2023-2025 PIPELINE EXCELLENCE STRATEGIC PLAN

AND 2022 PERFORMANCE REPORT

The **American Petroleum Institute (API)** is the only national trade association that represents all aspects of America's oil and natural gas industry.

The **Liquid Energy Pipeline Association (LEPA)** represents over 50 owners and operators of pipelines delivering liquid energy and related products. LEPA members range from small operators focused on a local region to operators with multi-state systems supporting energy production, refining and carbon capture, to large midstream transmission companies operating across the nation.

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At its heart, pipelines are about moving the products that power our lives from here to there. We produce energy in places like Texas, North Dakota and Alaska, and we use energy in places like New York, Atlanta and Chicago. Pipelines connect us to the energy we need and use every day, from heating our homes, to powering our vehicles, to supplying our manufacturing and help keep input costs low.

But we know life is so much more complicated. We have ongoing debates on the future of energy and our energy infrastructure. We have war in Europe unsettling global energy markets. We have bad actors engaging in cyber-attacks that can threaten our energy delivery. We are competing with industries outside of oil and gas in order to attract, develop and retain talented employees who will usher in a new era of energy.

Yet, we continue to deliver affordable energy reliably and safely. One thing remains constant: pipelines are a safe way to move large volumes of liquid energy. A barrel of oil or refined products transported by pipeline arrives safely at its destination 99.999 percent of the time. Government comparisons of pipelines, rail and trucks keep finding pipelines come out on top.

This year's annual performance report includes data that show pipelines are not only a safe mode of energy transportation, but they are also getting safer. Over the last five years, total liquids pipeline incidents are down 28 percent. Pipeline incidents affecting people or the environment are down 16 percent. Pipeline incidents caused by equipment failure or incorrect operation that impacted people or the environment are down 42 percent and 45 percent respectively.

For the pipeline industry, no matter what our performance record says, we always want to do better. Internally we call that continuous improvement. We have a goal of zero incidents, because that is the safety culture we want to drive.

I invite you to read about industry-wide safety efforts contained in our new three-year strategic plan. Pipeline operators are undertaking initiatives to drive organizational improvements through safety management systems, enhancing methods of learning from incidents, and boosting incident preparedness, training and response. We are supporting technical initiatives to further improve pipeline inspection technologies, harness advanced data analytics, better detect corrosion, and increase our capabilities to protect against geohazards.

This year's industry-wide strategic plan contains a new set of initiatives to address a broader set of challenges facing pipeline operators. Our plan shows how we aim to increase cybersecurity protections, attract, train and retain a quality workforce, and prepare to initiate a multifold expansion of carbon dioxide and other emerging fuels pipeline networks to help advance a safer and more sustainable energy future.

One initiative we are particularly excited about is strengthening our public engagement. Industry has partnered with interested members of the public, regulators, and operators of all types of pipelines to develop recommended practices for the type of two-way conversations about pipelines the public is seeking. We're excited to finalize that tool in 2023 and help operators implement it throughout the life of this strategic plan. Thank you for your interest in liquid energy pipelines and learning more about our commitment to safety and continuous improvement.

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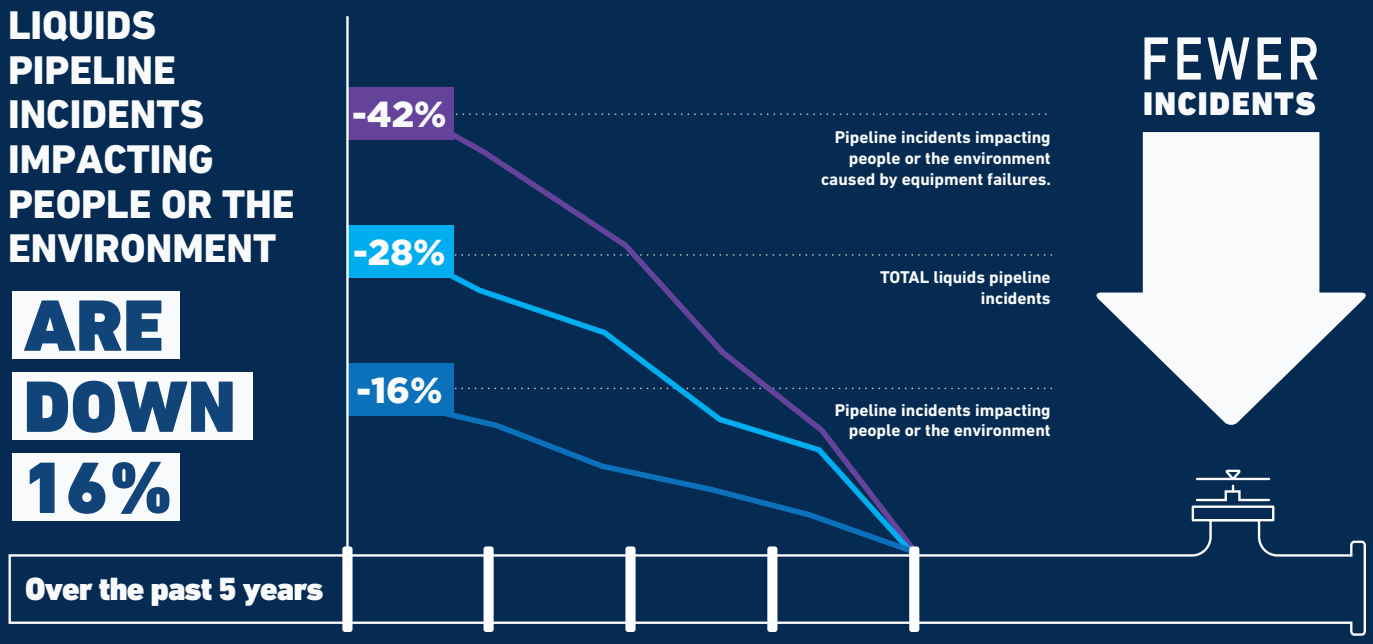

EVEN AS PIPELINE MILEAGE AND BARRELS DELIVERED HAVE INCREASED

Source: Data from the Pipeline and Hazardous Materials Safety Administration

POSITIVE COMMUNITY IMPACTS

MINNESOTA

PIPELINES TO REFINERIES IN THE TWIN CITIES

Over 20 percent of all the crude oil consumed in the United States is transported by pipeline and rail through Minnesota to refineries in the Midwest, Gulf and East Coasts.

Because Minnesota has no local sources of petroleum, pipelines enable local refineries to make the gasoline, diesel and fuel oil Minnesota families and workers need. Fortunately, Minnesota's proximity to booming production basins in Canada and North Dakota make it an important part of the energy supply network for the three million barrels per day of crude oil that flows through the state.[1]

The two refineries in the Twin Cities supply energy products by pipeline to the local metropolitan area of over 3.7 million people and other Northern Midwest markets. The St. Paul Park and Pine Bend refineries have a combined capacity of over 400,000 barrels per day, or more than 80 percent of the total refining capacity in the Northern Midwest.[2]

The St. Paul Park refinery and its over 350 employees manufacture gasoline, diesel fuel, propane and other petroleum products to be delivered via truck, rail and barge to the Twin Cities region and surrounding areas.

The Flint Hills Pine Bend refinery, located south of St. Paul, is the largest refinery in a non-oil producing state and the 13th largest in the country. It now supplies about one-half of the motor fuels in Minnesota and 40 percent in Wisconsin. Since 2010, the refinery has invested two billion dollars in a series of upgrades, including a planned $750 million renovation to replace or update equipment and install advanced emission controls.[3] At its peak, the project will employ 2,500 workers, involving craftsmen from at least 10 trades — from pipe fitters and electricians to ironworkers and carpenters. This contract construction workforce will exist alongside the 1,300 permanent employees who regularly operate the refinery.[4] "It is probably a couple Viking stadiums we are building out there," said Don Mullin, executive secretary of the St. Paul Building & Construction Trades Council, an umbrella group for the unions.

Pipelines also provide the energy that fuels Minnesotans' recreational activities. For example, propane drives the Zambonis that create fresh ice at hockey arenas and is a reliable heat and power source for ice fishing trailers during cold winter months.

Small town Minnesota is benefiting, too. Clearbrook, with a population of 529, is a critical hub for crude oil delivered from the Dakotas and Canada. In fact, Enbridge operates six oil pipelines that converge in Clearbrook and have the capacity to carry one-seventh of all petroleum consumed in the U.S. Situated at the nexus of several pipelines, Clearbrook's oil distribution terminal supplies refineries in the Twin Cities, MN, Superior, WI, Chicago, IL and beyond.[5]

This energy infrastructure is a boon to Clearbrook's economy, generating 25 percent of the county's property tax base.[6] From a local's perspective, "the terminal probably drives at least 30 percent of the local economy." North Country Hardware store owner Shawn Johnson explained, "I don't think I would be here without them. I don't think it would be worth my time."[7]

1 https://www.house.leg.state.mn.us/hrd/pubs/petinfra.pdf
2 https://www.eia.gov/dnav/pet/pet_pnp_cap1_dcu_SMN_a.htm
3 https://www.startribune.com/flint-hills-resources-plans-750-million-in-capital-investment-at-its-minnesota-refinery/367759651/
4 https://www.startribune.com/flint-hills-resources-plans-750-million-in-capital-investment-at-its-minnesota-refinery/367759651/
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POSITIVE COMMUNITY IMPACTS

SOUTH DAKOTA

FROM PIERRE TO PLATTE, PROPANE POWERS SOUTH DAKOTA

Agriculture is a critical component of South Dakota's economy, and the oil and natural gas industry is key to providing farmers and ranchers with the energy they need.

Propane, a by-product produced in the processing of natural gas, is especially important for South Dakota. In 2021, South Dakotans consumed over 50 million gallons of propane and approximately one out of every five households use propane for heating.

Crop drying, the process whereby excess moisture is removed from grain to prevent spoilage during storage, is imperative for South Dakota's agricultural sector, and over 80 percent of grain dryers rely on propane. Across the plains, propane provides farmers with a reliable, efficient and economical source of energy. In 2021, South Dakota consumed 350 million gallons of distillate, or diesel.[8] Distillate fuels play an important role in powering agricultural and mining machinery. Within the agricultural sector, diesel powers approximately 75 percent of all farm equipment, 20 percent of irrigation pumps and over 95 percent of the trucks that transport agricultural products.[9]

POWERING CONSERVATION

In Millboro, South Dakota, propane is also helping conservation efforts. H & H Game Birds, a fifth-generation operation, raises Chinese ring-necked pheasants for hunting lodges and repopulation efforts. Propane powers this operation, serving as a vital heat source for both water and barns.

"Propane is way more cost effective and efficient, environmentally friendly, prevents disasters and I always know that as long as I check the tank and keep propane in the tank that I am gonna have efficient fuel for whatever I need to do," said Jesse Heese, owner of H & H Game Birds.[10]

Did you know South Dakota is the pheasant capital of the world? In fact, the pheasant hunting industry generated over $246 million for the South Dakota economy in 2021.[11] Recently, the American Petroleum Institute partnered with Pheasants Forever, a wildlife conservation group, to launch Energy for Ecosystems. Through this program, oil and natural gas companies are working to implement best practices that prioritize conservation across pipeline rights-of-way and other energy infrastructure assets. With over 50,000 registered pheasant hunters in the state, pheasant hunting is an important tradition for South Dakotans.[12]

ENERGY INFRASTRUCTURE

Energy infrastructure, like pipelines, is key to ensuring South Dakota receives the energy it needs. As the state lacks refining capabilities and has minimal production, pipelines ensure that natural gas, crude oil and refined products are transported and delivered throughout the state.

Within South Dakota, there are over 10,000 miles of gas distribution and transmission lines; 495 miles of crude oil pipelines; and 500 miles of refined product pipelines.[13]

In addition to providing South Dakota with critical energy, pipelines also are an important source of tax revenue for the states. The Dakota Access Pipeline, which carries crude oil from North Dakota through South Dakota, Iowa and parts of Illinois, contributed over $18 million in South Dakota property taxes since 2017.[14]

[8] Energy Information Administration, South Dakota Prime Supplier Sales Volume, Distillate in 2021. https://www.eia.gov/dnav/pet/pet_cons_prim_dcu_SSD_a.htm
[9] Diesel Technology Forum. "Agriculture." https://dieselforum.org/agriculture#:~:text=Diesel%20engines%20power%20about%2075,powered%20by%20a%20diesel%20engine.
[10] Build With Propane. "H&H Game Birds Uses Propane". Interview with Jesse Heese. https://www.youtube.com/watch?v=fkGCpr1E1zc
[11] South Dakota Game, Fish & Parks. Pheasant. https://gfp.sd.gov/pheasant/
[12] South Dakota Game, Fish & Parks. Pheasant. https://gfp.sd.gov/pheasant/
[13] PHMSA. Pipeline Miles and Facilities 2010 +. https://portal.phmsa.dot.gov/analytics/saw.dll?Portalpages&PortalPath=%2Fshared%2FPDM%20Public%20Website%2F_portal%2FPublic%20Reports&Page=Infrastructure
[14] Dakota Access Pipeline, "Moving America's Energy The Dakota Access Pipeline." https://www.daplpipelinefacts.com/

IOWA

CREATING NEW MARKETS

Iowa's nickname is the Hawkeye State, but it could be called the Corn State.

