 Select appropriate application for task, e.g. word processing, presentation, spreadsheets
- P2 Use application's tools to create, enhance or customize content
- P3 Save document to appropriate folder and drive

Knowledge

- K1 Organizational policies and procedures, e.g. file naming, file sharing, cybersecurity
- K2 Purpose and features of common applications
- K3 Links between applications, e.g. cell phone camera photos are saved automatically in photo application

Glossary

- **Cybersecurity:** the practice of protecting systems, networks, and programs from digital attacks that interrupt normal business operations. Digital or cyberattacks try to:
 - access confidential and/or sensitive information to use for illegal purposes, e.g. identity theft;
 - destroy or change confidential and/or sensitive information to disrupt business operations; or,
 - extort money from users by holding their systems hostage until some form of payment is received.

CONTEXTUAL VARIABLES

Range of Context

- Applications will differ depending on device and operating systems.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

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|---|---|
| <input type="checkbox"/> Recall, Remember | <input type="checkbox"/> Analyze |
| <input type="checkbox"/> Understand | <input type="checkbox"/> Evaluate |
| <input checked="" type="checkbox"/> Apply | <input type="checkbox"/> Create/Transform |

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Computer
- Tablet
- Cell phone
- Common software applications

Major Category	Information and Communication Technology Foundations
Competency Area	Use Digital Technology
Competency Unit	Use navigation and mapping applications

Purpose

Navigation and mapping applications are used to ensure accurate identification and documentation of asset and work locations, as well as ensure the safety of personnel in the field and the efficient use of resources.

Performance/Abilities

- P1 Use global positioning system (GPS) and geographical information system (GIS) device required for tasks e.g. GPS receiver, truck tracker, cell phone
- P2 Follow manufacturer's instructions
- P3 Ensure correct types of maps of field work area are uploaded or correct views selected, for example:
 - street maps
 - topographical maps
 - satellite view
- P4 Comply with GPS features in vehicles and personal tracking fob requirements when working in field

Knowledge

- K1 Manufacturer's instructions
- K2 Organization's policies and procedures, e.g. safety
- K3 Capabilities and limitations of different types of devices and applications
- K4 Types of maps
- K5 Geographical coordinates
- K6 Functions of navigation and mapping applications

Glossary

- **Geographic information system (GIS):** a computer application that captures, stores, checks and displays data related to positions on Earth's surface; may include cartographic data, photographic data, digital data, or data in spreadsheets.
- **Geographic coordinates:** a grid system consisting of lines of latitude (north-south) and lines of longitude (east-west) that allow users to define a precise location on the earth's surface. Expressed in degrees and minutes.
- **Global Positioning System (GPS):** a computer program that uses triangulation to determine a user's location on the earth by feedback received from at least three satellites orbiting the earth.
- **Waypoint:** is the marking of a location by obtaining the geographic coordinates with a GPS unit.

CONTEXTUAL VARIABLES

Range of Context

- Locating assets may require both GIS and GPS.
- There is generally no cellular or wireless service in remote destinations which may impact the type of GPS device that can be used.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- | | |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input type="checkbox"/> Analyze |
| <input type="checkbox"/> Understand | <input type="checkbox"/> Evaluate |
| <input checked="" type="checkbox"/> Apply | <input type="checkbox"/> Create/Transform |

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- GPS receiver
- Cell phone
- Computer

Major Category

Information and Communication Technology Foundations

Competency Area

Use Digital Technology

Competency Unit

Use digital mobile radios

Purpose

Digital mobile radios (DMRs) are used for internal communications between departments and work groups for the purposes of primary and emergency backup communication.

Performance/Abilities

- P1** Use digital mobile radios as required, for example:
- from field to office
 - between work groups
 - within own work group
 - for emergency communications
- P2** Follow manufacturer's instructions
- P3** Comply with organization's policies and guidelines
- P4** Comply with Industry Canada's radio communication regulations, e.g. licensing requirements

Knowledge

- K1** Applicable legislation, e.g. Industry Canada's radio communication regulations
- K2** Manufacturer's instructions and recommendations
- K3** Organization's policies and procedures, e.g. safety, communication protocols
- K4** Capabilities and limitations of different types of devices

Contextual Variables

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- | | |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input type="checkbox"/> Analyze |
| <input type="checkbox"/> Understand | <input type="checkbox"/> Evaluate |
| <input checked="" type="checkbox"/> Apply | <input type="checkbox"/> Create/Transform |

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Digital mobile radio

Purpose

Following the organization's protocols to enter and retrieve information in the computer system is essential to ensure the organized, accurate, and secure documentation of an organization's activities across various types of computerized equipment.

