



# Safety and Asset Integrity

## Our Highest Priority

Safety is not just a core value at Enbridge. It's the very foundation of our business. We work relentlessly to ensure the safety of our workforce and communities, keep our infrastructure healthy and fit for service, and maintain strong emergency preparedness and response systems.

**In this section:**

**A Safe and Healthy Workplace**

**Maintaining the Fitness of Enbridge's Systems**

**Emergency Preparedness and Response**



## A Safe and Healthy Workplace

The safety of our people, and the communities in which we live and operate, always comes first.

### Business Context and our Strategic Response

Enbridge's strategy identifies safety and operational reliability as our highest priority. We don't view safety in terms of degrees, or incremental improvement. For Enbridge, safety is a value. We are committed to ambitious safety goals: to lead our sector in safety and operational reliability; to foster a strong performance-based safety culture; and to achieve zero injuries, incidents and occupational illnesses. We are pursuing those goals aggressively.

While our overall performance for employee and contractor personal safety continues to rank among the strongest in the industry, tragically we lost a member of our team last year while completing an aerial survey of one of our pipelines. The loss was a reminder of the inherent risk in our work and how we must maintain constant vigilance, rigorous processes and unwavering focus on ensuring all who work on our behalf go home safely every day.

### Our Approach

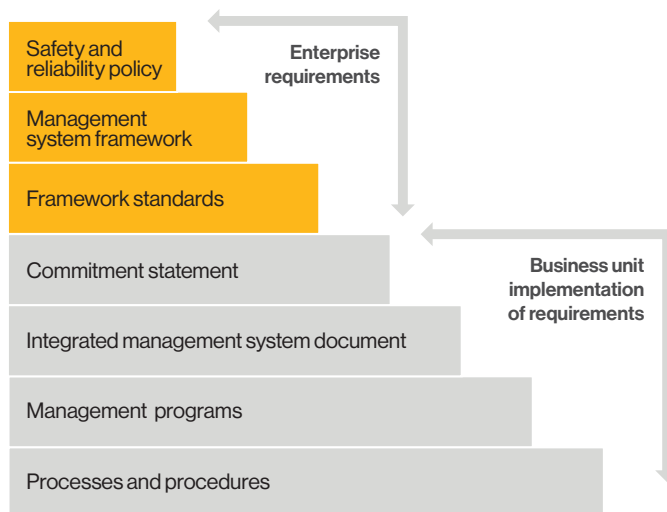
In 2018, Enbridge established a centralized safety and reliability team serving LP and GTM. We will further expand on this centralization in 2019 to include our utility business unit, Gas Distribution and Storage. Consolidating our safety teams will ensure that we apply the best in safety standards, policies and practices in an efficient, consistent manner across the organization.

### Enbridge Management System Structure

Enbridge's Management System Structure (EMSS) helps us assess risks, mitigate them and design and implement programs to ensure their effectiveness.

EMSS sets enterprise-wide minimum safety and reliability requirements, including risk management and process safety, and guides implementation of the programs.

This structure allows us to mandate the application of systematic risk management—design principles, engineering and operating practices—throughout the Company.



Our leaders are responsible for developing and supporting improved safety performance and a positive safety culture, as well as demonstrating and exercising safety leadership. In addition, all workforce personnel—employees and contractors—help sustain our strong safety culture, including the responsibility to report hazards, potential hazards and incidents.

We investigate incidents and near misses to identify root causes and implement effective corrective actions to prevent recurrence. And, on a quarterly basis, we analyze the nature of any injuries that occurred, as well as the type and root cause of the incidents that led to the injuries. Based on that analysis, we work to mitigate workplace risks and improve our safety performance.

### Safety Principles and Lifesaving Rules

Our safety principles are a set of actions with the purpose of improving performance and creating awareness of actions for a safe workplace. They complement our Lifesaving Rules.

“Safety is at the foundation of everything we do. It is the base upon which we build our success and the cornerstone of our reputation. But safety is about more than that. Safety is our shared value—it is our obligation and commitment to protect ourselves, our co-workers, the public, the communities where we live and work, and the environment from harm—in every decision and action, every day.”

