canadian energy pipeline association | association canadienne de pipelines d'énergie

Committed to safety. Committed to Canadians.

2015 Pipeline Industry Performance Report

About CEPA

The Canadian Energy Pipeline Association (CEPA) represents Canada's transmission pipeline companies who operate approximately 117,000 kilometres of pipeline in Canada. These energy highways move approximately 1.2 billion barrels of liquid petroleum products and 5.3 trillion cubic feet of natural gas each year. Our members transport 97 per cent of Canada's natural gas and onshore crude oil production from producing regions to markets throughout North America.

Our vision

A safe, socially and environmentally sustainable energy pipeline industry for Canadians.

Our mission

Continually enhance the operating excellence, business environment and recognized responsibility of the Canadian energy transmission pipeline industry through leadership and credible engagement between member companies, governments, the public and stakeholders.

Our values

Accountability

Accountable to Canadians, we dedicate ourselves to the safety and operating excellence of member operations, and to understanding and meeting expectations for social responsibility.

Transparency

Open and responsive, we're focused on achieving success through credible, trustworthy leadership and open communications.

Respect

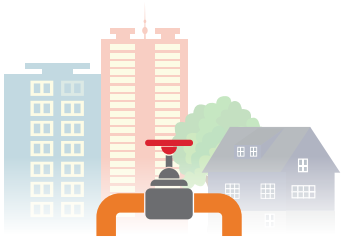
Every stakeholder is treated with respect, heard without judgment, and asked to share, question and challenge in the advancement of positive change.

Leadership

Approachable and balanced, we're committed to the relentless pursuit of a better future through improved performance, and by embracing science, innovation, progressive policy and engagement to enhance sustainability.

Liquids pipelines

Liquids pipelines transport crude oil or natural gas liquids from producing fields to refineries, where they are turned into gasoline, diesel and other petroleum products. Liquids pipelines are also used to transport these finished products to terminals or distribution centres in or nearby population centres.



Natural gas pipelines

Natural gas pipelines transport natural gas from gas wells to processing plants and to distribution systems throughout Canada that deliver natural gas directly to homes and businesses.

Report summary

> **The purpose of this report is simple:** to share with you the recent performance of the Canadian transmission pipeline industry and the actions CEPA's member companies are taking to improve safety, lessen environmental impacts and achieve operational excellence. These are key priorities for us, and they matter as much to us as they do to you."
>
> **– CEPA Board of Directors**

Working together

Our member companies are committed to sharing best practices to improve our industry's performance. From our perspective, there is no such thing as competition when it comes to improving safety and acting responsibly.

Goal of ZERO incidents

The CEOs of our member companies have publicly committed to the shared goal of zero incidents. This commitment starts with a pledge to leave no stone unturned when it comes to safety.

CEPA integrity first®

Through CEPA Integrity First®, our members have made an industry-wide commitment to continuous improvement in three areas: safety, environment and socio-economic impacts. They're initially focusing on improving performance in: pipeline integrity; emergency management; and control room management.

CEPA FOUNDATION

As Canada's pipeline industry forum, the CEPA Foundation brings together all participants in the Canadian energy pipeline industry, including suppliers and contractors, to ensure our industry exceeds Canadians' expectations concerning safety, quality, environmental stewardship and social responsibility.

Measuring our performance

Safety is the top priority for CEPA and our member companies and is integrated into every aspect of our industry. Here are some key statistics on our industry's recent safety performance.

- **99.999% safe delivery record** of crude oil and natural gas in 2014
- **122 liquids and natural gas spills and releases** in 2014, four categorized as 'significant'
- **$2.9 billion invested** over two years (2013 and 2014) in maintaining and monitoring member pipeline systems
- **45,306 kilometres** of pipeline inspected in 2014 using sophisticated in-line inspection devices
- **335 emergency response exercises held** in 2014
- **25% decrease in rate of injuries** to our members' employees over past five years

Taking action for continuous improvement

Through multiple initiatives and forums, leaders and experts in our industry are working together to improve practices and challenge each other to do better. In 2015, our member companies agreed to a strategic framework that sets down specific goals and major priorities they will work on together to achieve.

Four strategic priorities:

1. **Improve pipeline safety**
2. **Improve regulatory engagement, transparency and sustainability of the industry**
3. **Improve trust and credibility**
4. **Facilitate the exchange of ideas and best practices**

Industry collaboration

Our members are collaborating to ensure the effective use of technologies, codes and standards to combat and prevent key risks like external corrosion, a leading cause of failures in transmission pipelines.

Preventing third-party damage

CEPA's Damage Prevention Work Group is compiling industry-wide data on near-misses and unauthorized activity on pipeline rights-of-way into a database that our members will use to raise public awareness.

Committing to a culture of safety

In 2015, all 12 CEPA member companies are participating in an industry-wide employee survey based on the Safety Culture Framework issued by the National Energy Board to identify those areas where our industry is performing well and where improvement is needed.

Innovation

Our members are investing in leading-edge research at Canadian universities and through the Canadian Pipeline Technology Collaborative to uncover new and innovative approaches to ongoing pipeline integrity challenges.

Environmental initiatives

Working in collaboration with over 100 biologists, engineers, government officials and other experts, CEPA is currently producing the fifth edition of its comprehensive guidelines for constructing transmission pipelines across bodies of water. The results of this and other initiatives will assist our industry with future environmental risk assessments and help inform and improve spill preparedness and response capabilities.

Critical resources

In 2014, CEPA announced the Mutual Emergency Assistance Agreement, which formalizes an existing practice of companies lending critical resources to each other in case of an emergency.

Regulations

CEPA will support efforts by regulators to harmonize regulations, definitions and metrics for our industry across different jurisdictions to ensure strong regulatory oversight and enable Canadians to easily understand our industry's performance.

Responsive to Canadians

In 2015, CEPA launched the interactive About Pipelines Map, which enables Canadians to find the location of pipelines and related facilities operated by our members.

Disclosure of information

A CEPA Executive Task Force has set down guidelines on developing a common approach to public disclosure of emergency response information by transmission pipeline operators. In line with this initiative, CEPA members will improve transparency around their emergency response plans.

External Advisory Panel

Recognizing the need to reach out to the public directly in an effort to build trust and address real-life concerns, CEPA formed an External Advisory Panel, which includes representatives from a variety of community groups, Aboriginal Peoples, academia and landowners. Panel members bring their diverse perspectives and constructive and critical voices and viewpoints to help identify and clarify the topics and issues that matter most to Canadians.

Canadian Pipeline Technology Collaborative

Our members are co-funding the Canadian Pipeline Technology Collaborative, which unites pipeline operators, researchers, technology providers and supply chain partners to pursue responsible advancement of pipeline operations and technology development.

Moving forward, together

Letter from CEPA's President & CEO

Like city streets and electricity power lines, energy transmission pipelines are part of Canada's critical infrastructure.

Sometimes referred to as "energy highways", extensive networks of these pipelines stretch across the country, keeping Canadians constantly connected to the sources of natural gas and petroleum products we need to heat our homes, drive our cars and create hundreds of household products we rely on every day.

While transmission pipelines aren't completely risk-free, Canadians should know that CEPA's member companies take their responsibility to safely deliver energy very seriously.

In the spirit of openness and transparency, this report turns a spotlight on our industry's recent performance and how our members are working together to provide the safety and reliability their customers and all Canadians expect and deserve.

Our goal is to demonstrate the many ways we're making the Canadian transmission pipeline industry, which is already recognized as one of the safest in the world, even safer.

Brenda Kenny
President & CEO, CEPA

Contents

Building trust

Message from CEPA's Board of Directors

Welcome to CEPA's inaugural Pipeline Industry Performance Report. Its purpose is simple: to share with you the recent performance of the Canadian transmission pipeline industry and the actions CEPA's member companies are taking to improve safety, lessen environmental impacts and achieve operational excellence. These are key priorities for us, and they matter as much to us as they do to you.

We're dedicated to ensuring that, as an industry, we are strong and viable. Transmission pipelines are critical energy infrastructure. For more than 60 years, our pipelines have operated across the country and in your communities, delivering the energy you use every day. We're committed to fulfilling our essential role safely, reliably and efficiently. The people of Canada and the customers we serve—from oil and gas producers; to refiners and processors; to residential, commercial and industrial customers—expect this of us. At the same time, we're aware of the risks associated with our operations. Public safety, the protection of our natural environment and being able to respond effectively and efficiently to emergencies are priorities to us as an industry.

> "For us, no incident is acceptable."

Our duty to move energy safely for our customers comes with the understanding that we must earn the public's trust and the continued right to operate. One of the ways we'll achieve this is by demonstrating our commitment to attaining our goal of zero incidents. Even though over the past decade CEPA members had a safe delivery record of 99.999 per cent of crude oil and natural gas, for us no incident is acceptable.

Together we're....

Improving our safety culture

Embracing accountability

Seeking continuous improvement

When it comes to safety, CEPA members don't compete, we cooperate and collaborate.

Firstly, the senior management of every member company has publicly committed to the goal of zero incidents. This commitment starts with a strong safety culture—a pledge to leave no stone unturned when it comes to safety. This pledge is embraced through every level of our member organizations.

Secondly, we've embraced accountability across the industry. That's why we've dedicated ourselves to a shared commitment to continuous improvement, common metrics, industry best practices, evaluation of each member company's performance and third-party verification. We hold each other accountable and expect everyone to step up their game. It's the power of accountability and transparency amongst our peers—the power of challenging each other respectfully—that will unlock a higher level of safety and improve industry performance.

Thirdly, we've made an industry-wide commitment to continuous improvement of our safety and environmental performance through CEPA Integrity First®. The program involves CEPA and its members working together and constructively challenging each other to strengthen the collective performance of our industry. You can learn more about the program on page 5.

Our goal is to build public confidence and trust by demonstrating that our industry's safety and environmental performance are beyond reproach. This is core to our values as an industry and to the peace of mind of Canadians.

We hope you find this report useful and informative. Please let us know what you think of it. Your feedback will help us improve future reports to ensure they provide you with the information you need.

On behalf of the Board

Terrance Kutryk
Chair

Working together

CEPA's member companies are committed to sharing best practices to improve our industry's performance.

Through two major initiatives—the CEPA Foundation and CEPA Integrity First®—our industry is working collaboratively to address a range of issues related to Canada's energy pipelines.

CEPA FOUNDATION

As Canada's pipeline industry forum, the CEPA Foundation brings together all participants in the Canadian energy pipeline industry, including suppliers and contractors, to ensure our industry exceeds Canadians' expectations concerning safety, quality, environmental stewardship and social responsibility.

In addition to transmission pipeline operators, CEPA Foundation members include engineering, design, construction, manufacturing, pipeline maintenance, legal, land and environmental service companies—key suppliers who play a crucial role in our industry's work to achieve zero incidents. Founded in 2013, the CEPA Foundation is aligned with CEPA but is independent from CEPA.

In 2015, the CEPA Foundation held its Pipeline Construction Safety Roundtable in Calgary, Alberta.

With over 40 participating companies, the Safety Roundtable is focused on developing a common set of standards around personal protective equipment, overhead power-line hit prevention and light-vehicle safety requirements. They've also initiated a workshop series to facilitate in-depth discussion, information sharing and collaboration regarding pipeline construction.

For more information on the CEPA Foundation, please visit http://www.cepa.com/about-us/cepa-foundation

Safety

Quality

Environmental stewardship

Social responsibility

CEPA Integrity First®

In the business world, it's rare for competitors to sit down and share information on best practices. But through the Integrity First program, which formally began in 2012, our members, who own and operate the major transmission pipelines, have set competition aside and are working together to improve performance in three broad areas:

The goal of Integrity First is to relentlessly improve our industry's performance.