Performance/Abilities

- P1** Follow organization's policies and procedures, e.g. data entry, cybersecurity
- P2** Retrieve required information from saved files or databases, for example:
- access information from saved files or databases as permitted from:
 - computer hard drive
 - organization's shared drive(s)
 - use appropriate search terms to find required information, e.g. file name, subject matter, customer name
- P3** Enter/update information, for example:
- complete all data fields accurately
 - check accuracy of manual data entry
 - do not enter same data more than once
 - do not edit or change data without appropriate permissions
- P4** Upload information, e.g. files, photograph, prints, data:
- ensure information sources are secure
- P5** Save work:
- use file naming protocol
 - save in appropriate drive(s) and folder

Knowledge

- K1** Organization's protocols, for example:
- cybersecurity
 - access permissions
 - file naming
 - organization of shared drives
 - printing
 - file sharing
- K2** Applications purposes and functions
- K3** Consequences of inaccurate or incomplete data
- K4** Different uses of data
- K5** Allowable data requests
- K6** Organization of shared drive(s)
- K7** Uploading and downloading of documents, files, drawings and photos

Glossary

- Computer Aided Design (CAD):** a computer application that is used to produce 2- and 3-dimensional drawings of an engineered design that details the physical components and layout.
- Cybersecurity:** the practice of protecting systems, networks, and programs from digital attacks that interrupt normal business operations. Digital or cyberattacks try to:
 - access confidential and/or sensitive information to use for illegal purposes, e.g. identity theft;
 - destroy or change confidential and/or sensitive information to disrupt business operations; or,
 - extort money from users by holding their systems hostage until some form of payment is received.
- Geographic Information Systems (GIS):** a computer application that manages geographic information, which can be manipulated to display aspects of geographical information in a map format.

CONTEXTUAL VARIABLES

Range of Context

- Organizations will have different levels of permissions and access to different applications and shared drives based on occupational requirements and responsibilities.
- Organizations may use proprietary closed computer systems and networks.
- Access to system and applications may differ if using a mobile device.
- Cybersecurity protocols may differ in levels of automation and auto-surveillance, e.g. audit trails.
- Organizations may use different purchased applications.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Computer or mobile device
- Software programs

Major Category	Personal Competencies
Competency Area	Demonstrate Professionalism
Competency Unit	Work as a member of a team

Purpose

Working as a member of a team helps to ensure that operations run smoothly, and allows project managers, supervisors, employees and contractors to be proactive before small issues become large problems.

Performance/Abilities

- P1** Demonstrate respect and empathy towards others:
 - respect diversity
 - respect differing perspectives
 - promote an inclusive work environment
 - recognize changes in team members' behaviours, e.g. mental health strain
- P2** Be accountable:
 - report unexpected conditions
 - be punctual
 - comply with schedule
 - take action when issues arise
- P3** Initiate contact with other team members on regular basis:
 - ask questions
- P4** Share knowledge and skills
- P5** Recognize others' contributions and success
- P6** Accept and provide constructive feedback
- P7** Ask for help, when needed
- P8** Offer help to team members
- P9** Respond to requests in a timely manner
- P10** Be open to change
- P11** Participate actively in team meetings

Knowledge

- K1** Organization policies, procedures and plans
- K2** Organization/project goals, vision and status
- K3** Roles and responsibilities of team members, including own role
- K4** Team members' contact information
- K5** Sector and project terminology and common abbreviations
- K6** Symptoms of psychological strain, e.g. decreased quality of work, withdrawal

CONTEXTUAL VARIABLES

Range of Context

- Team members will vary, for instance, there may be a range of small, temporary working groups and more permanent, long-term working groups.