Iowa leads the nation in corn production with nearly 2.5 billion bushels of corn produced in 2022.

With all that production, Iowa farmers are always looking for new markets. One market is renewable fuels, which Iowa leads by producing over 4 billion gallons of ethanol and biodiesel annually. Over 40 ethanol plants across Iowa convert corn to low-carbon fuels.

Pipelines will help Iowa farmers open up new markets for the ethanol produced from their corn. Some regions of the country, especially on the West Coast, are currently closed to Iowa produced ethanol because of its carbon content. To sell in these markets, Iowa ethanol producers are partnering with pipeline operators to capture the carbon emissions from ethanol production and send it to permanent storage in North Dakota and Illinois. This lower-carbon ethanol is eligible for sale in California, Oregon and Washington and represents a large new market for Iowa ethanol and corn growers. None of this is possible without new CO_2 pipelines to deliver the captured CO_2 emissions from Iowa ethanol plants to storage locations underground.

POWER OF PROPANE

Iowa's abundant corn production requires a lot of energy to dry that corn and allow for its safe storage and transportation. Iowa ranks as the fourth-largest consumer of hydrocarbon gas liquids (HGLs), largely thanks to propane consumption. For decades, Iowan farmers have relied on propane for essential grain drying and the heating of livestock barns. Propane, an HGL produced mainly from natural gas processing, has a high energy content, carries minimal risks for soil, water, or crop contamination and can be easily stored on site. Propane grain dryers are also more efficient when compared to other fuel alternatives, leading to improved crop yields. In 2021, Iowa farmers had both record corn and soybean yields, a nearly 16 percent and 15 percent increase from 2020, respectively. Because of these advantages, propane is the primary fuel of choice for grain dryers, with over 80 percent of grain dryers running on propane.

Swift Greenhouses, in Gilman, Iowa, has been family owned and operated since 1952. Across their operation, they grow approximately 1,300 plant varieties—many requiring varying greenhouse temperature ranges to ensure viability. Swift Greenhouses relies on two, 30,000-gallon propane tanks to power their 4.5-acre horticulture operation. Scott Swift's goal is "to make the business more sustainable as far as from a family standpoint. We try to look long-term and for the dependability, which is why we choose propane. That's the thing I look at to the future, what can we invest in now that will make things better and yet easier for us in the future." From grain-dryers to greenhouses, propane, delivered safely and reliably by pipeline, powers Iowa agriculture.

A STRATEGIC PLAN TO

IMPROVE PIPELINE SAFETY

ZERO INCIDENTS
Only with a goal of zero safety incidents can accidents be minimized.

ORGANIZATION-WIDE COMMITMENT
Safety is emphasized at every level, from employees who accept personal responsibility for safety to managers who are vital to reinforcing a safety culture.

A CULTURE OF SAFETY
Promoting a workplace culture where safety is an enduring value that all employees share.

CONTINUOUS IMPROVEMENT
Pipeline operators believe that no matter how safe they already are, they can always improve safety.

LEARN FROM EXPERIENCE
Pipeline operators learn how they can improve safety from their own experiences and from other pipeline operators.

SYSTEMS FOR SUCCESS
Safety management systems bring a consistent, holistic structure to safety management, helping to improve safety performance.

EMPLOY TECHNOLOGY
From enhancing the performance of "smart pigs" and remote sensing systems to innovating ways to analyze and interpret integrity data, operators constantly develop new ways to advance pipeline safety.

COMMUNICATE WITH STAKEHOLDERS
Operators know that communicating and establishing a positive relationship with the public and other stakeholders is vital to improving safety.

2023-2025

PIPELINE STRATEGIC GOALS

1

PROMOTE ORGANIZATIONAL AND WORKFORCE EXCELLENCE

Develop and promote a robust safety culture through continuous-improvement mechanisms and voluntary industry implementation of Pipeline SMS. Transform industrywide sharing into a robust, sustainable program and emphasize the benefits and power of data integration. Attract, train and retain a work force that is qualified to manage complex operations. Boost operator and first responder planning, preparedness and response capabilities.

2

IMPROVE SAFETY THROUGH TECHNOLOGY AND INNOVATION

Drive industrywide engagement in advancing pipeline inspection capabilities to achieve the pipeline industry's goal of zero incidents. Create sustainable, workable frameworks for operator leak detection management and enhance detection capabilities. Improve corrosion detection and response capacity, as well as geohazard detection and mitigation capabilities.

3

INCREASE STAKEHOLDER AWARENESS AND ENGAGEMENT

Improve industry's engagement with the public and government through the adoption and implementation of a recommended practice. Promote robust and effective public awareness and damage prevention programs to reduce excavation damage from all parties and protect critical infrastructure systems.

4

ADDRESS CYBERSECURITY THREATS

Prevent cybersecurity incidents from occurring by engaging on effective policymaking, advancing cybersecurity best practices and promoting sharing and learning among operators and regulators. Promote safe and timely responses after cyber events through industry-wide guidance.

5

ADVANCE SAFE AND SUSTAINABLE ENERGY FUTURE

Facilitate pipeline transportation and storage of CO_2 through revised emergency planning and response guides for operators and expanded training for first responders. Prepare guidance for safe CO_2 pipeline construction and operations and participate in industry CO_2 pipeline research. Limit environmental and community impacts using a midstream conservation program for pipeline rights-of-way and expand liquids participation in environmental partnerships.

GOAL 1

PROMOTE ORGANIZATIONAL AND WORKFORCE EXCELLENCE

OBJECTIVE 1.1

EXPAND SAFETY MANAGEMENT PRACTICES

KEY ACTIVITIES:

1. Promote pipeline operating companies' adoption of SMS practices (owner and contractor companies)
2. Advance maturity of SMS programs within companies that have adopted SMS and API RP 1173
3. Support triennial safety culture surveys to assess pipeline companies' safety culture
4. Revise and publish the second edition of API RP 1173 with small operator adoption assistance tools
5. Continuously improve operator SMS program assessments and evaluations

Since its initial publication in 2015, the pipeline industry has continued to make significant progress on the commitment to and implementation of API Recommended Practice (RP) 1173, *Pipeline Safety Management Systems (PSMS)*. A Pipeline SMS Industry Team, which includes liquids and gas gathering, transmission and distribution operators, as well as representatives from the contractor community, are leading SMS implementation programs. The team, established in 2015, has expanded to now include each aspect of the pipeline industry supply chain, united in the common goal of operating with zero incidents. The team focuses on four strategic initiatives: increase industry participation; support contractor and operator journeys; engage stakeholders; and provide governance and oversight.

In 2022, the team conducted its annual survey in the fall. Responses from pipeline stakeholders continued an increase in pipeline mileage responding to the survey from a record high of nearly 85 percent in 2021. The team also tied PSMS implementation efforts with ongoing environmental, social and governance (ESG) goals. API's PSMS Third-Party Assessment Program completed six assessments in 2022, bringing the total above 10 and allowing for the issuance of the benchmarking report showing operator scores compared with the industry averages. The Team also finalized a contractor guidance framework to facilitate contractors' implementation of SMS to comply with operators' requirements and supported critical work around the next standards action for API RP 1173.

For the 2023-2025 Strategic Plan, the team will continue its critical work while also overseeing the next standards action for API RP 1173. A task group will begin revising the first edition following the approved list of potential updates and will look to publish the second edition in 2025. The second edition will include guidance for program implementation for very small operating companies and learnings from the API PSMS Third-Party Assessment Program on implementation challenges. The Team will also support the first combined liquid and gas transmission safety culture survey among U.S. and Canadian operators. The team will also monitor and facilitate PHMSA's mandate from the 2020 PIPES Act to complete a study on implementation for gas distribution operators required by December 2023.

OBJECTIVE 1.2

PROMOTE TIMELY SAFETY SHARING AND LEARNING

KEY ACTIVITIES:

1. Foster organizational incorporation of industry lessons learned
2. Facilitate timely industrywide sharing and learning of safety lessons and key safety topics through industrywide sessions and other stakeholder platforms

Liquids pipeline operators have a long track record of sharing and learning to drive continuous improvement in pipeline safety. Sharing of experiences and best practices is a cornerstone of operators' safety and integrity programs and is one of the pillars of Pipeline Safety Management Systems (SMS). The API-LEPA Sharing & Learning Subteam (Subteam) developed the **Guide to Sharing** and **Guide to Learning**. The liquids pipeline industry has created a safety culture that constantly promotes the sharing of safety lessons and information. Sharing and learning occurs routinely among pipeline operators at many levels across the industry through networking, webinars, podcasts and other means. The liquids industry is building on these efforts to promote more deliberate and timely sharing of information throughout the industry and measure the benefits derived by the industry through surveys and interviews.

In 2022, the Subteam conducted a Facilities Integrity Workshop in January to support the deployment of the first edition of API Recommended Practice (RP) 1188, *Hazardous Liquid Pipeline Facilities Integrity Management*. In April, Marathon Pipe Line, NTSB and PHMSA held a joint webinar to accelerate the sharing and learning process after a geohazard-related release less than one month prior. Learnings from the sharing will feed into Recommended Practice 1187, *Pipeline Geohazards* which industry is currently developing with a focus on geohazards and pipeline integrity management. In November, industry personnel gathered for the 2022 API Pipeline Information eXchange (PIX) conference to share lessons learned with several hundred gathered personnel.

From 2023 to 2025, the liquids pipeline industry will sponsor informal roundtable discussions on a regular basis to address topic areas that affect pipeline operators. These informal exchanges will supplement webinars, workshops, safety tailgates and the annual PIX conference, which are well-established Sharing & Learning tools currently used by the liquids industry. In addition, liquids pipeline operators will conduct peer-to-peer benchmarking sessions to promote information sharing at a more in-depth level among operators to help solve problems related to similar challenges (e.g., corrosion failures at facilities). One of the key areas of focus will be on the timely sharing of safety information and lessons learned through pipeline integrity incidents. Industry will conduct member surveys following Sharing & Learning events to capture how operators are incorporating learnings into manuals, procedures, process improvements, training and other programs.

OBJECTIVE 1.3

ATTRACT, TRAIN AND RETAIN A QUALITY WORKFORCE

KEY ACTIVITIES:

1. Advance knowledge of industry best practices for training, qualification and certification of pipeline personnel
2. Promote and leverage skills-based education opportunities to prepare the next generation of energy sector workers
3. Attract and expose diverse populations to training and career opportunities
4. Develop pipeline industry communications material for attracting and retaining a quality workforce

Pipeline operations are an engineering-intensive sector requiring a technically educated and experienced workforce. Organizations supporting pipeline operations need the professional expertise and staffing of any major corporation. The scale of operating over 200,000 miles of liquids pipelines across the United States requires that it is necessary to attract, train and retain a sizable workforce. Like any sector in the current economic environment, pipeline operators are facing challenges attracting and retaining a skilled workforce. The pipeline sector also faces the heightened challenge of competing with new energy and infrastructure sectors perceived to have a larger role in the future.

From 2023 to 2025, API and LEPA are advancing a new, industry-wide initiative to attract, train and retain a quality workforce. The initiative will facilitate industry-wide sharing and learning from individual company best practices for attracting and developing new employees. The range of member companies across size, business segment and geographic footprint offers a variety of programs and experiences to harvest and will extend the current industry culture of sharing pipeline safety information to human resources. To ensure a diverse range of future employees, industry sharing will include an emphasis on attracting and exposing diverse populations to training and career opportunities. In addition, industry will help prepare the next generation of energy pipeline workers through the API SkillsReady Program, which provides opportunities for diverse and under-advantaged communities to secure employment in the energy industry. To help ensure current workers are appropriately trained, the pipeline industry will also continue to review and revise API Recommended Practice 1161, *Pipeline Operator Qualification*, which defines the requirements for the qualification of liquids pipeline personnel who perform operations and maintenance tasks that are regulated by PHMSA.