Brianne Metzger-Doran,  
Vice President, Safety and Reliability



The Lifesaving Rules are six powerful rules founded on real incidents at Enbridge that focus on eliminating incidents and guide the behavior of employees and contractors.

### Our safety principles

- 1 All injuries, incidents and occupational incidents can be prevented.
- 2 All operating exposures can be controlled.
- 3 Leaders are accountable for safety performance.
- 4 All employees and contractors are responsible for safety.
- 5 Assessment and improvement are a must.
- 6 We promote off-the-job health and safety for our employees 24/7.

### Safety Accountability

Strong safety performance requires a multi-layered management approach to promote and support individual and team contributions. Senior management annually sets detailed safety performance metrics at the business-unit level. These metrics focus on key performance factors related to safety and operational reliability. They link safety performance to employee compensation through incentives, rewarding effective and proactive safety behaviors and excellent safety performance. See the Executive Compensation section on Page 14 for more information.

In addition, we provide training on risk and safety topics such as hazard management, Lifesaving Rules, incident prevention and emergency preparedness and response.

## Our Lifesaving Rules



#### #1: Hazard Management

Always ensure an analysis of potential hazards has been completed and proper authorization received prior to starting the work.



#### #2: Driving Safety

Only drive a vehicle or operate equipment when not under the effect of alcohol or any substances that cause impairment.



#### #3: Confined Space Entry

Always follow procedures for Confined Space Entry.



#### #4: Ground Disturbance

Always follow procedures for locating, positively identifying and excavating buried facilities.



#### #5: Isolation of Energized Systems

Always follow procedures for Lockout/Tag-out.



#### #6: Reporting of Safety-Related Incidents

Always report significant safety-related incidents.

## Safety Culture

In 2018, Enbridge finalized its Safety Culture Framework and, more importantly, the supporting safety culture assessment toolkit and implementation strategy.

Our safety culture framework aligns with the Canadian National Energy Board Statement on Safety Culture, the American Petroleum Institute's Recommended Practice 1173 and safety culture frameworks from other high-hazard industries.

We must continually assess and improve upon how we think, act and interact when it comes to safety. In 2019, in partnership with the Interstate Natural Gas Association of America and the Canadian Energy Pipeline Association, we conducted an employee safety survey. This will help us understand where we are performing well and where we need to improve.

## Contractor Safety

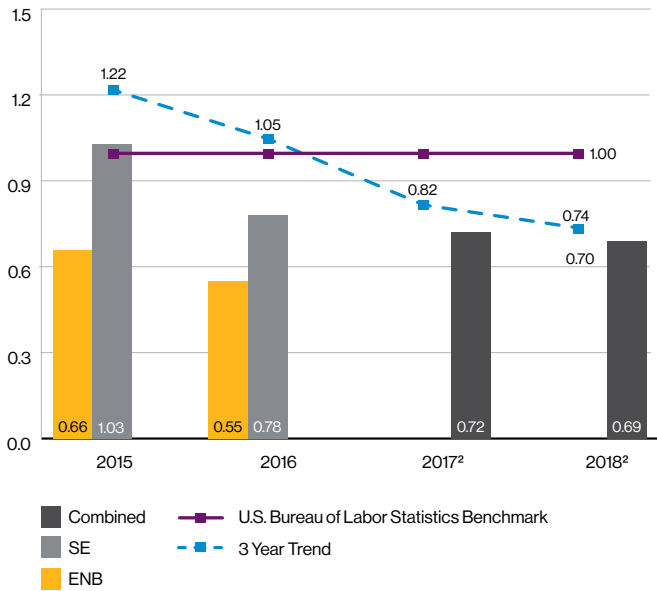
The contractors and subcontractors we work with are our partners in safety, and we expect them to be leaders in safety. We systematically and continually monitor contractors' safety and work performance. Our Contractor Safety Committee comprises contractor safety management members from across the enterprise. The committee focuses on continual improvement of our contractor safety management process to drive safety performance throughout Enbridge and across our industry.

