



Before darkening the room, offer a welcome and an overview.

Begin by introducing the program:

Welcome to First Responder Beware: Staying Safe While Protecting Others, Electrical Safety for First Responders. Today's session will share strategies for working safely around electric power lines and for handling certain emergencies involving electricity.

By following the procedures we'll cover here today, you can keep yourself, your fellow first responders, and the public safe. Now I know that some of you will have heard this information before, and so for you, this program will be a refresher. For others, this may be the first time you're hearing about this topic, but I hope everyone will find the program valuable.

Darken the room and begin the presentation.

Firefighters, police, and EMTs are typically first on the scene in an emergency and face the greatest risk from electrical infrastructure contacts.

Understanding the potential dangers and dealing with them correctly makes everyone safer.

This program is designed to supplement, not replace, your department's standard operating procedures (SOPs).

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This is a good time to reiterate the importance of this information: that it can protect first responders, incident victims, and bystanders from electricity-related injury or death.

Please note that each local department will have its own standard operating procedures about electrical safety. Emphasize to participants that this program is not designed to replace these procedures, only to supplement them.

⚡ Electrical Safety Basics

- Respect the Power of Electricity
- Hands Off Electrical Systems
- Protect Yourself and Others from Shock
- Always Observe the 20-Foot Rule
- Be Aware of Overhead Power Lines
- Always Assume PV Systems Are Energized
- Use Extra Caution Near Downed Power Lines
- Manage Substation, BESS, and Transformer Fires



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This presentation will cover key practices you need to know to keep yourself safe around electric power lines and on the scene of emergencies involving electricity. The topics we are going to focus on are:

- Respect the Power of Electricity
- Hands Off Electrical Systems
- Protect Yourself and Others from Shock
- Always Observe the 20-Foot Rule
- Be Aware of Overhead Power Lines
- Always Assume PV Systems Are Energized
- Use Extra Caution Near Downed Power Lines
- Manage Substation, BESS, and Transformer Fires

⚡ **Respect the Power of Electricity**

- **Electricity always seeks the easiest, most direct path to ground** through conductors like:
 - Your body
 - Trees
 - Water
 - Metal objects and structures
 - Long or tall equipment
- **Even low-voltage electrical shock can be fatal.**
- **Standard-issue protective gear does not insulate you against electrical shock.**
- **Electrical shock and burn injuries may include internal tissue damage that is not immediately apparent.** Make sure victims receive thorough medical attention.



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First of all, we need to know a few basic things about electricity.

- Electricity always seeks the easiest, most direct path to the ground through conductors like:
 - Your body
 - Trees
 - Water
 - Metal objects and structures, including fences and gutters
 - Long or tall equipment such as ladders
- Even low-voltage electrical shock can be fatal. Protecting yourself means always remembering that there are no minor risks when dealing with electricity.
- Standard-issue protective gear DOES NOT insulate you against electrical shock.
- Electrical shock and burn injuries may include internal tissue damage that is not immediately apparent. Make sure victims receive thorough medical attention. Shock victims often show no visible injuries or only minor burns on the skin, but the internal organs can be critically wounded. Treat these injuries as serious regardless of their appearance.

⚡ Hands Off Electrical Systems

- **Never attempt to disconnect electrical services:**
 - **Never cut service wires.** This is extremely dangerous. Instead, turn off power at the main circuit breaker.
 - **Never attempt to remove electrical meters.** This is extremely dangerous and can cause serious injury or death.
 - **Never attempt to open or enter a manhole or vault** until utility personnel tell you it has been de-energized.
- **Never touch or attempt to move power lines.**
 - **Although some wires may appear insulated, they are not.** Their weatherproof coating will not protect you from electrical shock.



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Remember that even low-voltage electrical shock is potentially fatal. To avoid this risk, keep away from electrical equipment and systems.

- Never attempt to disconnect electrical services. This can be an extremely dangerous, even deadly, mistake. Instead, turn off power at the main circuit breaker.
 - Never cut service wires or power lines.
 - Never attempt to remove electrical meters. This is extremely dangerous and can cause serious injury or death.
 - Never attempt to open or enter a manhole or vault until utility personnel tell you it has been de-energized.
- Never touch or attempt to move power lines. Remember, your protective gear does not insulate you from electrical shock. In dealing with electrical systems, employ a hands-off policy and call SMUD.
 - Although some wires may appear insulated, they are not. Their weatherproof coating will not protect you from electrical shock.

