

A photograph of a power line tower with several insulators and wires. The scene is outdoors with green trees in the background. The power lines and equipment appear to be damaged or in a state of disrepair, with some wires sagging and equipment hanging from the tower. The overall tone is serious and cautionary.

ENERGY SAFETY FOR EMERGENCY RESPONDERS

GUIDANCE FOR RECOGNIZING
POTENTIAL HAZARDS INVOLVING
WORK AROUND ELECTRICITY



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INTRODUCTION

At Xcel Energy, safety is our number one priority. We appreciate the emergency responders who are committed to keeping our customers and communities safe in the eight states where we operate.

When a 911 operator receives a call reporting an energy-related emergency, such as a downed power line, you and your fellow emergency responders are often first on the scene. This book provides important energy-safety guidance from Xcel Energy for police officers, firefighters, and other first responders to help you stay safe when you are first to arrive on the scene of an energy emergency.

Your safety is important to us, and we encourage you to follow the guidance provided in this booklet. These resources will help you recognize potential hazards involving electricity, as well as provide guidelines to help keep you, your co-workers, the public, and our employees safe.

Just as you have been trained and know your jobs well, our employees receive extensive, ongoing training, making them uniquely qualified to respond safely to electrical emergencies. When a situation requires electric crews, please call our electricity emergency numbers (see Contacts and Resources section for numbers). We encourage our customers and community partners to call us to report any outage in your area so we can pinpoint the equipment involved and assign crews accordingly.

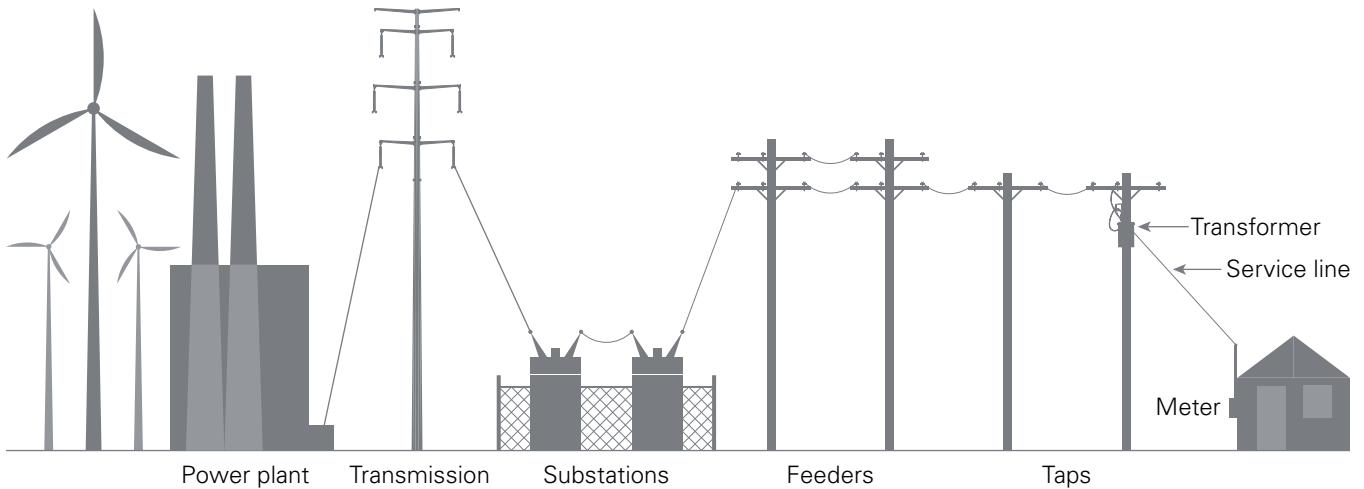
If you have any questions about how to stay safe around energy lines or would like additional information, please contact Public Safety team publicsafety@xcelenergy.com. Please forward this information to the appropriate people on your staff to ensure they have the correct numbers on record.

Please note that Xcel Energy may not be the electric or natural gas service provider in your area. While you should be sure to reach out to your local energy service provider in emergencies, the safety information contained in this book is still valuable to you and your team. In some cases, you may provide mutual aid to a neighboring municipality that we do service.

ELECTRIC SAFETY

The presence of any electrical hazard can alter rescue operations and require tactical changes. Responders must quickly size-up the electrical hazards present at the scene and develop actions to reduce, avoid or eliminate those hazards. To fully understand the hazards you are dealing with, it helps to know how the electric distribution system works.