Our initial program efforts have focused on improving performance in three specific areas: pipeline integrity; emergency management; and control room management. We identified these three priorities through research and feedback gathered from the public and industry.

Subject matter experts developed guidance documents that led each company through an industry-wide assessment of their operations in those three areas to help them identify ways to improve. While we've done individual company self-assessment for many years, the industry-wide assessments through Integrity First resulted in identifying continuous improvement areas for each member company and where industry can collaborate for overall improvement.

Integrity First also aims to advance our industry's environmental and socio-economic practices. Like safety, these areas are critical to the well-being, protection and prosperity of Canadians. For example, Canada's transmission pipeline companies are working together to improve performance in areas such as water impacts, land management, air emissions and building strong relationships with Aboriginal Peoples and other communities impacted by the pipeline industry.

CEPA integrity first®

Integrity First

Pipelines are a crucial part of our everyday lives and Canadians have the right to know what operators are doing to keep pipelines safe and communities protected. Integrity First works with both the pipeline industry and the public to ensure industry leading practices are applied, communicated openly and remain focused on what matters most to Canadians.

Integrity First's promise

We're focused on building the public's trust and confidence in the pipeline industry. Our ongoing mission is to ensure our member companies are equipped to understand what the public needs and expects, and then use our expertise to provide the best solution.

As an industry, we collaborate to improve together through a commitment to promote and facilitate a culture of safety, protect and respect the environment, and provide socio-economic benefits where we work.

CEPA integrity first®

Safety

- Enhance emergency preparedness and response
- Advance the reliability, design and monitoring of pipelines
- Protect workers and the safety of communities by creating a culture that is focused on safe operations
- Prevent damage to pipelines
- Educate and engage stakeholders on pipeline safety

Environment

- Manage the long- and short-term impacts to land and resources
- Improve air quality by reducing air emissions
- Maintain water quality and minimize watershed disruption
- Prevent habitat disruption and impacts to wildlife
- Limit noise impacts from operations

Socio-economic

- Improve land use and access by developing strong landowner relationships
- Provide economic benefits to communities through employment, investment and taxes, both nationally and regionally
- Build strong relationships and agreements with Aboriginal Peoples
- Attract, recruit, retain and build a highly competent workforce

Ongoing support

- Integrity First engages with stakeholders, the public and industry experts to determine where we can make the most impact
- Integrity First works diligently with our External Advisory Panel to obtain an uncensored view of the communities we serve
- CEPA member companies and Integrity First knowledge groups recommend and develop opportunities to improve

Continuous improvement

- Respond promptly to regulatory guidance and continue to work collaboratively and proactively
- Be transparent and above reproach in our actions
- Demonstrate measurable improvements in key areas
- Drive continuous safety improvements as an industry
- Review performance regularly to help drive future improvements

Measuring our performance

Canada's transmission pipelines carry large quantities of energy that need to be transported safely to ensure they don't pose a risk to the public and the environment.

That's why the safety and integrity of our pipelines is the top priority for CEPA and our member companies. We're committed to minimizing and even eliminating potential risks to our operations and the public.

Equally important is the safety of the 15,000 Canadians who work in our industry. Our vision for worker safety is that every person working with a CEPA member company will return home safely to his or her family at the end of the day.

By measuring our industry's performance and reporting the results publicly and transparently, we're aiming to create best practices for our industry; continually improve safety, reliability and efficiency; and build trust with Canadians.

In this section of the report, we provide some key statistics and background on our industry's recent safety performance.

2014 Safety performance snapshot

Safe delivery

99.999%
safety record

In 2014, CEPA member companies delivered natural gas and liquid petroleum products with a 99.999 per cent safety record. In fact, over the past decade, our industry's safe delivery record has remained the same. This is good, but it's not good enough. We're working tirelessly to reach our shared goal of zero incidents.

1 in **20,000** years
likelihood of a crude oil spill of more than 50 barrels for any given kilometre of pipeline

CEPA members operate around 40,000 kilometres of liquids pipelines in Canada. Based on our industry's safety record, the likelihood of a crude oil spill of more than 50 barrels occurring on one of these kilometres of pipe is 1 in 20,000 years.

Pipeline incidents

80% of natural gas and liquids releases occurred in facilities*

In 2014, our members reported 122 natural gas and liquids releases, of which approximately 80 per cent occurred in pipeline facilities. The vast majority of the pipe incidents were very minor, such as small pinhole leaks. These minor incidents must be addressed but pose little risk to the public or the environment. Typically, incidents that occur within a pipeline facility pose less potential threat to the public or the environment because of their size, and the fact that facilities have both restricted public access and a leak containment system to keep the releases within the facility.

** Please see page 48 for the definition of 'facilities'*

4 spills and releases categorized as 'significant'*

Of the total number of spills and releases in 2014 on all 117,000 kilometres of pipelines operated by CEPA member companies in Canada, two liquids spills and two natural gas releases were categorized as 'significant'. Through technological advancements and industry effort in the areas of leak prevention and detection and damage prevention, only a small percentage of pipeline incidents are severe enough to meet the criteria of significant.

** Please see page 15 for the definition of 'significant'*

503 barrels* of crude released

The two liquids pipelines spills categorized as 'significant' in 2014 resulted in the release of 503 barrels of crude or petroleum product, compared with 2,196 barrels in 2013. The amount of the spills in 2014 is equivalent to less than two-thirds of one rail car. In response to every spill, pipeline operators deploy sophisticated spill recovery techniques and tools as part of the post incident clean-up. Any spill clean-up is strictly regulated and includes extensive oversight, testing and sign-off by applicable regulators and agencies.

** 1 barrel = 159 litres*

20,360 barrels of oil equivalent* released from natural gas pipelines

Product released from natural gas pipelines in 2014 totalled 20,360 barrels of oil equivalent (boe). In natural gas pipeline leaks, it's not so much the size that presents the greatest potential risk to the public or the environment, but rather the location and chance of ignition. Of the 98 natural gas pipeline incidents that occurred between 2010 and 2014, three per cent resulted in an unintended ignition. There were no serious injuries or fatalities associated with these events.

** Please see page 48 for the definition of 'barrel of oil equivalent'*

Prevention

$2.9 billion

invested in maintaining and monitoring pipeline systems

In 2013 and 2014, CEPA members invested more than $2.9 billion in maintaining and monitoring their Canadian pipeline systems.

$23 million

invested in innovative technology

Our members invested more than $23 million in 2014 in innovative technology focused on reducing corrosion and improving pipeline inspection and leak detection.

3,818

integrity digs conducted

In 2014, our members conducted 3,818 integrity digs to examine pipelines for suspected defects and make repairs.

45,306 kilometres

In 2014, our members conducted in-line inspection runs on 45,306 kilometres of pipelines using highly sophisticated tools called "smart pigs" that examine a pipeline from the inside to identify changes such as dents or wall thinning that could threaten the pipeline's health.

Our members schedule in-line inspections throughout the year. They choose which pipelines to inspect based on numerous factors, including the pipeline's performance history, as well as comprehensive engineering and risk assessments.

Emergency preparedness

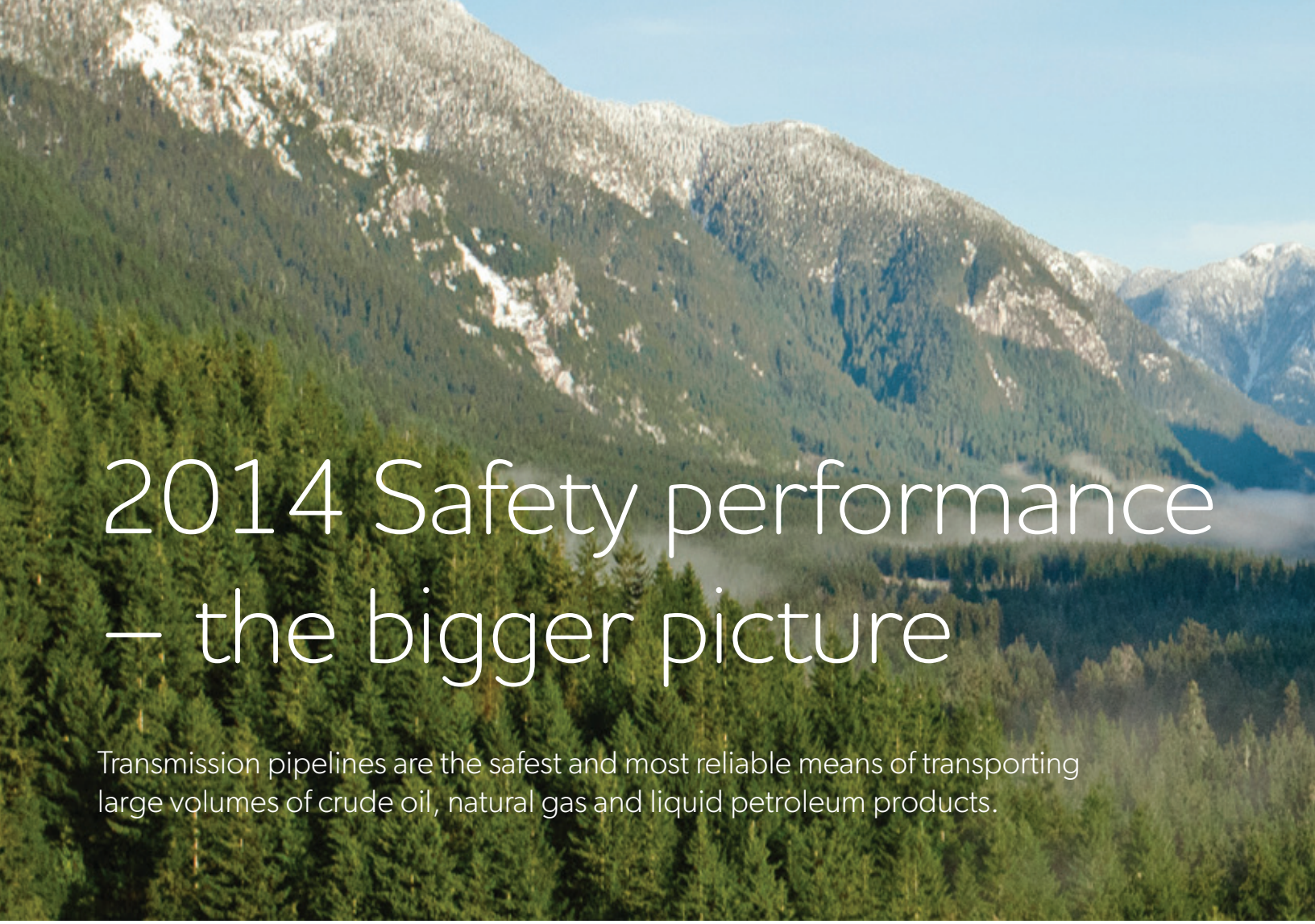
335 emergency response exercises held

In 2014, CEPA members held 335 emergency response exercises. Although emergencies are a rare occurrence for Canada's transmission pipelines, our members are focused on being prepared to quickly and effectively respond to an emergency, with the goals of protecting the public and the environment, reducing any risks and hazards, and fully cleaning up and restoring the site.

Employee health and safety

Rate of injury reduced to **0.64** per 100 full-time workers

CEPA's members are focused on ensuring the 15,000 people directly employed by our industry, and the many thousands of contractors who work on our behalf, return home safely at the end of the day. The rate of injuries to our members' employees that happened during the operations of their pipelines has declined over the past five years, from 0.87 per 100 full-time equivalent workers in 2010 to 0.64 in 2014. By comparison, the injury rate for the federally regulated banking industry in 2012 as reported by Employment and Social Development Canada was 0.81 per 100 full-time equivalent workers.



