

# Carbon Dioxide (CO<sub>2</sub>) Emergency Response

Best Practice Guidelines for Preparedness and Initial  
Response to a Release of CO<sub>2</sub>

May 22, 2025

# Carbon Dioxide Safety – Key References and Priorities

**API Tactical Guidance Document released August 2023  
(Updated November 2023) with input from National Association  
of State Fire Marshalls**

## **Applicable Federal Regulation:**

- 49 CFR 195, Transportation of Hazardous Liquids by Pipeline

## **Additional Resources:**

- API Recommended Practice 1162, Public Awareness Programs for Pipeline Operators
- API Recommended Practice 1174, Recommended Practice for Onshore Hazardous Liquid Pipeline Emergency Preparedness and Response
- DOT/PHMSA Emergency Response Guidebook (ERG)
- CDC/NIOSH Pocket Guide to Chemicals

Priorities for CO2 response are:

- People: safety of response personnel and the public;
- Environment: prevention of environmental, human health and welfare effects;
- Assets: minimizing damage to structures and equipment, and
- Relations: keep community and federal, state and local government agencies informed.

# API Guidance Document TOC

## Contents

	Page
Introduction .....	iii
Intended Audience .....	iii
Current Applicable Federal Regulations .....	iii
Additional Resources .....	iii
Acronyms and Abbreviations .....	iv
1 Transportation of Carbon Dioxide (CO <sub>2</sub> ) in Pipelines .....	1
2 Characteristics of CO <sub>2</sub> .....	2
2.1 Physical Hazards .....	2
2.2 Oxygen Displacement .....	4
2.3 Exposure Limits.....	4
3 Emergency Preparedness and Planning .....	6
3.1 Community/Stakeholder Outreach and Liaison .....	6
3.2 Response Drills and Exercises .....	7
3.3 Training.....	7
4 Dispersion Modeling Best Practices.....	10
5 CO <sub>2</sub> Pipeline Leak Detection & Identification .....	12
5.1 Physical Identification.....	12
5.2 Remote Identification .....	13
5.3 Supplemental Identification Methods.....	13
6 Internal Notification Protocols .....	14
7 Reportable Release Thresholds .....	14
8 Public Safety Answering Point Notification of CO <sub>2</sub> Pipeline Release .....	16
8.1 Information to Provide to First Responders During Agency Notifications .....	16
9 Third-party Notification of a CO <sub>2</sub> Pipeline Release.....	17
10 CO <sub>2</sub> Pipeline Release Response Actions.....	17
10.1 Emergency Responder Safety.....	18
10.2 Isolation Strategies.....	19
10.3 Real-time Plume Predictions and Surveillance .....	22
10.4 Air Monitoring Strategies.....	22
10.5 Incident Management.....	24

# CO<sub>2</sub> Uses

Various Uses of CO <sub>2</sub>	
<b>Dry ice</b>	Used as a refrigerant during shipping of perishable products such as meats or ice cream
<b>Fire extinguisher</b>	Used to displace oxygen to extinguish a fire
<b>Life jackets</b>	An inflatable life jacket contains a small cylinder of compressed CO <sub>2</sub> used for rapid inflation
<b>Carbonated beverages</b>	Used in soda products as a protective measure that keeps the soft drink fresh and prevents the growth of bacteria in the liquid while stored
<b>Enhanced oil recovery</b>	The injection of CO <sub>2</sub> into existing oil fields increases the overall pressure of the oil reservoir, forcing the oil toward production wells
<b>Carbon capture and storage</b>	CO <sub>2</sub> emissions are captured from industrial processes, then transported to and stored in deep, underground geological formations