How the electric distribution system works



Power is carried to homes or businesses through an electric distribution system. Electricity is generated at a power plant and distributed by high-voltage transmission lines through various distribution systems until it reaches homes or businesses.

1. Power plants generate energy and distribute it to substations via high-voltage transmission lines.
2. Transmission lines are used to distribute power to strategically located area substations that may serve one or multiple communities.
3. Substations distribute power to major power lines called feeders.
4. A feeder takes power from the substation and distributes it throughout an area serving several hundred to several thousand customers.
5. Taps are lines branching off feeders and typically serve 40 to 400 customers, including businesses and residential neighborhoods.
6. Transformers convert electrical power from high-voltage to the lower voltages used in homes or businesses. They typically serve individual buildings for commercial customers and several customers on the residential side.

Xcel Energy repairs power lines as safely and as rapidly as possible, working around the clock until power is restored to all customers. We give top priority to situations that threaten public safety, such as live downed wires. After that, repairs are prioritized based on what will quickly restore power to the largest number of customers.

Typically, we repair transmission lines first, because they serve the largest number of customers. Next we repair feeder lines, which serve thousands of customers, followed by tap lines (40 to 400 customers), transformers, and individual service wires.



Electric safety guidelines

Please review these guidelines for recognizing potential hazards involving electrical lines and help keep you, your co-workers, the public, and our employees safe:

Do

- Ensure your dispatch has communicated the electric emergency to Xcel Energy.
- Keep bystanders away.
- Position apparatus a minimum of 10 feet away from distribution wires, with greater distances required for higher voltage wires.
- Wait for Xcel Energy to arrive.
- Assume all lines are hot; consider them energized or live, as is anything they are touching. Always stay away!
- Anticipate potential ignition sources—they can be anywhere.
- Expect the electric system to try to re-energize. Our system is designed to keep electricity flowing. It locks out, or stops flow, after a few consecutive tries to rid the system of a problem, such as tree limbs blowing into lines, etc. When a problem persists, the system locks out.
- Follow your department's standard operating procedures (SOP) for pulling breakers/electric mains.

Do not

- Become a victim yourself.
- Remove fallen wires from vehicles, etc.
- Disconnect electrical services.
- Remove electric meters.
- Open transformers or switch cabinet secondary pedestals (green metal boxes).
- Enter substations unescorted.

Downed wires and structure fires

- Always establish a safe clearance for downed lines—a minimum of one full span between two structurally sound poles.
- Position apparatus emergency trucks safely. Watch for downed lines and lines that could fail with potential to hit apparatus.
- Keep aerial equipment a minimum of 10 feet from distribution wires and further for high voltage wires.
- Only properly utility-trained and qualified personnel should use rubber gloves, dielectric overshoes and special equipment for handling energized equipment. Pike poles are not the same as insulated and regularly tested utility fiberglass sticks.
- Never pull meters.
- Never cut wires.
- Never cut or remove padlocks from transformer or switch cabinets.

Electric equipment fires

- Never enter a substation, switchyard or generation plant fire, or attempt to fight one. Wait for utility personnel.
- As necessary, provide fire suppression to prevent fire from spreading to adjacent areas and facilities. Look up first for overhead lines before starting suppression.
 - Transformers can explode.
 - Arcing can kill.
- Maintain clearances from damaged or burning underground utilities, pad-mounted transformers or switch-cabinets. Treat vehicle collisions with electrical equipment the same as car/pole collisions. The vehicle's chassis may be energized.

Tactical use of hose streams

- Wait for trained electric utility personnel to de-energize any equipment before any operations begin.
- Avoid using water until you are advised to proceed by electric utility personnel.
- If water is used, you must use fog at 30 degrees or wider (100 psi at nozzle) applied from at least 33 to 35 feet, or 10 meters.
- Protect exposures and let the fire burn. Monitor the runoff.
- Never use straight streams.
- Never spray energized equipment.

Rescue

- In car/pole collisions, if electrical hazards are present (lines down), have victims remain in the car, if possible, and wait for electric utility personnel.
- If it's possible for the driver to move the vehicle away from fallen lines, first consider if movement will increase risk to area by pulling more lines down.
- Keep others far away from the collision site.
- If victims are free from life-threatening injuries, have them stay in the vehicle and keep others back, including you. Reassure the victims that it will be safest for them to stay in the vehicle.
- If victims must exit the vehicle, follow step potential safety procedures. Instruct them to jump clear without touching the vehicle and ground at same time. They must shuffle or hop away to avoid step potential.
- Use protective shields, barriers or alerting techniques to protect firefighters and bystanders from electrical hazards and energized areas.
- Treat vehicle/pad-mount collisions the same as car/pole collisions. The vehicle's chassis and surrounding area may be energized. Wait for utility personnel to verify equipment is dead before rescue is attempted.
- Remove vehicle only after equipment is determined to be de-energized.