- Physically locations may change the way this skill is performed, e.g. communication may have to occur via distance means.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Software, e.g. video chat, virtual meeting
- Communication tools, e.g. email, telephone

Major Category	Personal Competencies
Competency Area	Demonstrate Professionalism
Competency Unit	Develop professionally

Purpose

Developing professionally is important to keep current with sector trends, products and services. It improves an individual's attitude, knowledge, self-confidence and skills.

Performance/Abilities

- P1** Maintain qualifications and certifications, as required, e.g. trade license, professional designation, First Aid, CPR
- P2** Assess own skills, knowledge and abilities:
 - reflect on feedback from peers and supervisor
 - identify areas for improvement
- P3** Identify areas of interest where new skill and knowledge development might be useful, e.g. new methods/products used in the sector
- P4** Upgrade skills and knowledge, for example:
 - attend courses offered by equipment manufacturers
 - read sector-specific publications
 - conduct research
 - enroll in educational and professional development courses and programs
 - participate in mentorship programs
 - ask for assistance or instruction
- P5** Participate in local trade and business organizations, as applicable
- P6** Network with professional peers, e.g. attend conferences or trade shows
- P7** Join and participate in associations, as applicable
- P8** Ensure professional development is documented in organization's record management system, as required

Knowledge

- K1** Organization policies, procedures and plans
- K2** Organization/project goals, vision and status
- K3** Own skills, knowledge and abilities
- K4** Roles and responsibilities of team members, including own role
- K5** Where to find up-to-date and accurate information on the sector
- K6** Relevant training providers and their offerings

CONTEXTUAL VARIABLES

Range of Context

- Access to resources may affect the way this skill is performed, e.g. organization's professional development budget, individuals may only attend provided professional development sessions during work time.
- Physical location may change the way this skill is performed, e.g. all professional development may have to be pursued via distance means.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Computer access
- Mentoring/coaching program
- Education grant program, if available
- Collective agreement

Major Category

Personal Competencies

Competency Area

Demonstrate Professionalism

Competency Unit

Demonstrate professional and ethical conduct

Purpose

Demonstrating professional and ethical conduct is important to build trust and respect in relationships with others. It also helps to promote a positive image of the organization and the sector.

Performance/Abilities

- P1** Participate in relevant training, e.g. conflict of interest, code of conduct, ethics
- P2** Support high standards and practices that protect public and bring credibility to organization, sector, and community, for example:
 - follow professional code of ethics/code of conduct, as applicable
 - implement responsible policies
 - avoid degrading or malicious discussion
 - recognize potential conflict of interest
- P3** Demonstrate professional attributes, including:
 - approachability, e.g. be available to coworkers and clients
 - composure, e.g. remain calm in emergency
 - empathy, e.g. show concern for others' problems
 - emotional intelligence, e.g. awareness of own and others' emotional states
 - fairness, e.g. treat all equally
 - flexibility, e.g. be open to new situations and approaches
 - being proactive, e.g. address issues before they become large problems
 - initiative
 - QA/QC principles in relation to work, e.g. catching potential errors prior to issues
 - trustworthiness, e.g. honour commitments
 - social responsibility, e.g. report injured wildlife to appropriate authorities
- P4** Ensure appearance is professional, e.g. wear uniform or organizational id/tag, ensure attire is in good repair
- P5** Comply with legal requirements, e.g. high visibility clothing, NERC requirements, conflict of interest
- P6** Maintain confidentiality of information, as required
- P7** Maintain accurate records
- P8** Show respect for organization's assets, e.g. take proper care of tools and equipment

Knowledge

- K1** Relevant legislation, e.g. Freedom of Information and Protection of Privacy (FOIP), NERC Standards
- K2** Organization policies, procedures and plans
- K3** Organization/project goals, vision and status
- K4** Code of conduct/Code of ethics
- K5** Own skills, knowledge and abilities
- K6** Roles and responsibilities of team members, including own role
- K7** Where to find up-to-date and accurate information on standards and practices

CONTEXTUAL VARIABLES

Range of Context

- Formal codes of ethics may exist in some subsectors and not others.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

Major Category	Personal Competencies
Competency Area	Demonstrate Professionalism
Competency Unit	Mentor/coach others

Purpose

Mentoring/coaching others is important to help create an environment of continuous learning within the organization. It helps to ensure consistency in the work being completed, and assists with building positive workplace relationships. It contributes to an improvement of both individual and team performance.