2014 Safety performance – the bigger picture

Transmission pipelines are the safest and most reliable means of transporting large volumes of crude oil, natural gas and liquid petroleum products.

Pipeline incidents

Pipeline incidents are rare considering our member companies operate 117,000 kilometres of pipelines in Canada. In 2014, the transmission pipeline industry in Canada moved 1.2 billion barrels of liquid petroleum products and 5.4 trillion cubic feet of natural gas.

Despite being the safest way to transport oil and gas products over long distances, no transmission pipeline is completely risk-free. From time to time incidents do occur and when this happens, pipeline operators are trained and ready to manage these emergency situations.

All incidents are investigated, and our industry is committed to sharing important lessons learned across CEPA's work groups and among members of CEPA's Board of Directors. This information sharing helps identify areas for further analysis and research and refines priorities for action. The information also informs enhancements to pipeline integrity management programs and will help prevent future incidents.

Note to readers:
For the purposes of this report, a 'pipeline incident' is defined as any unplanned release of a product due to the failure of a pipe or third-party damage.

> “Our industry is committed to investigating all incidents and to sharing important lessons learned across CEPA’s work groups and among members of CEPA’s Board of Directors.”

Transmission pipeline companies are required to report all pipeline incidents to either federal or provincial regulators. This includes spills along the pipeline right-of-way, as well as incidents contained inside a pipeline operator’s facility such as small leaks from pumps and valves in compressor-station and storage facilities.

Facility incidents occur with greater frequency than incidents on the pipeline right-of way, which is why as an industry we are also focused on facility integrity management to better determine root causes and what improvements can be made. Typically, incidents that occur within a pipeline facility pose less potential threat to the public or the environment because of their size, and the fact that facilities have restricted public access and a leak containment system to keep the releases within the facility. These facility incidents would be similar to small incidents in any industrial facility such as a car plant or furniture manufacturer.

Our members' performance

Total releases

In 2014, CEPA member companies reported a total of 122 natural gas and liquids releases, of which approximately 80 per cent occurred in pipeline facilities.

Aiming for zero incidents

While 2014 showed significant improvement, there has been an increase in the number of pipeline incidents over the past several years. This increase is in part due to a concerted effort by CEPA members to ramp up their pipeline inspection and leak detection activities, which has led to the detection of smaller defects that were leaking. They were repaired before they became more serious.

For example, in 2012, a leak detection survey conducted by a natural gas pipeline operator detected nine small leaks on one pipeline due to a failure of the cathodic protection on the pipe. While there was no immediate risk to the public or the environment, the pipeline was immediately taken out of service and permanently decommissioned.

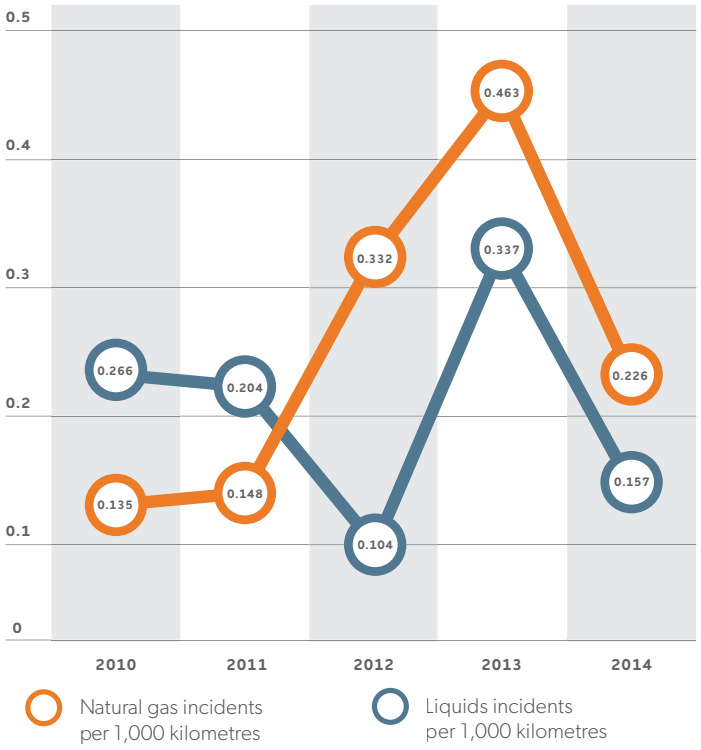
Similarly, in 2013, another company discovered and repaired 20 small leaks through their annual leak survey. Using highly sensitive gas leak detectors, this company conducts ground surveys of its entire network annually and twice per year in urban areas. By identifying and repairing small leaks through these inspections and its ongoing integrity management activities, this company has reduced the risk of a more serious incident.

Right-of-way incidents

CEPA has collected statistics on pipeline incidents along the pipeline rights-of-way of our members for more than a decade.

We focus on right-of-way incidents because they have the greatest potential to impact the public or the environment.

Number of right-of-way incidents per 1,000 kilometres



What is a pipeline right-of-way?

A pipeline right-of-way is the strip of land above a buried pipeline. Pipeline companies acquire the right to use the land for construction, operation, inspection and maintenance of their pipelines.

Certain activities are prohibited on rights-of-way to protect the public and the integrity of the pipeline. Rights-of-way are always clearly marked with warning signs.

Significant incidents

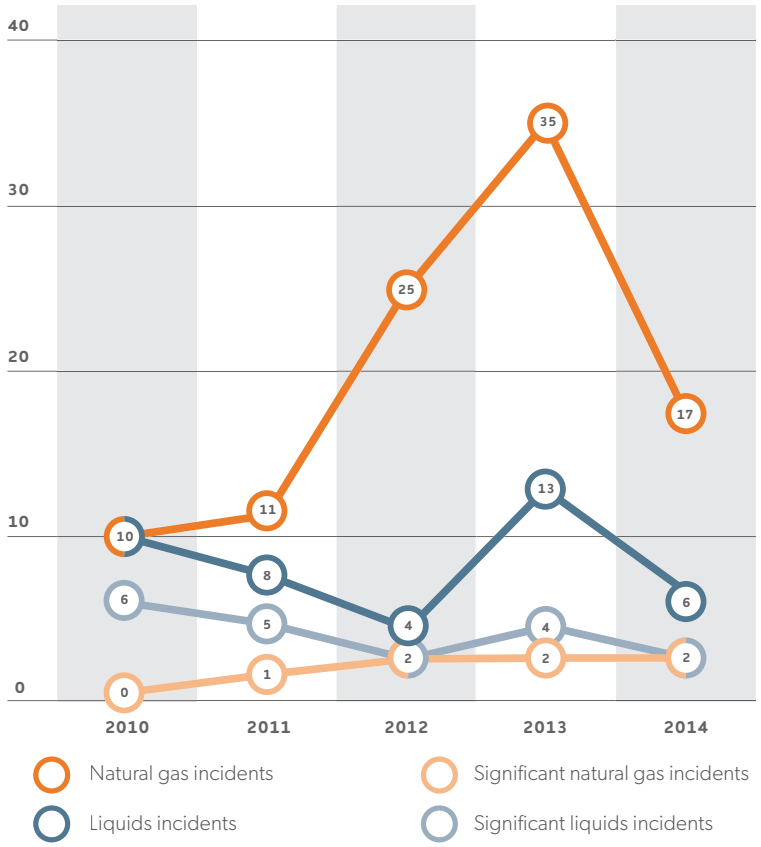
The majority of pipeline incidents are minor, such as small pinhole leaks. These minor incidents must be addressed but pose little risk to the public or the environment.

To differentiate higher risk incidents, CEPA has adopted a set of criteria that defines 'significant incidents'. A significant incident would include one or more of the following:

- Caused a serious injury or fatality. In the more than 60 years of pipeline operations in Canada, there have been two public fatalities. The last one was in 1999. Both fatalities were the result of third-party external damage to pipelines where, tragically, the individual struck the pipeline and was killed. This highlights the critical importance of public awareness of safe digging practices.
- Caused a liquid release of greater than eight cubic metres (50 barrels).
- Produced an unintentional ignition or fire.
- Resulted in a rupture of a pipeline.

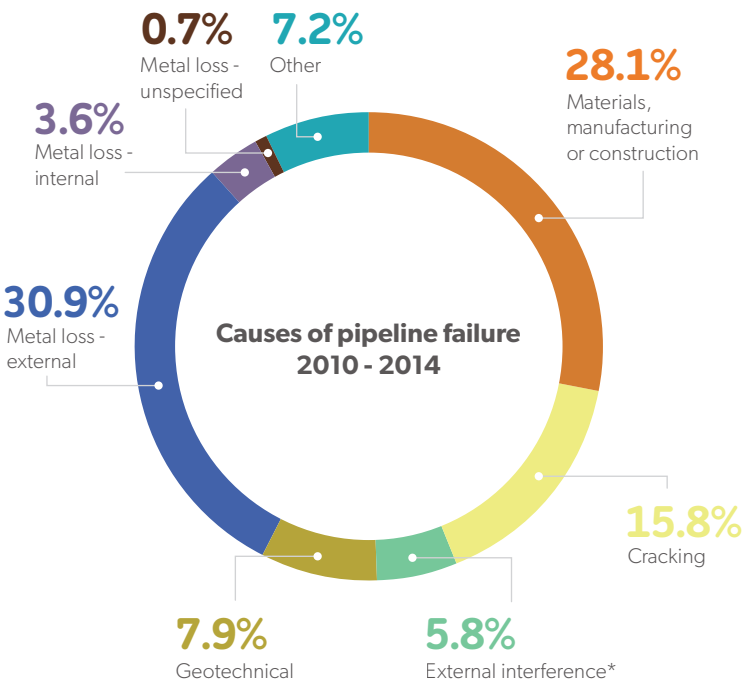
Through technological advancements, as well as our industry's effort in the areas of leak prevention and detection and damage prevention, only a small percentage of pipeline incidents are severe enough to meet the criteria of 'significant'.

Number of right-of-way incidents versus significant incidents



Causes of pipeline incidents

The leading causes of pipeline failure are: metal loss, i.e. reduction in the thickness of a pipe due to corrosion or other causes; materials, manufacturing or construction defects; and cracking. Collectively, these accounted for more than 79 per cent of the total incidents over the period 2010 to 2014. Our industry is aggressively addressing all causes of pipeline failure. This includes regular in-line inspections using sophisticated tools that can even identify very small changes inside and outside pipe walls; collaborating with manufacturers and suppliers through the CEPA Foundation to ensure the highest standards; regular surveillance of pipeline rights-of-way; and raising public awareness about safe digging practices.



** Damage caused by external activities (such as digging) and predominantly caused by third parties*

Comparing performance

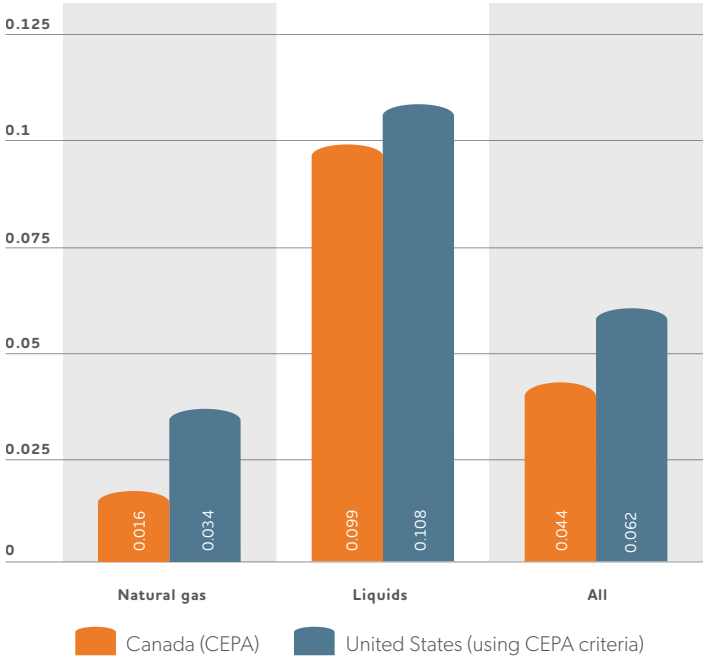
To put Canada's pipeline safety record into perspective, it can be helpful to compare it to other jurisdictions.

