



Before darkening the room, offer a welcome and overview.

Begin by introducing the program and its topic:

- Welcome to First Responder Beware: Staying Safe while Saving Others, Natural Gas Safety for First Responders. Today's session will share strategies for working safely around and handling certain emergencies involving natural gas. 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.
- Click for the next slide. (Throughout this presentation, you will need to click for text and graphics on each slide and to bring up new slides.)

Natural gas safety for first responders

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- Firefighters, police and EMTs are typically first on the scene in an emergency and face the greatest risk from natural gas leaks and fires.
- 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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- Firefighters, police and EMTs are typically first on the scene in an emergency and face the greatest risk from natural gas leaks and fires.
- 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).

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

Please note: *Each local department will have its own standard operating procedures or SOPs about natural gas safety. Emphasize to participants that this program is not designed to replace these procedures, only to supplement them.*

Natural gas safety basics

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- Properties of natural gas
- The natural gas delivery system
- Preventing natural gas ignition
- Responding to natural gas emergencies
- Indoor natural gas leaks
- Carbon monoxide poisoning
- Outdoor natural gas leaks
- Natural gas fires



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Natural gas safety basics. This presentation will cover key practices you need to know to keep yourself safe around natural gas lines and on the scene of emergencies involving natural gas.

The topics we are going to focus on are:

- Properties of natural gas
- The natural gas delivery system
- Preventing natural gas ignition
- Responding to natural gas emergencies
- Indoor natural gas leaks
- Carbon monoxide poisoning
- Outdoor natural gas leaks
- Natural gas fires

Properties of natural gas

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Natural gas is lighter than air.

- It will follow the path of least resistance and will travel upward through any available space.
- When underground or in enclosed spaces, natural gas will move laterally, or “migrate.”

Natural gas is odorless. The addition of mercaptan produces the familiar sulfur-like smell.

- You may not always be able to smell mercaptan, so never rely on your nose alone to detect a gas leak. Monitor the atmosphere with your department's approved and calibrated air-monitoring equipment.



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Properties of natural gas. You will someday have to deal with natural gas at an incident scene. So, it's important to know a few basic facts about natural gas, its properties and how it behaves.

- Natural gas is lighter than air. This means it will naturally tend to rise.
 - It will follow the path of least resistance and will travel upward through any available space. Be alert. This can include stairwells, ducts or cracks in the road. It can even seep up through soft ground. Leaking gas will flow out of open windows and doors naturally, making this an effective method of venting a room or building.
 - When underground or in enclosed spaces, natural gas will move laterally, or “migrate.” It will travel as far as it can under roads, along utility lines and trenches or along a ceiling, until it finds a way up. This explains how gas can accumulate in buildings at some distance from the site of a leak.
- Natural gas is odorless. The addition of mercaptan produces the familiar, sulfur-like smell.
 - You may not be able to smell mercaptan if you have been exposed to it for a long time, the mercaptan odor is masked by other odors, or the odor fades due to chemical or physical processes that strip mercaptan from the gas. So never rely on your nose alone to detect a natural gas leak. Monitor the atmosphere with your department's approved and calibrated air-monitoring equipment.

Properties of natural gas

- Natural gas is **highly flammable**.
- Natural gas will **burn** when the **gas-to-air ratio is between about 5% and 15%**.
 - At concentrations **below 5% or above 15%**, natural gas will not burn.
- Liquefied gases such as propane have **different properties** than natural gas.

100% gas

15% gas

5% gas

0% gas

Flammable Range

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Natural gas is highly flammable. This means that first responders must exercise extreme caution to prevent ignition hazards in the vicinity of any natural gas leak.

- Natural gas will burn when the gas-to-air ratio is between about 5% and 15%.
 - At concentrations below 5% or above 15%, natural gas will not burn.
- Liquefied gases such as propane have different properties than natural gas. Propane is heavier than air and may accumulate in trenches, drains and other low areas. Propane is used in most gas grills, so if an incident involves a gas grill leak or fire, keep this behavior in mind.