FIRE SAFETY RESPONSE FOR SUBSTATION EMERGENCIES

All operations involving Xcel Energy substations require de-energizing the affected equipment and isolating the surrounding area. If entry is deemed necessary by a unified command team, emergency personnel should be guided by Xcel Energy substation electricians.

Decision making for high voltage/substation emergencies

The initial task during high voltage emergencies involving Xcel Energy substations is to determine the tactical action plan. This is done by assessing the incident's potential.

The incident commander (IC), based on input from Xcel Energy, should estimate the likely outcome of the emergency and select the overall operating strategy to favorably impact this outcome.

Pre-planning for substation emergencies will help identify response strategies and tactics, as determined by representatives from both the emergency services and local utility companies, like Xcel Energy. The absence of a preplan for a substation or generation plant emergency raises the risk of disaster and injury.

Strategy and tactics for substation emergencies

Strategy is an important step of the response effort. Strategic goals should be general in nature, such as life preservation, incident stabilization, environmental impact, and utility service restoration. Examples of common strategic goals at utility emergencies could include the following:

- Rescue (if possible and can be done safely)
- Public protective actions (isolate downed wires, arc safety and downwind evacuation)
- Preventing cooling oil from impacting the environment
- Controlling the spread of oil around the substation
- Fire suppression and control
- Safety during restoration operations

Tactics are action-specific and implemented to achieve the strategic goals. Tactics could include:

- Protecting in place vs. evacuating
- Use extinguishing agents rather than water spray
- Cooling exposures from radiant heat

Operational modes

Mitigating utility emergencies requires implementation of an overall operational mode. The three modes are nonintervention, defensive and offensive. Criteria for evaluating operational modes include the level of resources available (e.g. personnel and equipment), level of training and capabilities of the emergency responders, and the potential harm created by the incident.

Nonintervention

“No action” is taken. The risks of intervening are unacceptable when compared to the dangers of fighting the electrical fire. All personnel are withdrawn to a safe location.

Defensive

Conditions indicate that the defensive actions chosen will buy time, enabling the response effort to be directed towards limiting the overall spread of the problem.

Offensive

The offensive mode must never be initiated without local utility provider substation electricians present to advise the responder. All operations must be done in conjunction with, and under the direct supervision of, substation personnel.

Substation fire response

The overall mission of an emergency response involving Xcel Energy substations is always to:

1. Protect lives.
2. Establish a protective perimeter around the substation, protecting surrounding structures: DO NOT enter or extinguish any substation equipment until receiving authorization from Xcel Energy substation personnel.
3. Assist Xcel Energy in efforts to stabilize the incident, as directed/needed.

Responders must use extreme caution around high voltage areas due to the severe electric hazards. High voltages in these sites can exceed 500,000 volts, or 500 kilovolts (kV), and operating amperages (A) of 1000A or more. Substations contain transformers, circuit breakers, switch gear, capacitors, bus bars (large diameter, non-insulated metal conductors), and large banks of batteries to control power in control rooms.

Electrical emergencies at Xcel Energy substations should be approached cautiously. Responders should wait for Xcel Energy personnel to arrive before initiating any type of offensive actions (see note 2 above). Since there is extreme risk to responders during high voltage emergencies, decisions must be made by the emergency services incident command in conjunction with Xcel Energy’s incident commander. Unified command is critical in these types of operations.





Caution

Substations can contain a great deal of oil. It is used for cooling transformers and as an arc suppression agent while opening a circuit breaker. In some facilities the oil reservoir can be large, or stored indoors.

When there is a fire or damage to oil-cooled equipment, an oil spill can result. Regular hazardous materials tactics can be employed if the area is free from any energized equipment. Most utilities have eliminated the polychlorinated biphenyl (PCB) problem in their cooling oils; however, the real hazards are the flammability of heated oils and the ever-present danger of energized equipment.