⚡ Protect Yourself and Others from Shock

- **Always identify power lines and electrical equipment upon arrival at an incident scene.**
- **Assume all lines are energized** as well as all objects touching power lines.
- **If power lines or electrical equipment are involved in an incident**, have your dispatcher contact **SMUD**.
- **Provide the best possible directions** to the location.
- **Secure the area.** Be prepared for the utility vehicle to arrive and make sure there is a clear path to the incident site for SMUD personnel.



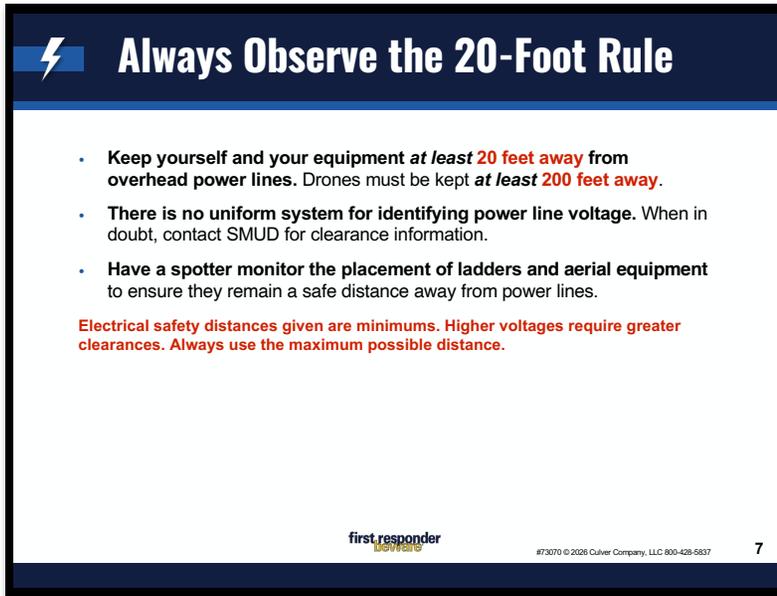
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Adhering to some simple best practices can minimize the risk of electrical shock.

- Always identify power lines and electrical equipment upon arrival at an incident scene. The first thing to do is to survey the area for overhead power lines, downed lines, solar photovoltaic (PV) systems, batteries, and other electrical equipment such as transformers. Especially during or after a storm, look for lines down in trees or on fences. Proper electrical safety procedures should figure into any operational planning.
- Assume all lines are energized as well as all objects in contact with power lines. Additionally, areas around power lines and electrical equipment or objects touching them (such as trees, fences, or vehicles) should also be treated as energized. This includes the ground. Approach with caution.
- If power lines or electrical equipment are involved in an incident, have your dispatcher contact SMUD. Calling is always the right thing to do whether you identify electrical infrastructure or are just unsure. SMUD wants you and the public to be safe and will respond quickly. Their personnel will switch off the power and tell you when the area is safe and de-energized.
- As simple as it sounds, provide the best possible directions to the location. Intersections, landmarks, and specific buildings will help.
- Secure the area. When dealing with electricity, your priority is to protect yourself and the public. SMUD personnel will tell you when it is safe to approach. Be prepared for the utility vehicle to arrive and make sure there is a clear path to the incident site for utility personnel.



Always Observe the 20-Foot Rule

- Keep yourself and your equipment **at least 20 feet away from overhead power lines**. Drones must be kept **at least 200 feet away**.
- There is no uniform system for identifying power line voltage. When in doubt, contact SMUD for clearance information.
- Have a spotter monitor the placement of ladders and aerial equipment to ensure they remain a safe distance away from power lines.

Electrical safety distances given are minimums. Higher voltages require greater clearances. Always use the maximum possible distance.

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Always observe the 20-foot rule.

- Keep yourself and your equipment at least 20 feet away from overhead power lines. (Drones are an exception to this 20-foot rule. Keep them at least 200 feet away from power lines and other electrical equipment, and follow department SOPs for drone operation.)
- There is no uniform system for identifying power line voltage. When in doubt, contact SMUD for clearance information. Their line workers get a lot of specialized training that teaches them to recognize the voltages they're dealing with at any given site. Don't make the mistake of thinking you can know the appropriate voltage and clearance by looking at a line.
- Have a spotter monitor the placement of ladders and aerial equipment to ensure they remain a safe distance away from power lines.

Electrical safety distances given are minimums. Higher voltages require greater clearances. Always use the maximum possible distance. Your best practice is always to stay as far away as possible from power lines and electrical infrastructure.