## Our Performance

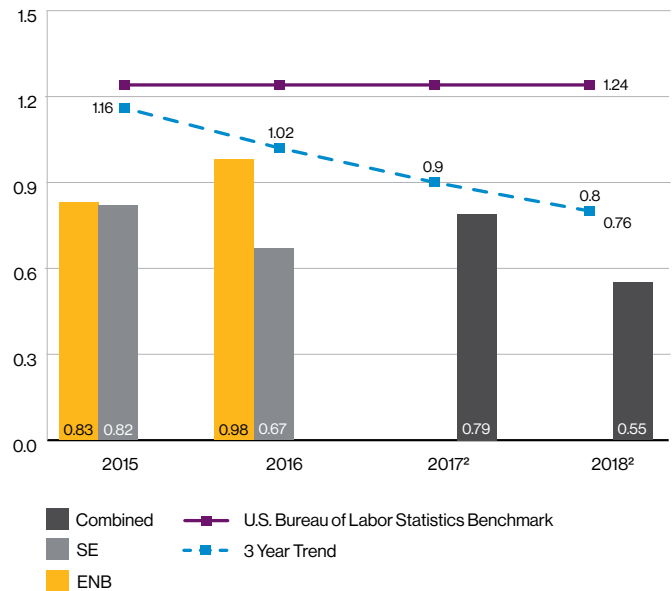
Our employee three-year average trend in Total Recordable Incident Frequency continues to improve and is well below industry benchmark of 1.0, determined by the Bureau of Labor Statistics (BLS). In total, we had 80 recordable employee injuries in 2018, compared with 95 recordable injuries in 2017.

Contractor incident rates have greatly improved in 2018, and the three-year average is also well below the industry benchmark of 1.24.

### Employee Total Recordable Incident Frequency<sup>1</sup>



### Contractor Total Recordable Incident Frequency<sup>1</sup>



<sup>1</sup> Number of recordable incidents multiplied by 200,000 hours, then divided by total hours worked

<sup>2</sup> 2015 and 2016 show respective Enbridge and Spectra data prior to the companies' combination



## Maintaining the Fitness of Enbridge's Systems

Everything we do at Enbridge begins with safe and reliable operations to keep our energy infrastructure healthy and fit for service. Our goal, always, is to lead our industry in safety and reliability.

### Business Context and our Strategic Response

Enbridge's integrity management program addresses all aspects of evaluating and maintaining asset integrity to minimize risks and consequences. We take a lifecycle view of integrity management, encompassing design and construction, monitoring and prevention, leak detection and community outreach and engagement.

Maintaining and continually improving upon safe, reliable performance requires us to not only diligently inspect our pipelines and facilities to ensure fitness for service; we must also learn from past incidents and near misses so we continually strengthen the system of barriers and controls that will prevent leaks and releases.

We are disappointed when we experience any incident—of any magnitude. Our goal is clear: *to prevent all injuries, occupational illnesses and incidents*. We investigate each event to identify and address root causes. The learnings from incidents, research and reviews feed back into our management system, our operating procedures and the conversations we have with our employees about maintaining an accountable, vigilant and resilient safety culture.

## Our Approach

We invest in tools, technology and leading-edge research to continually improve our understanding of threats to our system and our ability to prevent them. We examine the effectiveness of our operational controls and management system to determine if we have any unmitigated risks or areas where we are underperforming on safety and reliability.

We invest significantly in the fitness of our systems and in leak detection:

- We monitor our systems 24/7, 365 days a year.
- We continually inspect pipelines and facilities to ensure optimal safety and reliability performance.
- We conduct visual right-of-way surveillance—both ground and air patrols—to watch for potential issues.

- We verify our performance and protective measures.
- We secure our systems against all identified threats.
- We monitor our pipelines for possible leaks using [multiple computerized systems](#), each with a different focus and each using different technology, resources and timing to provide overlapping and layered leak detection.