# Characteristics of CO<sub>2</sub>

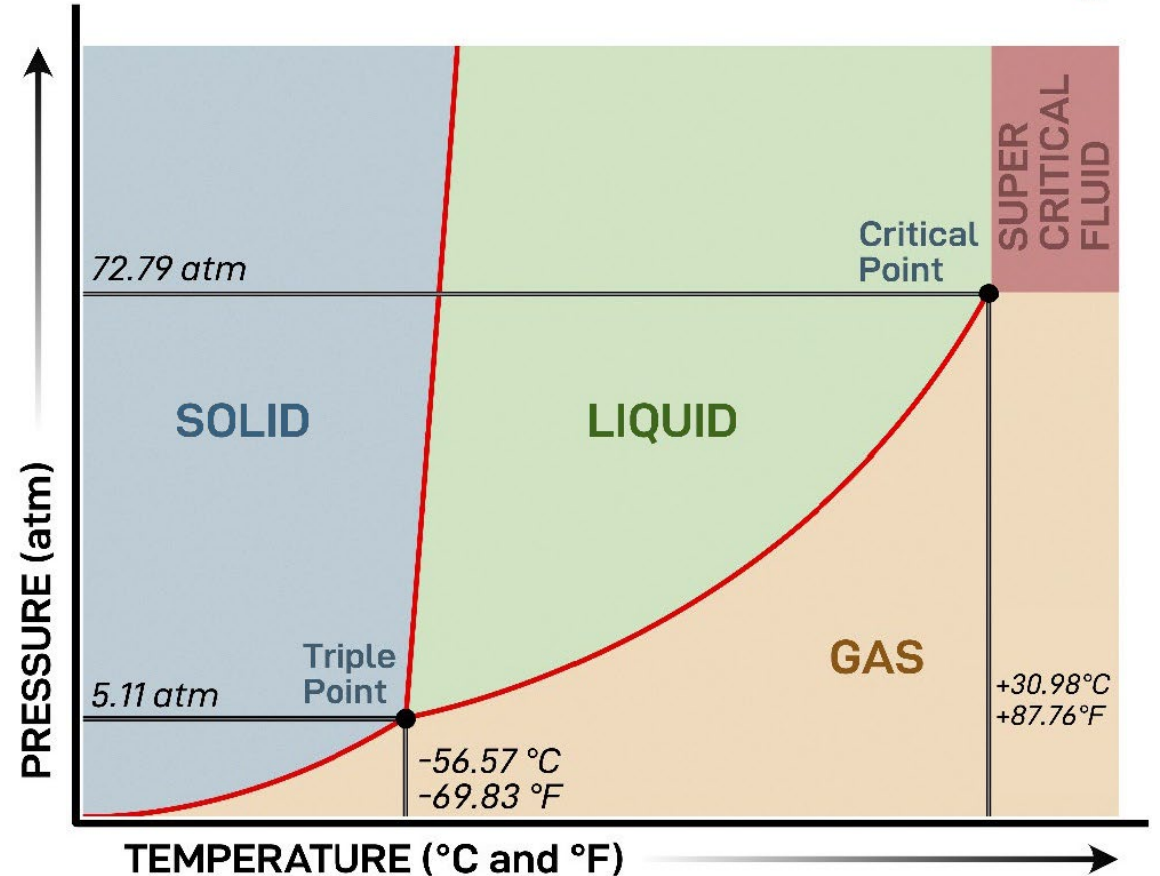
CO<sub>2</sub> is:

- Nonflammable
- Colorless
- Odorless

CO<sub>2</sub> exists as a:

- Gas
- Liquid
- Solid
- When pressures and temperature exceed the critical point (supercritical), the gas phase and liquid phase become indistinguishable

## PHASE DIAGRAM OF CARBON DIOXIDE (CO<sub>2</sub>)



# Physical Hazards

- During a release of CO<sub>2</sub> from a pressurized environment, pressurized CO<sub>2</sub> will expand, generating a refrigeration effect.
- The release can produce an opaque water vapor cloud which may be dispersed by wind.
- With no wind and humid conditions, CO<sub>2</sub> will settle into low lying areas, displacing other gas, including oxygen.

Meteorological Effects on Physical Hazards			
Scenario	Potential Hazards		
	Reduced Visibility	Dermal Hazards	Accumulation of CO <sub>2</sub> in Low Areas
Daytime, sunny, with winds greater than 10 mph		X	
Daytime, cloudy, humid, with winds less than 3 mph		X	X
Nighttime, with winds greater than 10 mph		X	X
Nighttime, humid, with winds less than 3 mph	X	X	X