The natural gas delivery system

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- Natural gas travels through three **types of pipelines** on its way from the wellhead to individual service laterals:
 - Gathering pipelines
 - Transmission lines
 - Distribution mains
- **Service laterals carry natural gas from distribution mains to customers' gas meters.**
- In general, the closer natural gas gets to the end user, the smaller the pipeline and the lower the pressure.



Single-unit residential meter

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The natural gas delivery system. It's useful to know a bit about the how gas is delivered to structures.

- Natural gas travels through three types of pipelines on its way from the wellhead to individual service laterals:
 - Gathering pipelines
 - Transmission lines
 - Distribution mains
- Service laterals carry natural gas from distribution mains to customers' gas meters.
- In general, the closer natural gas gets to the end user, the smaller the pipeline and the lower the pressure.

Transmission pipeline markers

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- **High-visibility markers** indicate the appropriate location of transmission pipelines in rights-of-way.
- These markers include the pipeline company's name, the type of product carried and an emergency phone number.
- National Grid's markers are usually **freestanding**; in urban areas, they may also be found on utility poles.
- You can also locate gas transmission pipelines in your area by registering with the National Pipeline Mapping System (NPMS) at www.npms.phmsa.dot.gov.



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Transmission pipeline markers. It's important to know how to recognize pipeline markers.

- High-visibility markers indicate the approximate location of transmission pipelines in rights-of-way. For security purposes, these markers do not show the exact location, path, depth or number of gas pipelines in the area. But they will give you a general sense of the location of National Grid's high-pressure lines. They are usually found where a pipeline crosses a highway, railway, waterway or natural boundary.
- These markers include the pipeline company's name, the type of product carried and an emergency phone number.
- National Grid's transmission pipeline markers look like this. They are usually freestanding; in urban areas, they may also be found on utility poles. If a natural gas leak is detected or even just suspected in the vicinity of one of these markers, or if you see suspicious activity near a marker, notify National Grid immediately at the number shown.
- You can also locate gas transmission pipelines in your area by registering with the National Pipeline Mapping System (NPMS) at www.npms.phmsa.dot.gov.

Preventing natural gas ignition

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Even the smallest flame or spark can ignite leaking natural gas. Avoid turning electrical equipment or devices on or off in the vicinity of a leak:

- **Do not use spark-producing equipment.** Intrinsically safe radios and flashlights should be used for the duration of any incident response.
- **Avoid using doorbells, wall switches, garage door openers or cell phones,** and prevent their use by others.
- **Do not step on doormats.** Friction from your boots could create a spark of static electricity.



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Preventing natural gas ignition. It's vital to know the correct precautions for preventing gas ignition when a natural gas leak is detected.

- Even the smallest flame or spark can ignite leaking natural gas. Avoid turning electrical equipment or devices on or off in the vicinity of a known or suspected gas leak.
- Do not use spark-producing equipment. Intrinsically safe radios and flashlights should be used for the duration of any incident response.
- Avoid using doorbells, wall switches, garage door openers or cell phones, and prevent their use by others.
- Do not step on doormats. Friction from your boots could create a spark of static electricity.

Responding to natural gas emergencies

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Notify National Grid through your dispatcher as soon as practicable for all gas emergencies, and take these precautions:

- Approach cautiously and stay upwind.
- Park safely away from collapse zones and manholes.
- Secure the perimeter.
- Evacuate 330 feet in all directions.
- Stay out of manholes and sewers.
- Eliminate ignition sources.
- Use full SCBA and PPE.
- Monitor the atmosphere.



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Responding to natural gas emergencies. In addition to preventing gas ignition, there are certain procedures you should follow when responding to any natural gas emergency. Here are a list of steps to take when you approach any natural gas incident.

