Bipartisan Policy Center

The Future of Natural Gas: A Strategic Framework for Reliability, Affordability, Security, and Decarbonization

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Executive Summary

Natural gas will continue to play a critical role in the U.S. energy system and broader economy over the coming decades, helping to meet domestic demand for reliable, affordable, and clean energy. Furthermore, with low-emissions natural gas in demand globally, the United States is well positioned to capitalize on that market opportunity both due to the success of prior investments in decreasing emissions and the ability to further reduce emissions across the value chain. To deliver on these objectives, the Bipartisan Policy Center urges the adoption of a comprehensive federal policy framework across five key areas:

1. Infrastructure
2. Coordinated planning
3. Liquefied natural gas (LNG) and exports
4. Measurement, monitoring, reporting, and verification (MMRV)
5. Innovation and decarbonization

TAKEAWAY RECOMMENDATIONS

Infrastructure:

1. Congress should pass comprehensive permitting reform legislation to reduce the time it takes to deploy infrastructure.
2. Congress should reauthorize the Pipeline and Hazardous Materials Safety Administration (PHMSA) and continue robust implementation of and oversight over key natural gas infrastructure safety and enhancement programs.
3. Congress should build on the concepts in the bipartisan Next Generation Pipelines Research and Development Act, which has not yet been passed, to strengthen public-private partnerships and improve federal research, development, and demonstration activities related to advanced, next-generation pipeline technologies and systems.

Coordinated Planning:

1. Regional reliability organizations should continue efforts to strengthen operational and planning coordination across the natural gas and electricity sectors.
2. The U.S. Department of Energy (DOE) and the Federal Energy Regulatory Commission (FERC) should work together to encourage and aid in the

development of objective forecasting and modeling data to support coordination in planning and operations between the natural gas and electric utility sectors.

3. DOE should continue to administer existing programs and work with the energy industry to identify new opportunities that support state and/or regional assessment and planning efforts, with an emphasis on cross-sector reliability.

LNG and Exports:

1. Congress should direct the Trump administration to form international gas partnerships to facilitate market access for U.S. LNG exporters.

2. The United States should continue efforts to increase the transparency and accuracy of emissions measurement, monitoring, reporting, and verification.

3. Congress should support financing for LNG import infrastructure and for carbon capture utilization and storage (CCUS) technology in destination markets.

Measurement, Monitoring, Reporting, and Verification:

1. Congress should fund efforts to facilitate consistent measurement and reporting practices; streamline processes for the reporting, collection, and sharing of emissions data across federal agencies and programs; and recognize alternative detection and measurement technologies and procedures.

2. Federal emissions standards based on the best technologies and approaches to address new and existing sources for natural gas producers and midstream operators are necessary.

3. Congress should support public-private collaboration to standardize greenhouse gas (GHG) intensity measurements for natural gas.

4. Congress should support DOE's efforts to standardize MMRV protocols to help to verify the emissions profiles of U.S. natural gas exports.

Innovation and Decarbonization:

1. Congress should support R&D to advance U.S. global leadership in technology innovation and decarbonization across the natural gas value chain.

2. The United States has made significant progress in energy efficiency over the past few decades, due in part to integrated applications of federal standards and incentives. While sustaining that progress, DOE, the Environmental Protection Agency (EPA), and other relevant federal agencies should ensure

that energy efficiency standards for end-use applications are drafted in a fuel-neutral manner, reflecting bipartisan statutory mandates that were signed into law by then-President Ronald Reagan.

3. Congress should support programs to scale up and ensure the safety of a complementary carbon dioxide (CO_2) pipeline and storage network to support natural gas system decarbonization.

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Background

BPC launched its Future of Natural Gas Policy Initiative in fall 2023 with the aim of developing a national policy agenda for natural gas that aligns economic and environmental goals. Participants included experts from an array of companies and organizations, including natural gas producers, utilities, clean power companies, former energy regulators, and labor and environmental organizations. The group's shared goal was to develop a national policy framework for the natural gas industry that is thoughtful and pragmatic, able to secure bipartisan support in Congress, responsive to stakeholder perspectives, and, above all, capable of meeting the energy challenges of today while laying the foundation for the net-zero economy of the future.

In a National Strategy Overview released in November 2024, members of the Future of Natural Gas Policy Initiative proposed a new approach to natural gas policy organized around three pillars:

1. We must implement new policies, standards, and incentives that (a) drive down greenhouse gas (GHG) emissions associated with natural gas to the fullest extent and as quickly as possible throughout the value chain (i.e., upstream, midstream, and downstream end uses); (b) meet growing energy demand reliably, affordably, and equitably; and (c) support labor and workforce development opportunities and continue to generate quality jobs for American energy workers.