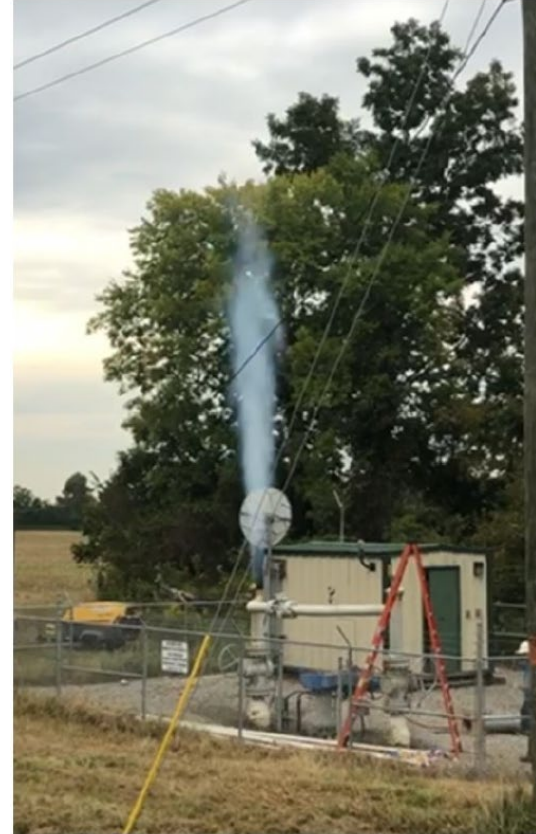
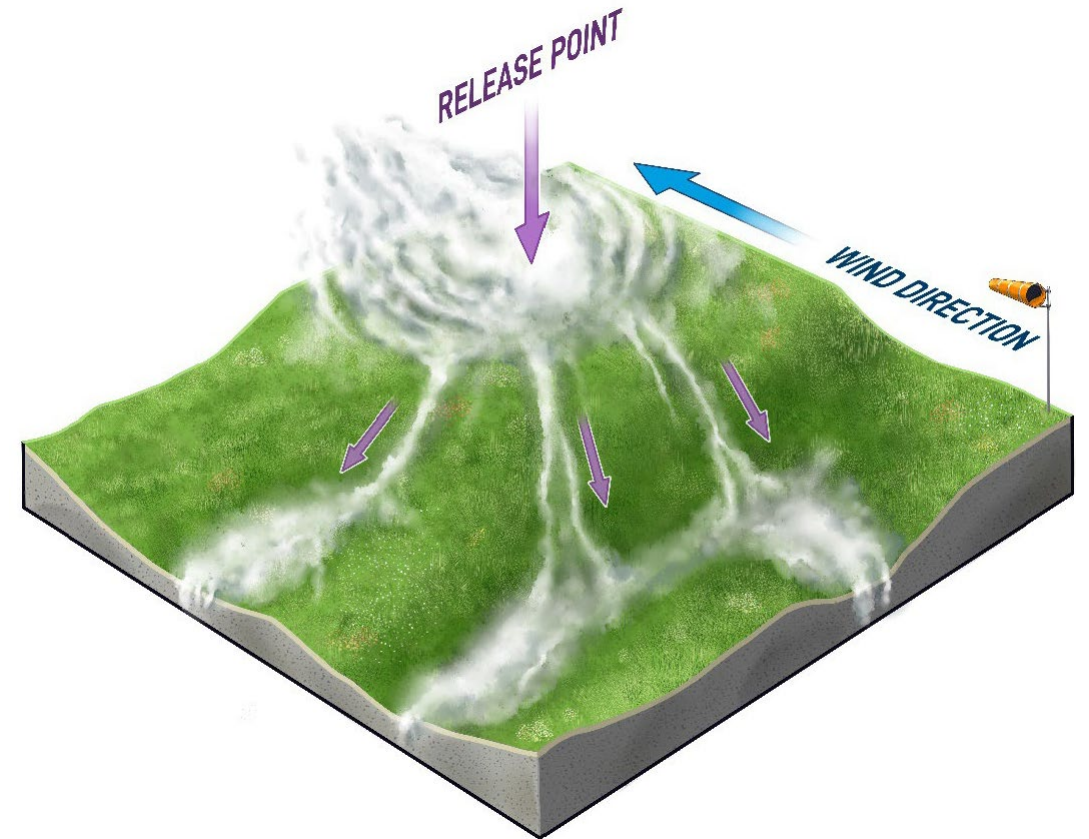