The best way to do this is by comparing the frequency of pipeline incidents, which considers the number of pipeline incidents per 1,000 kilometres of pipeline. On this basis, Canada's performance compares favourably with the United States.

> "Without pipelines, large volumes of crude oil (over three million barrels per day in Canada) would have to be transported to refineries by other modes of transport, such as tanker trucks, tanker ships, or rail cars. Transporting three million barrels per day by truck would mean more than 15,000 additional long distance truck trips every day on Canada's highways, which would have public safety, road maintenance, noise, and emissions implications. Studies continue to confirm that pipelines are safer than any other mode of transportation of hydrocarbons."[1]

[1] Source: ***Natural Resources Canada*** *http://www.nrcan.gc.ca/energy/infrastructure/5893*

Frequency of significant pipeline failure incidents per 1,000 kilometres – Canada vs. United States 2010 - 2014



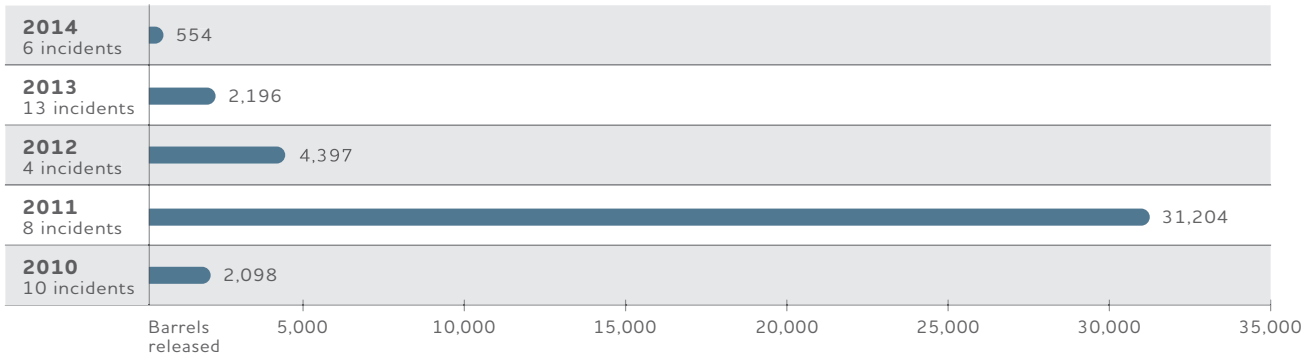
Liquids pipelines spill volumes

Liquids spills are infrequent when you consider the large volume of products transported by CEPA members. Over the past 12 years, they have transported approximately 12 billion barrels of crude oil and other liquid products and safely delivered 99.9995 per cent of that volume. While our members are proud of their safety record, they look at the .0005 per cent spilled and are driven to improve performance and do everything they can to attain their goal of zero incidents.

The majority of liquids pipelines spills between 2010 and 2014 were small in volume (less than 8 cubic metres or 50 barrels). The single largest spill, which occurred in 2011, accounted for more than 70 per cent of the total volume spilled, and the three largest spills accounted for more than 80 per cent of the five-year total.

In response to a spill, pipeline operators deploy sophisticated spill recovery techniques and tools as part of the post-incident clean-up. For example, in the case of the three largest spills, the operators successfully recovered and removed 99 per cent of the liquids volume either in liquid form or oil-contaminated soils or vegetation. Any spill clean-up is strictly regulated and includes extensive oversight, testing and sign-off by applicable regulators and agencies.

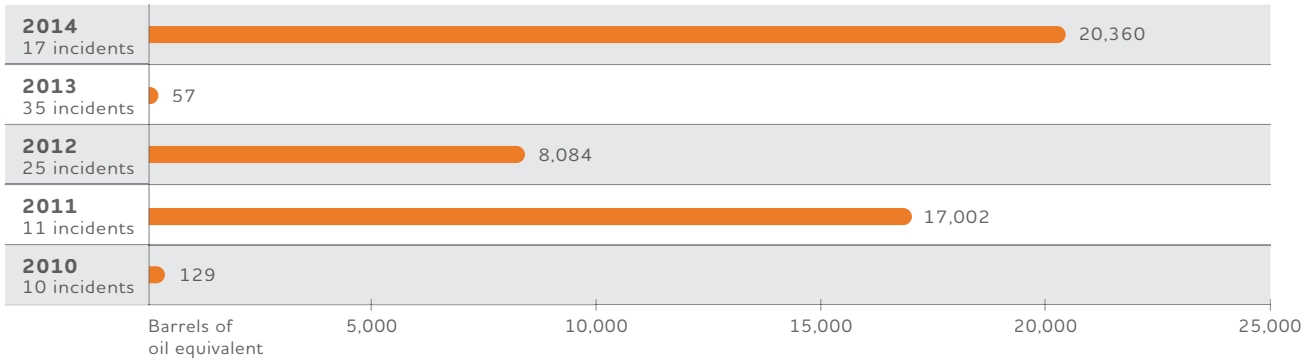
The illustration below shows the total annual volume of product released from liquids pipelines in Canada over the past five years.



Natural gas release volumes

In natural gas pipeline leaks, it's not so much the size that presents the greatest potential risk to the public or the environment, but rather the chance of ignition. Of the 98 natural gas pipeline incidents that occurred between 2010 and 2014, only three per cent resulted in an unintended ignition. There were no serious injuries or fatalities associated with these events.

The illustration below shows the total annual volume of product released from natural gas pipelines in Canada over the past five years.



Employee health and safety

Employee fatalities

CEPA member companies are proud of their record when it comes to worker health and safety. However, tragically, they experienced one employee fatality in 2008. The incident involved an electrician conducting work at an oil pipeline pumping station. The incident was thoroughly investigated by both the company and the regulator, and important corrective actions were identified and implemented to ensure this type of incident would not occur again.

Total recordable injury rate

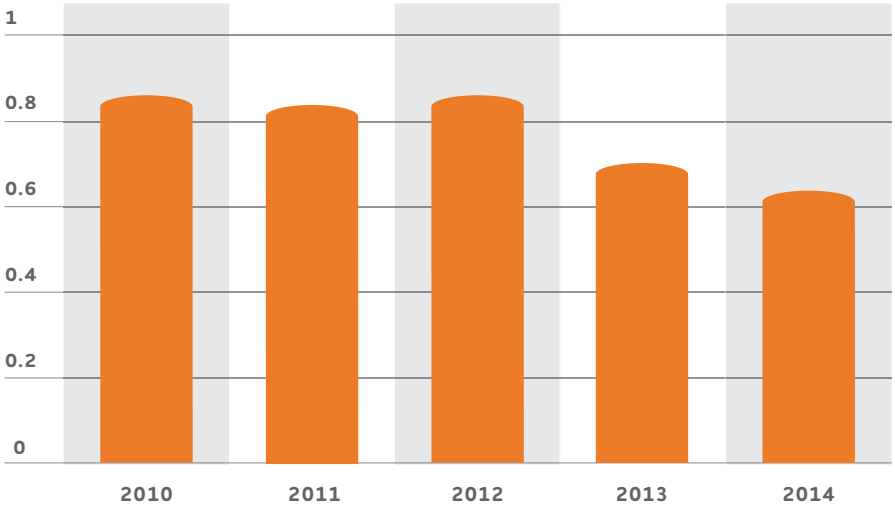
CEPA's members are focused on ensuring the 15,000 people they directly employ return home safely at the end of the day.

Just as they've committed to a goal of zero pipeline incidents, they also have a goal of zero incidents affecting the health and safety of their employees.

Our industry's health and safety statistics show their progress towards this goal. The rate of injuries to our members' employees that happened during the operations of their pipelines has declined more than 25 per cent over the past five years from 0.87 per 100 full-time equivalent workers in 2010 to 0.64 in 2014. By comparison, the injury rate for the federally regulated banking industry in 2012 as reported by Employment and Social Development Canada was 0.81 per 100 full-time equivalent workers.

Our industry is also committed to the safety of contractors. CEPA's member companies work closely with their contractors to ensure they are just as familiar and committed to safety practices as employees.

Total recordable injury rate[1] – 2010-2014



Rate of injuries of our members' employees reduced more than

25%

over the past five years

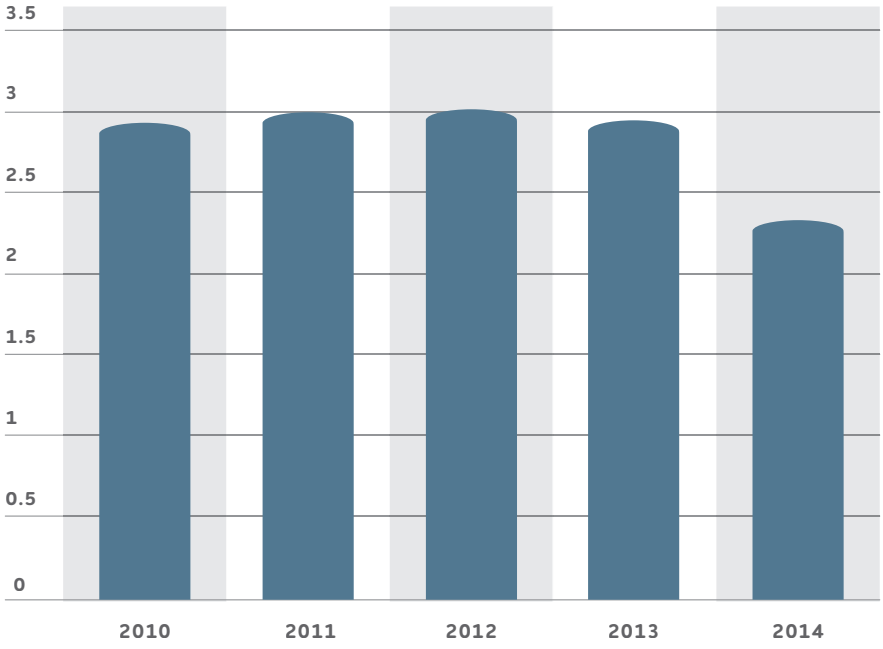
[1] *The rate per 100 full-time equivalent workers is computed by (1) dividing the number of occupational injuries reported by the total number of hours worked by all employees during the calendar year, and (2) multiplying the result by 200,000. The factor 200,000 represents the hours worked in a year by 100 full-time equivalent workers (working 40 hours per week, 50 weeks a year).*

Driving incidents

Whether on company business or traveling to and from work locations, motor vehicle incidents are the most significant hazard for our industry's workers, which is why we've made driver safety a top priority.

Our industry's driving record points to the need to strengthen our efforts in areas such as regular driver training, work planning that ensures workers are not fatigued and have sufficient time to travel the required distances, and work instruction that includes information on rest stops and when it's appropriate to get off the road altogether.

Motor vehicle incident rate[2] – 2010-2014



The number of driving incidents per million kilometres driven fell from 2.91 in 2010 to 2.31 in 2014.

That's a

20%

decline

[2] The motor vehicle incident rate is the number of motor vehicle incidents per million kilometres driven for business use and is calculated by (1) multiplying the total number of incidents by 1,000,000 and (2) dividing by the total business kilometres driven.

Responding to emergencies

Although infrequent, releases of crude oil and natural gas on pipeline rights-of-way pose a special challenge for our industry—not only because of their potential impacts to nearby communities, wildlife and waterways, but also because of the complexity of cleaning up and remediating spill sites.