OBJECTIVE 1.4

BOOST OPERATOR AND FIRST-RESPONDER PLANNING, PREPAREDNESS AND RESPONSE CAPABILITIES

KEY ACTIVITIES:

1. Promote pipeline-specific training to first responders
2. Foster the sharing and learning of best practices from operator emergency response drills and training
3. Produce tactical response resources for pipeline emergencies
4. Share best practices for approaching all hazards impacting pipelines, including cybersecurity

Successful pipeline emergency planning, training and response requires skills and cooperation from multiple stakeholders. Pipeline operators have the ultimate responsibility for pipeline emergency response. However, an effective response requires advance planning with the operator and local emergency authorities. The government has a role not only ensuring compliance with capability requirements but also helping to make resources available during emergencies. Training and

drilling by all parties are necessary to ensure skills are fresh and operational. Additionally, emergencies impacting pipelines can include weather disasters and cyber events.

In 2022, the pipeline industry continued to fund a free online pipeline response training program for first responders. Developed in partnership with the National Association of State Fire Marshals, the program trains local emergency personnel to respond safely to a pipeline emergency. Over 17,000 individuals have completed a pipeline emergency online training course through the **http://pipelines.training** website since its 2018 inception. To enhance pipeline operator emergency response capabilities, the API-LEPA Emergency Response Group (ERG) facilitated cross-company participation in training and drills, with companies sending personnel to peer company events to provide outside feedback. For specific pipeline emergency scenarios, the ERG continued development of tactical guides for responding to a midstream tank farm incident or hazardous winter weather. The ERG also began planning a tactical guide on incident air monitoring and development of a guide for CO_2 pipeline emergencies.

From 2023 to 2025, the industry will continue to fund free online training for first responders for pipeline emergency response. API and LEPA will work with state and local partners to expand awareness of and participation in the online training. The ERG also expects to add CO_2-specific training to the offered courses after completion of the CO_2 emergency tactical guide. That tactical guide is scheduled for completion in 2023, along with guides on winter weather and tank farms. Industry also expects to grow its peer sharing and learning programs through response training and drills with increased in-person activity (after COVID restrictions), as well as a more structured collection and compilation of learnings. Beginning in 2023, the ERG will develop a program to assist pipeline operators with responding to all hazards and emergencies impacting pipelines. The program will include ways to apply, train and drill on the incident command system (most often used on pipeline releases) to non-release incidents, such as extreme weather or cybersecurity.

GOAL 2

IMPROVED SAFETY THROUGH TECHNOLOGY AND INNOVATION

OBJECTIVE 2.1

ADVANCE PIPELINE INSPECTION TECHNOLOGY AND ANALYTICS

KEY ACTIVITIES:

1. Improve in-line inspection (ILI) systems' capabilities for cracking, seam anomalies and selective seam weld corrosion
2. Advance non-destructive examination (NDE) technology and certification programs
3. Update API Bulletin 1178, API RP 1176 and API RP 1183

The ability to detect and identify conditions that represent a threat to pipeline integrity is central to ensuring the safe operation and reliability of pipelines. Pipeline operators inspect their systems on regular schedules, looking for indications that pipelines and/or facilities need maintenance. Through these regular inspections, pipeline operators identify and fix issues long before they become a problem for the pipe. In-line inspection (ILI) and non-destructive examination (NDE) systems are the primary tools used for analyzing the health of pipelines, assessing integrity threats to pipeline systems and making decisions on when and where to make repairs when these systems indicate the need for maintenance. The systems include high-precision sensors and advanced methods of computational analytics to detect, characterize and locate anomalies in pipelines that could represent an integrity threat. Decisions on which anomalies require maintenance are supported by sophisticated engineering assessment methods and tools. Through its internal member company programs and membership in Pipeline Research Council International (PRCI), the liquids pipeline industry continuously leads initiatives to drive improvements in ILI and NDE technologies and works directly with technology service providers to advance inspection technologies and the analytical systems that process the data. Through these efforts, liquids pipeline operators have reported a decrease in pipeline releases that impact people or the environment and will continue to work toward a goal of zero incidents by leading the industry efforts to improve ILI and NDE technologies.

In 2022, industry received encouraging results from the test trials of the latest ILI technologies and their ability to detect mechanical damage, corrosion and cracking. The ILI test trials will provide data to support improvements in systems specifications for detecting, identifying and sizing features in pipelines. Substantial progress was made in completing ILI systems' performance testing for mechanical damage, with over 60 test trials conducted in 2022. The data demonstrated the capability of ILI systems to detect coincident features within a dented region of a pipe wall. This data will provide a basis to support regulatory changes that relate to mechanical damage anomaly response criteria, special permit conditions related to dent engineering critical assessment (ECA) and justification for using engineering screening and integrity assessment tools in API RP 1183, *Assessment and Management of Dents in Pipelines*, to evaluate the integrity of dents with coincident features. Consideration will also be given to any appropriate modifications to API Standard 1163 regarding ILI reporting specifications for corrosion, cracks and mechanical damage. Also in 2022, significant progress was made in developing advanced NDE techniques and technologies, including in-ditch materials property verification and X-ray computed tomography. Through PRCI and the API Individual Certification Program (ICP), efforts are continuing to develop a series of pipeline

reference standards for corrosion, mechanical damage/deformations, cracks and pipeline weld seam features. Operators will use these standards for technology and personnel testing and qualification.

For the 2023-2025 Strategic Plan, industry will complete several substantial ongoing ILI programs for mechanical damage, dents, cracking and corrosion, as well as evaluating ILI performance improvements for selective seam weld corrosion (SSWC). The results from these programs will establish the industry state-of-the-art for inspection using ILI systems and identify where performance improvements may be appropriate to continue advancing pipeline inspection. Additional research through PRCI centers on advances in NDE technologies that determine material properties and measure toughness value for pipe steels and X-ray computed tomography. Work will also include development of industry databases through information sharing and advanced methods of data integration and analysis. In 2023-2025, the liquids pipeline industry will revise three important documents that pertain to pipeline integrity management, including a technical bulletin on data integration (Bulletin 1178), and RPs for management and assessment of cracks (RP 1176) and dents (RP 1183) in pipelines.

OBJECTIVE 2.2

ENHANCE LEAK DETECTION CAPABILITIES

KEY ACTIVITIES:

1. Prepare and implement a leak detection program risk assessment tool
2. Develop metrics for assessing leak detection program performance
3. Improve leak detection sensor sensitivity and placement

Liquids pipeline operators use multiple complementary programs to detect leaks and ruptures, including tracking product delivery volumes, monitoring pressure and flow sensors, and regular visual inspections of their systems from the ground and air. Operators are assisted by API RP 1175, which provides a framework for building and evaluating a comprehensive leak detection strategy, and API RP 1130 for computational pipeline monitoring. While RP 1130 and RP 1175 establish guidance on developing a program that is consistent with operating conditions and product types being transported, there is no industry-wide data on the types of systems, techniques and approaches used by operators in developing their individual leak detection programs.

In 2022, a recently formed industry-wide Leak Detection Subteam undertook a strategic review of operator leak detection programs. Operators of all sizes and system capabilities shared their capabilities and needs. The Subteam developed the key activities for 2023-2025 discussed below. The Subteam also developed a survey tool for the operator leak detection program, which will collect data on industry-wide leak detection program needs going forward. Finally, the Subteam supported development and adoption of a Leak Detection Strategic Research Priority program through the industry-supported Pipeline Research Council International.

For the 2023- 2025 Strategic Plan, the liquids pipeline industry will gather member company knowledge on Leak Detection Program management and key performance indicators (KPIs) to develop metrics for pipeline leak detection program performance. To support pipeline operators and individual systems of all capabilities, the Subteam will develop a Leak Detection Risk Assessment Tool. A third initiative will focus on control points and measurement systems including improvements in equipment sensitivity and calibration, as well as equipment location evaluations and validation.

OBJECTIVE 2.3

IMPROVE CORROSION DETECTION AND RESPONSE

KEY ACTIVITIES:

1. Advance modern engineering corrosion assessment methods
2. Perform root cause analysis of corrosion incidents to identify key areas for corrosion threat management focus
3. Improve In-line Inspections (ILI) performance for corrosion features
4. Collaborate with outside organizations to formalize industrywide corrosion management guidance

Corrosion incidents continue to be the most frequent failure mode in energy pipeline systems and have remained a focus of the energy pipeline industry in advancing ILI technology development and pipeline safety regulations. Significant effort and attention have addressed corrosion prevention, mitigation, detection and repair in recent years, and a more detailed level of data analysis is warranted to better understand the root causes of corrosion-related failures, with emphasis on incidents that occur on pipeline rights-of-way (ROWs) and within liquids pipeline facilities.

In 2022, industry directed its focus on facility integrity due to the higher number of corrosion incidents that occur at facilities and analysis of industry data by the API-LEPA Data Mining Team. In 2022, API published API RP 1188, *Hazardous Liquid Pipeline Facilities Integrity Management* and the related API RP 1184, *Facility Construction Inspection*, and initiated the development of a companion and supplemental technical report on internal corrosion at pipeline facilities (API Technical Report 1189), which will be published in 2023. These documents provide industry best practices to liquids pipeline operators to improve corrosion management programs at facilities and reduce the number of incidents that occur. Test trials were completed through PRCI funded research that evaluated ILI technologies' performance for characterizing difficult-to-inspect corrosion features and where improvements in corrosion detection and sizing are needed for pipelines outside of facilities.

From 2023 to 2025, liquids pipeline operators will collaborate and share detailed information on incident analysis and root cause failure analysis for corrosion failures. The work will expand on the PHMSA database for incident statistics and the liquids industry Pipeline Strategic Data Tracking System (PSDTS) database to better understand the factors that led to incidents and provide information that can be directed to improve pipeline integrity programs (i.e., inspection, preventive and mitigative measures and fitness-for-service). The Subteam will emphasize the application of modern engineering assessment methods for corrosion features and development of a comprehensive standard that addresses all aspects of corrosion management for pipeline systems, working in coordination with other industry trade associations. Industry will incorporate results into API RPs and technical reports that address pipeline corrosion management and will be integrated into other industry standards, including API RP 1173,

Pipeline Safety Management Systems. Throughout 2023-2025, the liquids pipeline industry will also continue its work with PRCI and ILI service providers to drive improvements in ILI systems' performance to detect and characterize corrosion features.

OBJECTIVE 2.4

INCREASE GEOHAZARD DETECTION AND MITIGATION CAPABILITIES

KEY ACTIVITIES:

1. Prepare and release API RP 1187, *Pipeline Geohazards*
2. Promote industrywide data sharing related to geohazard threat management

Geohazards caused by ground movement and landslides are increasingly recognized within the industry as a factor in pipeline failures. Recently, pipeline failures have occurred due to landslides. These strain pipelines that intersect with the landslide terrain. While some operators have built full geohazard management programs that help identify, characterize, monitor, assess and remediate geohazard sites, there is no industrywide consensus standard for developing a geohazard management and mitigation program and providing the tools to ensure pipeline assets remain fit-for-purpose. Therefore, guidance to operators for implementing and improving landslide hazard management programs is needed and is expected to help reduce the number of landslide-caused incidents.

The 2023-2025 Strategic Plan will include a new industry-wide initiative to address geohazards. Industry will develop API RP 1187, *Pipeline Geohazards*. This document is intended to provide a set of practical guidelines for effective ground movement hazard management. The RP will reflect a collective effort of pipeline industry operators and consultants to leverage the extensive research that has been conducted on the impact of geohazards on pipeline integrity, including ongoing research being conducted by PRCI. The standard will also provide guidance on conducting fitness-for-purpose (FFP) testing on pipelines within geohazard sites, as well as recommend remediation techniques that can be utilized as FFP limits are reached.

GOAL 3

INCREASE STAKEHOLDER AWARENESS AND ENGAGEMENT

OBJECTIVE 3.1

IMPROVE STAKEHOLDER ENGAGEMENT

KEY ACTIVITIES:

1. Finalize publication and support implementation of API RP 1185, *Pipeline Public Engagement*
2. Improve biennial PAPERS program to increase value for program participants and raise awareness of program value
3. Enhance engagement with emergency responders and other stakeholders for increased awareness of pipeline locations and available trainings
4. Encourage PHMSA to incorporate API RP 1162, 3rd edition by reference

The pipeline industry recognizes the need to increase its engagement with the public throughout the life cycle of a pipeline, including planning, construction, operations and abandonment phases. Public awareness is a regulatory requirement addressed in API RP 1162, *Public Awareness Programs for Pipeline Operators*, the first edition of which was published in 2003 and incorporated into federal regulations in 2005. This RP provides the framework for one-way communication and guidance on ensuring that stakeholders near pipelines are aware of an existing pipeline's operations and location, can identify hazard recognitions and follow appropriate procedures (such as calling 811 before excavating).