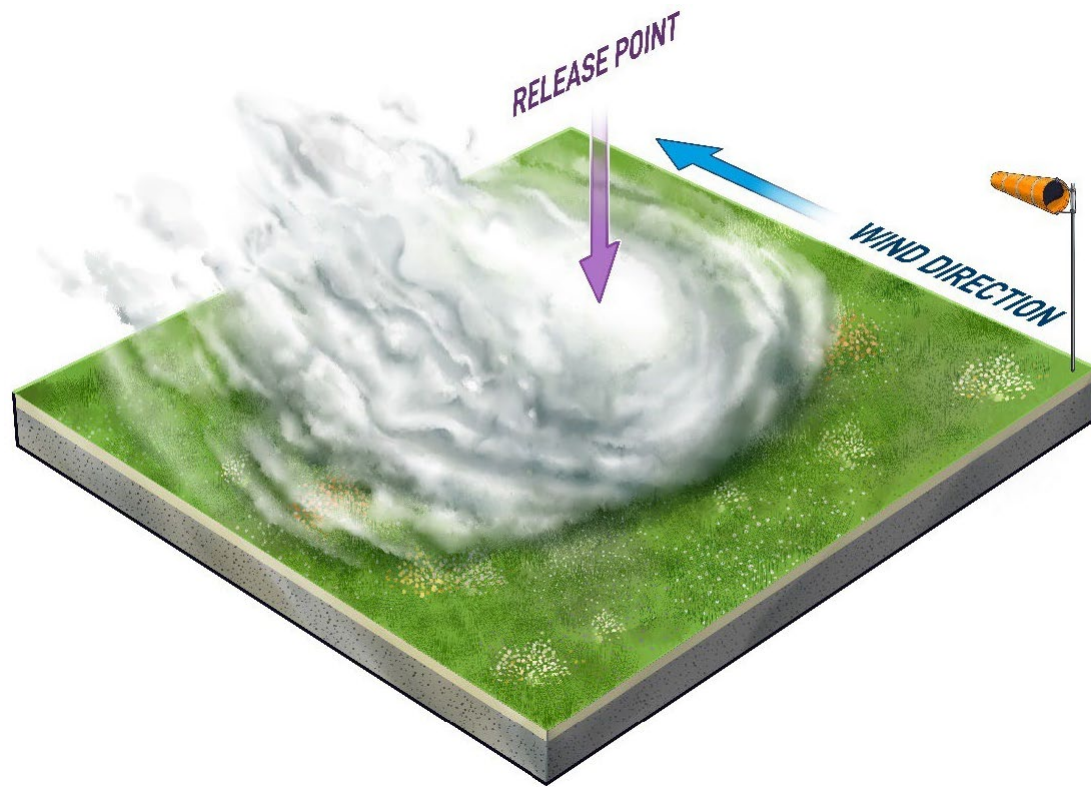