Pre-planning questions

- **What type of incident is it?**
Is it a generation substation or distribution substation incident? Is the equipment visible from the outside, or is it inside a surrounding wall or building?
- **Are all safety considerations identified?**
Have all electrical safety hazards or considerations associated with the event been identified? Has the site been de-energized and verified by Xcel Energy substation electricians? Can the emergency area be isolated from electricity, and is it of a magnitude that would allow operations without fear of runoff, steam, or extinguishing agent contacting energized equipment and causing an arc?
- **Is there an electrical hazard still present?**
Even though the immediate area has been de-energized, equipment nearby may remain energized.
- **What is the location of the incident?**
Is the substation in a rural or remote outside area (perimeter chain link fence), in a populated area (perimeter "fence" limiting view inside), or in the heart of the city (potentially inside a building)?
- **What is the external public impact?**
Has Xcel Energy addressed the informational needs of the emergency services, the impact on the public and what will be necessary to lessen the public's fear, imposition and loss of power? Xcel Energy's communications team is ready to respond.
- **Are there any other hazards present?**
Could there be an explosion, structural instability due to earthquake, mechanical equipment or hazardous materials present? In many substations there is combustible oil used to cool the circuit breakers and transformers. This hazard can create large flammable liquid fires outside and inside the substation.
- **Can the incident escalate?**
What could possibly happen that would make this incident worse and has it been addressed? Can oil in transformers ignite or explode? Will the oil flow through duct openings or travel to lower floors?

SOLAR SAFETY

Fire safety guidelines for rooftop- and ground-mounted solar photovoltaic systems

Solar photovoltaic (PV) systems can present a variety of significant hazards when responding to an emergency. The following information is intended to assist emergency responders in their decision-making process at emergencies involving solar power systems on buildings.

- The PV array will always generate electricity during daylight, even when cloudy, raining, snowing, etc., and the generation of electricity cannot be turned off.
- Consider all PV equipment and wires to be energized, and do not touch or cut into or through PV modules, conduit or equipment.
- Do not open combiner box (square box, usually only on large commercial units). All energized wires from the solar panels are fed into the combiner box, then combined into two large high-current wires. Opening this box is dangerous. Boxes are normally locked.

If solar panels or batteries are on fire:

- Wear SCBA and full protective clothing.
- Locate battery storage area (if applicable).
- Ensure that people downwind of the fire are safe.
- Use CO₂ or dry chemical fire extinguishers to extinguish lead-acid battery fires, or if a PV system shorts and starts a fire. For larger fires some foams* can be effective to extinguish lead-acid battery fires. Be mindful not to stand in run-off water.
- Should the PV array become engulfed in fire, let it burn but protect the surrounding exposure with a wide fog pattern of water at appropriate nozzle pressure.
- Avoid spraying water directly on energized electrical equipment.

***Note:** Some fire-fighting foam is a surfactant mixed with water, which could potentially conduct electricity. It is not advisable to use such foams to put out electrical fires. Be sure to follow the manufacturer's recommendations for using foam to fight fires.





Solar Safety – A-Z Guide

Under normal operating conditions, PV systems are safe to operate. The PV industry has a good safety record. Keep the following hazards in mind when responding to emergencies around PV systems.

Battery emergencies

- Wear full protective clothing and self-contained breathing apparatus (SCBA).
- Extinguish lead-acid battery fires with dry chemical, CO₂ or foam fire extinguishers.
- Do not use water to put out a battery fire.
- Never cut into the batteries under any circumstances.
- If the battery is punctured by a conductive object, assume that the object has electrical potential.

Battery hazards – Some installations may have batteries installed.

- Batteries that are burning or exposed to fire may produce extremely corrosive fumes and gases.
- Electrolyte is corrosive and should be handled appropriately.
- Spilled electrolyte can react and produce toxic fumes.
- Spilled electrolytes that come in contact with other metals and liquids may produce flammable and explosive gases, such as hydrogen.
- Due to the potential of explosive gases, prevent all open flames and avoid creating sparks.

Electrical shock and burns – Contact with electricity can cause a range of effects, from a slight tingling sensation because of involuntary muscle reaction to severe burns, and even death. Burns that may occur in electrical incidents include electrical, arc and thermal. Arc temperatures can reach 15,000 to 35,000 degrees.

Evacuation – If a rooftop-mounted system is involved in a fire, evacuate the building where the rooftop array is located.

Foam or salvage cover – You cannot block the sunlight on the PV array with foam or a salvage cover. Foam will slide off the PV array, and although a salvage cover significantly reduces sunlight to the array, electricity can still be generated through it.

Ground hazards – There may be uneven terrain where ground-mounted arrays are located. Use caution when approaching. Also, be alert to local wildlife habitat in the area and do not cut any electrical conduits.