⚡ Be Aware of Overhead Power Lines



- **Park emergency vehicles as far away as possible** from overhead power lines.
- **Keep aerial equipment at least 20 feet away** from overhead lines.
- **Use a spotter** to keep your aerial equipment away from power lines.
- **Never use a solid water stream** to fight fires near overhead power lines.

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When overhead lines are present at an incident scene, remember a few simple safety rules.

- Park emergency vehicles as far away as possible from overhead power lines. You don't want to be surprised by a falling, burning power line.
- Keep all aerial equipment at least 20 feet away from overhead lines. Remember the 20-foot rule and that metal ladders are conductors. Be aware that wind can move aerial equipment.
- Remember that higher voltages require greater clearances, and always use the maximum possible distance. (A good rule of thumb is to maintain a safety clearance that is greater than the length of the equipment when extended.)
- An equipment operator working alone cannot judge the distance between equipment and power lines. Assign a spotter to monitor your equipment's proximity to power lines.
- Never use a solid water stream to fight fires near overhead power lines. A solid stream can create a clear path for electric current. When overhead lines are in the vicinity of a fire, you can, with extreme care, use a mist or spray to extinguish flames. But remember that ALL water is a conductor and always be extremely cautious when using water around overhead lines.

Be Aware of Overhead Power Lines

- **If your aerial equipment contacts a power line:**
 - **Remain on the equipment.** Move the equipment away from the line if you can do so safely. If the equipment cannot be moved, all personnel on the equipment should remain there.
 - **Warn others to stay far away.** Anyone who touches the equipment or even the ground nearby may be injured or killed.
 - **Have someone call SMUD at 1-888-456-7683 immediately.** Utility personnel will respond quickly, switch off the power, and tell you when it is safe to get off the equipment. Wait for their instructions.

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Remember that anything touching a power line will become energized, including your vehicle or aerial equipment.

- If your aerial equipment contacts a power line, stay put, warn others to stay away, and have someone call SMUD immediately.
 - Remain on the equipment. Move the equipment away from the line if you can do so safely. If the equipment cannot be moved, all personnel on the equipment should remain there.
 - Warn others to stay far away. Anyone who touches the equipment or even the ground nearby may be injured or killed.
 - Have someone call SMUD at 1-888-456-7683 immediately. Utility personnel will respond quickly, switch off the power, and tell you when it is safe to get off the equipment. Wait for their instructions.

⚡ Be Aware of Overhead Power Lines

- **If fire or other imminent danger forces you off the equipment:**
 - **Jump clear**, keeping both feet together and without touching the equipment and the ground at the same time.
 - **Shuffle away with small steps**, keeping both feet close together and on the ground at all times.
 - **Do not run or take large steps.** When equipment contacts a line, electricity spreads out in the ground like ripples in a pond, and the voltage decreases with distance from the point of contact. If your legs bridge two areas of different voltage, serious injury or death can occur.



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In some cases, other hazards such as fire make it impossible to stay on the energized equipment until utility personnel give the all clear.

- If fire or other imminent danger forces you off the equipment:
 - Jump clear, keeping both feet together and without touching the equipment and the ground at the same time. Otherwise, you will become electricity's path to the ground and you will be seriously—or fatally—shocked. Make every attempt to land on both feet at the same time.
 - Shuffle away with small steps, keeping both feet close together and on the ground at all times.
 - Do not run or take long steps. When equipment contacts a line, electricity spreads out in the ground like ripples in a pond, and the voltage decreases with distance from the point of contact. If your legs bridge two areas of different voltage, serious injury or death can occur.

Demonstrate the jump-off procedure.

⚡ Always Assume PV Systems Are Energized

- **In incidents involving PV systems,** be alert for electrical, structural, and chemical hazards.
 - **Consider all PV equipment,** junction boxes, batteries, and wiring to be energized at all times. Do not touch or cut into PV modules, conduit, or equipment.
 - **Prepare for fires** near a rooftop array to grow unexpectedly, in some cases causing rapid structural failure.
 - **Always wear full protective clothing and SCBA.** Batteries that ignite or overheat may release hazardous materials and highly toxic and explosive gases.



Always assume PV systems are energized, whether or not the sun is shining.