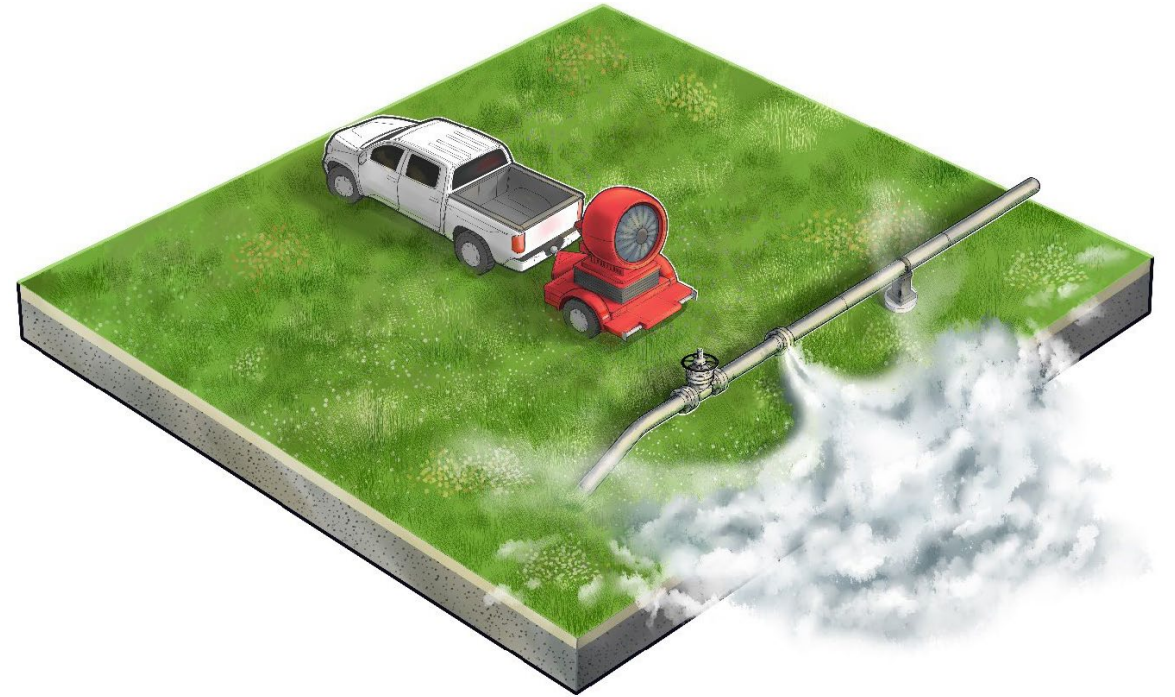
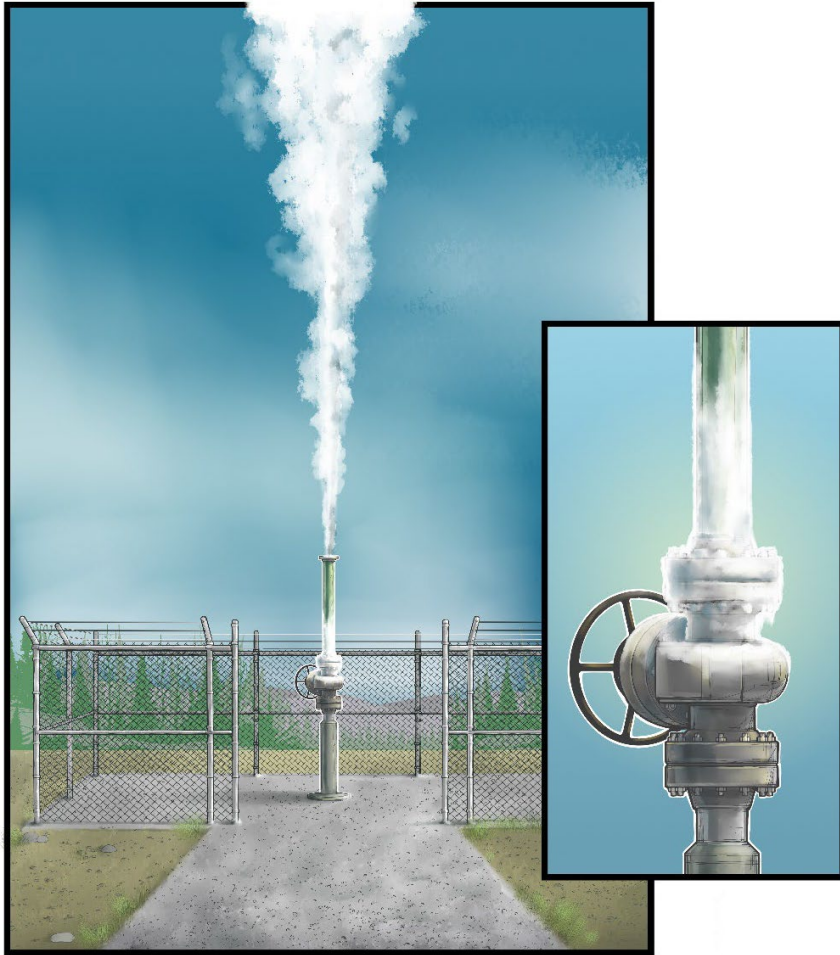
Figure 3—Day Dispersion during Blowdown Operations