All pipeline companies are committed to preventing releases from happening in the first place. They do this by pursuing and implementing pipeline integrity programs designed to proactively deal with potential threats to pipelines; and by monitoring their pipelines 24/7 at centralized system control rooms.

They also have comprehensive emergency preparedness and response plans in place that are designed to ensure a thorough and successful response should a release occur.

Preparedness includes: always having emergency response equipment ready; holding regular emergency-response exercises and training for employees, contractors, first responders and community members; and public education and awareness to prevent third-party damage, which is one of the biggest risks to pipeline safety.

In the event of a release, response priorities include: stopping the leak by shutting down systems quickly and safely; isolating the line and immediately dispatching clean-up crews; ensuring the safety of the public, employees and contractors; protecting wildlife, water bodies and vegetation; repairing the pipeline; cleaning up, remediating and restoring the site to its previous state; and monitoring the site over the long term to determine if any further action is required.

The two case studies on the following pages describe how CEPA member companies responded to a recent natural gas pipeline fire and a liquids pipeline spill on their rights-of-way.

Case study: TransCanada – Canadian Mainline fire – Otterburne, Manitoba

On January 25, 2014, a fire occurred on TransCanada's Canadian Mainline natural gas pipeline system near the community of Otterburne, Manitoba, approximately 50 kilometres south of Winnipeg. Natural gas delivery to nine communities was interrupted for several days as a result of the fire.

Due to the fire, natural gas delivery to nine communities was interrupted, affecting 4,000 people.

⚠ Initial response

The fire broke out at approximately 1:15 a.m. central time. As a precaution, residents from five nearby homes were temporarily evacuated by emergency responders, but these residents were cleared to return home shortly thereafter. The fire self-extinguished at around 2 p.m. central time and no one was injured. Residents and crews had to brave high winds, snow-squall conditions and temperatures below -40° Celsius with wind chill.

Local emergency response agencies including the RCMP, fire department and Manitoba Hydro played a key role in providing support to ensure public safety. TransCanada quickly established Community Information Centres (CICs) to provide information to local residents and assistance to those directly affected by the incident. Hundreds of employees and contractors worked tirelessly to complete repairs and restore power and natural gas service to impacted communities.

Collaboration and community

The incident left more than 4,000 people without natural gas service in the middle of winter. TransCanada immediately mobilized every resource at its disposal to respond. Hundreds of employees and contractors—across Canada—worked around the clock to get specialized equipment to the site to begin the repairs and support the response to get the heat back on and provide assistance to those affected by the outage.

Over the course of several days following the incident, TransCanada crews worked alongside local emergency response agencies, Manitoba Hydro and provincial authorities to address the needs of the community.

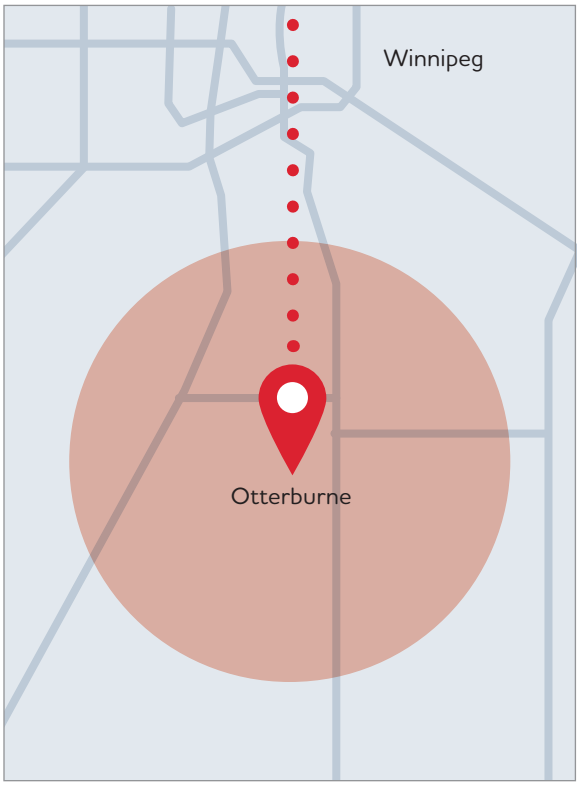
TransCanada provided dozens of portable heaters to residences and businesses, and collaborated with Manitoba Hydro to truck in compressed natural gas and provide heat to warming shelters and other locations.

"TransCanada's 50-year relationship with area residents, landowners and community leaders were put to the test, and we were very grateful and appreciative for the patience they exhibited and the hard work of the agencies and teams on the ground," said Bryce Lord, TransCanada's Vice President Canada & Mexico Gas Operations. "These relationships also extended to first responders who helped escort critical equipment safely

along highways that were experiencing near winter white-out conditions. What we achieved with our response demonstrates the value of the long-term relationships that TransCanada already had in place with these agencies and emergency workers."

Approximately 675 people visited the CICs in the surrounding communities, as representatives from TransCanada and Manitoba Hydro answered questions from residents and businesses and processed their claims on the spot for expenses that were directly related to the loss in gas service. All evacuated residents were provided with gift cards to cover short-term costs. Dozens of electric heaters were supplied, or residents were reimbursed if they had purchased their own heaters.

On January 28, 2014, regular natural gas service was restored to Manitoba Hydro's distribution network serving each community.



> "Approximately 675 people visited Community Information Centres where representatives from TransCanada and Manitoba Hydro answered questions from residents and businesses."

Lessons learned

The Transportation Safety Board (TSB) report about the incident concluded the incident occurred because of a manufacturing defect in a valve assembly that had formed when the pipeline was constructed over 50 years ago. The pre-existing crack had remained stable for over 50 years.

After the incident, TransCanada thoroughly inspected the pipeline and related infrastructure, including a physical inspection of all similar welds, to ensure it could be returned to service safely. TransCanada did not find any additional instances of such a crack.

"Through our Pipeline Integrity Management Program, TransCanada is continually pursuing new technologies to advance our capabilities for inspecting pipelines," said Lord. "TransCanada's modern welding and non-destructive examination methods, such as radiographic and ultrasonic inspection, are in place to ensure the quality and integrity of welds made during the construction of a pipeline.

> "Through our Pipeline Integrity Management Program, TransCanada is continually pursuing new technologies to advance our capabilities for inspecting pipelines."

"To help put this incident in perspective, in the entire history of our pipeline system we have never encountered a weld flaw like this one from original construction (constructed in 1960) and then to also have it fail in this manner. The TSB investigation report on the failure did not identify any deficiency with our pipeline integrity program or processes."

Value of strong community relationships

The TSB investigation did not identify any additional actions or recommendations for TransCanada, but one lesson that wouldn't be found in an engineering or metallurgical report is the importance of strong community and landowner relationships.

"The value of the goodwill TransCanada built with landowners and nearby communities for over half a century cannot be taken for granted," said Lord. "With decisive action and the commitment to make things right, those relationships paid off in spades. TransCanada received extremely positive feedback from public officials and was very grateful for the kindness of residents, who expressed their thanks in cards dropped off at the CICs and they even sent coffee and donuts to our crews during those frigid days and nights."

Concluded Lord: "This was a very unfortunate incident, but it proved once again that the key to effective emergency response is maintaining solid relationships with emergency responders and other groups in the communities we serve. This collaboration delivers many benefits. In addition to helping us quickly respond to an emergency, it also supports our efforts to continuously refine our emergency response plans and improve our pipeline operations. We consider every incident on our pipelines as a learning opportunity in order to make our facilities even safer."

Case study: Enbridge – Northern Alberta release

On June 22, 2013, a once-in-100-year rainfall in the Fort McMurray, Alberta area throughout the month of June triggered ground movement on the right-of-way of Enbridge's 12-inch Line 37, causing the line to buckle and release approximately 1,300 barrels of light synthetic crude oil. Line 37 is part of the Enbridge Regional Oil Sands System in Northern Alberta.

140 mm of rainfall was recorded in Fort McMurray, Alberta during June 2013.

⚠ Initial response

"When our leak detection system detected a potential release from Line 37, we immediately shut down the line, mobilized field personnel with equipment to investigate the site, and notified regulatory authorities and Aboriginal and Métis communities in the area," said Leon Zupan, Chief Operating Officer, Enbridge Pipelines. "As a precaution, we also temporarily shut down all of our other pipelines in the area while we conducted extensive engineering and geotechnical assessments on all of these lines to ensure they would be safe to operate."

When Enbridge first responders arrived at the leak site, they found that oil had migrated to the surface, down a slope and into a small creek and an unnamed lake. Work began immediately to contain the oil using containment booms and absorbents, as well as deploying wildlife deterrents.

Enbridge also immediately initiated an Incident Command System that continued around the clock, while additional responders and support resources arrived from across Western Canada within the first 24 hours.

"In responding to the release, our priorities were to ensure the safety of the public and our response crews, while minimizing the impacts to the environment as we contained and removed the oil," said Zupan.

Clean-up and recovery

At the peak of the clean-up and recovery operation during the last week of June 2013, approximately 200 personnel were on-site.

"Our people had to work in a very challenging environment," said Zupan. "The heavy rainfall made site conditions difficult, initially requiring access to the site by foot, all-terrain vehicle and helicopter."

Enbridge built a road to the leak site constructed of rig mats to allow access for vacuum trucks, excavators and emergency response equipment, which were used to remove product from the area. These 18 foot-by-40 foot wooden mats distribute the weight of heavy equipment across a wide area, providing immediate access while reducing environmental damage. The road was extended to other areas of the site to permit access for heavy equipment.

In addition to deploying wildlife deterrents, Enbridge established a site-specific wildlife management strategy, and conducted extensive aerial and ground-based wildlife surveys. Enbridge also fenced the area impacted by the release to prevent wildlife from entering the area. As a result, the overall impact on wildlife was minimal.

Enbridge also deployed a portable water treatment plant to the site to treat any oily water collected from the site.

The oil recovery process entailed the collection and treatment of approximately 3,000 cubic metres of water, as well as the removal of approximately 6,800 tonnes of impacted soil and sediment. Through this process, Enbridge recovered approximately 93 per cent of the oil from the area. All material recovered from the site was safely stored and treated for disposal.

In conjunction with oversight from Alberta Environment, Enbridge conducted environmental site assessments concurrently with their remediation work. The assessments included investigations to quantify the leak's impacts to the air, soil, groundwater, sediment and surface water. The results were used to develop optimal clean-up strategies.

Enbridge personnel conducted extensive engineering and geotechnical analysis, and carried out inspection work at various points on the pipeline. Enbridge also implemented various measures to mitigate ground forces on Line 37 and other pipelines sharing the right-of-way.

Throughout their response, Enbridge worked closely with regulatory agencies and local stakeholders to establish a comprehensive response and remediation plan. Regulators visited the site, and Enbridge provided regular updates on the status of the clean-up, repair and remediation to everyone concerned.

Results

Enbridge's response was effective in mitigating the environmental impacts while minimizing further impacts to the local environment.

On July 11, 2013, the repaired line was returned to service at a reduced operating pressure and, after additional monitoring and analysis, returned to normal operating pressure on July 29, 2013. All the other pipelines in the region that Enbridge had shut down were also fully assessed and individually returned to normal service by early July 2013.

Lessons learned

"The Enbridge team and our contractors responded rapidly, professionally and safely to this incident," said Zupan. "Through this incident we saw how important it is to work together to ensure an effective and efficient response."

Taking action for continuous improvement

CEPA's 2015 strategic priorities

Through multiple initiatives and forums, leaders and experts in our industry are working together to improve practices and challenge each other to do better. This collaborative approach ensures CEPA member companies can share their knowledge and innovations with each other and drive industry-wide improvements.