- Notify National Grid through your dispatcher as soon as practicable for all gas emergencies, and take these precautions.
 - Approach cautiously and stay upwind. Stage apparatus out of the path of the leak and a safe distance away—typically 50 to 200 feet, depending on the situation.
 - Park safely away from collapse zones and manholes. Stay clear of storm sewer grates as well.
 - Secure the perimeter. Reroute traffic if necessary.
 - Evacuate at least 330 feet in all directions. For larger leaks, consider initial downwind evacuation for at least ½ mile. (The incident commander will consult with a National Grid emergency representative to determine the final extent of the evacuation.)
 - Stay out of manholes, sewers or any type of underground vault. Natural gas can accumulate in these underground spaces.
 - Eliminate ignition sources such as vehicle engines, flame-producing devices, and anything that could produce sparks.
 - Use full self-contained breathing apparatus (SCBA) and personal protective equipment (PPE).
 - And last but not least, monitor the atmosphere using multiple monitors.

Responding to natural gas emergencies

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- **NEVER** attempt to open or close underground pipeline valves.
- First responders who have been trained to do so may turn off gas at aboveground meter valves or appliance supply lines.
 - A quarter turn to the right will turn off a meter. Use the same procedure at an appliance supply line.
 - Inform National Grid of any valve you have closed and its precise location.
- After the service valve has been closed, **DO NOT** open it under any circumstances.



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When you respond to an incident involving a structure that is fed by natural gas, you must follow very specific procedures regarding gas pipeline valves.

- **NEVER** attempt to open or close underground pipeline valves. Doing so could cause dangerous pressure changes in the system.
 - First responders who have been trained to do so may turn off gas at aboveground meter valves or appliance supply lines. If you can identify a specific appliance causing the leak, shut off the gas at the appliance's supply line. If you cannot identify a specific appliance or when in doubt, use the meter to shut off the gas.
 - A quarter turn to the right will turn off a meter. Use the same procedure at an appliance supply line.
 - Inform National Grid of any valve you have closed and its precise location. This information is critical for system safety and service restoration.
 - After the service valve has been closed, **DO NOT** open it under any circumstances. Only National Grid employees are permitted to turn gas service back on.

Indoor gas leak response

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Natural gas leaks inside buildings present a significant hazard. Take these precautions:

- Have a charged hand line with fog nozzle ready.
- Do not use spark-producing equipment.
- Evacuate at least 330 feet in all directions.

Coordinate with National Grid before ventilating.

- Remove all ignition sources. Ventilate structures from the top down.
- Use extreme caution when ventilating a building with a gas concentration above 15%. As gas disperses, concentrations will pass through the flammable range.



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Indoor natural gas leaks.

- Natural gas leaks inside buildings present significant hazards. Take these precautions:
 - Have a charged hand line with fog nozzle ready. The general rule is you should not put out a gas fire, but you may use a fog spray to cool combustible exposures and assist with rescue operations.
 - Do not use spark-producing equipment. Only intrinsically safe radios and flashlights should be used.
 - Evacuate at least 330 feet in all directions.
- Coordinate with National Grid before ventilating.
 - Remove all ignition sources. Ventilate structures from the top down.
 - Use extreme caution when ventilating a building with a gas concentration above 15%. As gas disperses, concentrations will pass through the flammable range. Be aware that what appears to be an indoor leak may be the result of gas migrating into the structure. Once service to the structure is off and ventilation has occurred, verify that the leak has been eliminated.

Carbon monoxide

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Understanding carbon monoxide (CO) leaks:

- CO is a colorless, odorless, poisonous gas.
- CO leaks are frequently caused when fuel-burning appliances malfunction or are used without adequate ventilation.

CO poisoning can look like a common illness, but is deadly if untreated. Know the signs:

- Flu-like symptoms
- Nausea/confusion/slow breathing
- Loss of consciousness

Make sure victims get fresh air and seek medical attention immediately.



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Carbon monoxide poisoning. Every year approximately 1,500 people in the U.S. die from being poisoned by carbon monoxide. This deadly gas is not a component of natural gas, but natural gas-burning appliances can be a source of carbon monoxide.