Figure 4—Night Dispersion during Blowdown Operations

# CO2 Transport and Dispersion





### 3 Emergency Preparedness and Planning

#### 3.1 Community/Stakeholder Outreach and Liaison

Operators transporting CO<sub>2</sub> through pipelines are required to conduct outreach and awareness efforts for specific areas along the pipeline's route. A CO<sub>2</sub> release and the subsequent response will present unique circumstances that will likely differ from responses to more common products, such as natural gas, crude oil, gasoline, etc. It is important to educate the stakeholders on these unique circumstances so that they will be more likely to identify a release of CO<sub>2</sub> and assist in enacting the proper response procedures. Stakeholders may include, but are not limited to:

- affected public;
- local emergency managers;
- fire department, law enforcement, local emergency planning committees (LEPCs);
- hazardous materials response team (HAZMAT);
- excavator/contractor;
- public officials.

Operators should also become familiar with potential public gathering centers such as schools, hospitals, etc., along their pipeline rights-of-way (ROWs) and proactively develop a plan of action for a large-scale pipeline release with local emergency response officials. When developing a course of action with local emergency response officials, the following should be considered:

- ability to safely evacuate people from the school, hospital, or other place of gathering;
- visibility limitations caused by the dense vapor cloud and risk of driving or walking into the vapor cloud;
- potential of vehicles stalling in the dense vapor cloud and increasing exposure to the released CO<sub>2</sub>;
- effectiveness of sheltering in place, making sure people stay off the ground or move to an upper floor of a building and not into a basement or low area where CO<sub>2</sub> may enter a building and collect;
- communicating with and educating emergency response personnel that may be stationed outside of your area for public awareness but could ultimately respond to a release from your pipeline.

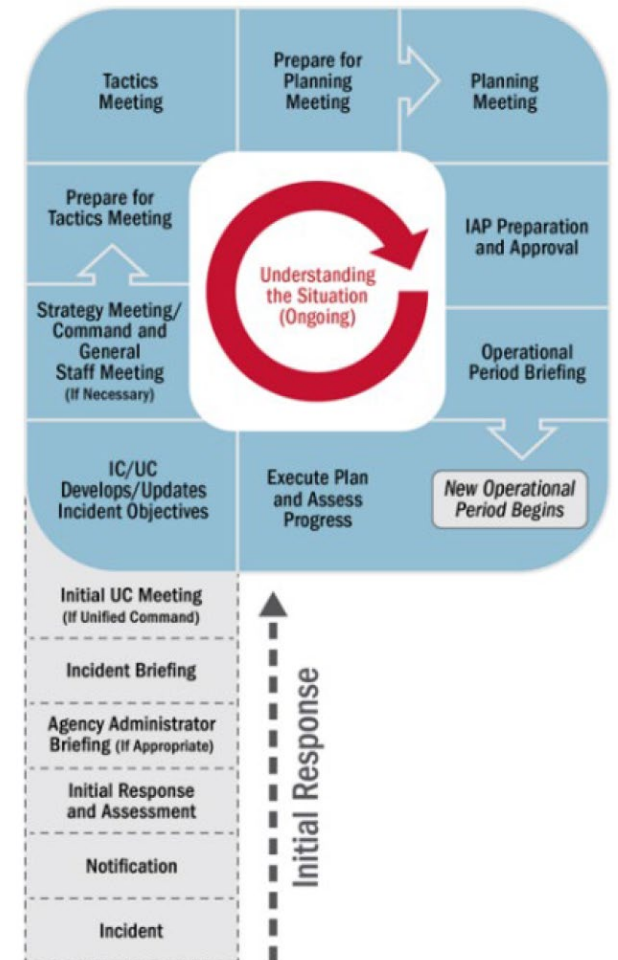
# Incident Command System (ICS) Training

## 3.3.2 Incident Command System (ICS) Training

The Incident Command System (ICS) is used by public agencies to manage emergencies per the requirements of the National Incident Management System (NIMS). ICS can be used by private-sector businesses to work together with public agencies during emergencies such as CO<sub>2</sub> pipeline releases. As a result, operators and their personnel should be familiar with the fundamental concepts of the Incident Command System to help coordinate planning and incident management with public emergency services and agencies.

The ICS structure is meant to expand and contract as the scope of an incident requires. For small-scale incidents, only the incident commander may be assigned. Per ICS, the first on-scene representative of the responsible party would be considered the incident commander and would coordinate with the jurisdictional local, state, or federal emergency response agencies within Unified Command. Command of an incident would likely transfer to the senior on-scene officer of the responding public agency when emergency services arrive on the scene, which may also happen for the responsible party incident commander. This is done by performing a proper Transfer of Command.

It is important to train responding personnel in the implementation and use of the Incident Command System, including relevant terminology, forms, and position roles and responsibilities. It is recommended to train personnel expected to respond to and manage a CO<sub>2</sub> pipeline-related incident to the ICS-200 level at a minimum.



# Questions?