INGAA Climate Report

NOVEMBER 2021

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A Message from INGAA President and CEO

Natural gas serves as the foundation to nearly every aspect of our daily lives, and the members of the Interstate Natural Gas Association of America (INGAA) firmly believe that natural gas has and will continue to play a critical role in building a clean energy future. Natural gas is vital to our economy and its increased use has contributed to historic reductions in greenhouse gas (GHG) emissions. In short, natural gas is an economic and environmental winner.

At INGAA, we support regulatory and legislative solutions for the natural gas pipeline industry in North America. Our members operate nearly 200,000 miles of natural gas pipelines, representing the vast majority of the interstate natural gas transmission in the U.S. and Canada.

For years our members have worked to reduce methane emissions from their operations, and INGAA members will lead the effort to modernize our nation's energy infrastructure to meet the dual goals of reducing emissions and continuing to deliver affordable, clean energy safely and reliably to households and businesses.

Earlier this year, INGAA members issued a climate statement outlining our commitment to continuing to improve our operations, aided by necessary technology advancements and sound public policies, to be part of the clean energy future. Among other things, our members committed to: working together as an industry towards reaching net-zero GHG emissions from natural gas transmission and storage operations by 2050; reducing the carbon intensity of our operations through the adoption of innovative technologies; and supporting the continued growth of renewable energy.

INGAA's 2021 climate commitments are the next step on our industry's climate journey and demonstrate our member's dedication to environmental progress and desire to work closely with policymakers, researchers, and other stakeholders to deliver a cleaner and more affordable energy future. Members of INGAA have already made important strides in reducing methane emissions, including adopting INGAA's methane commitments in 2018, engaging in voluntary programs and coalitions facilitated by regulators or industry groups, and conducting research and analysis to better understand and calculate methane emissions from natural gas infrastructure.

These efforts are succeeding. Thanks to the natural gas pipeline industry's work and the deployment of advanced technologies, GHG emissions from the transmission and storage sector have declined by more than one-third since 1990. This report provides an overview of some of our progress and highlights many of the actions our members have taken to-date to reduce GHG emissions from natural gas infrastructure.

This report will be the first of many, demonstrating our commitment to transparently communicate our efforts to address the challenge of global climate change. INGAA members are committed to reducing emissions while providing clean, reliable, and affordable energy to all Americans. With this report, in conjunction with other efforts, we hope to foster collaboration and information sharing across our industry that will lead to further improvements and ultimately help deliver the clean energy future we all support.

Sincerely,

Amy Andryszak
President and CEO of INGAA and the INGAA Foundation

INGAA's Climate Statement

INGAA members have worked for years to reduce methane emissions from the U.S. natural gas transmission and storage network. In 2018, INGAA established voluntary commitments to further reduce methane emissions from natural gas transmission and storage (T&S) facilities while maintaining pipeline integrity, ensuring safe operations, and minimizing environmental impacts.

INGAA and its members recognize the need to build upon these efforts and to further address global climate change. As a result, in January 2021, INGAA announced a set of stronger climate commitments, including a commitment to work together as an industry to reach net-zero GHG emissions from our members' T&S assets by 2050. These commitments reflect the consensus of the INGAA membership and are memorialized in INGAA's Climate Statement.

INGAA's members address climate change by modernizing our nation's interstate natural gas delivery network infrastructure with a goal of reducing emissions and helping minimize the impact on our climate. INGAA's commitments include supporting the growth of renewable energy as well as investing in new and innovative technologies and process enhancements that will further reduce emissions. Working together as an industry, INGAA and its members will support sound public policies that protect the environment while ensuring a safe, reliable, and resilient energy transmission system that delivers affordable energy to homes and businesses across the country.

Members of INGAA are committed to:

- Reducing GHG emissions from their natural gas T&S operations.
- Setting and meeting individual company emission reduction goals.
- Working as an industry towards reaching net-zero GHG emissions from natural gas T&S operations by no later than 2050, supported by necessary technology advancements and sound public policies.
- Providing consistent and transparent data collection, measurement, and reporting of GHG emissions from operations to demonstrate that INGAA members are making actionable progress to achieve our shared climate goals.
- Both reducing the carbon intensity of our natural gas infrastructure operations and supporting the reduction of net global GHG emissions by adopting and investing in the transportation and storage of innovative low- or zero-carbon solutions, such as renewable natural gas (RNG), hydrogen, carbon capture and storage, and others.
- Working together with customers, governments, non-governmental organizations, and other stakeholders to accelerate efforts to reduce and minimize all GHG emissions across the entire natural gas value chain through the adoption of innovative solutions.
- Investing in responsible environmental stewardship and practices as part of our efforts to modernize our nation's natural gas infrastructure, including supporting meaningful and positive engagement with the communities in which we operate.

INGAA's Climate Statement does not replace the organization's 2018 Methane Commitments but complements those commitments by expanding the scope of our focus beyond just methane emissions. In addition to these commitments, INGAA supports federal new and existing source methane standards, including reinstituting the U.S. Environmental Protection Agency's (EPA) New Source Performance Standards OOOOa. Furthermore, INGAA supported the inclusion of methane emissions reduction provisions in the Protecting Our Infrastructure of Pipelines and Enhancing Safety (PIPES) Act of 2020 and will continue working with the Pipeline and Hazardous Materials Safety Administration (PHMSA) on developing sound regulations to minimize methane emissions from pipeline maintenance activities and leaks.

INGAA's Climate Statement is intended to be flexible and provide our individual member companies the opportunity to take the specific steps that work for their organizations. INGAA and its members recognize that climate change is an extremely complex issue and updates to our climate statement will be necessary as new technological solutions are developed and constructive energy policies are implemented. INGAA's Climate Statement applies to the direct emissions from our members' natural gas T&S operations (Scope 1 emissions).

INGAA hopes these commitments will assist regulators and lawmakers as they develop new energy and climate change policies that encourage innovation, support investment in our country's interstate natural gas transmission network and benefit the environment.