Performance/Abilities

- P1** Initiate contact with other team members/learners on regular basis:
 - ask questions
- P2** Use positive approach to help team members/learners solve problems:
 - ask questions to help focus on problem
 - guide resolution/performance
 - demonstrate patience
- P3** Demonstrate tasks for others, as required:
 - explain importance of and reasons for process/tasks
 - link learning to other tasks and overall job
- P4** Set up environment for learner to practice skills, as required:
 - ensure safety of learning environment
- P5** Recognize success, e.g. praise team member/learner
- P6** Assess learners' progress, as appropriate
- P7** Provide supportive and corrective feedback
- P8** Ask for feedback on own performance as coach/mentor

Knowledge

- K1** Organization policies, procedures and plans
- K2** Organization/project goals, vision and status
- K3** Roles and responsibilities of team members/learners, including own role
- K4** Role of workplace mentor/coach
- K5** Sector and project terminology and common abbreviations
- K6** Different ways of learning/learning needs and strategies to address them, e.g. language proficiency, learning preference
- K7** How to adjust to different learning styles
- K8** Importance of, and techniques for, providing effective feedback

CONTEXTUAL VARIABLES

Range of Context

- Mentoring/coaching may be a formalized or informal process, which will affect how this skill is performed.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Software, e.g. video chat, virtual meeting
- Communication tools, e.g. email, telephone

Major Category	Personal Competencies
Competency Area	Demonstrate Professionalism
Competency Unit	Manage stress

Purpose

Managing stress is important to improve one's own ability to balance personal and professional demands, perform one's job competently, and contribute to a harmonious workplace.

Performance/Abilities

- P1** Attend to own physical, emotional, spiritual, family and financial needs:
 - ask for help, if needed
- P2** Recognize own limitations and those of others, e.g. know when to say no
- P3** Recognize how your stress affects others
- P4** Manage time effectively:
 - prioritize tasks to be done
 - ensure schedule is realistic
 - negotiate or discuss with team members/supervisor, as required
- P5** Delegate responsibilities, when appropriate
- P6** Adapt to shift work, as required, for example:
 - prepare self for shifts
 - ensure proper rest/sleep
 - ensure proper nutrition
- P7** Maintain open communication with others
- P8** Identify coping strategies, e.g. maintain a sense of humour

Knowledge

- K1** Organization policies, procedures and plans
- K2** Organization/project goals, vision and status
- K3** Organization's wellness program, e.g. available gym memberships, counselling programs
- K4** Own skills, knowledge and abilities
- K5** Roles and responsibilities of team members, including own role
- K6** Symptoms of psychological strain, e.g. fatigue, irritability, difficulty concentrating, isolation

CONTEXTUAL VARIABLES

Range of Context

- Availability of an organization wellness program, and its associated offerings, may alter the way this skill is performed.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Psychological health and wellness program

Major Category	Personal Competencies
Competency Area	Demonstrate Professionalism
Competency Unit	Manage time

Purpose

Managing time is important to support efficiency and productivity by allowing the required time to be spent on the areas/tasks of most importance, and ensures that all tasks can be completed according to schedule.

Performance/Abilities

- P1** Set goals:
 - ensure goals are realistic and relevant
 - outline objectives to be achieved for each goal
- P2** Identify tasks that need to be achieved for each objective:
 - prioritize based on importance and urgency
- P3** Determine amount of time each task will take, considering:
 - previous experience
 - available resources
 - competing priorities
 - possible delays
- P4** Use time management system, e.g. electronic calendar, daytimer:
 - record appointments, meetings and critical dates
- P5** Create action plan:
 - identify timelines and critical dates
- P6** Schedule tasks:
 - delegate tasks, as required
- P7** Monitor progress of tasks and action plan:
 - review/update timelines regularly
- P8** Identify incomplete tasks:
 - develop plan for completion
- P9** Review goals and objectives periodically:
 - review time management system
 - evaluate own tasks
 - evaluate progress toward goals
 - make adjustments, as required

Knowledge

- K1** Organization policies, procedures and plans
- K2** Organization/project goals, vision and status
- K3** Own skills, knowledge and abilities
- K4** Roles and responsibilities of team members, including own role