We actively research and develop new inspection, prevention and leak detection technologies to meet our needs and continually improve our ability to manage the hazards to our system.

### Monitoring our Crude Oil Pipeline System

**Controller monitoring:** Our Supervisory Control and Data Acquisition (SCADA) system is designed to identify operational changes, such as pressure drops, that may indicate a leak. This SCADA system also monitors vapor concentrations, pump-seal failures, equipment vibration levels and sump levels.

**Computational pipeline monitoring:** We constantly monitor pressure, temperature and other key data from thousands of points along our systems to quickly identify and respond to unexpected changes. Computer-based systems use measurements and pipeline data to detect anomalies that could indicate possible leaks.

**Scheduled line balance calculations:** Many times a day, at regularly scheduled intervals, we calculate and confirm that the volumes of crude oil we receive into our pipeline systems precisely match the volumes we deliver.



## Managing Hazards

How the integrity of a pipeline is managed depends on the threats the pipeline faces. Because every pipeline faces unique threats and stresses, Enbridge employs a wide range of risk assessment, inspection and surveillance techniques. Once threats and hazards have been identified, we select an optimal combination of controls and safety

barriers to preserve integrity over the life cycle of the pipeline. As inspection technology, pipeline materials and construction practices improve with time, and new data on threats and pipeline condition are gathered, our methods of maintaining fitness for service evolve. For more information, please [review our commitment to pipeline safety](#).

## How We Prioritize and Respond to Threats

### Threats

- External and internal corrosion.
- Fatigue and stress corrosion cracking.
- Geohazards (including slope movement, submarine currents and scouring at watercourse crossings).
- Human error, including third-party mechanical damage to pipe, causing releases of hazardous material.

### Key Priorities

- Achieve zero spills or leaks.
- Maintain the fitness for service of our pipelines and facilities.
- Focus on damage prevention, leak detection and corrosion prevention programs.
- Ensure the quality of the assets we build.
- Instill robust process safety management and high levels of operational discipline across the entire system.

## How We Take Action

### Design and Construction

- Carefully select pipeline routes and facility locations.
- Follow strict standards for engineering and design.
- Extensively test new materials and technology before they are introduced.
- Ensure designs meet or exceed all governmental codes and regulations to provide the safest and most reliable assets practicable.
- Incorporate special design considerations for areas such as road, river and creek crossings and for high-consequence areas where the public may be affected.
- Set rigorous standards for pipeline materials received from manufacturers and check to ensure they meet our standards and specifications.
- Employ professional inspectors to oversee every facet of construction; use X-ray or ultrasound technology to inspect welds for potential defects.

### Monitoring and Prevention

- Once pipelines are running, continuously monitor them for any signs of trouble.
- Conduct in-line inspections to detect any signs of internal and external corrosion, cracking, strain, fatigue, dents and legacy manufacturing defects; repair any defects found.
- Recognize conditions that have been known to cause failures and carefully analyze failures from our peers; work to minimize the risks.
- Ensure adequate cathodic protection is provided to steel pipelines.
- Minimize pressure cycling of liquids pipelines to prevent fatigue.
- Conduct regular preventative maintenance.
- Monitor land use changes and ground disturbance work around pipelines.
- Inform the public, public works and excavating companies about the presence of pipelines and how to dig safely.
- Locate pipelines for parties digging in the vicinity.
- Investigate unauthorized activities on rights-of-way.

### Leak Detection

- Devote resources—both people and automated systems—on a continuous, 24/7/365 basis to ensure control of pipelines and rapid response to abnormal situations.
- Apply comprehensive, multi-layered leak detection system on liquids pipelines using several independent leak monitoring methods.
- Monitor pipelines for possible leaks and damages using multiple, redundant methods.

For more details on our ongoing actions to maintain the fitness of our systems and detect leaks, please visit the following pages on [enbridge.com](#): [Crude Oil and Liquids Pipeline Systems Integrity](#); [Crude Oil Pipeline Monitoring](#); [Operations](#); and [Natural Gas Systems Integrity](#).