Progress on Reducing Emissions

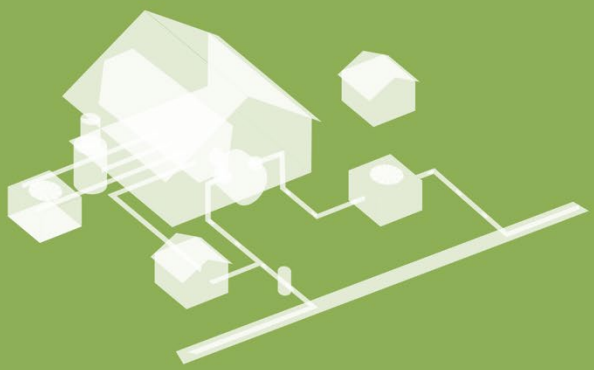
Minimizing GHG emissions isn't just a goal; it's something the natural gas industry has made demonstrable progress on. According to the EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks, between 1990 and 2019, total GHG emissions from the natural gas transmission and storage sector decreased by 33.4% even as demand for natural gas increased by 49%. INGAA's members played an important part in that progress, making significant strides to minimize GHG emissions across their individual operations and assets.

Between 1990-2019, total GHG emissions from the natural gas transmission and storage sector decreased by 33.4%

Owners or operators of petroleum and natural gas systems that emit 25,000 metric tons or more of GHGs per year (expressed as carbon dioxide equivalents) must report their emissions data to EPA under Subpart W and Subpart C of the GHGRP.

INGAA's analysis of emissions reported under Subpart W of the GHGRP from compressor stations found that between 2011 and 2019, the average methane emissions from transmission and storage natural gas compressor stations decreased by 31 percent, even though the number of reporting facilities increased from 465 to 661.

This is just one example of INGAA members' commitment to continuous improvement to minimize methane emissions. Through ongoing work between companies, regulators and other stakeholders, the natural gas transmission and storage industry will continue to provide clean, affordable energy to businesses and families across the country.



Compressor stations **increase from**

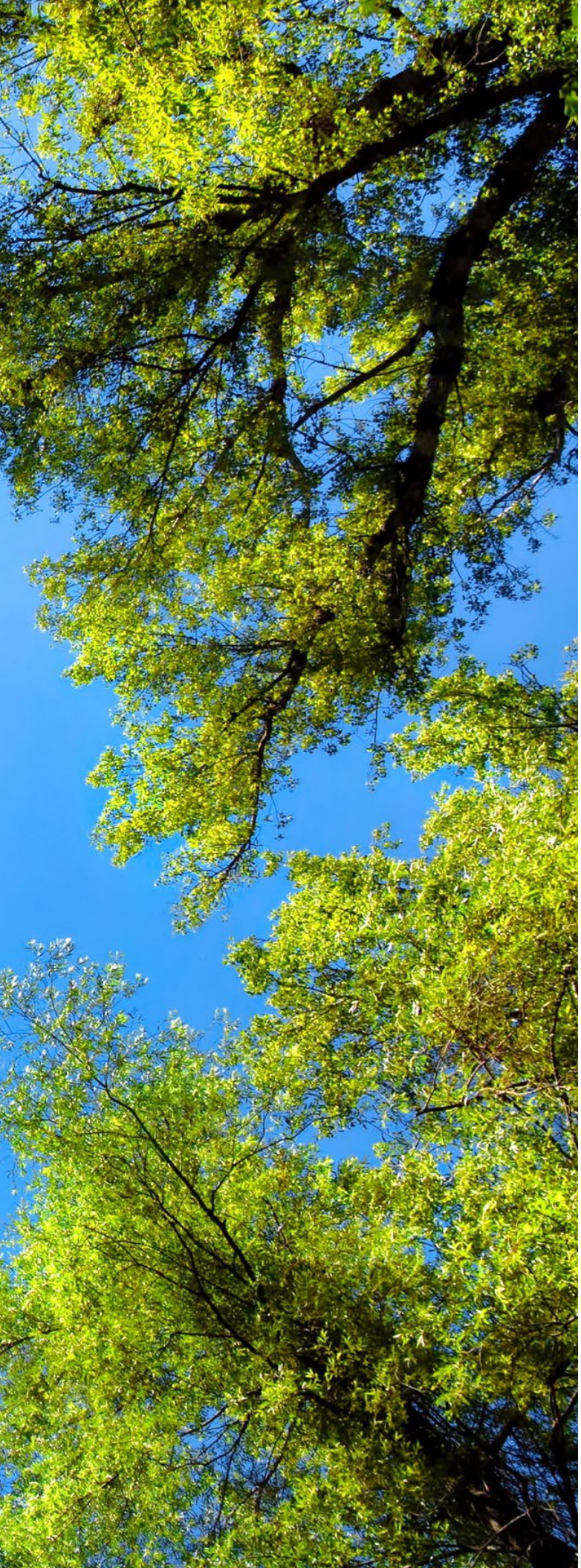
465 to **661**

Average methane emissions from a compressor station down

31%

These reductions are equivalent to removing **over 1.5 million** passenger vehicles from the road.

2011 2019



Methane Emissions Reporting

INGAA's members recognize the importance of transparently and consistently demonstrating progress towards achieving our shared climate goals. For that reason, members of INGAA are committed to providing regular and transparent data collection, measurement, and reporting of GHG emissions from their operations. Our members report GHG data to EPA under the GHGRP, as well as in compliance with state programs.

Although state and federal emissions data are publicly available, INGAA's members recognize that some stakeholders desire to compare emissions between companies. Given the differences between the sizes of companies and the amount of natural gas that they transport, a comparison of raw emissions data is not always useful.