Sharing knowledge and innovations to drive industry-wide improvements

To bring this commitment to an even higher level, in 2015 CEPA member companies agreed to a strategic framework that sets down specific goals and major priorities that they will work on together to achieve.

On the following pages, we outline these strategic priorities and provide details on some of the actions our industry is taking or plans to take to ensure we are continuously improving in all areas of activity.

Strategic priority 1: Improve pipeline safety

We're committed to pipeline safety and advancing a safety culture throughout our industry based on a strong foundation of leadership and continuous improvement leading to zero incidents.

Actions we are taking 1.1

The safety of people and the environment is our top priority; take action to reach our goal of zero incidents.

Goal of ZERO incidents

Recent actions

Addressing root causes of incidents

In 2012, CEPA completed an in-depth analysis of 35 transmission pipeline incident reports and briefs released by the Transportation Safety Board of Canada and the National Transportation Safety Board in the United States since 2000.

The analysis provided valuable information about the root causes of pipeline incidents. That information has been used by CEPA members to inform additional research and actions to prevent future incidents. It also highlighted three areas that were found to contribute to the severity of transmission pipeline incidents—detection and isolation of the failure (control room procedures); emergency response; and public awareness—and as a result our members resolved to address potential gaps in those three operational areas.

Through our Integrity First initiative, CEPA members defined leading practices for emergency management and pipeline integrity and completed industry-wide self-assessments in these areas in 2014. The leading practices for control room management have also been developed and companies will complete self-assessments in 2015. (For more information on Integrity First, please see pages 5-7.)

In 2015, individual transmission pipeline companies started sharing their Integrity First assessment results with

peer companies to ensure consistency, learning and systematic improvement. This is a first step in a staged verification process that moves Integrity First toward independent third-party verification.

Transmission pipeline companies will also be working together to define leading practices in the following areas in 2015 and 2016 to help inform future assessments and continuous improvement: damage prevention; public awareness; and water impacts.

Tackling external corrosion

Through CEPA, leading experts are working together to improve pipeline integrity. One of our principal areas of focus for measurable improvement is in the area of external corrosion, which is the leading cause of failures in transmission pipelines.

Corrosion is a naturally occurring phenomenon that can happen when metal is exposed to natural elements such as air, soil or water. Not all pipelines corrode, but if one does, corrosion is a gradual process that left untreated will impact the strength of a steel pipeline.

CEPA member companies are dedicated to detecting corrosion through internal and external monitoring, prevention and repair. Furthermore, CEPA members actively participate in research and development of new technology to discover and design ways to combat and prevent corrosion.

Our members also regularly collaborate on corrosion prevention and control methods to ensure the effective use of technologies, codes and standards. CEPA's In-line Inspection Committee is focused on analyzing various aspects of pipelines and corrosion, including prevention and detection of pinhole leaks, inspection technologies and using different grades of steel in pipeline construction.

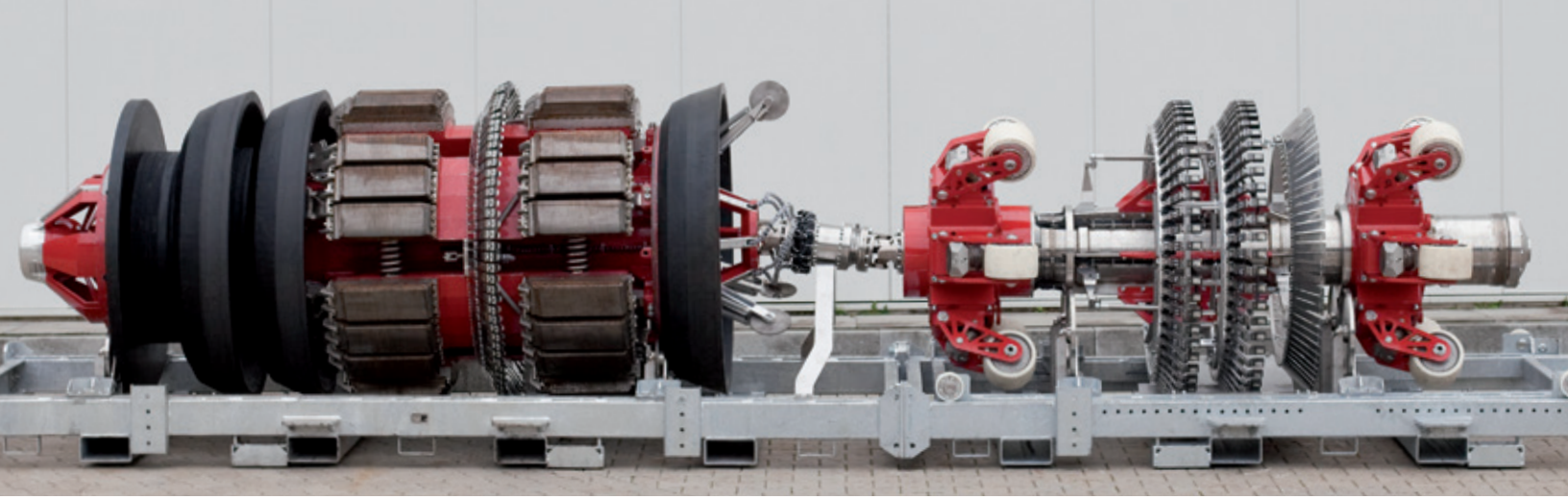
Preventing Corrosion

The primary method of preventing and reducing the severity of external corrosion on buried transmission pipelines involves a combination of protective coatings and cathodic protection. Protective coatings offer a corrosion barrier and abrasion protection against land movement, rock and other abrasives in the soil. Cathodic protection involves applying a low-voltage electrostatic current to the pipes to block the chemical reaction that causes corrosion.

Detecting corrosion

The transmission pipeline industry continues to improve its processes, techniques and technologies in an effort to monitor pipeline corrosion. For example, technological advances in in-line inspection (ILI) tools called "smart pigs" have substantially increased the industry's ability to detect and identify corrosion issues. These highly sophisticated tools travel inside the pipeline and use sensors to identify and locate anything out of the ordinary in the pipe. ILI tools allow operators to collect information regarding the length, width, depth, orientation and location of pipeline flaws. These devices gather valuable information and use advanced software to evaluate the data, helping operators monitor the real-time condition of their pipeline and pinpoint areas that require additional monitoring, maintenance or immediate action to prevent an incident.

CEPA member companies use data from past in-line inspections, as well as comprehensive engineering and risk assessments of their pipelines, to determine



which pipelines to inspect and when to inspect them. The frequency of in-line inspections varies from line to line, but typically they are carried out every two to 10 years.

CEPA brought industry experts together in 2014 to create a metal-loss ILI tool validation guidance document, which provides transmission pipeline companies with a process to validate whether in-line inspections are done correctly. Doing this assessment provides transmission pipeline operators increased confidence in the data collected and their subsequent decisions on whether additional action, such as an integrity dig, needs to be taken.

ABOVE: Technological advances in ILI tools called "smart pigs" have substantially increased our industry's ability to detect and identify corrosion issues.

Stress corrosion cracking

CEPA is actively addressing stress corrosion cracking (SCC), which are small cracks that develop on the outside of a buried pipeline. Faced with this new phenomenon in the 1990s, CEPA brought together experts in pipeline operations, pipeline integrity and risk assessment from member companies, as well as other industry experts and researchers, to develop and recommend practices designed to help manage and prevent SCC.

Since their publication in 1997, these best practices have dramatically reduced the risks related to SCC. As part of our ongoing commitment to remain a valuable resource for pipeline operators around the world, CEPA facilitates regular reviews and updates to this document, including one in 2015, to ensure our recommended practices remain current and include the latest research and innovations.

Mitigating AC interference

Transmission pipelines sharing a corridor with high-voltage power lines or other infrastructure that uses electricity (e.g. railway controls) are at increased risk for corrosion and damage.

The presence of alternating current (AC) in the vicinity of steel pipelines can interfere with pipeline corrosion-control measures such as cathodic protection, harm pipeline coatings and pose an electrical hazard to pipeline workers.

With the increased use of utility corridors in Canada, CEPA member companies have collaborated to develop a recommended practice for identifying, mitigating and monitoring AC interference with pipelines. The guidelines can be incorporated into pipeline and power-line specifications, designs and operating procedures both to prevent problems from occurring and reduce risks to pipeline integrity and safety.

Leveraging our in-line inspection capabilities

The relatively recent use of advanced in-line inspection tools by transmission pipeline operators is providing significant amounts of data that CEPA member companies can analyze and learn from collectively. That information has already boosted our members' ability to better understand specific risks, such as pinhole corrosion and

cracking, and respond proactively. During 2015, CEPA's Pipeline Integrity Work Group has been delving deeper into the root causes of incidents—expanding our members' knowledge of risks to pipeline health and where our industry can target further efforts to increase safety and reduce incidents.

Mitigating the impacts of geological and environmental hazards

CEPA's Pipeline Integrity Work Group is assembling industry expertise and research to develop a recommended practice for transmission pipeline companies to assess, monitor and mitigate impacts of geohazards such as earthquakes or landslides. Geohazards are harder to manage than other aspects of pipeline and facility integrity because they are out of our control. However, just as structures such as bridges and buildings are engineered to withstand certain events like earth tremors, engineering can be used to advance pipeline design and specifications to help manage risks from these geological and environmental conditions.

Preventing third-party damage

One of the biggest risks to pipeline safety is external damage. In over 60 years, there have been two members of the public killed, both due to incidents caused by unsafe digging. Incidents caused by unsafe digging are entirely preventable, so prevention of damage to buried pipeline infrastructure is a high priority for the transmission pipeline industry and utility companies in Canada. In our experience, this is where lives are saved.

CEPA's Damage Prevention Work Group is compiling industry-wide data on near-misses and unauthorized activity on pipeline rights-of-way into a database that we expect will be completed in 2015. CEPA members will use the database to analyze trends and identify focus areas that can be addressed through public awareness or other damage prevention activities.

Building a strong safety culture

CEPA members are committed to operating in a manner that protects workers, the environment and the public. Our members recognize that when it comes to safety, they do not compete, they cooperate. They also recognize that in order to reach their shared goal of zero incidents, they must continue to build a strong safety culture industry-wide by placing the highest importance on the values, attitudes and behaviours related to safety and ensure that commitment is embedded into everything they do.

In 2015, CEPA members came together to undertake an industry-wide employee survey based on the Safety Culture Framework issued by the National Energy Board (NEB) in 2014. Results identify those areas where our industry is performing well and where improvement is needed.

Supporting One-Call centres and 'Before You Dig'

CEPA members are committed to advancing standardization and best practices around safe digging and utility locating, and our industry will continue advocating for national legislation that addresses damage prevention, including mandatory One-Call centres in each province and territory. The hope is that a stronger investment in communication with the communities in which our members operate will lead to a reduction in third-party damage to pipelines.

For example, CEPA is fully supporting efforts by the Canadian Common Ground Alliance (CCGA) to simplify both access to One-Call centres and the damage prevention process. In 2013, the CCGA and CEPA jointly launched the ClickBeforeYouDig one-window national portal to initiate the damage prevention process anywhere in Canada serviced by a One-Call centre. The portal is part of the CCGA's national "Before You Dig" brand that is being expanded to include provincial mobile apps.

For more information, please visit http://www.canadiancga.com/page-776157/1545687

Actions we are taking 1.2

Continue to advance science and industry practices to drive improvements in pipeline safety and environmental protection.

Recent actions

In 2014, CEPA members invested more than $23 million in innovative technology—focused on reducing corrosion and improving pipeline inspection and leak detection—and they will continue to make the advancement of pipeline safety research and development a high priority.