## Our Performance

### Maintain Pipeline and Facility Integrity

In 2018, Enbridge invested more than **\$1.1 billion** in programs that help us maintain the fitness of our systems and detect leaks across our operations. Over the past three years, our investment has totaled more than **\$3.7 billion**.



Percentage of liquids transmission system with real time leak detection

**100%**



Length of leak detection survey on gas distribution mains

**29,348km**



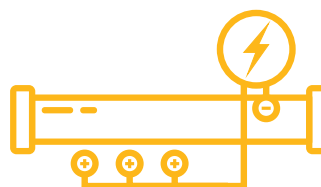
Direct pipeline assessments

**2,519**



Length of transmission pipelines inspected with smart in-line inspection tools

**36,473km**



Cathodic protection system checks

**87,562**



Pipeline inspection completed on our liquids and natural gas pipelines and distribution network<sup>1</sup>

**29,153**



Gas service connections leak-surveyed

**745,781 connections**



In-line pipeline inspections

**358**

<sup>1</sup> The number of pipeline inspections includes direct assessments of pipeline integrity, in-line inspections and follow-up digs, hydrostatic pressure tests, inspections completed on bridges, inspections completed on slopes and water courses and other inspections completed, such as storage-well integrity inspections and valve inspections. Our CSR and Sustainability reports prior to the 2017 report have included primarily in-line inspections.

### Prevent Spills, Leaks and Releases

The integration of Spectra Energy in 2017 has approximately doubled the asset base of Enbridge, which has had a corresponding effect on the number of incidents that occurred across the expanded Enbridge system. For the purpose of our Sustainability Report, we include incidents that are significant and reportable to our Board of Directors:

- Tier 1 events are commodity releases with greater consequences and/or higher release volumes.
- Other Reportable incidents, termed Tier 2 events, are commodity releases with lesser consequences.

An injury or a fire as a result of a release often dictates classification of an event at a higher tier than the volume released would. Similarly, our management may decide to upgrade how we classify any event—including those that did not result in any spills, releases or harm, but that were potentially serious—to a higher tier if they deem doing so to be prudent. As such, the incidents that we include in this report have not all resulted in a spill or release.



## Maintaining the Fitness of Enbridge's Systems

### Liquids Spills, Leaks and Releases

In 2018, we delivered more than 3.96 billion barrels of crude oil and natural gas liquids. We experience 14 process safety events, of which 11 involved the release of a liquid hydrocarbon. The other three involved other forms of uncontained and uncontrolled hazardous energy on a liquids pipeline (e.g. mechanical energy, heat). Of the 11 leaks and releases, two were deemed to be Tier 1 process safety events.

The total volume from the 2018 liquids spills, in all Enbridge business segments, was 411 barrels. Of this total liquids volume released, 206 barrels were on our Liquids Transmission Pipeline System and 205 barrels were in gas processing plants. All but 157 barrels were contained within plant/terminal boundaries or secondary containment. Based on volumes spilled and our gross delivery volumes, we achieved a safe delivery rate greater than 99.99999% in 2018.