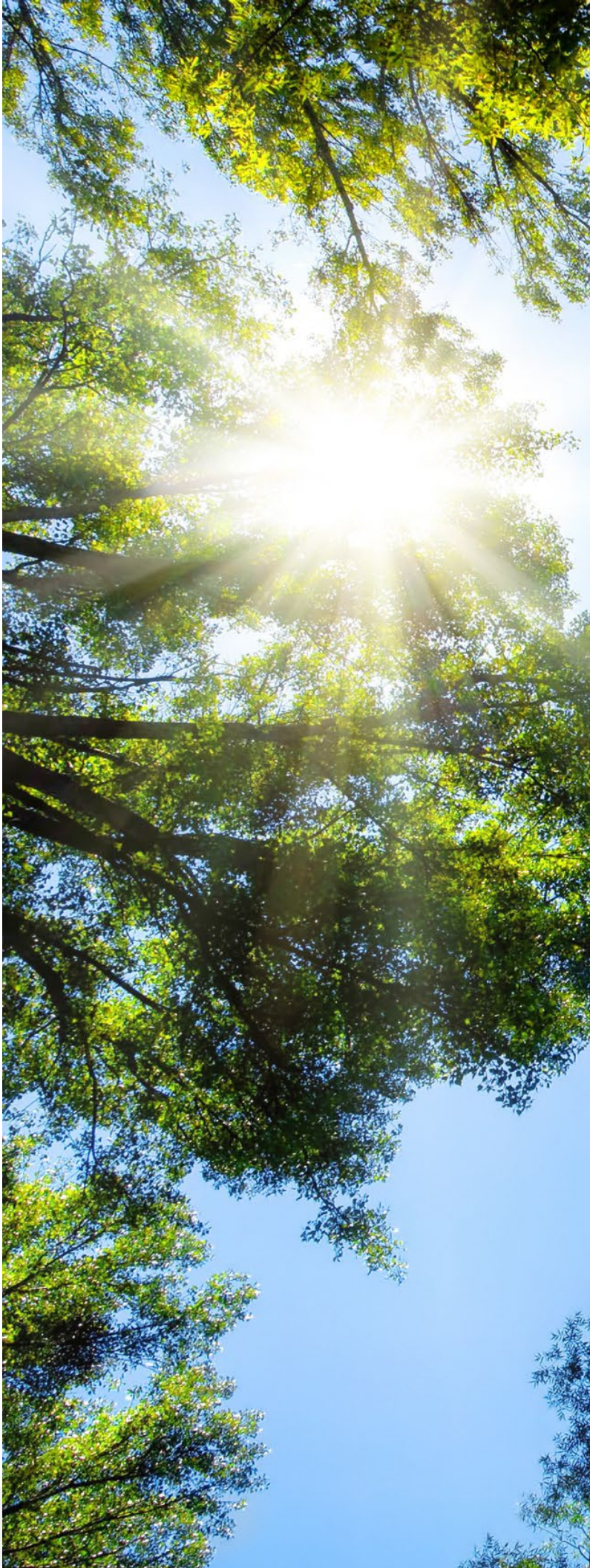
To address this concern, the Natural Gas Sustainability Initiative (NGSI) developed an industry-wide approach to calculate individual company methane emissions intensity, which is a measure of methane emissions relative to natural gas throughput. The voluntary initiative was created through a collaboration between the Edison Electric Institute (EEI) and the American Gas Association (AGA) so that investors, customers, environmental groups and other stakeholders know that a consistent methodology was used to calculate a company's methane emissions intensity.

INGAA submitted recommendations to NGSI, in conjunction with the ONE Future coalition to calculate the methane emissions intensity from the transmission and storage sector. The central focus of INGAA's recommendation was what throughput value transmission and storage companies should use to calculate methane emissions intensity given that the interconnected nature of the natural gas pipeline network creates a high likelihood that the same natural gas molecules may be handled by several T&S companies.

Informed by INGAA and ONE Future's recommendation, NGSI's February 2021 version of the protocol uses PHMSA throughput data when calculating methane emissions intensity for transmission and storage companies.

NGSI participants are expected to disclose total methane emissions (in metric tons) associated with the T&S segment, total natural gas transported (thousand standard cubic feet), the methane content (as a percentage) of the transported natural gas, and the methane emissions intensity (as a percentage) as calculated under NGSI's protocol.

To-date, our industry has made important progress in reducing the natural gas supply chain's impact on the environment and INGAA members are committed to building upon these efforts. INGAA supports NGSI's work to provide a standardized reporting framework to demonstrate the industry's commitment to transporting natural gas in a safe, secure, and environmentally conscious manner. Reducing both the intensity and the overall emissions will be critical as economies around the world transition to a clean energy future.



Methane Emissions Programs & Initiatives

Minimizing methane emissions remains a focus for INGAA member companies. Many INGAA members participate in voluntary programs and initiatives focused on minimizing methane emissions, communication and collaboration across the natural gas value chain, and driving new and innovative technologies and processes. Some of these programs include: EPA's Natural Gas STAR Program, EPA's Methane Challenge Program, ONE Future Coalition, the Environmental Partnership, Methane Guiding Principles, Stanford Natural Gas Initiative, and the Business Roundtable.

EPA's Natural Gas STAR Program

The Natural Gas STAR Program provides a framework for partner companies to implement methane emissions reducing technologies and practices across operations and document voluntary emission reduction activities. Partners are committed to developing a company specific approach to methane emissions and annually evaluating cost-effective methane emission reduction opportunities. More than 60 companies from all segments of the industry— production, gathering, transmission and storage, and distribution participate in the program.

INGAA member participants: BHE GT&S; Boardwalk Pipelines, DTE Energy, Duke Energy, Enable Midstream, Enbridge, Iroquois, Kinder Morgan, National Grid, ONEOK, Inc., PG&E, Sempra LNG, Southern Company Gas, TC Energy, UGI Energy Services and Williams.

EPA's Methane Challenge Program

Members of EPA's Methane Challenge Program are committed to transparently reporting systematic and comprehensive actions to reduce methane emissions through one or both of the program's frameworks: Best Management Practice Commitment and the ONE Future Emissions Intensity Commitment. Both options seek to mitigate methane emissions across the natural gas value chain. Methane Challenge Program partners also engage with members of the Natural Gas STAR Program to share information, technologies, and best practices among peers.

INGAA member participants: BHE GT&S, DTE Energy, DT Midstream, Duke Energy, Iroquois, Kinder Morgan, National Fuel Gas Supply, National Grid, PG&E, Sempra LNG, Southern Company Gas, Spire, TC Energy, and UGI Energy Services.

ONE Future Coalition

ONE Future Coalition members agree to segment-specific emissions intensity targets that inform a collective goal of reducing methane emissions associated with the production, processing, transmission, and distribution of the U.S. onshore natural gas value chain to 1 percent or less by 2025. Each industry segment's reduction target is determined by its proportional share of current emissions that can be abated cost-effectively. The 2025 target for transmission and storage is 0.31 percent. The ONE Future members have achieved the target well ahead of schedule with a 2019 total emissions intensity of 0.334% and the T&S sector's methane intensity of 0.112%.

INGAA member participants: BHE GT&S, Boardwalk Pipelines, DT Midstream, Duke Energy, Equitrans Midstream, Enbridge, Kinder Morgan, National Grid, Southern Company Gas (distribution sector), Southern Star Central Gas Pipeline, Spire, TC Energy, Williams, and UGI Energy Services.