CONTEXTUAL VARIABLES

Range of Context

- Complexity of time management will vary with job role and current tasks.
- Goals, objectives and action plans may be provided, depending upon job role and organization.
- Unplanned situations, including emergencies, can make it difficult to perform this skill.
- Collaboration may or may not be required, e.g. some activities need to be coordinated with others/other work teams.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Time management systems, e.g. electronic calendar, daytimer
- Software, e.g. project management software

Major Category	Personal Competencies
Competency Area	Communicate Effectively
Competency Unit	Use active listening skills

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Software, e.g. video chat, virtual meeting
- Communication tools, e.g. telephone

Purpose

Using active listening skills helps to ensure that all parties understand each other. This promotes effective teamwork, improves productivity and reduces stress.

Performance/Abilities

- P1** Choose appropriate time and place to listen, if possible:
- remove distractions, as required
- P2** Listen carefully to message:
- be open-minded
 - use attentive body language, e.g. face speaker
 - listen until message is complete, i.e. do not interrupt
 - give speaker undivided attention
- P3** Watch for nonverbal indicators that reinforce or contradict message, e.g. nod, rolling eyes
- P4** Respond to message, for example:
- use nonverbal indicators, e.g. nod, smile
 - offer comments
 - use questions to seek additional information or clarify details
 - paraphrase to confirm understanding

Knowledge

- K1** Relevant legislation, e.g. Freedom of Information and Protection of Privacy
- K2** Organization policies, procedures and plans
- K3** Organization/project goals, vision and status
- K4** Effective communication practices, e.g. verbal versus non-verbal, characteristics of respectful communication
- K5** Sector, trade and project terminology and common abbreviations
- K6** Question types, e.g. open-ended, closed, probing, mirror
- K7** Communication that constitutes harassment and discrimination

CONTEXTUAL VARIABLES

Range of Context

- Physical location may change the way this skill is performed, e.g. all listening may have to occur via distance means.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

Major Category

Personal Competencies

Competency Area

Communicate Effectively

Competency Unit

Use speaking skills

Purpose

Using speaking skills helps to ensure that all parties understand each other, and reduces errors due to misinterpretation. This promotes effective teamwork, improves productivity and reduces stress.

Performance/Abilities

- P1** Identify purpose of message
- P2** Consider needs and limitations of listeners
- P3** Organize ideas before speaking
- P4** Determine appropriate time and place to deliver message
- P5** Determine appropriate format, e.g. formal/informal, group/individual
- P6** Make final revisions to message
- P7** Communicate message:
 - be concise
 - speak clearly
 - use proper grammar
 - vary tone, volume, inflection and rate of speech
 - make eye contact
 - use positive language whenever possible
 - ensure that verbal and non-verbal communication convey same message
- P8** Adjust message to listener, if appropriate, for example:
 - simplify technical information
 - use different question types to determine listener's needs
 - avoid using slang, jargon, profanity or sarcasm
 - consider impact of message on listener, e.g. time restrictions, emotional impact
- P9** Confirm understanding:
 - ask for questions and feedback
 - review what was explained
- P10** Encourage additional questions at later date, if appropriate
- P11** Answer questions or know where to find answer:
 - follow up with listener who asked question

Knowledge

- K1** Relevant legislation, e.g. Freedom of Information and Protection of Privacy
- K2** Organization policies, procedures and plans
- K3** Organization/project goals, vision and status
- K4** Organizational communication protocols, e.g. who needs what information, speaking to media
- K5** Effective communication practices, e.g. verbal versus non-verbal, characteristics of respectful communication
- K6** Sector, trade and project terminology and common abbreviations
- K7** Question types, e.g. open-ended, closed, probing, mirror
- K8** Communication that constitutes harassment and discrimination

CONTEXTUAL VARIABLES

Range of Context

- Physical location may change the way this skill is performed, e.g. speaking may have to occur via distance means.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Software, e.g. video chat, virtual meeting
- Communication tools, e.g. telephone

Major Category	Personal Competencies
Competency Area	Communicate Effectively
Competency Unit	Use writing skills

Purpose

Using writing skills helps to ensure that all parties understand each other, and reduces errors due to misinterpretation. This promotes effective teamwork, improves productivity and reduces stress.