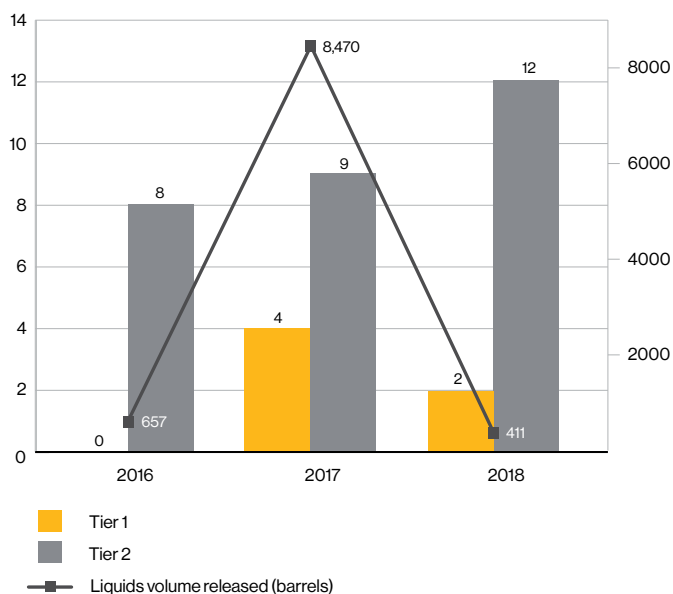
### Natural Gas Releases

In 2018, Enbridge transported and distributed more than 10.6 trillion cubic feet of natural gas through our natural gas pipelines and our natural gas distribution network. We experienced 26 reportable (Tier 1 and 2) process safety events involving the release of gas from process equipment on our natural gas systems. Of this total, we experienced 14 Tier 1 process safety events.

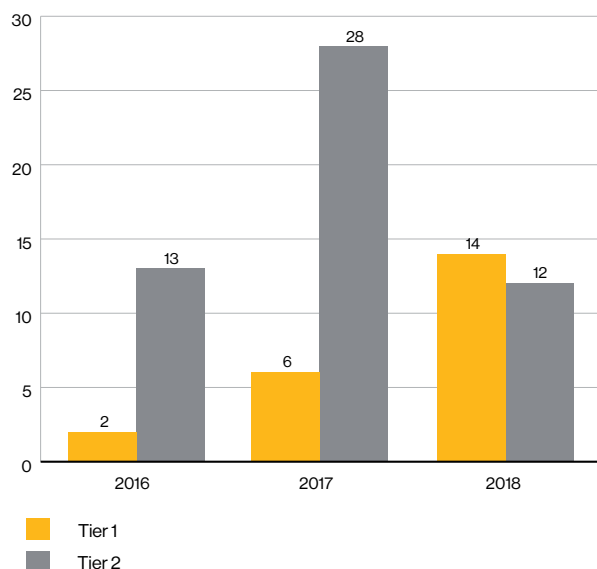
We experienced two significant incidents on our natural gas system in 2018 and two in 2019.

- In October 2018, our T-South transmission pipeline ignited in a rural, forested area north of Prince George, British Columbia. There were no injuries associated with the rupture; however, approximately 5.2 hectares of forest were damaged in the fire. Immediately following the incident, the pipeline and an adjacent pipeline were shut down. The pipeline remained shut down until its fitness for service was confirmed and a return-to-service order was issued by the National Energy Board. The majority of the T-South system remains under a pressure restriction while Enbridge completes its comprehensive integrity program on the T-South system.
- In December 2018, a release occurred on our East Tennessee pipeline near Pleasant Shade, TN. A nearby residence and two other buildings sustained limited damage from pipeline cover displaced in the release. Local residents were evacuated, and the pipeline was isolated and blown down without ignition. There were no injuries associated with the incident. Following repairs, gas supply to downstream customers was returned at a reduced pressure while Enbridge conducted its investigation and completes its comprehensive integrity program.
- In January 2019, a rupture occurred on our Texas Eastern Pipeline in Noble County, OH. The rupture resulted in a fire that injured two people and damaged three nearby residences. We coordinated with and supported the Pipeline and Hazardous Materials Safety Administration (PHMSA) and the Public Utilities Commission of Ohio (PUCO) as the investigation progressed. Enbridge also conducted its own investigation. Following a completion of a comprehensive integrity assessment, all three pipelines were returned to service.

### Liquids/Liquids Systems Process Safety Incidents



### Natural Gas Process Safety Incidents



- In August 2019, a rupture occurred on Line 15, part of our Texas Eastern transmission pipeline system, near Danville, KY, resulting in one fatality and several injuries. A number of homes were destroyed. The line was isolated, and the National Transportation Safety Board assumed control of the incident site and ensuing investigation, returning site control to Enbridge after eight days. PHMSA issued a Corrective Action Order which set out return to service and assessment requirements. The two adjacent pipelines to the impacted line were returned to service approximately one month later. At the time of the release of this report, Line 15 remains out of service.