The Environmental Partnership

The Environmental Partnership, a program of the American Petroleum Institute, works to continuously improve the oil and natural gas industry's environmental performance through technically feasible and commercially proven solutions that will result in significant emissions reductions. The partnership provides a forum for members to share information, analyze best practices, and share technological breakthroughs.

INGAA member participants: Enbridge, Equitrans Midstream, TC Energy and Williams.

Methane Guiding Principles

Methane Guiding Principles is a voluntary, international multi-stakeholder partnership between industry and non-industry organizations related to the natural gas value chain. The group developed the Methane Policy Framework, which sets out the key elements of an effective policy framework focused on ensuring ambitious methane reduction outcomes are met.

INGAA member participant: TC Energy.

Stanford Natural Gas Initiative

The Stanford Natural Gas Initiative is a collaboration of more than 40 research groups at Stanford University drawn from engineering, science, policy, geopolitical, and business disciplines that works with a consortium of industry partners and other external stakeholders to generate the knowledge needed to use natural gas to its greatest social, economic, and environmental benefit. The initiatives include evaluating the development of new technology to better identify, locate and quantify methane emissions; the development of cost-effective carbon capture, use and sequestration systems and using the natural gas infrastructure to facilitate increased utilization of hydrogen.

INGAA member participants: Kinder Morgan and PG&E.

Business Roundtable Principles and Policies for Addressing Climate Change

The Business Roundtable has developed a set of principles and policies using a market-based approach to addressing climate change. This includes an emissions reduction strategy that implements a price on carbon where environmentally and economically effective and administratively feasible. Participants support preserving U.S. business competitiveness while encouraging greater efficiency, technological innovation, and the deployment of low-, no- and negative- emissions technology necessary to reduce GHG emissions by at least 80 percent by 2050.

INGAA member participants: Duke Energy, NextEra Energy, Sempra Energy, Southern Company (parent company of Southern Company Gas), and Williams.

Pipeline Research Council International (PRCI)

INGAA members are proud to partner with Pipeline Research Council International (PRCI) to advance collaborative research of innovative technologies and practices to enhance safety and minimize emissions within the pipeline industry. PRCI is a community of the world's leading pipeline companies, and the vendors, service providers, equipment manufacturers, and other organizations supporting the energy pipeline industry.[1] Since 1952, PRCI has been recognized around the world as a unique forum within the industry delivering value through the development and deployment of research solutions to improve pipeline safety and performance. PRCI's mission is to collaboratively deliver relevant and innovative applied research to continually improve the global energy pipeline systems.

As the natural gas industry strives to attain net zero GHG emission, there are a number of key areas in which INGAA members and PRCI are partnering to lower overall GHG emissions and reduce the environmental impact of the global pipeline infrastructure. PRCI has established a GHG Emissions Reduction Strategic Research Priority to address these issues, as a three-year, $4 million initiative that builds upon many years of research in this arena. The research will explore the following areas: analytic tools and data analysis, fugitive emissions/leak detection surveys and mitigation, leak detection and quantification, incomplete combustion from reciprocating engines (methane slip), blowdown reduction through capture, recovery, and flaring, and efficiency improvements.

The desired outcomes of this research will include:

- Developing an economic prioritization model/tool to help identify the GHG reduction efforts that provide the largest reduction in GHG emissions relative to implementation costs.
- Increasing the efficiency of both compression driver and driven equipment.
- Developing tools and methods to ensure compressor and other equipment is operating to reduce natural gas blowdowns associated with pipeline maintenance and equipment shutdowns.
- Reducing fugitive leaks through compressor rod packing, gas seals, and isolation/blowdown/dump valves.
- Developing enhanced natural gas leak detection/quantification methods; "quantification" could include "qualification" methods that, at a minimum, categorize leaks based on action/response levels (e.g., timing of repair, ongoing monitoring for leak growth).
- Enhancing leak mitigation programs to focus on efficiently implementing alternatives to conventional regulatory leak detection and repair (LDAR) programs, including practices that implement technology advancements.

[1] INGAA members that are PRCI members: BHE GT&S, Boardwalk Pipelines, Enbridge, Kinder Morgan, National Fuel Gas Supply corporation, National Grid, PG&E, TC Energy, and Williams.

Developing alternatives to natural gas pneumatic control and actuation devices, and/or assessing the feasibility of, or optimization of, current alternatives (i.e., electric actuators, intermittent versus continuous bleed devices, compressed air systems, etc.).

Another area of research PRCI is undertaking to assist the industry in achieving net zero GHG emissions is enabling the transition to the next generation of fuels. In 2021, PRCI established the Emerging Fuels Institute (EFI) to solve the technical issues around the transportation and storage of hydrogen, renewable natural gas, and other fuels. There are many technical challenges that need to be addressed for the next generation of fuels, and the EFI will play a key role in assisting the industry to safely manage the changes in transporting and storing these products. PRCI has two additional efforts to advance the energy transition and complement EFI. The first is the establishment of the global emerging fuels initiative which brings together leaders from around the world to understand what is being done and what is planned. The other is a series of roundtable discussions with key government agencies in the U.S. and Canada. These efforts provide an insight into the current activities and future work in this area.

Areas the EFI will initially focus on are:

1. What advancements in materials, design, and processes are needed for retrofitting the pipeline systems for transport;
2. How to ensure the integrity of inspection tools with new fuels; and
3. How to address the challenges associated with storing hydrogen using current assets.

Member-Specific Targets & Initiatives

Through ongoing partnership between companies, regulators and policy makers, the natural gas industry will continue to advance our collective understanding of greenhouse gas emissions and identify additional opportunities to minimize and mitigate these emissions across operations. Investments in and the adoption of innovative technologies will continue to drive down GHG emissions in the natural gas industry. Reducing both the intensity and overall emissions will be critical as economies around the world transition to a lower carbon future.

INGAA members are committed to being part of the clean energy future. As detailed in the following section our members are aggressively pursuing initiatives that will help push the energy transition forward. INGAA companies are working to reduce GHG emission for their transportation and storage operations, and a number have established specific net-zero targets. Beyond emissions reductions from operations, our members are investing in many other initiatives to support the transition to a clean energy future. These initiatives include enabling the growth of renewable natural gas (RNG), research into hydrogen as a zero carbon fuel, building carbon capture, utilization and storage projects, and other initiatives to ensure that natural gas continues to be a foundation of the clean energy landscape.

Below are some specific examples of efforts our members are pursuing to reduce GHG emissions.