Performance/Abilities

- P1** Determine purpose of message
- P2** Identify target audience
- P3** Provide accurate, complete and concise information
- P4** Use format, tone, and style suited to purpose, e.g. email, business letter, report
- P5** Consider reader's:
 - perceptions
 - reading ability
 - needs
 - technical understanding
- P6** Write first draft, if required:
 - arrange ideas logically
 - be clear and concise
- P7** Proofread message:
 - correct errors
- P8** Produce final copy:
 - send to reader(s)/recipient(s)
- P9** File copy according to organizational/project protocol
- P10** Follow up, as required, e.g. ensure message was received

Knowledge

- K1** Relevant legislation, e.g. Freedom of Information and Protection of Privacy
- K2** Organization policies, procedures and plans
- K3** Organization/project goals, vision and status
- K4** Organizational document management system
- K5** Organizational communication protocols, e.g. who needs what information
- K6** Basic spelling and grammar
- K7** Sector, trade and project terminology and common abbreviations
- K8** Communication that constitutes harassment and discrimination

CONTEXTUAL VARIABLES

Range of Context

- Depending upon the message and audience, process may be formal or informal.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Software, e.g. Microsoft Word
- Communication tools, e.g. email

Major Category	Personal Competencies
Competency Area	Communicate Effectively
Competency Unit	Negotiate with internal and external stakeholders

Purpose

Negotiating effectively with internal and external stakeholders helps to ensure all parties are satisfied with the resulting outcomes.

Performance/Abilities

- P1** Determine who needs to be involved in negotiation
- P2** Determine own position:
 - represent project/organization’s position, as required
- P3** Identify what is flexible and what is not
- P4** Present offer to other party
- P5** Acknowledge position or offer of other party
- P6** Discuss possible outcomes with other party:
 - remain open, honest and flexible
 - focus on positive outcomes
 - clarify position, as required, e.g. provide supporting information, discuss ramifications
 - focus on issue at hand
 - suggest alternatives
- P7** Analyze impacts of possible outcomes, e.g. schedule, resources/cost
- P8** Facilitate agreement
- P9** Confirm agreement in writing:
 - file agreement according to project/organizational protocol

Knowledge

- K1** Relevant legislation, e.g. Freedom of Information and Protection of Privacy
- K2** Organization policies, procedures and plans
- K3** Organization/project goals, vision and status
- K4** Organizational document management system
- K5** Effective communication practices, e.g. verbal versus non-verbal, characteristics of respectful communication
- K6** Project stakeholders and their contact information
- K7** Relevant government agencies and their contact information
- K8** Sector and project terminology and common abbreviations
- K9** Negotiation techniques and strategies

Glossary

- **Stakeholders:** individuals and groups who are impacted by the activities or decisions of others; the individuals and groups could be within (internal) or outside (external) of the organization or project, e.g. co-workers, supervisors, contractors, customers, the public, government, union, shareholders.

CONTEXTUAL VARIABLES

Range of Context

- Stakeholders involved in interactions will vary, e.g. tradespeople, team members, managers, agency representatives, and this may affect the tone of the communication, i.e. formal or informal.
- Physical location may change the way this skill is performed, e.g. all communication may have to occur via distance means.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom’s Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Software, e.g. video chat, virtual meeting, Microsoft Word, project management software
- Communication tools, e.g. email, telephone

Major Category	Personal Competencies
Competency Area	Communicate Effectively
Competency Unit	Conduct meetings and presentations

Purpose

Conducting meetings and presentations effectively allows the sharing of information and ideas, which results in positive and solution-focused working relationships and working environments.