The importance of research and development cannot be overstated. It has been and will continue to be a significant contributor towards making transmission pipelines safer and lessening the environmental impact of pipeline construction, operations and eventual retirement.

$23 M
investment
in innovative technology in 2014

Evaluating leak detection technologies

In 2013, CEPA members Enbridge and TransCanada joined forces to conduct ground-breaking research in the area of leak detection by using a state-of-the-art pipeline simulator known as the External Leak Detection Experimental Research (ELDER) test apparatus. Developed by Enbridge and project partner C-FER Technologies, the ELDER test apparatus allows researchers to evaluate external leak detection technologies in a setting that very closely represents the actual conditions where liquids pipelines are installed.

TransCanada, Enbridge, Kinder Morgan Canada and the Alberta Ministry of Innovation and Advanced Education are also now funding research to test new leak detection technologies, such as vapour-sensing tubes, fibre-optic distributed temperature-sensing systems, hydrocarbon-sensing cables and fibre-optic distributed acoustic-sensing systems.

Investing in research

CEPA member companies support and invest in leading-edge research projects at Canadian universities to uncover new and innovative approaches to ongoing pipeline integrity challenges. Canada has some of the most active and progressive pipeline researchers in the world, including:

University of Waterloo – Natural Sciences and Engineering Research Council of Canada (NSERC)/TransCanada Industrial Research Chair

Adrian Gerlich and other experts in metallurgical science are looking at ways to improve welding techniques and inspections to ensure consistent, high-quality and predictable results for metal welding—a key aspect of pipeline construction and maintenance. Research projects are exploring how to make welds tougher and with properties of even higher integrity.

University of Calgary – Pipeline Engineering Centre

The University of Calgary's Pipeline Engineering Centre (PEC) has 14 interdisciplinary researchers in three main areas advancing research in:

- Corrosion and Cracking: Research led by Frank Cheng, Canada Research Chair in Pipeline Engineering, is analyzing how corrosion and cracking, the leading causes of pipeline failure, occur in pipelines and investigating ways to prevent them.
- Sensor Technologies for Leak Detection and Monitoring: Simon Park is investigating ways to quickly provide data that control room operators need to properly respond to any issues and prevent pipeline leaks.
- Reliability and Risk Assessment: Researcher Markus Dann is bridging geotechnical modeling, assessment of corrosion pitting and crack growth for improved decision-making. By developing better computer modeling techniques, pipeline operators can predict and address possible failure mechanisms and maintain pipeline system health.

The University of British Columbia – Pipeline Integrity Institute

Responding to the growing need for enhanced technology and expertise in the transmission pipeline sector, The University of British Columbia (UBC) launched its Pipeline Integrity Institute in April 2015. The Institute aims to apply research and innovative technology solutions to help the transmission pipeline industry reach its goal of zero incidents. Specialized engineering classes for undergraduate and graduate students focus on key engineering knowledge areas important to advanced pipeline performance.

Researchers such as Dharma Wijewickreme and Akram Alfantazi are focused on: reducing the risk of damage to pipelines caused by ground movements; the degradation and corrosion of advanced high-strength pipeline materials; and methods to monitor and control internal and external corrosion of pipelines.

Contributing to the development of standards

The transmission pipeline industry is working with the Canadian Standards Association (CSA) to establish world-leading standards for their operations.

For example, as part of our ongoing commitment to industry improvements, CEPA and our member companies contributed to the development of Canadian Standard Z662-11 for oil and gas pipeline systems, as well as to the updated Z662-15 oil and gas pipeline systems standard scheduled for release by the CSA in late 2015. This industry standard covers the design, construction, operation and maintenance of oil and gas industry pipeline systems that convey liquid hydrocarbons, oilfield water, oilfield steam, carbon dioxide and gas.

CEPA also contributed to the development of CSA Z247, the first damage prevention standard in Canada. It articulates the damage prevention process and elements that, when consistently applied, will reduce damage to Canada's underground infrastructure, thereby enhancing public, worker and community safety, preserving the environment and, ultimately, saving lives.

Canadian Standards Association (CSA)

Internationally recognized and accredited to develop industry standards, the CSA works with businesses, organizations and code authorities around the world to develop innovative solutions for their evolving safety, reliability and sustainability needs.

Managing interactions with migratory birds

While transmission pipelines and related facilities pose little risk to migratory bird populations, some of our industry's construction and operational activities can affect individual migratory birds and their nests.

To address this concern, CEPA has published best practices on how our members can best manage potential interactions between pipeline facilities and migratory birds, and to help ensure our members comply with Canada's Migratory Birds Convention Act, which is designed to conserve and protect migratory birds and their habitats.

These best practices guide our members in their decision-making regarding the timing of construction so it doesn't interfere with the summer nesting period, as well as how to choose pipeline routes that avoid bird habitats altogether or how to include the planting of tree and vegetation buffer zones to safely draw birds away from pipeline rights-of-way.

Updating guidelines for watercourse crossings

Installing pipelines across bodies of water presents unique challenges for transmission pipeline companies.

Working in collaboration with over 100 biologists, engineers, government officials and other experts, CEPA is currently producing the fifth edition of its comprehensive guidelines for constructing transmission pipelines across bodies of water. These science-based guidelines analyze the variety of factors that companies must consider for watercourse crossings, and suggest the best possible action.

Our members take special care throughout the pipeline lifecycle to protect ecosystems in these environments.

Actions we are taking 1.3

Ensure quick and effective response to an emergency to better protect the public and the environment, reduce risks and hazards, and efficiently clean up and restore the site.

Recent actions

Adopting best practices

The Incident Command System (ICS) is a standardized on-site management system designed to enable effective and efficient incident management through a common organizational structure. ICS is widely used across North America by military, first-response agencies, and local, provincial/state, and federal governments. ICS provides a scalable, common approach and language to incident response so that all organizations involved in a response (i.e., companies, emergency responders and government agencies) can play an effective and coordinated role.

All CEPA members are committed to the

ICS

(Incident Command System)

CEPA members have identified ICS as a best practice and, in 2014, CEPA's Board of Directors recommended that all CEPA members adopt and implement ICS. All 12 CEPA member companies have committed to training employees on how to incorporate ICS into their emergency management practices.

Working together to improve response

In order to be prepared to respond to every possible situation, transmission pipeline companies regularly conduct spill response exercises under both summer and winter conditions for both land and water spills.

In 2014, CEPA announced the Mutual Emergency Assistance Agreement (MEAA), which formalizes an existing practice of companies lending critical resources to help each other in case of an emergency. To ensure the reliability and effectiveness of the MEAA, CEPA members conducted a joint emergency management exercise in Edmonton, Alberta in 2014. The exercise tested the ability of participants to follow procedures, put a call out for assistance and execute the MEAA in real-time. It also tested the ability of member companies to work together using the principles of the Incident Command System (see above). Lessons learned from the exercise will be used to improve processes and procedures.

Raising first-responder awareness

The Canadian transmission pipeline industry is working to strengthen its existing first-responder awareness training programs by combining the efforts and knowledge of individual member companies and other industry groups in both Canada and the United States.

The first phase of the awareness program will be launched in 2015, and will provide a range of channels and tools—from online information, to face-to-face training sessions—that CEPA member companies can use to enhance their first-responder outreach efforts.

Studying impacts on water

To better understand the behaviour and environmental impacts of a broad range of crude oil types in water, CEPA is currently, on behalf of industry and alongside other industry associations, co-sponsoring a North American-focused, independent, science-based study conducted by an expert panel of the Royal Society of Canada.

The results of the study, which are expected to be released in the fall of 2015, will assist industry with future environmental risk assessments and help inform and improve our industry's spill preparedness and response capabilities.

What's being done about aging infrastructure?

People are concerned about risks associated with aging infrastructure. While some of our pipelines were constructed several decades ago, many new ones continue to be built.

Interestingly, an older pipeline doesn't necessarily mean there's higher risk. In fact, when it comes to the integrity of a pipeline, age is a minor factor if the infrastructure has been thoroughly maintained and constantly monitored. Just like an old family car or vintage aircrafts flown in airshows, age is a minor factor if there is appropriate maintenance and continuous monitoring. This is precisely what CEPA's member companies do every day.

The second most common cause of pipeline incidents in Canada is related to materials, manufacturing and construction. Over the decades, advancements in materials and construction practices, as well as quality assurance and inspection, have resulted in higher quality and safer pipelines. But some of our oldest pipelines were constructed with lower-strength, thick-walled pipe and coated with coal tar, both of which have stood the test of time extremely well.

To reduce and eliminate incidents related to materials, manufacturing and construction, our members are doing two things. First, knowing the specifics of each existing kilometre of pipeline, operators maintain a fit-for-purpose safety regime and continue to deploy advanced technologies and practices suited to those specifics. Second, for new pipelines, our members are working with suppliers and contractors, for example through the CEPA Foundation, to continue to advance and implement key actions to make new pipelines even safer. Those actions range from welding research, to standards for pipe manufacturing, to pipeline inspector certification, to materials management information technology that tracks every piece of pipe from the steel making through to its exact placement in the right-of-way.

Addressing climate change

The facts show that climate change is real and CEPA's member companies are committed to reducing greenhouse gas (GHG) emissions from their operations.

For example, there are two main ways natural gas pipelines emit GHGs: from burning fossil fuels at compressor stations; and methane releases during maintenance activities or from small leaks in pipes. Therefore, natural gas pipeline operators are using a variety of techniques to limit the amount of GHGs they release. This includes upgrading compressor-station equipment to be more energy efficient; and adopting technologies that divert or capture the release of methane during maintenance. They're also using technologies that detect small leaks in pipes, including portable gas detectors and ultrasonic detectors, so the leaks can be pinpointed and repaired.

Beyond operations, many CEPA members have climate change and environmental sustainability programs to track, address and manage their GHG emissions. CEPA members will continue to adopt practices, programs and new technologies to limit and reduce their GHG emissions.

For more information on climate change and the action our members are taking to reduce emissions, please see the 'Environment' fact sheets at http://www.cepa.com/library/fact-sheets

Strategic priority 2: Improve regulatory engagement, transparency and sustainability of the industry

CEPA's member companies are committed to going above and beyond compliance in response to all legislation and regulations, and to engaging and consulting openly and honestly with all stakeholders.

Actions we are taking 2.1

Support efforts by regulators to ensure a robust, consistent and comprehensive approach to pipeline regulation that addresses the real-life concerns of the communities our industry serves.

Recent actions

Supporting the Pipeline Safety Act (Bill C-46)

Over the past two years, CEPA and its members have worked closely with Natural Resources Canada and other stakeholders to develop the Pipeline Safety Act (Bill C-46). The bill received widespread support from industry, environmental groups, Aboriginal communities and all major political parties.

Enacted in June 2015, the Pipeline Safety Act puts into law a number of previously implemented measures to strengthen pipeline safety, including:

- Increasing the number of inspections and audits by the National Energy Board (NEB).

- Reinforcing the long-accepted 'polluter pays' principle by requiring companies to have a minimum of $1 billion readily available to respond to any incident.
- Providing increased authority to the NEB and governments to ensure companies respond properly to and are held financially responsible for spill clean-up costs and environmental damage.
- Ensuring pipeline companies remain responsible for their retired pipelines that are no longer in service.

The pipeline industry encourages strong, independent regulatory oversight of its activities. CEPA supports the Pipeline Safety Act as an important and positive step to instill further public confidence in the transmission pipeline industry.

Collaborating with stakeholders

The National Energy Board created its Land Matters Group (LMG) in 2011 to encourage collaboration and consultation between our industry, landowners, Aboriginal groups and the federal regulator. CEPA holds two seats on the LMG, which meets three to four times a year. To date, CEPA has worked on several LMG initiatives, including:

Standard Easement Agreement

Landowners requested the development of this standard right-of-way agreement to build confidence that they are being treated consistently. Written in plain language, the agreement has been available for use by CEPA member companies since April 2015, and it will be reviewed after one year to measure if it's being used appropriately.