Reducing Methane & CO_2 Emissions from Operations

Although new technology will be necessary for the transmission and storage sector to achieve net-zero GHG emissions, there are numerous steps that companies can take now to reduce methane and CO_2 emissions from their operations.

For example, actions INGAA members are taking to minimize methane emissions include:

⇒ Reducing blowdown emissions by lowering line pressure before conducting planned pipeline maintenance.

⇒ Routing compressor blowdown gas into a vent gas recovery system.

⇒ Conducting leak surveys along the pipeline, at compressor stations, natural gas storage wellheads, metering and regulating stations and taking corrective measures.

⇒ Replacing rod packing on reciprocating compressors.

⇒ Identifying and replacing high-bleed pneumatic devices with low- or no- bleed devices.

⇒ Assessing pipeline and storage well integrity to detect potential defects and leaks that require corrective actions.

Below are additional examples of technologies and practices that individual INGAA members are pursuing to reduce GHG emissions from their operations.

- **Boardwalk Pipelines** utilizes a variety of strategies and practices to reduce emissions associated with the transportation and storage of natural gas in its systems. These include: modifying fuel systems to lower fuel consumption and emissions on key reciprocating compression equipment; replacing reciprocating engines with turbines and installing electric driven compressors where appropriate; upgrading compressor engine operational controls to maintain pressurized or standby status; conducting regular emissions testing and leak surveys on existing equipment, tracking and tagging all leaks discovered during surveys, and performing maintenance and repairs on identified component leaks; conducting emissions testing and leak surveys on newly constructed compressor stations to identify and repair leaks; replacing compressor rod packing; installing repair sleeves and composite wraps to avoid pipeline blowdowns; using in-line drawdown and portable compression to lower pressure before pipeline blowdowns when applicable; using portable flares when applicable; using hot taps for in-service pipe; replacing leaking valves and fittings on pipelines; and replacing all high bleed natural gas pneumatic devices with low or zero flow bleed devices.

- To meet its net zero aspiration, **DT Midstream** is utilizing best practices and innovative technologies to reduce emissions. DT Midstream employs the EPA methane release mitigation best practices including lowering line pressure before blow downs to minimize venting, flaring where available and utilization of hot taps. To further reduce methane emissions, DT Midstream is investing in methane reducing technologies such as vent control devices, electric glycol pumps, and pneumatic instrument replacement. Additionally, it is currently transitioning to renewable energy powered electric compression where feasible.

- To reach its methane emissions goals, in addition to having replaced all its bare steel and cast-iron pipe, **Duke Energy** plans to add advanced methane leak detection technologies to improve measurement and

monitoring of methane emissions, including the use of satellite technology; add technology to avoid emissions from blowdowns and flaring; develop a technology platform to measure and track actual methane emissions; and work with the industry to achieve reductions in upstream methane emissions.

- To reach its emissions goals, **Enbridge** has identified several initiatives that are aligned with its current strategy and longer-term business plans. Enbridge will modernize and apply innovative technology to existing infrastructure to increase efficiency and reduce emissions, build and operate renewable "self-power" generation facilities to reduce emissions related to the energy consumed by operations, and procure low-emission power. And finally, Enbridge will develop or acquire offsets where necessary to balance residual emissions to achieve net-zero.

- **Enable Midstream Partners** adjusted its procedures to reduce emissions by lowering pipeline pressure prior to maintenance, rerouting blowdown gas to be used as fuel, and deploying electric compression. The company is replacing high bleed natural gas pneumatic devices with low or zero bleed devices (where possible) and uses solar panels to power thousands of its gas meters.

- To reach its emissions goals, **Equitrans** continues to develop and enhance its targeted mitigation plan, which outlines specific steps to realize emission reductions. As a starting point, Equitrans established a goal to reduce 2021 methane emissions from pneumatic devices by 40%, as compared to 2019 baseline emissions. Pneumatic devices were selected as a target for methane reductions as these sources are one of the largest methane emitters for the company. The project, which includes replacing gas-driven pneumatics with instrument air systems and replacing high-bleed pneumatics with low-bleed devices, is on track for completion by year-end 2021 and will result in an approximately 11% reduction, or 1,100 metric tons, in total methane emissions. Additionally, Equitrans expects to pursue geographically relevant and reputable carbon offsets.

- **Iroquois** has modified its inspection and operational practices to reduce or eliminate blowdowns of valves, piping, meters, and compressors during annual inspections and shutdowns. The company has also initiated a project to electrify compressor motors and valve operators to reduce combustion emissions. Iroquois uses transfer compressors to remove natural gas from pipelines and equipment before maintenance and is installing vent recovery systems at its compressor stations to reduce annual methane emissions by approximately 70%. The company surveys its system with handhelds and aerial laser technology to detect leaks.

- **Kinder Morgan** advised DOE's Advanced Research Projects Agency-Energy (ARPA-E) and Colorado State University on the development of a methane emission test site. This test site simulated actual natural gas leaks that might occur at production, gathering, and underground pipeline facilities with the goal of developing innovative and cost-effective methane leak detection technologies to more precisely and efficiently locate and measure methane emissions associated with natural gas operations and oil production wells. The results of the ARPA-E Project demonstrated that several leak detection technologies can detect leaks and locate a leak within two meters of its location, with some technologies differentiating between large and small leaks and minimizing false positive detections. The site is also used as the location for Optical Gas Imaging (OGI) training courses where operators receive hands-on experience to improve their ability to detect methane leaks.

- To minimize methane emissions from its compressor stations, **Millennium Pipeline** is now employing capped ESD tests at all compressor stations for full station blowdowns and aims to have seal gas booster pumps installed by the end of 2021.

- **National Fuel** utilizes a number of strategies to reduce GHG emissions, examples include conducting capped ESD tests, which prevents entire station blowdowns, while meeting Department of Transportation (DOT) safety testing requirements; minimizing methane emissions vented to the atmosphere from transmission pipeline blowdowns by using pipeline portable compression; and installing instrument air systems to replace gas-driven pneumatics. Furthermore, National Fuel participates in EPA's Methane Challenge Program and has developed and implemented a new BMP with EPA to reduce fugitive emissions, targeting compressor unit isolation and blowdown valve leakage. The company continues to make voluntary commitments, and most recently joined the ONE Future Coalition.