In 2022, the pipeline industry published the third edition of API RP 1162 following roughly four years in development. The updated edition also aligns public awareness programs with the Plan-Do-Check-Act cycle of continuous improvement originally included in RP 1173, *Pipeline Safety Management Systems*. With publication complete, the RP 1162 Task Group has also developed an implementation guidance website to support operator implementation journeys and provide additional anecdotes and examples. Additionally, in 2021 and throughout 2022, the industry partnered with representatives of the public and regulators to develop a recommended practice for improving pipeline public engagement. API RP 1185, *Pipeline Public Engagement*, will provide pipeline operators with tools to engage in two-way conversations with the public wanting to learn more about an existing pipeline, ask questions about a proposed pipeline or engage historically underrepresented communities. The scalable and flexible program will allow operators to tailor their engagement efforts to the specific needs of a project or local community.

From 2023 to 2025, after publication of API RP 1185 in 2023, a pipeline industrywide team will encourage and assist operator implementation of the RP. The team will create additional education and implementation tools. The team will host information exchanges to facilitate operator programs and share leading practices and lessons learned regarding engagement. Industry will also promote the incorporation by reference of API RP 1162 to ensure that best practices are available for all operators and will support participation in the 2023 cycle of the Public Awareness Program Effectiveness Research Survey (PAPERS) program. API/LEPA also intend to exchange best practices regarding shallow pipe or changing depth of cover and promote greater awareness and use of the National Pipeline Mapping System (NPMS) with firefighters and first responders through webinars, trainings and messaging.

OBJECTIVE 3.2

PROMOTE INNOVATIVE APPROACHES TO EXCAVATION DAMAGE PREVENTION

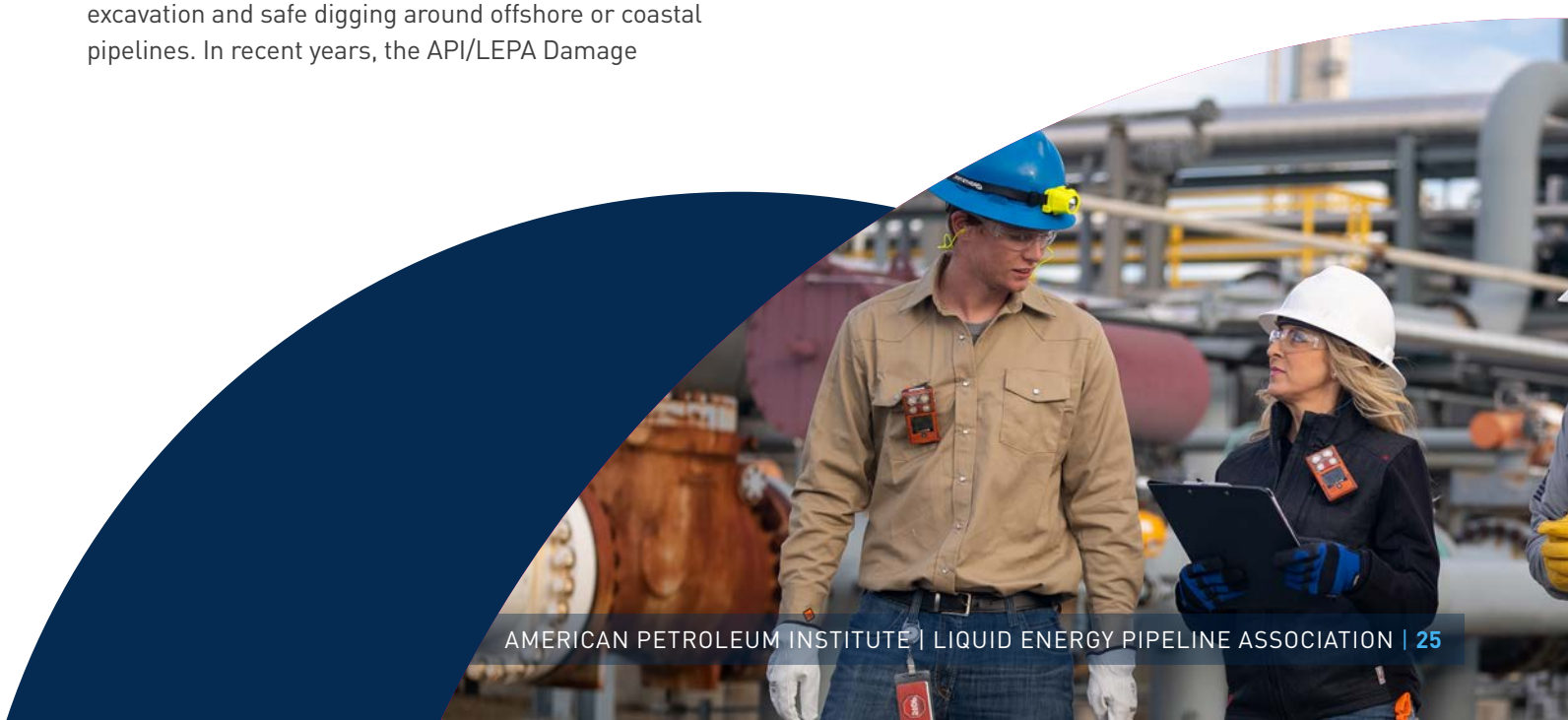
KEY ACTIVITIES:

1. Publish and implement expanded guidance for dredging in marine environments
2. Analyze second-party damage root causes and develop training tools to reduce incidents
3. Engage with states to eliminate/reduce exemptions to One Call requirements
4. Assess capabilities of nationwide One Call centers and increase standardization of ticket types and data collection

Excavation damage to underground energy pipelines remains a significant source of incidents impacting people and the environment and is a threat to critical infrastructure integrity. Despite decades of public awareness campaigns, failure to call 811 before digging remains the leading cause of excavation incidents from professional contractors to homeowners alike. Similarly, an incident caused by dredging in a marine environment highlighted the need for additional guidance for marine excavation and safe digging around offshore or coastal pipelines. In recent years, the API/LEPA Damage Prevention Work Group (DPWG) has focused more on first- and second-party damages, more directly in their control, with other organizations promoting 811 overall and working to reduce third-party damages.

In 2022, the DPWG supported the revision and publication of the third edition of API RP 1162, *Public Awareness Programs for Pipeline Operators*. The DPWG also started monthly tracking of unauthorized activity and encroachment on rights-of-way to identify problematic regions or types of excavators needing additional messaging or awareness initiatives. Lastly, the DPWG provided key subject matter expertise in addressing the National Transportation Safety Board (NTSB) recommendations for preventing excavation incidents during dredges in marine environments and will play a critical role in this effort moving forward.

From 2023 to 2025 DPWG members will look to maintain their focus on tracking unauthorized activity, incorporating the third edition of API RP 1162 into federal pipeline safety regulations (i.e., IBR) and improving guidance for marine excavations. Additionally, the DPWG will emphasize modernizing and standardizing One Call centers so they are using the same technologies and forms and collecting similar data on ticket type, excavation type, equipment used and work performed from operators instead of the current patchwork system. Lastly, DPWG members will create model language to reduce One Call exemptions, such as for agricultural activity or municipal crews, to eliminate loopholes and reinforce use of calling or clicking 811 to better protect underground infrastructure.



GOAL 4

ADDRESS CYBERSECURITY THREATS

OBJECTIVE 4.1

PREVENT CYBERSECURITY INCIDENTS

KEY ACTIVITIES:

1. Engage policymakers on effective pipeline cybersecurity strategies and inter-agency collaboration
2. Advance operator implementation of enhanced digital and operational risk assessment and safeguards through API Standard 1164, *Pipeline Control Systems Cybersecurity*
3. Promote sharing and learning of cybersecurity expertise between operators and regulators

The U.S. pipeline network is critical to the functioning of the national energy supply and security, which makes it a prime target for cyberattacks. The 2020 ransomware attack on Colonial Pipeline provided examples of both the criticality of pipeline systems and the importance of pipeline cyber defenses. The pipeline industry shares the cybersecurity objectives of policy makers to protect critical infrastructure, provide reliable energy for society, safeguard public safety and the environment and protect the intellectual property and marketplace competitiveness of companies. Pipeline companies employ layers of security to protect against cascading failure, including mechanical controls that are not capable of being overridden through any cyber compromise of industrial control systems.

In 2022, operators of critical pipeline systems implemented cybersecurity actions under security directives (SD) issued by the U.S. Transportation Safety Administration (TSA). A revised SD issued mid-year requires covered operators to establish and implement a TSA-approved cybersecurity implementation plan, develop and maintain a cybersecurity incident response plan to reduce the risk of operational disruption, establish a cybersecurity assessment program and submit an annual plan that describes how to assess the effectiveness of cybersecurity measures. The pipeline industry worked with TSA to ensure the revised SD set performance-based requirements reflecting pipeline-specific operational technology and the variety of operating conditions and systems. Industry also engaged PHMSA to assist TSA with pipeline operations expertise and avoid agency activity duplication.

From 2023 to 2025, API and LEPA will support member company engagement with TSA as it replaces the existing temporary pipeline cybersecurity SDs with a permanent program of cybersecurity regulatory requirements. Industry will work with TSA to ensure that upcoming regulations set performance-based requirements, reflect pipeline-specific operational technology and allow company cybersecurity activities to adapt and evolve over time to meet constantly changing cyber threats. Industry will also engage PHMSA to ensure that its oversight of operator control rooms and safe operations appropriately interacts with TSA's cybersecurity authority. API will continue promotion and assist implementation of API Standard 1164 to help pipeline operators manage their cyber risks. Over the course of the 2023-2025 plan, API and LEPA will represent liquid pipeline operators at the Oil and Natural Gas Sector Coordinating Council (ONG-SCC), coordinating security activities between the U.S. Department of Homeland Security (DHS), U.S. Department of Energy (DOE), TSA, Cybersecurity

& Infrastructure Security Agency (CISA) and PHMSA. API will also convene its annual API Cybersecurity Conference & Expo, which brings together leading cybersecurity experts from industry, government, academia and vendors to share and learn about the latest developments, share insights and network with other cybersecurity professionals.

OBJECTIVE 4.2

SAFE AND TIMELY RESPONSE TO AND RECOVERY FROM CYBERSECURITY EVENTS

KEY ACTIVITY:

1 Develop industrywide guidance for safe return to operations after cybersecurity events

A cyber incident can impact pipeline operations in multiple ways. It can affect business functions unrelated to pipeline operations, commercial systems supporting operations, and operational technology itself or can necessitate temporary suspension of operations during an impact assessment. A crucial challenge for pipeline operators is to safely resume operations. Many of the safety assurance and control systems built into a pipeline system are digital, remote and require electronic communications.

For the 2023-2025 Strategic Plan, the pipeline industry is launching a new initiative to develop industry-wide guidance for safely restarting and manually operating pipeline systems after a cyber incident. The guidance will include recommendations for assessing the impact of the cyber intrusion on the ability to safely operate the pipeline system. The API Construction and Operations Group will lead development of the industrywide guidance, with a target for completion in 2024. In 2024 and 2025, API and LEPA will assist member companies with implementation of the guidance.

GOAL 5

SAFE AND SUSTAINABLE ENERGY FUTURE

OBJECTIVE 5.1

CO_2 PIPELINE TRANSPORTATION AND STORAGE

KEY ACTIVITIES:

1. Develop a CO_2 pipeline emergency planning and response guide for pipeline operators
2. Expand pipeline emergency training materials and free online resources for first responders to include CO_2 pipeline incidents
3. Prepare guidance to construct, convert and maintain safe CO_2 pipelines
4. Participate in industry research on odorants for improved leak detection and emergency response

Over 5,000 miles of carbon dioxide pipelines currently operate in the United States. For over 40 years, pipelines have delivered CO_2 for use in energy, food production and medical applications, as well as the manufacture of products such as refrigerants, foam rubber, fire extinguishers and carbonated beverages. New CO_2 pipeline systems have been proposed and/or are under development to transport CO_2 from carbon capture locations to permanent underground storage sites. The safety record of CO_2 pipelines is strong, with fewer incidents per mile over the last five years than both crude oil and refined products pipelines. Even as the safest method to transport large volumes of CO_2 long distances, opportunities exist to improve CO_2 pipeline-specific best practices around emergency planning and response, integrity management and stakeholder outreach.

From 2023 to 2025, the pipeline industry is undertaking a new initiative to deploy a range of CO_2 pipeline-specific safety programs. In 2023, the API-LEPA Emergency Response Group will develop a new tactical guide to help operators plan for and respond to CO_2 pipeline incidents. The guide will assist operators in incorporating topography and atmospheric conditions into incident modeling, as well as provide additional guidance for first responder consideration of surrounding communities. After completion of the operator response guide, API and LEPA will facilitate development of a new online training module for local first responders, which the pipeline industry operates in partnership with the National Association of State Fire Marshals. The API Construction and Operations Group and Pipeline Integrity Group will update guidance for the construction of new CO_2 pipelines and the conversion of existing pipelines into CO_2 service. The API Pipeline Integrity Group will examine practices for preventing fracture propagation in existing CO_2 pipelines. API, LEPA and member companies will also support pipeline sector research into an appropriate odorant for CO_2 pipeline service.