In 2018, our natural gas utility delivered more than 1.8 trillion cubic feet of natural gas. A large number of small leaks are detected on our utilities network each year because of the significant number of natural gas delivery points. In the vast majority of cases, these below-ground or outside leaks are not hazardous due to the system's low delivery pressure, small line capacity, and odourization, which serves as a warning sign.

The low-hazard nature of these small leaks means the majority fall below our reportable (Tier 2) process safety event criteria. Leaks due to third-party damage to pipeline assets make up a significant portion of these releases. To help prevent third-party damage, Enbridge has an extensive public education program for pipeline awareness and safe digging. Enbridge also supports and is a member of one-call/locate services.

Detailed data related to the safety performance of all our businesses are located in the Performance Data.

“Ensuring the safety of our pipelines is a challenge we’re addressing from every perspective—technically, organizationally and culturally. We have set an expectation that we will not have any more failures. We’re developing a multi-faceted plan to meet that expectation with confidence. Safety comes first, without question. In the absence of certainty, fitness for service will not be assumed. Decisions about the safety of our assets are based on facts and data, driving toward quantitative statistical confidence in our assessments. And, assuring the diligence of our assessments through a deliberate quality control review process against our safety targets.”

Andy Drake, Vice President of Asset Integrity, GTM



## Natural Gas Distribution Network

	2016*	2017	2018
Damages per 1,000 third-party locate requests	2.17	1.92	1.96

\*Reflects Enbridge Gas Distribution data only.



## Emergency Preparedness and Response

We have robust emergency preparedness and response systems—which we constantly test, review and improve—in the unlikely event of a pipeline incident.

### Business Context and our Strategic Response

At Enbridge, we plan for safe, reliable, incident-free operations, in keeping with our belief that all incidents can be prevented—and that no release is acceptable.

We also prepare to respond in the unlikely event of an incident involving the operation of our assets. Robust emergency preparedness and response systems are in place, regularly tested and continually enhanced through our own experience and learnings and through best practice within and beyond our industry. We partner proactively with local first responders, emergency management groups, and state and federal agencies.

We regularly review our emergency management programs across our businesses to ensure that they are functioning as intended and identify improvement opportunities. In the event of an incident, our employees and contractors are well trained and equipped to ensure a safe, rapid and effective response.

### Our Approach

Emergency preparedness requires a systematic approach to identify potential hazards and plan mitigation and remediation tactics so that a response is rapid and effective, and ensures the safety of responders, the community and the environment. An overview of our Emergency Management Programs is available [here](#).

Enbridge's emergency management programs, which are implemented within all our business units, guide our emergency preparedness and response. Our programs use an organizational structure for incident management that, depending on the nature and magnitude of an incident, covers all levels of the organization—from front-line workers to executive leadership—and can be activated immediately. Additionally, these programs are regularly reviewed and periodically audited to ensure their continual improvement and proper functioning.

### Our Performance

#### Ensuring our Emergency Response Plans Are Current

Our comprehensive [emergency response plans](#) are tailored to each business unit to cover distinct operations and risks, including geographic-specific information. We regularly review, audit, update and test these plans to ensure they work as expected. Our emergency management programs outline the review and improvement cycles. All of our regulated plans were updated in 2018. Relevant information from our emergency response plans is shared with local first responders.

#### Training our Emergency Response Teams

We place high importance on training our employees and direct contractors that would be involved in an emergency response. The [training](#) individuals receive aligns with the role they would fill during a response, and covers potential hazards or risks that may be encountered during an emergency. Through the end of 2018, approximately 2,700 of our employees and direct contractors have received emergency response training. And over 94% of the required training courses were completed across the enterprise by the end of 2018.

Our emergency response training uses the Incident Command System (ICS), a federally recognized emergency response methodology applied across North America by military, first-response agencies, and local, state, provincial and federal governments. ICS enables our employees and contractors to react quickly and efficiently to the emerging issues and challenges that are inevitable in a real-life emergency response.