- In incidents involving PV systems, be alert for electrical, structural, and chemical hazards.
 - Consider all PV equipment, junction boxes, batteries, and wiring to be energized at all times, and keep yourself and all tools away from them. Do not touch or cut into PV modules, conduit, or equipment.
 - Prepare for fires near a rooftop array to grow unexpectedly, in some cases causing rapid structural failure.
 - Always wear full protective clothing and SCBA. Batteries that ignite or overheat may release hazardous materials and highly toxic and explosive gases.

⚡ Use Extra Caution Near Downed Power Lines

- Assume every downed power line, and anything in contact with it, is **energized and dangerous**.
- Park emergency vehicles **away from fallen lines**.
- Secure the area:
 - Keep yourself and the public **at least 40 feet away** from fallen power lines.
 - Transmission lines from large towers require a distance of **100 feet**.
- **Never touch or attempt to move fallen lines** or objects contacting them.
- **Never use a solid water stream** to fight fires near downed lines.




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Dealing with downed lines requires additional measures to protect life and property.

- Assume every downed power line, and anything in contact with it, is energized and dangerous.
- Park emergency vehicles away from fallen lines, on the side of the street opposite the involved utility pole. Downed power lines can be energized even if they don't hum or spark. The ground and objects in the vicinity of a fallen power line may be energized. Wait for utility personnel to give the all clear.
- Secure the area.
 - Keep yourself and the public at least 40 feet away from fallen power lines. Always remember that objects and even the ground near downed lines may also be energized.
 - Transmission lines from large towers require a distance of at least 100 feet. In any incident involving downed lines, recall that wind as well as electric charge can cause lines to whip and move. Observing these expanded clearances can help protect everyone from the unexpected.
- Never touch or attempt to move fallen lines or objects contacting them. Doing so endangers you and incident victims. Contact SMUD immediately so they can de-energize the scene.
- Never use a solid water stream to fight fires near downed lines. If you must use water to extinguish a fire near downed lines, use only a mist or spray, and be extremely cautious.

⚡ Use Extra Caution Near Downed Power Lines

- **Do not enter, touch, or even approach a vehicle that may be energized.** Resist the temptation to extract passengers.
 - Call SMUD.
 - Instruct occupants to drive the vehicle far away from the line if this can be done safely.
 - If the vehicle cannot be moved, **instruct all occupants to stay put until utility personnel give the all clear.** Staying in the vehicle is their **BEST** protection against electrical shock.



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When incident victims are in or around the energized area, particularly in vehicles that have contacted power lines, remember that both you and they are safest staying put.

- Do not enter, touch, or even approach a vehicle that may be energized. Resist the temptation to attempt to extract passengers. You risk both your own and the victims' safety when you enter the energized area. Instead, stay at least 30 feet away from fallen distribution lines and 100 feet away from fallen transmission lines. You chose this work to save lives, and that instinct is strong. However, in this case, if you enter the energized area, you have a very high risk of electrical shock. Becoming a victim yourself puts everyone in greater danger.
 - Call SMUD immediately. They will respond quickly and de-energize the scene.
 - Keeping your distance, find a position where passengers can see you without exiting or moving around inside the vehicle, and attempt to reassure them.
 - Instruct vehicle occupants to drive the vehicle away from the line if this can be done safely.
 - If the vehicle cannot be moved, instruct the occupants to stay put until utility personnel give the all clear. Staying in the vehicle is their best protection from electrical shock. Tell them utility personnel are on the way to turn off the electricity. Tell them to stay where they are and to try to relax. If occupants are injured or panicked, talk with them, keep them calm and alert, and use the wait time to prepare medical assistance.

⚡ Use Extra Caution Near Downed Power Lines

- **If occupants in an energized vehicle are in imminent danger from fire or other hazards:**
 - Instruct them to **jump clear** without touching the vehicle and the ground at the same time.
 - Tell them to **shuffle away with small steps**, keeping both feet close together and on the ground at all times.
 - Demonstrate the proper procedure from a distance.
- **If occupants are injured, disabled, or otherwise unable to safely exit the vehicle on their own**, your incident commander will assess the situation and tell you how to proceed.



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In some cases, fire or other hazards make it impossible for occupants to remain in the vehicle.

- If occupants in an energized vehicle are in imminent danger from fire or other hazards, you must resist the temptation to approach the vehicle. Touching an energized vehicle is a sure way to become a shock victim yourself! Follow these procedures to get everyone out alive.
 - Find a vantage point where occupants in the vehicle can see and hear you, but keep your distance. Instruct them to jump clear without touching the vehicle and the ground at the same time.
 - Tell them to shuffle away with small steps, keeping both feet close together and on the ground at all times. Emphasize that they must not run or take long steps.
 - Demonstrate the proper procedure from a distance. Show occupants how to perform the jump-and-shuffle procedure from a visible distance before they attempt their escape.
- If occupants are injured, disabled, or otherwise unable to safely exit the vehicle on their own, your incident commander will tell you how to proceed. Wait for instructions before taking action or you could become another victim.