OBJECTIVE 5.2

LIMIT ENVIRONMENTAL AND COMMUNITY IMPACTS

KEY ACTIVITIES:

1. Promote pipeline operator and external stakeholder participation in midstream conservation program and maintaining conservation rights-of-way
2. Expand liquids pipeline sector participation in environmental partnerships focused on reducing releases

While America's natural gas and oil companies have a responsibility to deliver the affordable and reliable energy the public needs and wants, we recognize we must also do so sustainably. That means reducing our impact on the environment when possible. API and LEPA members are actively working together to track and improve their sustainability performance while striving for appropriate engagement and transparency with communities and stakeholders. Right-of-way (ROW) conservation programs serve as one way of achieving these goals, providing an integrated and systematic approach to planning, implementing and sustaining ROW land management that is value-driven. The result is enhanced safety, community benefits, operational efficiencies and a healthier ecosystem, while maintaining state and federal regulatory compliance.

In 2021, API members formed a task group and published "Guidance for Conservation Programs on Pipeline Right-of-Ways". The guidance provides industry and member organizations with information, tools and resources to gain knowledge and build capacity for safe and effective ROW conservation programs, and it includes leading practices for general habitat management, species-specific habitat management, integrated vegetation management (IVM) and coastal restoration projects. The guidelines also espouse the numerous benefits of ROW conservation, including increasing carbon capture, protecting habitats of threatened species, improving community relationships, and supporting corporate sustainability and environment, social and governance (ESG) goals. Using the guidance as a starting point, several API and LEPA members identified ROW areas for conservation in a pilot program and partnered with conservation associations such as Pheasants Forever throughout 2022.

In 2023 and beyond, API seeks to broaden understanding and implementation of the guidance. Greater utilization of the program can lead to companies becoming better environmental stewards by adopting pipeline ROW habitat management and IVM best practices. Operators can also capitalize on existing state and federal funding for conservation work, working throughout 2023 and beyond with state agencies and partnering NGOs to secure grants for ongoing conservation efforts. Along with environmental benefits, these projects can help lay the right foundation for future licenses to operate — creating new possibilities for pipelines. The guidelines also follow the Plan-Do-Check-Act cycle of continuous improvement to help operators avoid complacency and identify existing gaps while promoting environmental conservation and sustainability well into the future.

OBJECTIVE 5.3

REDUCE EMISSIONS FROM PIPELINES, TANKS AND FACILITIES

KEY ACTIVITIES:

1. Support incorporation of updated recommended practice for tank inspection and maintenance into regulation
2. Demonstrate the environmental and climate benefits of applying recommended practices to optimize tank inspection and maintenance
3. Reduce air emissions from pipeline and storage tank operations through environmental partnership programs

With a continuing focus of government agencies, the general public and pipeline operating company boards of directors on methane emission reductions, climate change and ESG reporting, the liquids pipeline industry is implementing programs to reduce emissions from operating pipeline systems.

In 2023, the API Hazardous Liquids Sustainability Work Group will roll-out three separate programs, which are modeled on similar programs being conducted through The Environmental Partnership, and begin to capture data on improvements being made by liquids operators to reduce emissions across the operating spectrum, including pipelines, tanks, and facility operations. Annual reports will be prepared to document and demonstrate the impacts of the initiative and support ESG reporting for the liquids industry, with the implementation plans focused on energy efficiency in operations, maintenance and integrity, and reducing emissions from tanks and at facilities. A key target for liquids pipeline emission reductions is optimizing tank inspections – work required to conduct tank inspections generate significant emissions and waste and are often not needed on the frequency mandated by regulation. API and LEPA will work with PHMSA to support the incorporation of the latest edition of API Standard 653, which allows for a risk-based, performance-based approach to tank inspection.

2022 PERFORMANCE REPORT

KEY PERFORMANCE INDICATORS

Measuring the performance of pipelines is a critical way to determine how safe they are and whether their safety is improving. Pipeline operators and PHMSA collect hundreds of different data points measuring how safely pipelines are operating and the reasons behind pipeline incidents when they occur.

Particularly useful measures of pipeline safety examine incident size, location, commodity and cause. The liquids pipeline industry uses each one of the following measures to better understand pipeline incident trends and develop strategies for improving pipeline safety. As a sign of overall safety performance, the liquids pipeline industry tracks a core set of key performance indicators (KPIs). These KPIs are based primarily on incidents impacting people or the environment. They were created through a recommendation of the U.S. National Transportation Safety Board in a collaborative effort between PHMSA, pipeline operators and public pipeline safety advocates represented by the Pipeline Safety Trust. They reflect the highest priority pipeline operators place on protecting people and the environment. The liquids pipeline industry has remained focused on safety, with pipeline incidents declining across the board. Incidents impacting people or the environment are down 16 percent over the last five years. The pipeline industry tracks its performance with three industrywide KPIs:

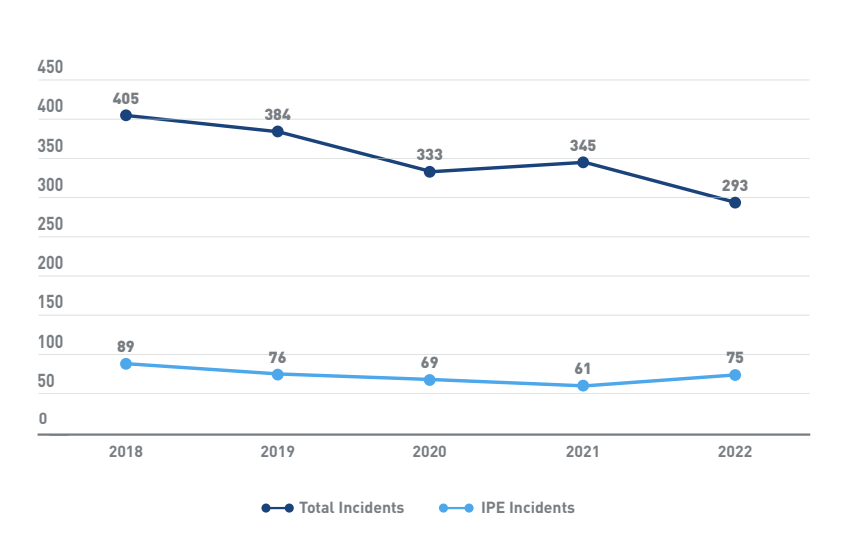
1. Total incidents impacting people or the environment
2. Integrity management incidents impacting people or the environment
3. Operations & maintenance (O&M) incidents impacting people or the environment

Integrity management incidents are those of the pipeline itself, such as corrosion, cracking, or weld failure. Operations and maintenance causes include equipment failure or incorrect operations.

KEY PERFORMANCE INDICATORS

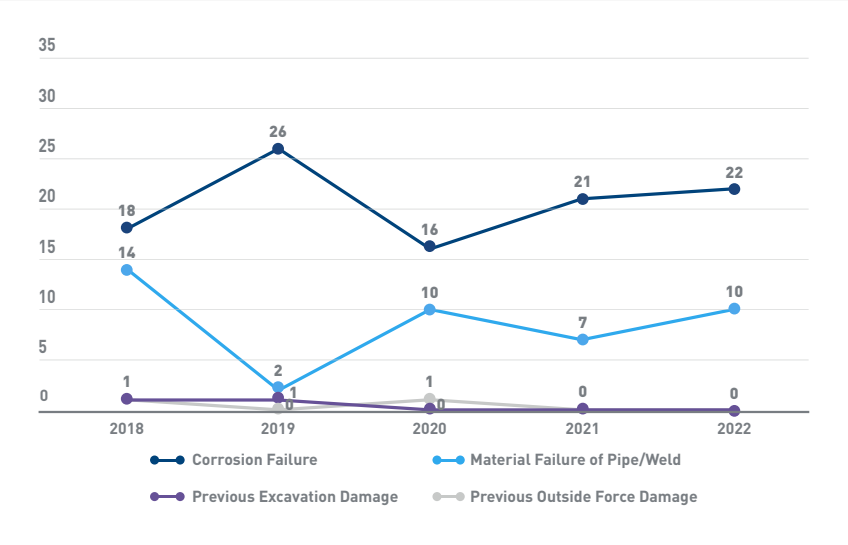
1 TOTAL INCIDENTS VS INCIDENTS IMPACTING PEOPLE OR THE ENVIRONMENT (2018 – 2022)

Pipeline incidents impacting people or the environment decreased 16 percent from 2018 to 2022. Total pipeline incidents were down, as well, dropping 28 percent over the last five years, with 112 fewer incidents in 2022 compared to 2018. A full description of the specific types of incidents impacting people or the environment can be found on page 56.



2 INTEGRITY MANAGEMENT INCIDENTS IMPACTING PEOPLE OR THE ENVIRONMENT (2018-2022)

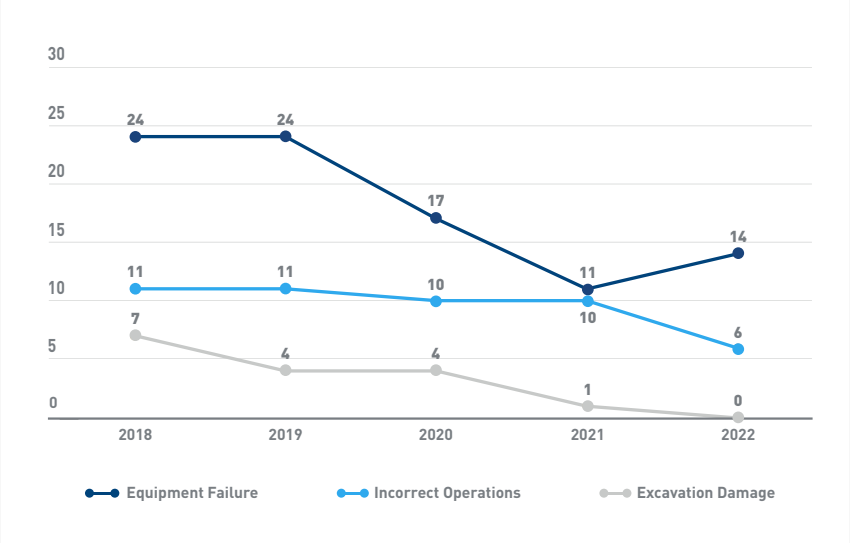
Incidents related to the pipeline itself, such as corrosion, cracking or weld failure, were down 6 percent over the last five years in areas impacting people or the environment. In these areas, material pipe/weld failures were also down 29 percent from 2018 to 2022.



KEY PERFORMANCE INDICATORS

3 OPERATIONS & MAINTENANCE INCIDENTS IMPACTING PEOPLE OR THE ENVIRONMENT (2018-2022)

Incidents related to maintaining pipeline equipment or operating the pipeline and its valves or pumps were down 52 percent over the last five years in areas impacting people or the environment. In these areas, incidents caused by incorrect operation decreased by 45 percent, while equipment failure decreased 42 percent from 2018 to 2022.

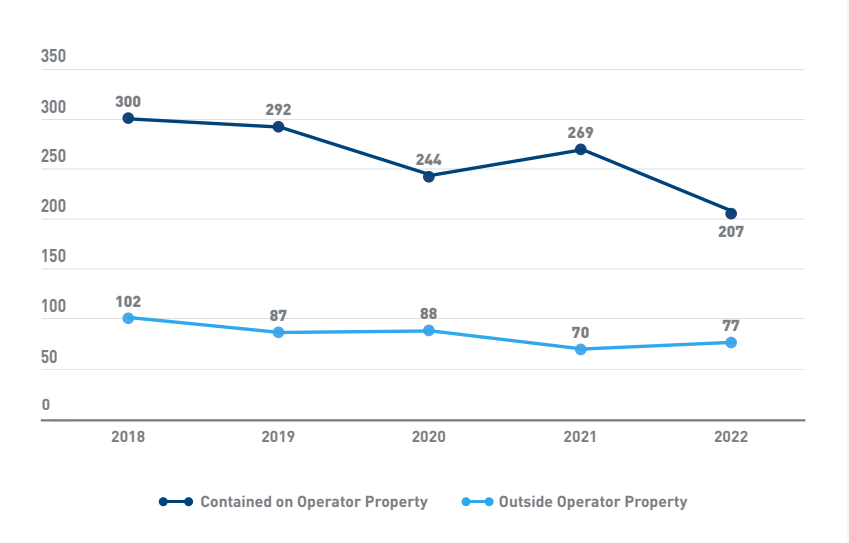


INCIDENTS BY LOCATION

The location of a pipeline incident matters both when gauging the impact of an incident and developing strategies to prevent incidents in the future. Pipeline operators place the greatest emphasis on preventing and minimizing impacts to people or the environment. Tracking these incidents helps operators focus on this priority. Additional measures of incident impacts are whether they are contained on operator property or outside the operator's facilities, specifically in high consequence areas (HCAs), a regulatory term used by PHMSA.