Performance/Abilities

- P1** Determine if meeting or presentation is required:
 - identify what message needs to be conveyed and within what timeframe
 - identify best type of meeting/presentation for the purpose
- P2** Determine who needs to be:
 - participant at meeting
 - in audience at presentation
- P3** Prepare for meeting/presentation:
 - confirm availability of key persons
 - prepare outline or agenda
 - make room arrangements, as required
 - determine resources or materials required
- P4** Inform participants/audience of location, start time and duration
- P5** Conduct meeting/presentation:
 - stay on topic
 - allow time for questions and feedback
- P6** Adjourn according to schedule
- P7** Document event, as necessary:
 - distribute documentation, as necessary
 - file according to organizational/project protocol
- P8** Complete any follow-up required, e.g. find answer to question asked during session

Knowledge

- K1** Relevant legislation, e.g. Freedom of Information and Protection of Privacy
- K2** Organization policies, procedures and plans
- K3** Organization/project goals, vision and status
- K4** Organizational document management system
- K5** Effective communication practices, e.g. verbal versus non-verbal, characteristics of respectful communication
- K6** Sector and project terminology and common abbreviations
- K7** Software applications for building visual presentations

CONTEXTUAL VARIABLES

Range of Context

- Stakeholders involved in meetings and presentations will vary, e.g. tradespeople, team members, managers, agency representatives, and this may affect the tone of the communication, i.e. formal or informal.
- Physical location may change the way this skill is performed, e.g. all communication may have to occur via distance means.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Software, e.g. Powerpoint, project management software, video chat, virtual meeting
- Communication tools, e.g. email, telephone, projectors, flip charts

Major Category	Personal Competencies
Competency Area	Communicate Effectively
Competency Unit	Exchange information with internal and external stakeholders

Purpose

Interacting effectively and appropriately with internal and external stakeholders helps to ensure that operations run smoothly and allows managers, supervisors, co-workers, customers and other stakeholders to be proactive before small issues become large problems. Exchanging relevant and accurate information in a timely manner is essential for good performance and relations between individuals and stakeholder groups.

Performance/Abilities

- P1** Determine what information needs to be shared and within what timeframe:
- respect confidentiality of sensitive information
 - tailor message to audience
 - collect information from stakeholders to make decisions or take action, e.g. communicate with host of co-generation station to meet their needs
- P2** Determine who needs information, e.g. department head, team members, customers, government agency
- P3** Determine best method for communicating information, e.g. conduct meeting, hold conference call, send email, share data analysis via SCADA
- P4** Share information through best method, including:
- conduct or participate in face-to-face meetings
 - communicate over distance, e.g. call department of environment about a log jam in dam, share video or photos of equipment and systems with maintenance team
 - email information and updates to have permanent record of exchanges
 - use specialized communication/reporting software, e.g. OASIS, Reliability Coordinator information System
 - use three-way communication to confirm understanding and ensure safety
- P5** Monitor own communication devices frequently, e.g. smartphone, email
- P6** Document communication, as necessary:
- file according to organization's information/record management system

Knowledge

- K1** Relevant legislation, e.g. NERC Standards of Conduct, Freedom of Information and Protection of Privacy
- K2** Organization policies, procedures and plans
- K3** Organizational goals, vision and status
- K4** Organizational information/record management system
- K5** Effective communication practices, e.g. verbal versus non-verbal, characteristics of respectful communication, three-way communication
- K6** Relevant stakeholders, e.g. team members, other departments, contractors, customers, government agencies,
- K7** Information needs of stakeholders
- K8** Industry terminology and common abbreviations
- K9** Basics of how overall electricity system works and how components impact each other, e.g. how distribution and transmission affect generation

Glossary

- **Stakeholders:** individuals and groups who are impacted by the activities or decisions of others; the individuals and groups could be within (internal) or outside (external) of the organization or project, e.g. co-workers, supervisors, contractors, customers, the public, government, union, shareholders.
- **Three-way communication:** sharing a message in three steps: 1. sender states message, 2. receiver repeats message, 3. sender confirms that receiver has repeated message correctly or corrects any misunderstandings.

CONTEXTUAL VARIABLES

Range of Context

- Stakeholders involved in interactions will vary, e.g. tradespeople, team members, managers, agency representatives, and this may affect the tone of the communication, i.e. formal or informal.
- Physical location may change the way this skill is performed, e.g. all communication may have to occur via distance means.
- Continuous training for proper communication, and monitoring of practice, is commonplace for many occupations within the industry.

Level of Practice

- Frontline
- Supervisor
- Manager/Executive

Adapted Bloom's Taxonomy

- Recall, Remember
- Understand
- Apply
- Analyze
- Evaluate
- Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Software, e.g. video chat, virtual meeting, OASIS, RCIS
- Communication devices, e.g. email, telephone

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