- **ONEOK** has implemented emissions reduction technologies and practices such as: utilizing fuel saver packages which recycle gas that would be vented to use as fuel; conducting emergency shutdown testing without blowdowns; lowering pipeline pressure before maintenance to minimize emissions; and installing sensors on vents to detect and respond timely to fugitive emissions. The company also instituted an Optical Gas Imaging (OGI) monitoring program at facilities not currently subject to mandatory EPA fugitive emission monitoring regulations. The OGI cameras identify fugitive emissions from equipment and facilitate timely repairs.

- **PG&E** has implemented a voluntary five-year carbon reduction program for the company's operations called the Million Ton Challenge. The strategies to reduce the company's carbon footprint include reducing energy use in facilities, minimizing methane and sulfur hexafluoride emissions in operations, and building a more sustainable supply chain.

- Between 1998 and 2018, **Southern Company Gas** invested more than $2.2 billion in local distribution company pipeline infrastructure replacements and improvements that increased reliability and safety and helped reduce annual methane emissions from its local distribution system by 50 percent even as the system grew by 20 percent. These investments have reduced the company's methane emissions intensity rate to 0.182 percent, which is below the ONE Future 2025 methane intensity goal for distribution companies of 0.44 percent by 2025. Southern Company Gas leverages best-in-class technology to help ensure the integrity of its system and prevent emissions from pipeline damage. For example, Southern Company Gas has partnered with Urbint to use Artificial Intelligence and machine learning to create a digital version of physical infrastructure that accounts for environmental risk factors that can contribute to damage. This information is then used to identify excavation locations and deploy intervention resources to prevent potential damages. Additionally, Southern Company Gas is evaluating leak-detection methods and equipment that will scan and detect fugitive methane leaks; evaluating opportunities to capture gas released during controlled venting and flaring procedures; and further reduce its operational emissions footprint.

- To steward its emission reduction practices, **Southern Star** formed a Methane Reduction Team with 5 multi-disciplinary sub-committees focusing specifically on reductions in 5 key emissions sources: rod packing vent emissions, condensate tank emissions, pipeline blowdown mitigation, pneumatic controller emissions, emissions data automation. This work is bolstered by that of the Emissions Data Automation Team who developed a dashboard to evaluate and track emissions data in real-time. In addition, Southern Star initiated a Leak Detection Program that commits to performing voluntary leak surveys for each compressor station annually.

- In order to achieve their climate and methane emissions reduction goals **Spire** is taking steps including upgrading pipelines and investing $287M to replace 359 miles of aging infrastructure; minimizing risk by diverting gas into low-pressure system; decreasing leaks; and reducing third-party damage.

- **TC Energy** continues to invest in its U.S. natural gas modernization program, which includes the company's ongoing modernization of the Columbia Gas Transmission system consisting of more than $2.5 billion in system enhancements. Work done under this program has led to improvements in reliability of service, integrity of assets and efficiency of operations—all while reducing emissions.
    - For example, efforts to address GHG emissions on the Columbia System have resulted in 258,000 tonnes of total CO2 equivalent emissions avoided since this cycle of investment was initiated in 2013—equivalent to taking 56,000 cars off the road. Based on the work currently completed, it's estimated that 57,000 tonnes of CO2 equivalent emissions will continually be avoided on an annual basis—and emissions reductions are expected to grow over the next several years as the third phase of the modernization program begins.

- **Tellurian** is committed to providing a cleaner energy source through early support of impactful environmental studies, new infrastructure design with advanced materials, and leading environmental procedures. For example:
    - Both the Driftwood Pipeline and the Driftwood LNG Terminal have committed to installing air/electric or nitrogen operated valves and installing lower-emitting flanges or zero-emitting welded connections.
    - The Driftwood Pipeline have proposed to use electric-driven compression, thereby reducing the pipeline's carbon dioxide emissions by more than 99%. The pipeline will also incorporate dry gas seal technology on turbine compressors, ensure all non-emergency compressor station blowdowns are designed to be ventless, and reduce gas in the pipeline before performing maintenance to minimize vented emissions.

- **Williams** has reduced its reported methane emissions from natural gas processing plants and transmission compressor stations by more than 58% since 2012 while increasing throughput volumes by 27% over the same period. The company's Emissions Reduction Program (ERP) is a voluntary, multi-year interstate transmission infrastructure investment project to significantly reduce Transco and Northwest Pipeline compressor station nitrogen oxide and methane emissions through replacement of legacy natural gas-fired horsepower. The ERP consists of a phased retirement of over 180 legacy reciprocating compressor engines and turbines at compressor stations along the transmission systems over a multi-year period. These upgrades are projected to reduce Williams' system-wide transmission sector nitrogen oxides emissions by over 75% and compressor methane emissions by approximately 50% from recent levels.

Finally, a number of our member companies have set individual emissions reductions targets. These can be found on their individual websites here: DT Midstream, Duke Energy, Enbridge, Equitrans Midstream, National Fuel, National Grid, NextEra Energy, PG&E, Southern Company, Southern Star Central Gas Pipeline, Inc., Spire, and Williams.

Renewable Natural Gas (RNG)

RNG provides a beneficial use of waste methane from other sectors, such as methane from agriculture and food waste, resulting in an impactful reduction in GHGs. Increasing the access to and use of RNG will help provide carbon-neutral/potentially carbon-negative fuel and accelerate our progress toward a clean energy future through infrastructure largely already in place. Below examples of INGAA members' efforts to enable the growth of RNG.

- **BHE GT&S** subsidiary Pivotal LNG is currently sourcing landfill gas that would otherwise be flared and liquifying it to provide renewable LNG for use in transportation. Additionally, **BHE GT&S** subsidiary Carolina Gas Transmission (CGT) is partnering with GreenGasUSA to construct the first RNG injection point on CGT's interstate pipeline system which will allow methane gas from landfills, farm waste, and other appropriate sources to be injected into the system.

- **DT Midstream** supports introducing low carbon fuels into its pipeline network and has an existing connection with an RNG supply source in Michigan. DT Midstream is currently pursuing a number of Midwest RNG connection and transport opportunities.

- **Enable Midstream Partners** currently has an existing supply connection with the University of California Shreveport RNG facility in Louisiana which converts landfill gas to RNG.

- **Enbridge** is currently working with partners to develop facilities and programs for the production, marketing, transportation, and distribution of renewable natural gas (RNG), hydrogen and compressed natural gas (CNG).