Inhalation exposure – During a fire or explosion, the PV frame can quickly degrade, exposing hazardous chemicals to direct flame which can then spread in the smoke plume:

- Boron – No health effects to humans or the environment.
- Cadmium Telluride – A known carcinogen. The primary route of exposure is inhalation.
- Gallium Arsenide – The health effects have not been studied. Considered highly toxic and carcinogenic.
- Phosphorus – Fumes from compounds are considered highly toxic. The NIOSH (National Institute for Occupational Safety and Health) recommended exposure limit to phosphorus is 5 mg/m³. A lethal dose of phosphorus is 50 milligrams.

Lock out/Tag out – Make sure you lock out and tag out all electrical disconnects, isolating the PV system at the inverter. Note that new systems have individual micro inverters on each panel or array.

Personal protective equipment – Emergency responders should follow the minimum standard in NFPA (National Fire Protection Association) 1971, Protective Ensemble for Structural Firefighting, and NFPA 1500, Chapter 7, Personal Protective Equipment.

Removal and cleanup – Damaged PV system removals are performed under the direction of the owner, by qualified and trained individuals. Owners of PV systems are prepared to have damaged panels removed and recycled. In the event damaged PV panels must be moved, emergency responders should use full turnout gear, due to the potential presence of hazardous chemicals and decomposition products. Some of these chemicals/products can be corrosive to the skin and dangerous if inhaled. Do not pull the electric meter to shut off power to a building.

Roof hazards – Consider the weight of the PV array on a weakening roof structure and the fact that you may not be able to access the roof over the fire:

- Do not cut into PV modules
- Do not cut any electrical conduits
- Consider cross-ventilation
- Be aware of tripping hazards to prevent falls

Shelter in place – Does the size of the emergency and the involvement of the array in fire constitute the need to protect populations downwind?

Ventilation – Consider where to cut or whether to use cross-ventilation.

Other safety considerations:

- Size up the rooftop- or ground-mounted system and look for warning labels on electrical disconnects.
- Walking on or breaking PV modules could release all the energy in the system simultaneously.
- Cut or damaged wires from a nighttime operation could become energized in the daytime.
- Hand lights used during an evening operation are not bright enough for the PV system to generate electricity, but scene lighting may.
- Please do not remove the electric meter to shut off power to a building.
- Lightning is bright enough to create an electrical surge.
- When working near electrical circuits, keep in mind that current detection instruments on many engines can only detect alternating current, and would not detect direct current in PV wiring or battery conductors.

For more information visit:

<https://xcel-energy.rtueonline.com/>

<http://www.nfpa.org/> (Keyword: Solar)



Prepare – Xcel Energy mitigates wildfire risks and incorporates wildfire concerns into Incident Response Plans.

Respond – 24-7 monitoring occurs for each operational area. Each operational area activates the appropriate level of response, which at times includes all operational areas.

Recover – Incident Response Plans include damage assessment and recovery planning, ensuring customers’ power is restored.

WILDFIRE RESPONSE

Xcel Energy continues to improve all-hazard Incident Response Plans to include wildfire concerns. Integrated wildfire monitoring, threat assessment, and communication protocols in Xcel Energy’s Incident Response Plans streamlines and strengthens our ability to respond to wildfire events.

Stakeholder engagement

An important component of wildfire response is developing partnerships and sharing information with local, state and federal agencies, emergency managers, dispatch agencies, and incident management teams, as well as community groups involved in wildfire planning. Pre-event engagement helps all stakeholders understand critical needs, reliance, and command structures. Xcel Energy’s operations and emergency preparedness teams continually work with our stakeholders to ensure response plans are coordinated as a “one team” approach.

Want to know more about Incident Response Plans or conducting drills? Contact us at: dlEnterpriseResilience@xcelenergy.com.

For information on our mitigation efforts, visit our website, [XcelEnergyWildfireProtection.com](https://www.xcelenergy.com/wildfireprotection) or contact us at: info@XcelEnergyWildfireProtection.com.



CONTACTS AND RESOURCES

Safety is our highest priority. To ensure the safety of the community, we have provided unpublished, dedicated 800-numbers to emergency communications centers in communities we serve. Our 800-numbers enable communications center personnel to directly and quickly contact us when they receive information about an emergency that involves our facilities. Business cards containing these confidential emergency phone numbers are available to emergency responder organizations from your Xcel Energy community representative.

Your communication dispatch center often is the first step in connecting us to an energy emergency. We ask that 911 dispatchers transfer calls like these to our Customer Service line at **800-895-4999**.

Which line should you call?