In addition to ICS training, we design emergency response training programs that meet the specific needs of each of our business units, and which reflect their specific risks and types of emergency situations. For example, operations staff in our LP business unit may complete booming, skimming and boat-handling courses.

## Maintaining and Strengthening Enbridge's Emergency Response Team

### E<sup>3</sup>RT

Our Enbridge Enterprise Emergency Response Team (E<sup>3</sup>RT) is a cross-business-unit group trained to respond to large-scale events in Canada and the U.S. that require more resources than one of our operating regions or business units alone could provide. The E<sup>3</sup>RT members are trained in ICS. In 2018, the E<sup>3</sup>RT participated in the full scale Des Plaines River exercise hosted by LP's Great Lakes Region.

### Exercising our emergency response teams

To maintain and exercise preparedness, we stage both discussion-based and operations-based exercises across the Company, including seminars, workshops and tabletop drills as well as full-scale exercises involving our employees and contractors, local first responders and other third-party agencies. In 2018, Enbridge staged 315 drills, exercises and equipment deployments to hone our emergency preparedness skills and capabilities.

During these exercises, local first responders, agencies, government and industry representatives get a firsthand look at how we are prepared to respond in the event of an incident and provide feedback on how they would respond or assist during a pipeline emergency.

## Working with key industry and emergency response associations

When required, our field response teams work with local emergency responders. We value the expertise of local [emergency responders](#), and we are committed to strengthening our partnerships with them through meetings, training exercises, personal contact, information updates and our [Emergency Responder Education Program](#).

Through industry associations, we exchange best practices with other operators and participate in committee activities and joint exercises for the purpose of advancing safety and emergency preparedness. In the U.S., we actively participate in public awareness groups sponsored by the American Petroleum Institute, the Association of Oil Pipe Lines, the Interstate Natural Gas Association of America, and the Common Ground Alliance. In Canada, we are a member of the Canadian Gas Association and the Canadian Energy Pipeline Association.

We are also a member of the Pipeline Operators Safety Partnership, a group of pipeline operators who work together to build relationships with first responders and promote pipeline safety at annual conferences. In addition, Enbridge Gas Inc. (GDS) is an associate member of the Northeast Gas Association, which can provide additional resources from nearby utility companies, if needed, to support a company's response to a significant incident on its natural gas distribution system.

## SPOTLIGHT :

### Training the (fire) trainers

In 2018 Enbridge GDS trained 329 firefighters and visited 101 fire stations as part of the Company's first responder natural gas awareness program. Going forward, the combined utility will focus on a train-the-trainer approach in conjunction with the Ontario Association of Fire Chiefs. Enbridge piloted this approach in December 2018, taking 21 fire department training officers through a train-the-trainer session at the Enbridge Technology and Operations Centre. This train-the-trainer approach will further enhance the delivery of training throughout the distribution area.

## SPOTLIGHT :

### Des Plaines River drill

In 2018 Enbridge conducted a full-scale emergency management exercise at our Des Plaines River facility in Will County, IL. The exercise involved the simulation of a large-scale incident (a light crude oil release from Line 14) to test response capabilities such as containment and recovery efforts. Line 14 predominately transports light crude oil to Chicago area refineries.

Exercise participants included members from E<sup>3</sup>RT and LP's Great Lakes Region Incident Management Team.

One hundred and thirty five employees and nearly 100 outside observers and participants tested and assessed Enbridge's overall response capability during the full-scale exercise, as well as specific activities, such as spill containment and recovery. Representatives from the Illinois Environmental Protection Agency, Illinois Emergency Management Agency, Will County Emergency Management, City of Joliet, the U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers and the Department of Transportation's Pipeline and Hazardous Materials Safety Administration also participated.

“Exercises like this one test the readiness of our team to quickly converge from across the Company. It also gives employees and first responders real-world training to work together effectively on an incident response.”

Brad Shamla, Vice President, LP U.S. Operations