4 PIPELINE INCIDENTS INSIDE AND OUTSIDE OPERATOR PROPERTY (2018-2022)

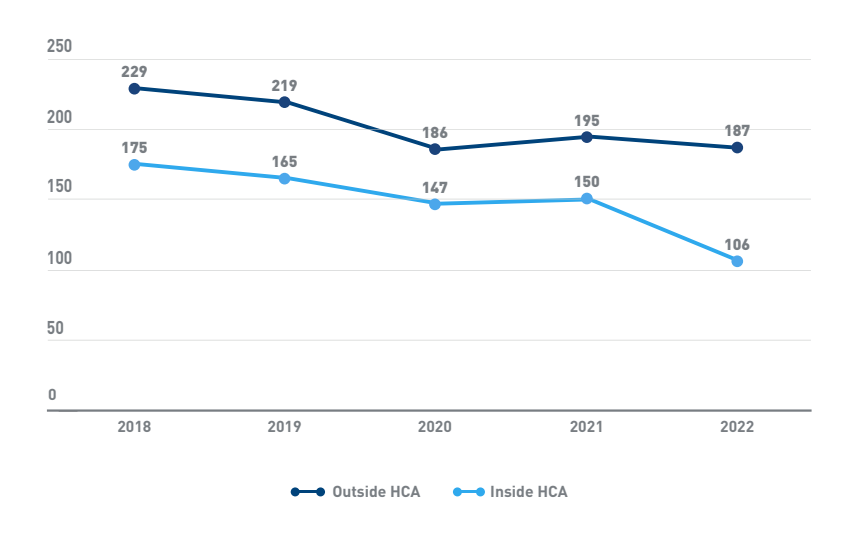
In 2022, 71 percent of incidents from liquids pipelines were contained within an operator's property. Examples of pipeline operator properties include pump stations, tank farms and terminals. Incidents in public spaces outside of operator facilities decreased 25 percent from 2018 to 2022.



INCIDENTS BY LOCATION

5 PIPELINE INCIDENTS INSIDE & OUTSIDE HCAs (2018-2022)

Liquids pipeline incidents occurring in high consequence areas (HCAs) declined 39 percent over the last five years. Through federal regulation, PHMSA defines HCAs as areas of population concentration, commercially navigable waterways or sensitive environmental locations. Fewer than half (36 percent) of pipeline incidents occurred in HCAs in 2022. HCA data differs from incidents impacting people or the environment because, under PHMSA regulation, an incident can have no impact on people or the environment, remain wholly within an operator's facility and still count as an HCA if that facility is surrounded by an HCA.



6 TOTAL INCIDENTS VS INCIDENTS IMPACTING PEOPLE OR THE ENVIRONMENT (2018-2022)

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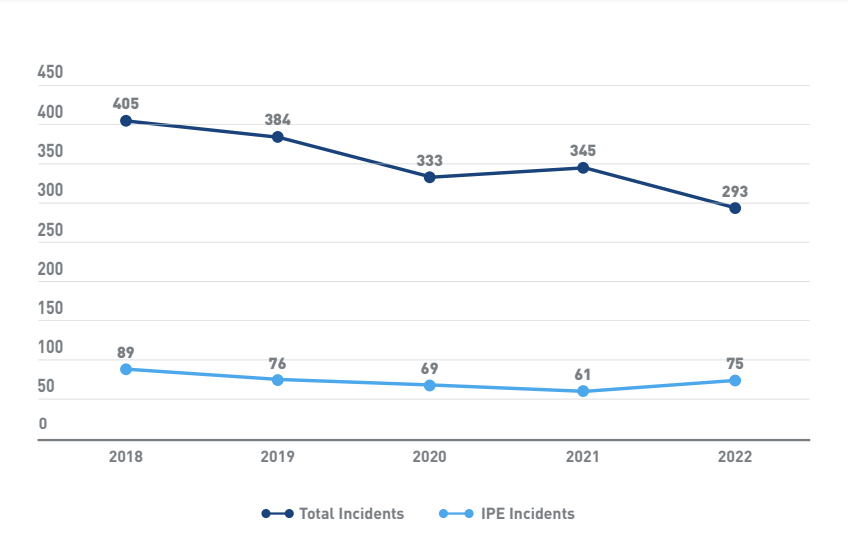
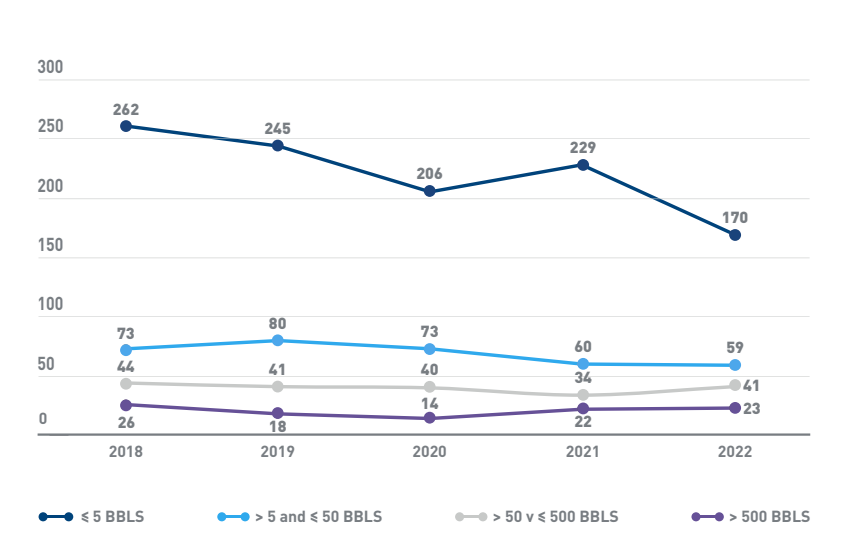


INCIDENTS BY SIZE

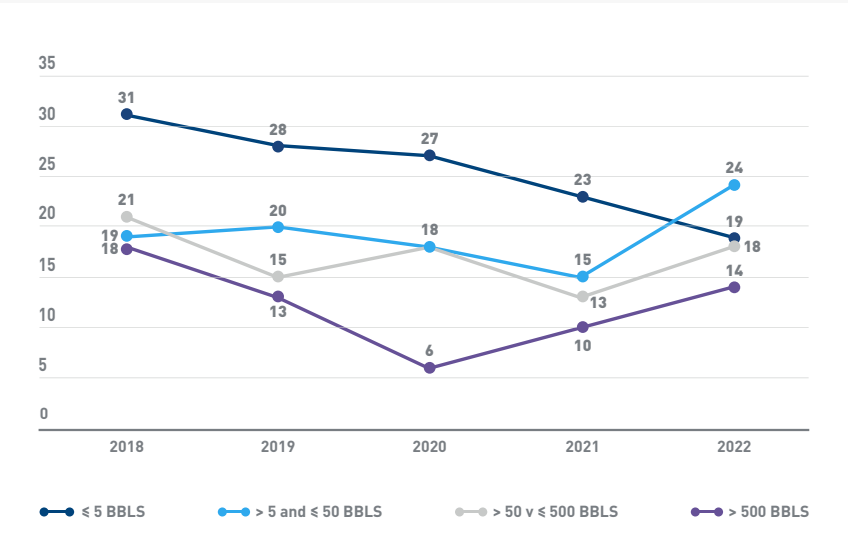
7 LIQUIDS PIPELINE INCIDENTS BY SIZE (2018-2022)

Most pipeline incidents are small. In 2022, 58 percent of incidents were less than five barrels and 78 percent were less than 50 barrels. Large pipeline incidents are also the rarest. In 2022, only 8 percent of incidents were 500 barrels or larger, and these large incidents are down 12 percent over the last five years.



8 IPE INCIDENTS BY SIZE (2018-2022)

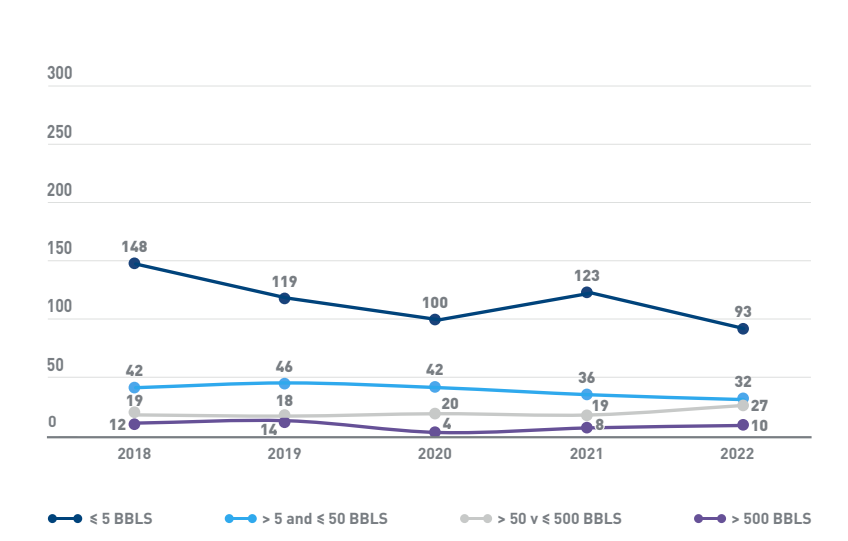
Most incidents impacting people or the environment are small. In 2022, approximately 57 percent of such incidents were less than 50 barrels, with only 19 percent of incidents impacting people or the environment 500 barrels or larger. Large incidents impacting people or the environment are down 22 percent over the last five years.



INCIDENTS BY SIZE

9 CRUDE OIL INCIDENTS BY SIZE (2018-2022)

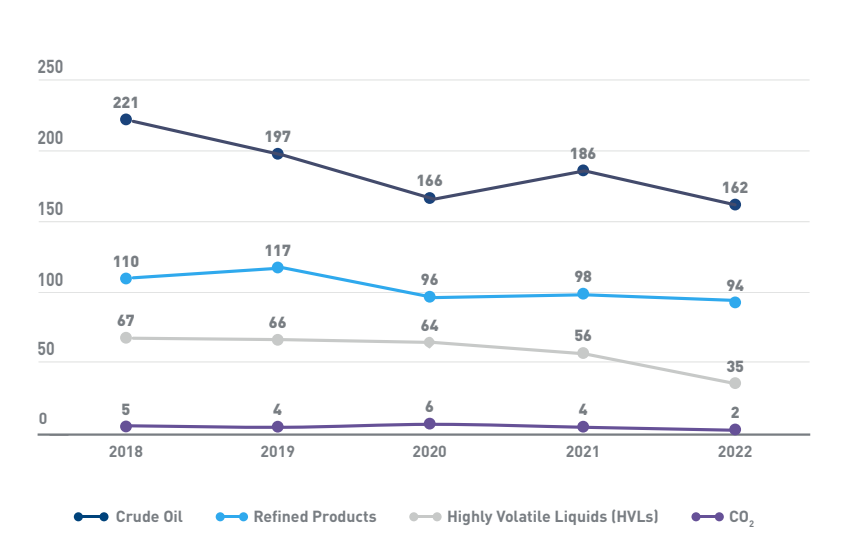
Similar to total incident trends, the majority of crude oil pipeline incidents are small in size. In 2022, 57 percent of crude oil incidents were five barrels or smaller and 77 percent of crude oil incidents were smaller than 50 barrels. Over the last five years, only 6 percent of crude oil incidents were over 500 barrels. Large crude oil releases are down 17 percent since 2018.