- Understanding the dangers of leaking carbon monoxide, commonly known as CO, requires knowledge of some basic properties and causes.
 - CO is a colorless, odorless, poisonous gas. Because it cannot be detected through the senses, it is important to exercise extreme caution if there is the possibility of carbon monoxide in a room or building.
 - CO leaks are frequently caused when fuel-burning appliances malfunction or are used without adequate ventilation. Warning signs of CO presence may include a sooty build-up around appliances and unusually high humidity indoors.
- CO poisoning can look like a common illness, but it is deadly if untreated.
 - Flu-like symptoms such as headache, tiredness and dizziness are signs of early exposure at low concentrations.
 - With continued exposure or higher concentrations, these may progress to nausea, confusion and slow breathing.
 - Prolonged exposure can lead to loss of consciousness or even death. It is important to be aware of all of these symptoms.
- Make sure CO poisoning victims get fresh air and seek medical attention immediately. If the building uses natural gas, notify National Grid as soon as practicable through your dispatcher.

Outdoor gas leaks

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- Outdoor natural gas leaks can be caused by **construction-related damage**, **cracks due to extreme weather**, or **pipe corrosion**.
- **Contact National Grid immediately** to shut off the gas.
- **Evacuate the area.**
- **Be alert for migrating gas.** Gas can accumulate in storm drains, construction trenches, buildings and other utility lines.



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Outdoor natural gas leaks. Gas leaks outdoors pose some different challenges than those indoors.

- Outdoor natural gas leaks can be caused by construction-related damage, cracks due to extreme weather, or pipe corrosion. Be on the lookout for evidence of construction activity and severe weather as indicators of a possible leak.
- Contact National Grid immediately to shut off the gas. Do this whenever you suspect a leak. They will respond, turn off the gas and repair the damaged pipeline.
- Evacuate the area.
- Be alert for migrating gas. Gas can accumulate in storm drains, construction trenches, buildings and other utility lines, particularly as it moves laterally and seeks a path upward. As gas migrates, localized concentrations will change. Remember that natural gas can burn or explode as concentrations move through the flammable range.

Outdoor gas leak indicators

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In addition to the familiar sulfur-like smell, other indicators of an outdoor leak include:

- A hissing, whistling or roaring sound
- Dirt blowing into the air from a hole in the ground
- Continuous bubbling in water
- Dead or dying vegetation (in an otherwise moist area) over or near a pipeline
- A damaged connection to a gas appliance
- An exposed pipeline after a disaster



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When on the scene of an outdoor emergency, always be alert for the telltale indicators of a natural gas leak. Depending on the pressure of the gas line, these indicators will vary.

- In addition to the familiar sulfur-like smell, indicators may include:
 - A hissing, whistling or roaring sound
 - Dirt blowing into the air from a hole in the ground
 - Continuous bubbling in water
 - Dead or dying vegetation (in an otherwise moist area) over or near a pipeline
 - A damaged connection to a gas appliance
 - An exposed pipeline after an earthquake, fire, flood or other disaster.
- In any gas leak incident, use a combustible gas leak indicator to be certain a flammable atmosphere does not exist.

Outdoor gas leak response

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- Have a charged hand line with fog nozzle ready for use.
 - In the event of a fire, a fog spray may be used to cool combustible exposures, assist with rescue and extinguish flames not originating from a gas pipe.
- Use a CGI to identify the general area of the leak.
 - Check for gas migrating into the nearby buildings (especially basements), storm drains and construction trenches.
- Evacuate at least 330 feet in all directions. Large leaks may require downwind evacuation for at least a mile.



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Outdoor gas leak response. There are certain procedures you should follow when a natural gas leak is detected or suspected in an outdoor area.

- Have a charged hand line with fog nozzle ready for use.
 - In the event of a fire, a fog spray may be used to cool combustible exposures, assist with rescue and extinguish flames not originating from a gas pipe.
- Use a CGI to identify the general area of the leak.
 - Un-ignited gas can migrate to the surface from an underground leak or from a damaged gas line in an open excavation.
 - Check for gas migrating into nearby buildings (especially basements), storm drains and construction trenches.
- Evacuate at least 330 feet in all directions. Larger leaks may require downwind evacuation for at least ½ mile.