⚡

Substation and BESS Fires

- **Burning electrical equipment is already ruined and will be replaced.** The safest course of action is to **LET IT BURN.**
- Contact SMUD and wait for their personnel to arrive. **Never attempt to enter a substation without utility personnel present.**
- **Evacuate the area** and keep everyone **at least 300 feet away** from a burning substation or Battery Energy Storage System (BESS).
- **Be alert for explosions, toxic smoke, and oil releases.** Stay upwind.

- **Protect area exposures** to prevent fire from spreading.
- **Prevent contamination of water resources.**
- **If an equipment fire must be suppressed,** utility personnel and the incident commander will tell you how to proceed.



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Substation and battery energy storage system (BESS) fires present specific risks.

- Burning electrical equipment is already ruined and will be replaced. The safest course of action is to let it burn.
- Contact SMUD and wait for their personnel to arrive. Never attempt to enter a substation without utility personnel present.
- Evacuate the area and keep everyone at least 300 feet away from the substation or BESS. Your most important responsibility in these types of emergencies is to protect the public.
- Be alert for explosions and toxic smoke, and stay upwind. Electrical equipment contains oil and other hazardous materials. A BESS can present an explosion hazard, even without signs of fire.
- Protect area exposures to prevent the fire from spreading. Once the area is evacuated, focus on defending nearby property and green space.
- Prevent contamination of water resources. Monitor for oil runoff and direct it away from catch basins, surface waters, and wetlands.
- Do not direct water into the substation. If an equipment fire must be suppressed, utility personnel and the incident commander will tell you how to proceed.

Transformer Fires

- Do not open or enter switch cabinets or pad-mounted transformers.
 - Never cut locks or pry cabinets open. Equipment contains live electrical components, and if you touch them, serious injury or death can occur.
- Call SMUD, evacuate the public, and protect area exposures.
- Let transformers burn unless or until otherwise instructed by utility personnel.



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Burning transformers call for procedures similar to those for substation fires.

- Do not open or enter switch cabinets or pad-mounted transformers, such as the one pictured here. This is very dangerous and unnecessary.
 - Never cut locks or pry cabinets open. Equipment contains live electrical components, and if you touch them, serious injury or death can occur. Once a fire has begun, the equipment is unsalvageable and will be replaced. Don't risk your life to save ruined equipment.
- Call SMUD, evacuate the public, and protect area exposures. Whether it's a transformer on the ground or on a pole, be alert for explosions and toxic smoke, and once the area is secure, do what you can to keep the fire from spreading.
- Let transformers burn unless or until otherwise instructed by utility personnel. They will determine when it is safe to extinguish an equipment fire and will advise your incident commander regarding the safest procedures.

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Electrical Safety Review

- **Identify all overhead power lines and electrical equipment upon arrival at an incident scene.**
- Whenever you suspect electrical infrastructure is involved, or when in doubt, **call SMUD**. Be prepared for the utility vehicle to arrive and make sure there is a clear path to the incident site for utility personnel.
- **Hands off electrical systems.**
 - Never attempt to disconnect electrical service.
 - Never touch power lines.
- **Assume all power lines are energized and keep yourself and your equipment at least 20 feet away.**
- **Use a spotter to keep equipment away from power lines.**
- **Even low-voltage electrical shock can be fatal.** Your gear does not insulate you against electrical shock.
- **When responding to a substation or transformer fire, let it burn,** evacuate the area, and protect exposures and water resources.