- Since 2018, **Kinder Morgan** has connected five RNG sites across three pipeline systems potentially representing nearly 25 percent of the RNG market share in 2019. Additionally, Kinder Morgan has acquired Indianapolis-based Kinetrex Energy, a leading supplier of liquefied natural gas (LNG) in the Midwest and a rapidly growing player in producing and supplying renewable natural gas (RNG) under long-term contracts to transportation service providers.

- **National Fuel** has established an internal cross-functional team, made up of technical, regulatory and business resources to study the feasibility and potential development projects focused on RNG. The company is facilitating transportation of RNG on interstate pipeline systems, with the first interconnect with RNG developer in Western New York completed during fiscal 2020.

- **ONEOK** interstate natural gas pipeline assets interconnect with RNG facilities, including landfills and dairy farms, and provide connectivity to end-use markets. These interconnections allow the company to transport ~4 MMcf/d of RNG from third parties, preventing more than ~600,000 metric tons of C02e from being released. ONEOK pipeline assets are currently connected with three RNG facilities with additional connections expected in 2021.

- In 2020, **Southern Company Gas** established two new departments, Sustainability & Innovation and Renewable Gas, to support the company's efforts on GHG emissions reductions initiatives and execute strategy for growing RNG capability. In May 2021, the company announced the acquisition of the Meadow Branch Landfill Methane Recovery Facility, an RNG facility located at the Meadow Branch Landfill in Athens, Tennessee.

- **Southern Star** currently has two existing RNG supply connections transporting landfill gas near Oklahoma City and Lawrence, Kansas. Additionally, Southern Star is constructing a new RNG supply connection from a wastewater treatment facility located near Topeka, Kansas.

- In the U.S., **TC Energy** is currently transporting RNG from 10 individual landfills and livestock farms across the country, with additional RNG facilities in various stages of development. TC Energy is currently capable of transporting 4 billion cubic feet of RNG annually and expects this to grow over the next year.
    - For example, TC Energy's Threemile Canyon Farms partnership in Oregon produces enough biogas from livestock on the farm to help bring RNG to consumers in California. The investment will reduce approximately 136,000 tonnes/year of CO2e, the equivalent to the annual greenhouse gas emissions from 29,500 passenger vehicles or from the energy consumption of 16,300 homes.

- **UGI Energy Services** plans to invest more than $1 billion on renewable gas initiatives through 2025. For example, the company is developing an RNG facility in St. Bernard, Ohio that will process approximately 190,000 tons of food waste annually and generate about 250 billion Btu of RNG per year for regional distribution.

- In 2020, **Williams** joined the Leadership Advisory Board on the Coalition for Renewable Natural Gas—a public policy advocacy and education platform for the renewable natural gas industry in North America. The coalition's sustainable methane abatement and recycling timeline initiative intends to capture and control methane from more than 40,000 organic waste sites in North America by 2050. In addition, Williams delivers renewable natural gas by partnering with renewable energy developers in Washington, Idaho, Ohio and Texas to transport methane emissions captured from landfills or dairy farms where the methane is a byproduct of the waste decomposition process. Watch video.

Williams Commercial Development Representative Sarah L. at the Apex landfill facility, one of the locations where Williams partners with energy companies to transport renewable natural gas.

Hydrogen

Hydrogen can be deployed as a fuel source that does not release CO_2 when combusted. Industry is currently evaluating the potential of hydrogen blending on the existing natural gas system, providing a lower carbon fuel to consumers while utilizing existing infrastructure. Development of new hydrogen pipeline infrastructure may be needed as the U.S. hydrogen market grows. Below examples of INGAA members' efforts to enable the growth of hydrogen.

- **BHE GT&S** is a member of the HYREADY Consortium which is addressing the technical challenges of blending Hydrogen with natural gas and working to develop clear engineering guidelines to help operators prepare their systems for the injection of H2.

- **DT Midstream** is working with customer groups and government entities to evaluate and advance partnership opportunities for future hydrogen infrastructure projects.

- In 2020, **Enbridge** and Cummins announced a USD 4.5M project which will blend renewable hydrogen gas into the existing Enbridge Gas natural gas network, reducing customer greenhouse gas emissions. The renewable hydrogen gas to be blended is currently produced at a 2.5-megawatt green hydrogen facility established in 2018 by Enbridge and Cummins with financial support from the Canadian government. This is the first project of its kind in North America and it starts to illustrate how existing assets are critical components of future energy systems. In Quebec, we're also developing a renewable energy ecosystem based on green hydrogen.

- **Equitrans Midstream** joined several other companies, including Southern Gas Company, in the HyBlend initiative to research the technical challenges related to the blending of hydrogen into the U.S. natural gas pipeline network. The four main research objectives include: 1) developing general principles for operation of HyBlend delivery systems in the context of structural integrity and assess the role of gas impurities on degradation of metal pipelines; 2) assessing gas impurities in HyBlend for polymer pipelines degradation and lifetime predictions; 3) analyzing the life cycle of technology pathways for hydrogen and natural gas blends, as well as alternative pathways; and 4) quantifying the costs and opportunities for hydrogen production and blending with natural gas networks, as well as alternative pathways.

- **National Fuel** has established an internal cross-functional team, made up of technical, regulatory, and business resources to study the feasibility and potential development projects focused on Hydrogen. To further support the development of Hydrogen, National Fuel is funding the Low-Carbon Resources Initiative (LCRI).

- In 2020, **National Grid** secured $12.45 million in funding from the U.S. Department of Energy (DOE) to facilitate research and accelerate the potential of hydrogen blending. Through the project, DOE, six national laboratories, 20 industry leaders, and leading academic institutions across the country have partnered together to support the accelerated research on blending hydrogen into natural gas distribution systems. National Grid has also joined the Columbia University's Center on Global Energy Policy on a program to address hydrogen technology and economics, use cases and applications, and policy design.

- **Southern Company Gas** has helped start a research and development initiative known as HyBlend to address the technical barriers to blending hydrogen in natural gas infrastructure and study the life-cycle emissions of hydrogen blends. Additionally, Southern Company Gas is an anchor sponsor of the Low-Carbon Resources Initiative (LCRI), a research and development collaboration between the Electric Power Research Institute and

the Gas Technology Institute. Over the next five years, LCRI will focus on developing pathways to advance low-carbon technologies for largescale deployment, including hydrogen, RNG and related low-carbon resources.