Natural gas fire response

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- When responding to a fire involving natural gas, **your best and safest course of action is to let it burn.**
 - Burning natural gas will not cause an explosion.
- **Allow the gas to burn until the source can be turned off.** When the gas supply is depleted, the fire will extinguish itself.
- **Evacuate the area** and protect exposures.



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Natural gas fire response. Burning natural gas poses special risks and requires extra precautions.

- When responding to a fire involving natural gas, your best and safest course of action is to let it burn. Your first priority, as always, is to protect life and property.
 - Burning natural gas will not cause an explosion.
- Allow the gas to burn until the source can be turned off. When the gas supply is depleted, the fire will extinguish itself.
- Evacuate the area and protect exposures.

Natural gas fire response

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- **DO NOT** use water to suppress a natural gas fire.
 - Use a hand line with fog nozzle to cool exposures and to extinguish open flames not originating from a gas pipe.
 - Avoid spraying water at the point where natural gas is being released.
- **Shut off gas ONLY** at the service valve before the meter or the appliance supply line.
- Once gas is off, **remain alert for gas migration and possible re-ignition.**



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Do NOT use water to suppress a natural gas fire.

- Use a hand line with fog nozzle to cool exposures and to extinguish open flames not originating from a gas pipe.
 - Avoid spraying water at the point where natural gas is being released. If you introduce water into a gas line, you could flood the line and cause serious problems in the distribution system.
- Shut off gas **ONLY** at the service valve before the meter or the appliance supply line. Do NOT shut off gas pipeline main valves. Do not shut curb valves unless you have been properly trained in curb valve operation.
- Once gas is off, remain alert for gas migration and possible re-ignition.

Natural gas safety review

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- **Prevent ignition** of natural gas. Eliminate spark hazards at the scene of a gas leak, and use intrinsically safe equipment.
- When natural gas is involved in an emergency, **notify National Grid through your dispatcher as soon as practicable.**
- **Park emergency vehicles** upwind and away from collapse zones and manholes.
- **Evacuate the area** and be alert for migrating or accumulating gas.
- **Coordinate with National Grid before ventilating.** Remove all ignition sources and ventilate from the top down.
- NEVER attempt to open or close **underground pipeline valves.**
- When natural gas is burning, **let it burn and protect area exposures.** Remember, water is not effective for extinguishing gas fires.

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

- Prevent ignition of natural gas. Eliminate spark hazards at the scene of a gas leak, and use intrinsically safe equipment.
- When natural gas is involved in an emergency, notify National Grid through your dispatcher as soon as practicable.
- Park emergency vehicles upwind and away from collapse zones and manholes.
- Evacuate the area and be alert for migrating or accumulating gas.
- Coordinate with National Grid before ventilating. Remove all ignition sources and ventilate from the top down.
- Never attempt to open or close underground pipeline valves.
- When natural gas is burning, let it burn and protect area exposures. Remember, water is not effective for extinguishing gas fires.

Thank you for your attention.

Thank you for your attention. National Grid thanks you for helping to keep yourself, your community and your fellow first responders safe.

In case of a natural gas emergency, notify National Grid at the following numbers:

New York:

Long Island and the Rockaways 1-800-490-0045

Metro NY 1-718-643-4050

Upstate NY 1-800-892-2345

Massachusetts: 1-800-233-5325

For additional information, visit National Grid's website at firstresponder.ngridsafety.com.

The image shows the National Grid logo, which consists of the word "nationalgrid" in a white, sans-serif font. The word "national" is in a smaller weight than "grid", which is bold. The logo is centered on a solid blue rectangular background.

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Take questions and begin discussion.

The trainer's guide includes more detail about how natural gas works, when to contact National Grid, what sort of devices and behaviors can cause explosion hazards, and other information about safety procedures.

Discuss how this information conflicts with what your audience believed about natural gas and how they may have put themselves or others at risk in the past. Ask what they would have done differently had they had this training before.

National Grid thanks you for helping to keep first responders safe.