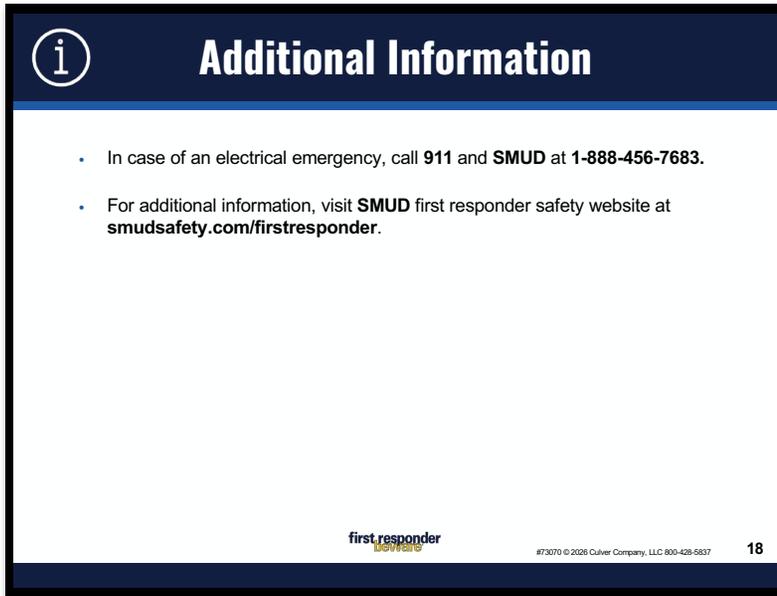
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So let's review the key points of this presentation.

- Identify all overhead power lines and electrical equipment upon arrival at an incident scene. Do this as part of your initial situation survey and include electrical infrastructure in your operational planning.
- Whenever you suspect electrical infrastructure is involved or when in doubt, call SMUD. They want to help you keep yourself and the public safe. Be prepared for the utility vehicle to arrive and make sure there is a clear path to the incident site for utility personnel.
- Hands off electrical systems.
 - Never attempt to disconnect electrical service.
 - Never touch power lines. Utility personnel will switch off the electricity to de-energize a scene and will inform you when the area is safe.
- Assume all power lines are energized, and keep yourself and your equipment at least 20 feet away. Drones are the exception to this rule: Keep them at least 200 feet away from power lines and other electrical equipment.
- Have a spotter monitor the placement of ladders and aerial equipment to ensure they remain a safe distance away from power lines.
- Even low-voltage electrical shock can be fatal. Remember, your gear does NOT insulate you against electrical shock.
- When responding to a substation or transformer fire, let it burn, evacuate the area, and protect exposures and water resources. Your focus should be on safeguarding life and property.



i **Additional Information**

- In case of an electrical emergency, call **911** and **SMUD** at **1-888-456-7683**.
- For additional information, visit **SMUD** first responder safety website at **smudsafety.com/firstresponder**.

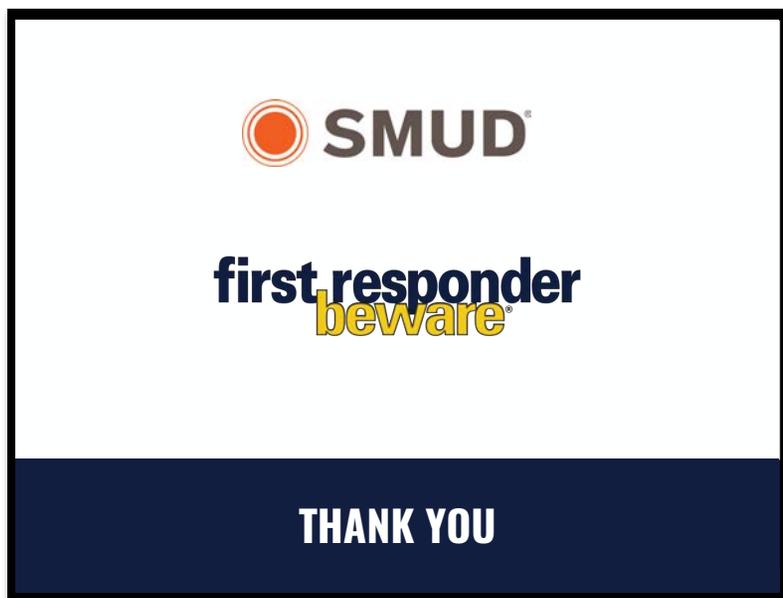
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Here is some contact information that you may find useful.

- In case of an electrical emergency, call 911 and SMUD at 1-888-456-7683.
- For additional information, visit SMUD's first responder safety website at smudsafety.com/firstresponder.



Thank you for your attention.

Take questions and begin discussion.

Discuss how this information conflicts with what your audience believed about electric utility safety and how they may have put themselves or others at risk in the past. Ask participants what they would have done differently if they had known this information before.

The trainer's guide includes more detail about the properties of electricity, safety procedures, an electrical safety quiz, suggested discussion topics, and simulations for group use. Consider some of the suggested simulations or use your own.

SMUD thanks you for helping to keep first responders safe.