INCIDENTS BY COMMODITY

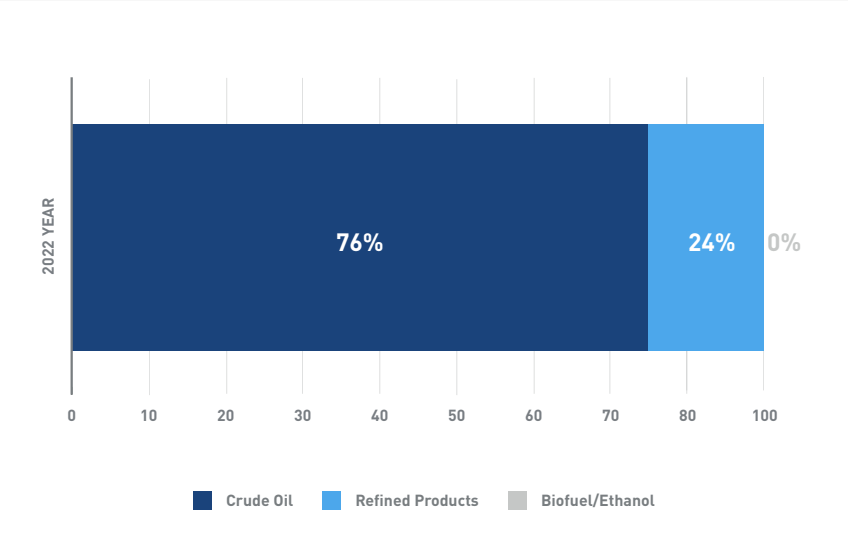
10 ALL INCIDENTS BY COMMODITY (2018-2022)

In 2022, crude oil incidents represented 55 percent of total incidents, with refined products at 32 percent and natural gas liquids at 12 percent of total incidents. The number of annual crude oil incidents is down 28 percent from 2018. Carbon dioxide pipeline incidents are down 60 percent over the last five years, with two nationwide in 2022.



11 TOTAL IPE INCIDENTS BY COMMODITY (2022)

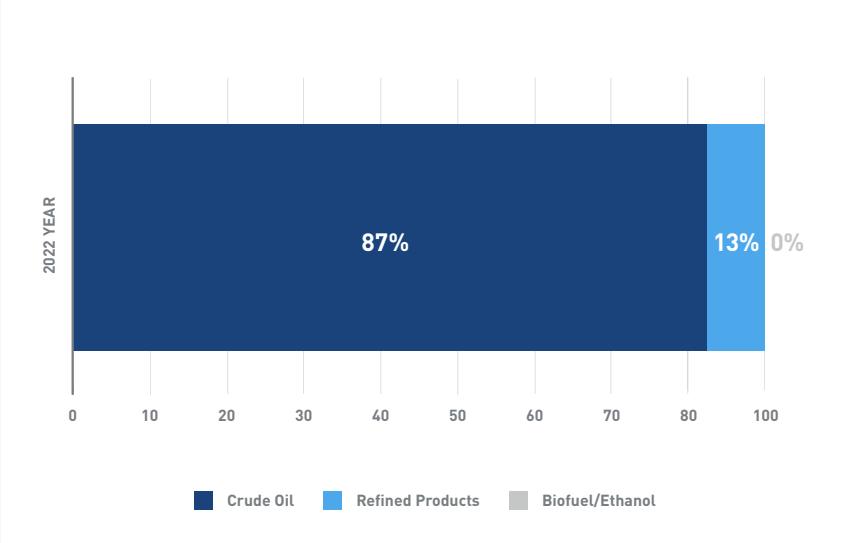
In 2022, there were 57 crude oil incidents and 18 refined products incidents impacting people or the environment. Refined products incidents impacting people or the environment are down 47 percent over the last five years.



INCIDENTS BY COMMODITY

12 PERCENT OF IPE BARRELS RELEASED BY COMMODITY (2022)

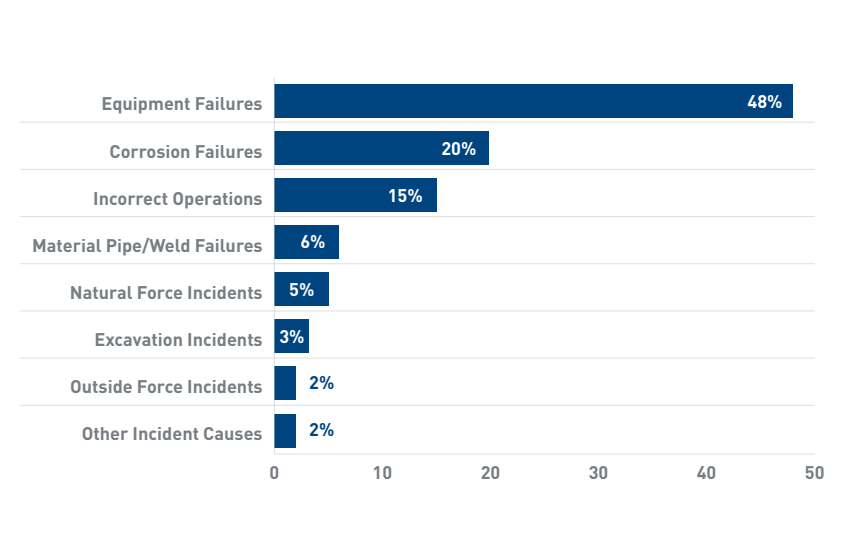
Crude oil incidents impacting people or the environment in 2022 represented 87 percent of the total, with refined products reflecting 13 percent of released barrels from liquids pipelines.



INCIDENTS BY CAUSE

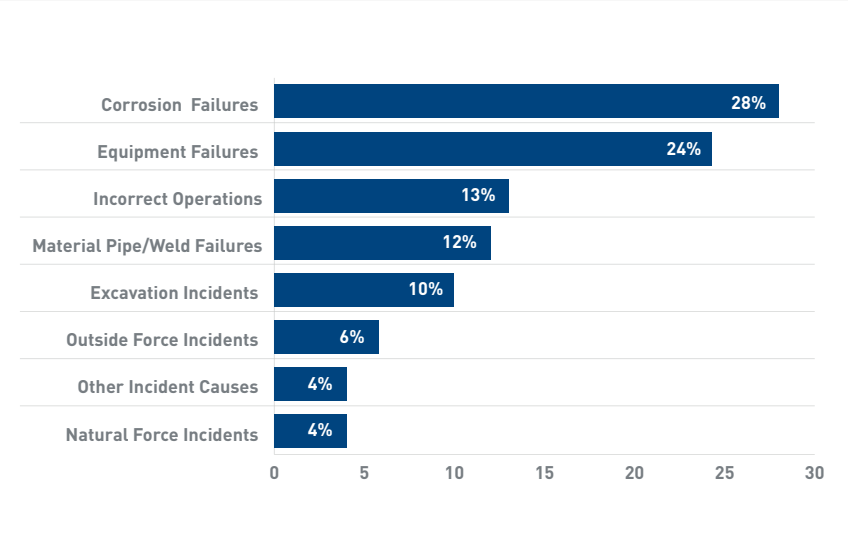
13 LIQUIDS PIPELINE INCIDENTS BY CAUSE (2018-2022)

Equipment failure is the most frequent cause of all liquids pipeline incidents. Over the last five years, equipment failure represented 48 percent of incidents, corrosion failure 20 percent and incorrect operation 15 percent. Material pipe/weld failures, which include cracking, a primary source of large volume releases, represented only 6 percent of incidents since 2018.



14 TOTAL IPE INCIDENTS BY CAUSE (2018-2022)

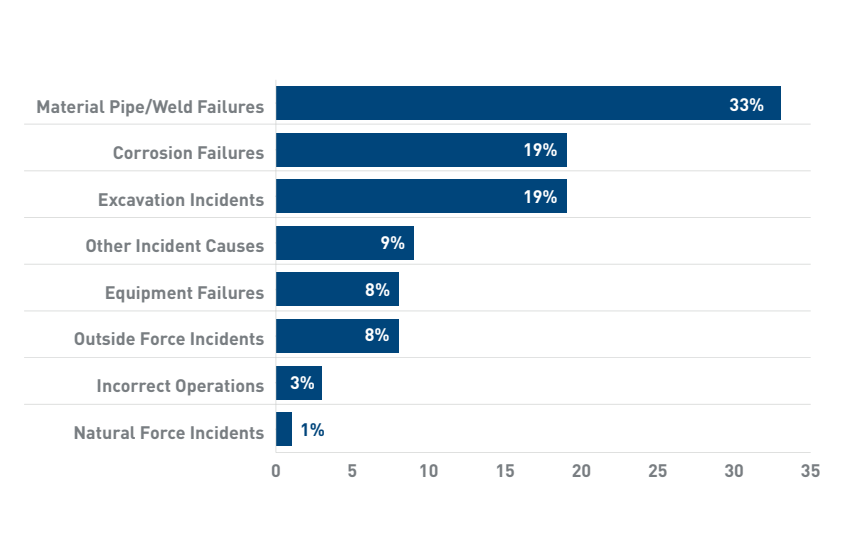
Over the last five years, corrosion failures (28 percent) were the most frequent cause of incidents impacting people or the environment, followed by equipment failure (24 percent), incorrect operation (13 percent) and material pipe/weld failures (12 percent).



INCIDENTS BY CAUSE

15 PERCENT OF IPE BARRELS BY CAUSE (2018-2022)

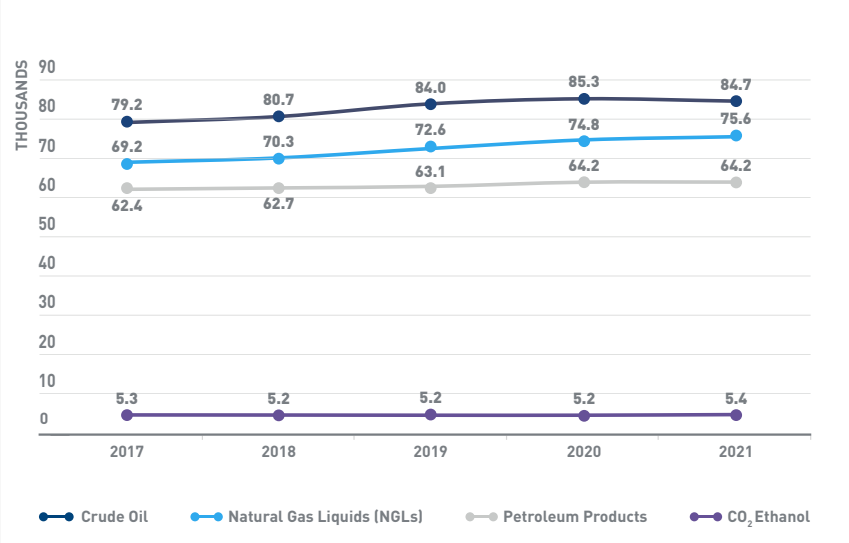
Material pipe/weld failures (33 percent) were responsible for the most barrels released in incidents impacting people or the environment, followed by excavation incidents (19 percent) and corrosion failures (19 percent).



PIPELINE MILES AND BARRELS DELIVERED

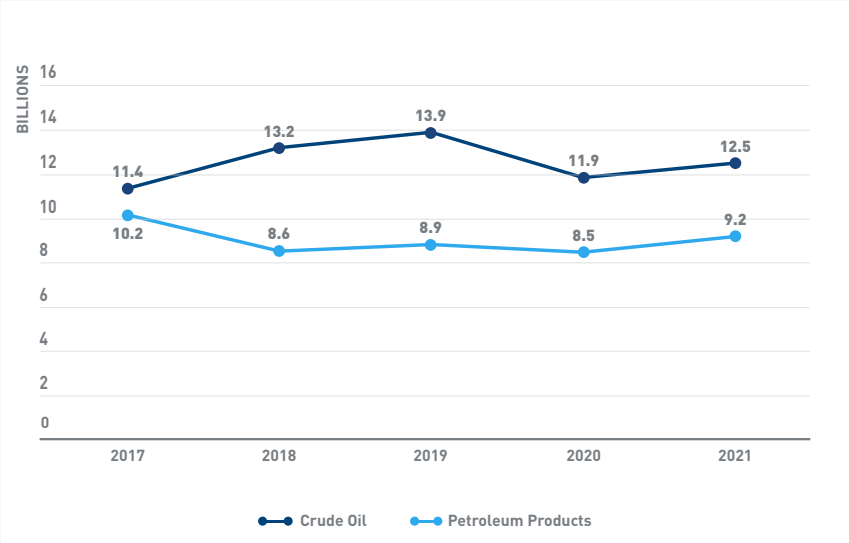
16 MILES OF U.S. PIPELINE BY PRODUCTS (2017-2021) (thousands)

At the end of 2021 (the most recent year this data is available), there were 229,888 total miles of liquids pipelines, with crude oil pipelines representing 37 percent of the total at 84,712 miles, refined products at 28 percent (64,218 miles) and natural gas liquids reflecting 33 percent (75,603 miles). Total liquids pipeline mileage is up 6 percent over the last five years, with crude oil pipeline mileage rising 7 percent (5,501 miles) and natural gas liquid mileage increasing by 9 percent (6,440 miles) between 2017 and 2021.



17 BARRELS DELIVERED BY U.S. PIPELINE (2017-2021) (billions)

In 2021, there were a total of 21,746,539,037 crude oil and refined products barrels delivered by pipeline, with crude oil representing approximately 58 percent (12,531,034,346) of the barrels delivered and refined products 42 percent (9,215,504,691) of the barrels delivered. Total barrels delivered reflect a 1 percent increase from 2017, including a 7 percent increase from 2020 barrels delivered.