Land Agent Code of Conduct

CEPA and its member companies firmly believe that with mutual understanding and responsibility between companies and landowners, many issues can be avoided. The Code of Conduct sets out common principles, expectations and values that land agents are required to read, understand and formally accept before engaging with landowners.

In order to ensure land agents are familiar with our industry and able to present information to the public in a consistent and accurate manner during the lifecycle of a pipeline, CEPA member companies took the additional step of developing the Industry Orientation Module to provide land agents with a clear understanding of the information they are providing to the public.

"CEPA and its member companies firmly believe that with mutual understanding and responsibility between companies and landowners, many issues can be avoided."

Advocating for regulation harmonization and clear language

CEPA believes that to best serve the public interest, harmonized regulations are needed. Many transmission pipelines cross multiple jurisdictions (civic, provincial, federal), and different reporting requirements, standards and metrics applied by provincial and federal regulators can make it hard to have consistent operating practices. As an industry, we want Canadians to be able to easily understand performance metrics and definitions. That's why CEPA will support efforts by regulators to harmonize regulations, definitions and metrics across different jurisdictions to ensure strong regulatory oversight.

> "CEPA believes that to best serve the public interest, harmonized regulations are needed."

Actions we are taking 2.2

Communicate openly and honestly about pipeline operations and pipeline safety to educate and build awareness and familiarity of the transmission pipeline industry with Canadians.

Recent actions

Advancing consultation with Aboriginal communities

Given that pipelines stay in use for many decades, CEPA members work to develop long-term relationships with all communities, including Aboriginal communities.

CEPA members have also committed to work with Aboriginal communities, governments and the Crown to help Aboriginal communities develop the capacity to participate in consultation processes and benefit from longer-term economic opportunities.

Engaging with the public and the media

Encouraging conversations and building a sense of community are critical to CEPA's goal of building trust. Whether CEPA and its members are communicating through websites, social media or visiting communities impacted by pipelines, we work to be responsive to the concerns of Canadians—by providing information about pipelines that is credible, objective and transparent.

Actions we are taking 2.3

Demonstrate commitment to the areas of environmental responsibility, protection and stewardship that extends beyond legal compliance.

Recent actions

Land-based spill response in British Columbia

Since 2012, CEPA and its members have been in consultation with the B.C. Ministry of Environment on a new policy direction for an enhanced land-based spill response regime.

The goal of the new policy direction, which applies to all modes of transporting oil and other hazardous materials, is to ensure that fast and effective spill response happens for every spill—no matter what is spilled, where or by whom.

CEPA is working with the B.C. Ministry of Environment, the B.C. Oil and Gas Commission and other stakeholders to develop legislation and regulations that support continuous improvement in pipeline safety and emergency response.

> "The goal of the new policy direction, which applies to all modes of transporting oil and other hazardous materials, is to ensure that fast and effective spill response happens for every spill—no matter what is spilled, where or by whom."

Strategic priority 3: Improve trust and credibility

The shared vision of CEPA and our member companies is zero pipeline incidents and to demonstrate to Canadians that we're serious about earning and keeping their trust.

Actions we are taking 3.1

Improve trust of the transmission pipeline industry with Canadians.

Recent actions

Addressing concerns through CEPA Integrity First®

Since 1993, Canada's transmission pipeline companies have collaborated through CEPA to:

- Bring together the best and brightest minds in our industry—including CEPA staff, member company experts, regulators, knowledge groups, external community advisors and international influencers—to share knowledge, technology and lessons learned in order to improve safety.
- Focus on issues that affect the industry as a whole and recommend best practice solutions.
- Be engaged with all industry audiences to ensure our efforts are always focused on what matters most to Canadians.

One of the ways we're achieving this is through Integrity First, a major initiative we introduced in 2012.

As we build Integrity First, we want the public to come to us with questions so that we can respond to the issues they're most concerned about. We're already doing this by utilizing research and analysis to identify priority areas that address real-life concerns and then focusing our attention on improvement in areas where

we can have the most impact. We bring together experts from across the industry to determine the leading practices and provide guidance on how to go beyond regulations for an identified priority. This information is then used by CEPA's member companies to assess their current operational systems, processes and practices.

For example, CEPA has already produced national and industry-wide guidance documents on pipeline integrity, emergency management and control room management, and we are currently developing one that encompasses damage prevention and public awareness. These guidance documents are verified by our member companies and third parties. CEPA's Board has also committed to ensuring all CEPA members are verified to a level of absolute continuous improvement.

Our members are also working together to improve performance in the area of water impacts, land management, air emissions, Aboriginal relations and workforce standards.

Actions we are taking 3.2

Be credible, transparent and values-driven.

Recent actions

Embracing transparency

CEPA embraces a transparent and accountable approach to communicating both the successes and shortcomings of our industry's performance in a variety of areas, including pipeline integrity, damage prevention, research and emergency response—all of which are addressed in this Pipeline Industry Performance Report. We plan to build on what we've started with this report. In 2016, we will report to Canadians on our performance and progress in 2015.

Sharing emergency response plans

A CEPA Executive Task Force has set down guidelines on developing a common approach to public disclosure of emergency response information by transmission pipeline operators.

In line with this initiative, CEPA members will improve transparency around their emergency response plans. The National Energy Board has also indicated a desire to see improved sharing of information with the public, while also taking into account Canadian legal requirements pertaining to public safety and security. Our industry will comply with any further direction provided.

Interactive pipeline map

Although some individual transmission pipeline companies publish maps of their operations to share with the public, CEPA members recognized the need to develop a broader map that Canadians could use to see where transmission pipeline infrastructure is located.

Launched in 2015, the About Pipelines Map shows liquids and natural gas transmission pipelines and related facilities operated by CEPA members. Visitors to the map website are able to enter an address, postal code, city or province to find the location of these pipelines and facilities in their area.

A second phase of the About Pipelines Map will display information about pipeline incidents that have occurred in the last five years as reported to the applicable regulator(s) by CEPA members.

Actions we are taking 3.3

Facilitate and nurture meaningful relationships and build a sense of community.

Recent actions

Identifying issues and concerns

The transmission pipeline industry is committed to engaging in open and honest conversations with Canadians about the industry and our performance. Recognizing the need to reach out to the public directly in an effort to build trust and address real-life concerns, CEPA formed an External Advisory Panel.

This panel of volunteers includes representatives from a variety of community groups, Aboriginal Peoples, academia and landowners, among others. Panel members bring their diverse perspectives and constructive and critical voices and viewpoints to help identify and clarify the topics and issues that matter most to Canadians.

We plan to expand our External Advisory Panel to provide an even broader diversity of views that we can consult and listen to about issues and topics of concern.

Strategic priority 4: Facilitate the exchange of ideas and best practices

As an industry, we watch and identify issues and work to address them. CEPA not only relies on our internal expertise and that of our member companies. We also draw upon the global expertise of some of the most recognized and respected minds focused on our industry's critical technical challenges.

Actions we are taking 4.1

Increase the exchange of ideas and best practices in select areas related to performance, business environment and technology.

Recent actions

Seeking new technology opportunities

Some of the expertise we rely on in our pursuit of zero pipeline incidents is home-grown in the CanmetMATERIALS laboratories operated by Natural Resources Canada. Collaborating with CanmetMATERIALS gives the National Energy Board, transmission pipeline companies and suppliers easy access to advanced-materials expertise.

We're also currently working with Sustainable Development Technology Canada (SDTC) to consider the case for other technology focus areas aimed at environmental protection. SDTC is an arm's-length foundation created by the Government of Canada to support projects that develop and demonstrate new technologies to promote sustainable development.

Advancing knowledge sharing

Through the Canadian Pipeline Technology Collaborative (CPTC), specific priorities for research and pilot testing are being advanced. For example, the CPTC's academic network of 12 Canadian universities will enhance knowledge sharing and new discoveries. Co-funded by CEPA members, the CPTC unites pipeline operators, researchers, technology providers and supply chain partners to pursue responsible advancement of pipeline operations and technology development. For more information, please visit www.thecptc.ca

Additional collaborative initiatives

On the recommendation of CEPA's Pipeline Integrity Work Group, the transmission pipeline industry is developing the Illusense inspection tool, which will provide operators with an unprecedented level of integrity information. This optical-based technology can be used with existing smart pig technology and targets both leak detection and prevention. For more information, please visit http://illusense.com

International collaboration can also help our industry achieve operational excellence. For example, in September 2016, members of the pipeline industry from around the world will gather in Calgary for the 11th International Pipeline Conference (IPC 2016). Co-sponsored by CEPA and organized by volunteers representing international energy corporations, energy and pipeline associations and regulatory agencies, the IPC has become internationally renowned as the world's premier pipeline conference. IPC is a not-for-profit conference and proceeds support educational initiatives and research in the pipeline industry.

Glossary

Barrel of oil equivalent (boe): A unit of energy based on the approximate energy released by burning one barrel (159 litres) of crude oil.

Facilities: All facilities related to the operation of a pipeline, including pump stations, terminals and storage tanks.

In-line inspection (ILI): Use of sophisticated in-line inspection tools called smart pigs to inspect transmission pipelines from the inside to identify changes such as dents or wall thinning that could threaten the integrity of the pipeline.

Integrity: A state of sound, unimpaired or perfect condition.

Integrity dig: Excavating and inspecting a segment of pipe using non-destructive examination methods. If required, repairs are completed and the site is backfilled and restored to the original condition or better.

Pipeline incident: Any unplanned release of a product due to the failure of a pipe.

Pipeline and facility integrity: Continuously operating a transmission pipeline and related facilities safely without disruption to service, the surrounding environment or individuals working or living in the vicinity.

Right-of-way: An area identified by markers that contains one or more transmission pipeline where certain activities are not allowed in order to protect public safety and pipeline integrity. It provides pipeline workers ease of access for inspection, maintenance, testing or an emergency.

Transmission pipelines: Transmission lines are Canada's energy highways—transporting oil and natural gas within a province and across provincial or international boundaries.

CEPA work groups

Collaboration is key to continuous improvement. CEPA facilitates 10 work groups that consist of subject-matter experts from across our member companies. Each group focuses on a key area within our industry:

Pipeline operations

- Damage prevention
- Emergency security management
- Environment
- Health and safety
- Pipeline integrity

Business environment

- Aboriginal affairs
- Climate change
- Land issues
- Property tax
- Regulatory policy

CEPA members

ACCESS PIPELINE
ALLIANCE pipeline
ATCO Pipelines
ENBRIDGE
interpipeline
KINDER MORGAN CANADA
PEMBINA
PLAINS MIDSTREAM CANADA
Spectra Energy
TransCanada
In business to deliver
TN
Trans-Northern Pipelines Inc.
Pipelines Trans-Nord Inc.
TransGas

We want to hear from you!

This is CEPA's first annual Pipeline Industry Performance Report and we'd like to know what you think about it so we can make the next report even better.

We also welcome your comments on our industry's performance. What can we do better? And how can we effectively demonstrate to you that we're doing it?

Email CEPA at **info@cepa.com** to submit your comments about the report and ideas on how our industry can improve. We welcome your feedback.

Further reading

CEPA is the hub of information regarding Canadian transmission pipelines. Beyond this report, we produce and maintain a variety of publications, statistics and background information on the topics discussed in the report and more, such as the significant economic contributions the industry makes to our country.

To learn more, please visit **www.cepa.com/library**

canadian energy pipeline association | association canadienne de pipelines d'énergie

CEPA loves to have conversations about our industry on any platform. Reach out to us on social media, via email or give us a call.

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