First responders receive top priority at Xcel Energy. The business cards provided by your community representative contain separate response lines for both life-threatening and non life-threatening emergencies. Here are the details for determining which number you should call:

Use the **response lines for life-threatening** situations when:

- Immediate action is required by Xcel Energy personnel.
- Emergency responders are on-scene.

Please have the following information available:


- Complete or closest address, GPS coordinates, if known, or best directions possible, including nearest cross streets.
- Exact nature of the situation.

Use the **response line for non life-threatening** situations or **essential services outages** when:

- Critical customers or essential public services are affected by outages, such as sewage pumping stations, water wells, essential municipal buildings and urgent care facilities (e.g., hospitals).

Please have the following information available:

- Address of the building affected by the outage.
- The building's Xcel Energy premises or account number. (This information will help us know what equipment may be affected.)



FOR EMERGENCY AGENCY USE ONLY.
These numbers are not intended for the general public.

Emergency Response Personnel Lines

For Life-Threatening Emergencies ONLY:

- Gas Emergency Response Personnel LineXXX-XXX-XXXX

For Non Life-Threatening Emergencies and Essential Services Outages ONLY:

- Electric Outages Response Line.....XXX-XXX-XXXX

Important

- **Do not release emergency response phone numbers to the public.**
- **Ensure that 911 dispatchers do not transfer calls to our emergency response line.**



Point your cellphone camera at the QR code to visit the Public Safety pages on XE.com.

NOTE: Xcel Energy may not be the electric or natural gas service provider in your area. Be sure to contact the correct local energy service provider in case of emergency.



When customers should call Xcel Energy directly

Customers should call Xcel Energy directly for the best service when:

- There are outages not associated with emergencies.
- There is a blown fuse or other loud noise.
- There are wires down and emergency response personnel are not on the scene.

In situations where your agency would not generally respond, please advise the customer to call us at the numbers listed below.

General public numbers and website

Xcel Energy Electric Outage: **800-895-1999**

Xcel Energy Residential Customer Service: **800-895-4999**

Xcel Energy Business Solutions Center: **800-481-4700**

TDD/TYY (hearing-impaired service): **800-895-4949**

Xcel Energy Website: xcelenergy.com

About response times

While emergency responders are often the first on the scene, our prompt response to emergency calls helps ensure the safety of those nearby. When the situation requires immediate action from our first responders, local emergency dispatch communications centers help us by providing accurate information when they initially contact us, such as:

- A complete address, the nearest one available or the best directions possible, including nearest cross streets, to the location of the emergency.
- An accurate description of the energy situation and specifics regarding what the responder anticipates Xcel Energy can do to make the situation safe, such as de-energizing a line, stopping blowing gas, etc.

During extreme conditions (most often storm-related) that cause extensive electrical outages, all available trained Xcel Energy employees perform some level of field inspections. Generally, our response time during such extreme conditions averages approximately four hours; however, it could be up to eight hours or more before an Xcel Energy inspector arrives on the scene.

Unified command at utility emergencies

In large incidents, it is common to use a modified incident command structure, called unified command, whereby representatives from both the emergency services command and utility companies work together. They share information and coordinate personnel to develop an overall action plan that best solves the problem. The unified command team develops an incident action plan that uses agreed-upon strategies and tactics to accomplish the mission.

In high voltage emergencies involving an electric substation or a generation plant, the unified command process is the only way to guarantee success and assure the safety of all responders and utility personnel at the scene. Unified command at utility emergencies provides a joint method for incident management teams to:

- Determine incident priorities and identify strategic goals
- Select tactics for achieving the strategic incident goals and priorities
- Ensure joint planning for objectives and tactical activities
- Allow joint tactical operations to be conducted
- Maximize the use of all assigned resources
- Provide a method for resolving conflicts among the team players

Responding to Utility Emergencies (RTUE) online

As an emergency responder you do everything possible to keep your community safe. But if the situation involves electricity or natural gas, do you know how to keep the public and your team safe? Utility emergencies present unique dangers to recognize and handle. Knowing about them and specific actions to take can lead to better results and, ultimately, to saved lives.

Responding to Utility Emergencies (RTUE) online

(<https://Xcel-Energy.RTUEonline.com>) can effectively bridge the knowledge gap. It complements your department's training program, and gives you new information. It also provides a refresher about working safely during a utility emergency.

RTUE online offers access to effective interactive training based on national standards. It includes learning objectives and application activities to educate and engage all types of responders, including firefighters, police officers and other emergency personnel. Training can be tracked and a certificate will be offered upon completion of the course.