DATA TABLES

KEY PERFORMANCE INDICATORS

1 TOTAL INCIDENTS VS INCIDENTS IMPACTING PEOPLE AND THE ENVIRONMENT (2018-2022)

YEAR	IPE INCIDENTS	NON-IPE INCIDENTS	TOTAL INCIDENTS
2018	89	316	405
2019	76	308	384
2020	69	264	333
2021	61	284	345
2022	75	218	293
Total Releases	**370**	**1390**	**1760**
% Change Since 2018	**-16%**	**-31%**	**-28%**

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety, March 2023

2 INTEGRITY MANAGEMENT INCIDENTS IMPACTING PEOPLE OR THE ENVIRONMENT (2018-2022)

YEAR	CORROSION FAILURE	MATERIAL FAILURE OF PIPE/WELD	PREVIOUS EXCAVATION DAMAGE	PREVIOUS OUTSIDE FORCE DAMAGE	TOTAL INCIDENTS
2018	18	14	1	1	34
2019	26	2	1	0	29
2020	16	10	0	1	27
2021	21	7	0	0	28
2022	22	10	0	0	32
Total Releases	**103**	**43**	**2**	**2**	**150**
% Change Since 2018	**22%**	**-29%**	**-100%**	**-100%**	**-6%**

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety, March 2023

DATA TABLES

KEY PERFORMANCE INDICATORS

3 OPERATIONS AND MAINTENANCE INCIDENTS IMPACTING PEOPLE OR THE ENVIRONMENT (2018-2022)

YEAR	EQUIPMENT FAILURE	INCORRECT OPERATION	EXCAVATION DAMAGE DUE TO INSUFFICIENT LOCATING PRACTICES	TOTAL INCIDENTS
2018	24	11	7	42
2019	24	11	4	39
2020	17	10	4	31
2021	11	10	1	22
2022	14	6	0	20
Total Releases	**90**	**48**	**16**	**154**
% Change Since 2018	**-42%**	**-45%**	**-100%**	**-52%**

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety, March 2023

INCIDENTS BY LOCATION

4 PIPELINE INCIDENTS INSIDE AND OUTSIDE OF OPERATOR PROPERTY (2018-2022)

YEAR	OUTSIDE OPERATOR PROPERTY	CONTAINED ON OPERATOR PROPERTY	TOTAL INCIDENTS
2018	102	300	405
2019	87	292	384
2020	88	244	333
2021	70	269	345
2022	77	207	293
Total Releases	**424**	**1312**	**1760**
% Change Since 2018	**-25%**	**-31%**	**-28%**

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety, March 2023

DATA TABLES

INCIDENTS BY LOCATION

5 PIPELINE INCIDENTS INSIDE AND OUTSIDE HCAS (2018-2022)

YEAR	OUTSIDE HCA	INSIDE HCA	TOTAL INCIDENTS
2018	229	175	404
2019	219	165	384
2020	186	147	333
2021	195	150	345
2022	187	106	293
Total Releases	**1016**	**743**	**1759**
% Change Since 2018	**-18%**	**-39%**	**-27%**

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety, March 2023Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety, March 2023

6 TOTAL INCIDENTS VS INCIDENTS IMPACTING PEOPLE AND THE ENVIRONMENT (2018-2022)

YEAR	IPE INCIDENTS	NON-IPE INCIDENTS	TOTAL INCIDENTS
2018	89	316	405
2019	76	308	384
2020	69	264	333
2021	61	284	345
2022	75	218	293
Total Releases	**370**	**1390**	**1760**
% Change Since 2018	**-16%**	**-31%**	**-28%**

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety, March 2023

DATA TABLES

INCIDENTS BY SIZE

7 LIQUID PIPELINE INCIDENTS BY SIZE (2018-2022)

YEAR	⩽ 5 BBLS	> 5 AND ⩽ 50 BBLS	> 50 AND ⩽ 500 BBLS	> 500 BBLS	TOTAL INCIDENTS
2018	262	73	44	26	405
2019	245	80	41	18	384
2020	206	73	40	14	333
2021	229	60	34	22	345
2022	170	59	41	23	293
Total Releases	**1112**	**345**	**200**	**103**	**1760**
% Change Since 2018	**-35%**	**-19%**	**-7%**	**-12%**	**-28%**

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety, March 2023

8 INCIDENTS IMPACTING PEOPLE OR THE ENVIRONMENT BY SIZE (2018-2022)

YEAR	⩽ 5 BBLS	> 5 AND ⩽ 50 BBLS	> 50 AND ⩽ 500 BBLS	> 500 BBLS	TOTAL INCIDENTS
2018	31	19	21	18	89
2019	28	20	15	13	76
2020	27	18	18	6	69
2021	23	15	13	10	61
2022	19	24	18	14	75
Total Releases	**128**	**96**	**85**	**61**	**370**
% Change Since 2018	**-39%**	**26%**	**-14%**	**-22%**	**-16%**

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety, March 2023

DATA TABLES

INCIDENTS BY SIZE

9 CRUDE OIL INCIDENTS BY SIZE (2018-2022)

YEAR	⩽ 5 BBLS	> 5 AND ⩽ 50 BBLS	> 50 AND ⩽ 500 BBLS	> 500 BBLS	TOTAL INCIDENTS
2018	148	42	19	12	221
2019	119	46	18	14	197
2020	100	42	20	4	166
2021	123	36	19	8	186
2022	93	32	27	10	162
Total Releases	**583**	**198**	**103**	**48**	**932**
% Change Since 2018	**-37%**	**-24%**	**42%**	**-17%**	**-27%**

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety, March 2023

INCIDENTS BY COMMODITY

10 ALL INCIDENTS BY COMMODITY (2018-2022)

YEAR	CRUDE OIL	REFINED PRODUCTS	HIGHLY VOLATILE LIQUIDS (HVLS)	CO_2	BIOFUEL/ ETHANOL	TOTAL INCIDENTS
2018	221	110	67	5	2	405
2019	197	117	66	4	0	384
2020	166	96	64	6	1	333
2021	186	98	56	4	1	345
2022	162	94	35	2	0	293
% Change Since 2018	**-27%**	**-15%**	**-48%**	**-60%**	**-**	**-28%**

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety, March 2023

DATA TABLES

INCIDENTS BY COMMODITY

11 TOTAL INCIDENTS IMPACTING PEOPLE OR THE ENVIRONMENT BY COMMODITY (2018-2022)

YEAR	CRUDE OIL	REFINED PRODUCTS	BIOFUEL/ETHANOL
2018	55	34	0
2019	51	25	0
2020	37	31	1
2021	36	24	1
2022	57	18	0
% Change Since 2018	4%	-47%	0%

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety, March 2023

12 PERCENT OF INCIDENTS IMPACTING PEOPLE OR THE ENVIRONMENT BARRELS RELEASED BY COMMODITY (2018-2022)

YEAR	CRUDE OIL	REFINED PRODUCTS
2018	53%	47%
2019	70%	30%
2020	10%	90%
2021	55%	45%
2022	87%	13%
% Change Since 2018	34%	-34%

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety, March 2023

DATA TABLES

INCIDENTS BY CAUSE

13 LIQUID PIPELINE INCIDENTS BY CAUSE (2018-2022)

CAUSE	TOTAL INCIDENTS	PERCENTAGE
Equipment Failures	843	48%
Corrosion Failures	345	20%
Incorrect Operations	261	15%
Material Pipe/Weld Failures	98	6%
Natural Force Incidents	87	5%
Excavation Incidents	51	3%
Outside Force Incidents	40	2%
Other Incident Causes	35	2%
Total	**1760**	**100%**

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety, March 2023

14 TOTAL INCIDENTS IMPACTING PEOPLE OR THE ENVIRONMENT BY CAUSE (2018-2022)

CAUSE	TOTAL INCIDENTS	PERCENTAGE
Corrosion Failures	103	28%
Equipment Failures	90	24%
Incorrect Operations	48	13%
Material Pipe/Weld Failures	43	12%
Excavation Incidents	37	10%
Outside Force Incidents	22	6%
Other Incident Causes	14	4%
Natural Force Incidents	13	4%
Total	**370**	**100%**

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety, March 2023

INCIDENTS BY CAUSE

15 BARRELS RELEASED IMPACTING PEOPLE OR THE ENVIRONMENT BY CAUSE (2018-2022)

CAUSE	BARRELS RELEASED	PERCENTAGE
Material Pipe/Weld Failures	76,428	33%
Corrosion Failures	44,060	19%
Excavation Incidents	42,788	19%
Other Incident Causes	20,165	9%
Equipment Failures	17,976	8%
Outside Force Incidents	17,361	8%
Incorrect Operations	6,930	3%
Natural Force Incidents	2,792	1%
Total	**228,500**	**100%**

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety, March 2023

DATA TABLES

PIPELINE MILES AND BARRELS DELIVERED

16 MILES OF U.S. PIPELINE BY PRODUCT (2017-2021)

	2017	2018	2019	2020	2021
Crude Oil	79,211	80,741	84,015	85,307	84,712
Petroleum Products	62,369	62,720	63,117	64,187	64,218
Natural Gas Liquids (NGLs)	69,163	70,269	72,632	74,794	75,603
CO_2/Ethanol	5,252	5,221	5,164	5,167	5,356
Total Miles	**215,995**	**218,951**	**224,928**	**229,454**	**229,888**

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety, March 2023

17 BARRELS DELIVERED BY U.S. PIPELINE (2017-2021)

	2017	2018	2019	2020	2021
Crude Oil	11,382,453,374	13,235,435,698	13,935,745,435	11,874,328,801	12,531,034,346
Petroleum Products	10,189,745,566	8,558,867,781	8,856,466,147	8,509,216,644	9,215,504,691
Total Barrels	**21,572,198,940**	**21,794,303,479**	**22,792,211,582**	**20,383,545,445**	**21,746,539,037**

Source: U.S. Federal Energy Regulatory Commission

APPENDIX

DEFINITIONS & NOTES

BARRELS

One barrel of crude oil or petroleum products is equivalent to 42 gallons.

BARRELS RELEASED

PHMSA requires operators to report intentional releases of natural gas liquids in gas form into the atmosphere during maintenance activities. Unintentionally released barrels of crude oil and petroleum products form the basis of "barrels released" data and analysis in this report. This process displaces residual hydrocarbons in gas state from the section of pipeline set to undergo maintenance. Barrels released data in this report does not include intentional blowdown releases.

IN-LINE INSPECTION DEVICE, OR "SMART PIG"

An in-line inspection (ILI) device, commonly referred to as a "smart pig," is a diagnostic tool that travels inside the pipeline scanning the pipe walls for imperfections and recording the data for later analysis.

NATURAL GAS LIQUIDS

Petroleum products that are liquids when traveling through a pipeline under high pressure and gases at atmospheric pressure are generally referred to as natural gas liquids (NGLs). Examples of NGLs transported by pipeline include propane, ethane and butane. They occur naturally in petroleum deposits and are produced along with crude oil or natural gas (methane). NGLs are separated from crude oil and natural gas after production and sent to manufacturers (ethane, butane) as an industrial raw material to produce consumer goods such as polymers, fertilizers and home goods, or for other commercial, agricultural or residential uses (propane).

INCIDENTS IMPACTING PEOPLE OR THE ENVIRONMENT (IPE) CRITERIA

If the criteria in either tier below is met for a crude oil or refined products pipeline, the incident counts as IPE:

TIER 1: Regardless of location of incident: fatality; injury requiring inpatient hospitalization; ignition; explosion; evacuation; wildlife impact; water contamination (ocean/seawater, groundwater or drinking water); or public/non-operator private property damage.

TIER 2: For location of incident "not totally contained on operator-controlled property": unintentional release volume greater than or equal to five gallons and in an HCA; unintentional release volume greater than or equal to five barrels and outside of an HCA; water contamination; or soil contamination.

PHMSA INCIDENT REPORTING

Pipeline operators regulated by PHMSA are required to report data related to pipeline incidents, including location, cause and consequences. PHMSA compiles this information in a publicly available online database. The pipeline safety data used in this report was obtained from PHMSA in March 2023

RECOMMENDED PRACTICE

Documents that communicate proven industry practices. RPs may include both mandatory and nonmandatory provisions.

REFINED PRODUCTS

Products derived from the process of refining crude oil. Examples of refined products include gasoline, kerosene and lubricating oil.

CRUDE OIL

Includes condensate, light, medium and heavy unrefined hydrocarbons extracted from underground petroleum formations.


DANGER
WATCH
YOUR TOES
CAUTION

LIQUID ENERGY PIPELINE ASSOCIATION

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