- **Williams** is currently evaluating the use of clean hydrogen produced from renewable power and electrolysis or methane reforming, coupled with carbon capture, to reduce greenhouse gas emissions within selected compression applications. The company is also studying the impact of blending clean hydrogen with natural gas in our pipeline infrastructure. Williams is a founding board member of the Clean Hydrogen Future Coalition, a newly launched coalition that supports the adoption of clean hydrogen in the United States. The Wyoming Energy Authority recently awarded Williams a nearly $1 million grant to study water access, compatibility and asset integrity in support of green hydrogen production and transport in southwestern Wyoming where Williams has a significant natural gas infrastructure footprint.

Carbon Capture, Utilization, Storage

Carbon capture, utilization, and storage (CCUS) technologies offer the potential to reduce combustion CO_2 emissions from natural gas infrastructure and end use by capturing, transporting and storing those emissions before they are released into the atmosphere. Below examples of INGAA members' efforts to deploy CCUS.

- **DT Midstream** has announced plans to pursue development of carbon capture and sequestration projects in Louisiana and Michigan. DT Midstream is collaborating with multiple government agencies, including the EPA, State of Louisiana DNR, Louisiana Center for Energy Studies, DOE National Energy Technology Laboratory.

- **Enbridge** has announced a partnership, Cross Carbon Ventures, to build carbon capture projects for industrial customers, such as cement, steelmaking, refining, and hydrogen production.

- **Kinder Morgan** participated in a study by the National Petroleum Council to define potential pathways for integrating CCUS into the energy and industrial marketplace, as requested by the U.S. Secretary of Energy. Kinder Morgan was part of the CCUS Technology Task Group and co-authored the CO2 transportation chapter of NPC's report, *Meeting the Dual Challenge: A Roadmap to At-Scale Deployment of Carbon Capture, Use, and Storage*, which was published in December 2019.

- **National Fuel** has established an internal cross-functional team, made up of technical, regulatory and business resources to study the feasibility and potential development projects focused on CCUS.

- **Sempra** has announced an intention to develop a CCS facility in Louisiana with the intention of capturing and permanently sequestering CO2 from Cameron LNG and other industrial sources along the Gulf Coast. When fully developed, the facility is projected to have the capacity to sequester 4.5 Mtpa of CO2 with a total storage volume of 89 million tons.

- Under a cooperative agreement with DOE, **Southern Company (parent of Southern Company Gas)** manages and operates the National Carbon Capture Center located in Wilsonville, Alabama. The center explores the most promising, cost-effective carbon dioxide (CO2) capture processes from third-party developers and bridges the gap between laboratory research and large-scale demonstrations.

- **Williams** is currently evaluating numerous carbon capture opportunities from its current and future operations for utilization or storage, to further reduce greenhouse gas emissions. For example, at its Parachute Creek gas processing plant in Colorado, Williams captures carbon dioxide through amine treatment of the gas stream and provides that the CO_2 as a feedstock for industrial chemical production.

Additional Initiatives

- In November 2020, **Boardwalk Pipelines** completed its first solar power installation at a compressor station to help reduce the amount of generation related GHG emissions associated with the site. The company plans to evaluate additional compressor stations for potential future solar panel installations.

- **Cheniere Energy** has announced plans to provide customers with the GHG emissions data associated with each LNG cargo produced at Cheniere's Sabine Pass and Corpus Christi liquefaction facilities. Designed to enhance environmental transparency, Cheniere's Cargo Emissions Tags ("CE Tags") will estimate the GHG emissions of LNG cargoes from the wellhead to the cargo delivery point and are expected to be provided to customers beginning in 2022.

- **DT Midstream** recently announced a first of its kind, carbon-neutral transport service via an expansion of its Haynesville gathering pipeline system to serve the growing Gulf Coast LNG market. The expansion project would add up to 1.0 bcf/d of capacity and would utilize carbon reducing technologies with emissions measurement and certification. The project also includes carbon capture and sequestration and electric compression powered by renewable energy. Additionally, DT Midstream is evaluating opportunities to create bio-sequestration offsets from its existing land holdings.

- In June 2021, **Enbridge** published its first-ever Sustainability-Linked Bond Framework in the North American midstream sector in an effort to strengthen the company's commitments and link its Environment, Social and Governance goals to its funding strategy. The Framework creates a direct link between the company's finance strategies and its ESG goals, incenting their achievement. Performance indicators that will be measured include the company's progress on reducing by 35% the intensity of its scope 1 and 2 GHG emissions by 2030.

- **Equitrans Midstream**, operator of the Mountain Valley Pipeline (MVP), announced plans to purchase carbon offsets and make MVP's operational emissions, often referred to as Scope 1 and Scope 2 emissions, carbon neutral for the first 10 years of service—one of the first interstate natural gas transmission pipelines to do so.

- **Iroquois Pipeline** has contracted for 100 percent wind-generated electricity for its 46 New York and 29 Connecticut-based facilities.

- **Kinder Morgan** has established an Energy Transition Ventures Group of in-house financial, commercial and engineering talent that focuses on analyzing and quantifying opportunities for additional assets and service offerings tailored to the ongoing energy transition. In addition, a Kinder Morgan subsidiary entered into a first-of-its-kind Responsibly Sourced Gas (RSG) pilot project this year with a Colorado utility.

- In 2020, **ONEOK** created the Renewables and International Business Development Group to focus on the commercial development of renewable energy and low-carbon projects. Opportunities under evaluation include the further electrification of compression assets, potential carbon capture use and storage (CCUS) opportunities, sourcing renewable energy for operations and other longer-term opportunities such as hydrogen blending, transportation and storage.

- **Sempra** is studying the utilization of electric driven compression, paired with zero carbon electricity, in future LNG facilities. This technology is projected to reduce Scope 1 GHG emissions by 60%.

- **Williams** is investing up to $400 million in projects across nine states spanning its footprint to supply electricity to company facilities. Williams has been identifying locations where solar power installations are both economical and can be primarily sited on company-owned land. Williams expects the first of these facilities to come online in 2023. Williams has also joined Greentown Labs, North America's largest climate tech incubator, as the first midstream Corporate Partner to support entrepreneurship that will accelerate the transition to a low carbon future. Williams believes it is through technology innovation and collaboration with organizations like Greentown Labs that we can develop solutions to reduce emissions and build a clean energy economy.

For more information about the Interstate Natural Gas Association of America (INGAA), please contact media@ingaa.org.

For more information about Pipeline Research Council International (PRCI), please contact Natalie Tessel, Director of Brand and Member Engagement, ntessel@prci.org.