2. We must invest in natural gas infrastructure in a manner consistent with achieving decarbonization across the value chain to ensure that the natural gas system can support current needs and be prepared to shift to the role it needs to play in the future.

3. We must engage in coordinated planning to ensure that we're deploying the right low-emissions energy solutions in the right situations.

The group further emphasized that robust energy efficiency and demand response strategies are critical to substantially reducing peak needs as well as overall demand.

Despite continued alignment on these shared principles, political and policy shifts following the U.S. presidential election in November 2024 complicated the development of a consensus policy framework. Recent actions of President Donald Trump's administration have created considerable uncertainty about the stability of the existing regulatory framework for natural gas and related GHG emissions. Against this backdrop of uncertainty, the group was not able to agree on consensus policy recommendations.

In this report, BPC sets out a series of recommendations based on the discussions of the Future of Natural Gas Policy Initiative that seek to balance the energy and environmental challenges and opportunities facing the United States today. While the members of the Future of Natural Gas Policy Initiative made substantial contributions to the process, these recommendations reflect the views of BPC and not the larger group.

Members of the Future of Natural Gas Policy Initiative

Amy Andryszak	President and CEO, Interstate Natural Gas Association of America (INGAA)
Maryam Brown	President, SoCalGas
Ralph Cavanagh	Former Energy Co-Director, Natural Resources Defense Council
Neil Chatterjee	Former Chairman, Federal Energy Regulatory Commission
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Paula Gant	President and CEO, GTI Energy
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Jeremy Harrell	CEO, ClearPath
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***Jeffery Preece**, Vice President of Research and Development for the Electric Power Research Institute (EPRI), served as a technical adviser to the Initiative.*

Thank you to the other experts who participated in the Future of Natural Gas Policy Initiative discussions:

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The recommendations in this report, while informed by the discussions of the Future of Natural Gas Policy Initiative, reflect the views of BPC and should not be attributed to any individual member of the Future of Natural Gas Policy Initiative.

Context

Natural gas plays an essential role in nearly all aspects of modern society and is a critical component of the U.S. energy system. It is a raw material in the manufacture of a host of products, including plastics, fertilizers, synthetic fibers, medicines, and cosmetics. It is also a major source of energy, fueling power plants and factories, and providing heat, hot water, and cooking fuel in millions of homes and businesses. In 2023, natural gas accounted for more than one-third (36%) of overall U.S. energy consumption and more than 43% of U.S. electricity production.[1]

Moreover, U.S. natural gas production is aligned with national strategic and policy objectives, including maintaining energy security, affordability, and reliability. Lower-cost methods of producing natural gas, together with an abundant resource base, have allowed the United States to meet its own energy needs while opening major export opportunities as a supplier of natural gas to other countries. Increased use of natural gas over the past several decades has been a driver of economic growth; it has also delivered significant reductions in emissions of GHGs and certain air pollutants from the power sector, as cleaner natural gas generators have replaced coal-fired power plants.

Recent developments in the U.S. energy landscape point to the continued importance of natural gas and the need for a robust national conversation about the future of this critical resource, given that natural gas will likely continue to contribute substantially to our overall energy mix in the coming decades. Total annual U.S. energy consumption declined by 4% over the past two decades,[2] despite economic growth that exceeded 40%, underscoring the potency of economy-wide energy efficiency gains, and creating opportunities for U.S. natural gas suppliers to displace higher-emissions energy sources around the world.

However, the trend in falling domestic energy demand paused in 2024 due to a range of factors, including the electrification of the transportation sector, new demand from data centers and artificial intelligence technologies, and a resurgence of domestic manufacturing.[3] Expectations of growing U.S. energy demand are precipitating new private-sector investment, with natural gas likely to meet a portion of this load growth, along with further energy efficiency gains. Global demand is also rising, creating an expanding market for U.S. LNG exports, particularly to European countries, where previous energy flows have been disrupted, and large demand growth areas like Africa and Asia.

Against this backdrop, government- and corporate-led efforts to limit GHG emissions are affecting all parts of the natural gas value chain, creating pressure to further reduce unintended releases of methane, a potent GHG, from existing natural gas production, transport, and distribution systems, while also continuing to develop technologies that will allow for low- and zero-carbon

utilization of natural gas in a decarbonized economy. The international and wide-ranging nature of these efforts suggests that they will continue to shape the decision-making framework for natural gas companies and their partners, regardless of near-term shifts in U.S. policy.

Broadly speaking, the U.S. natural gas industry is well positioned to meet rising domestic and international demand for reliable, affordable, and clean energy. The widespread deployment of hydraulic fracturing and other technologies in the early 2000s enabled a resurgence in U.S. natural gas production, with estimates of proved resources growing in tandem with higher rates of recoverability.

Figure 1: U.S. Dry Natural Gas Production over Time

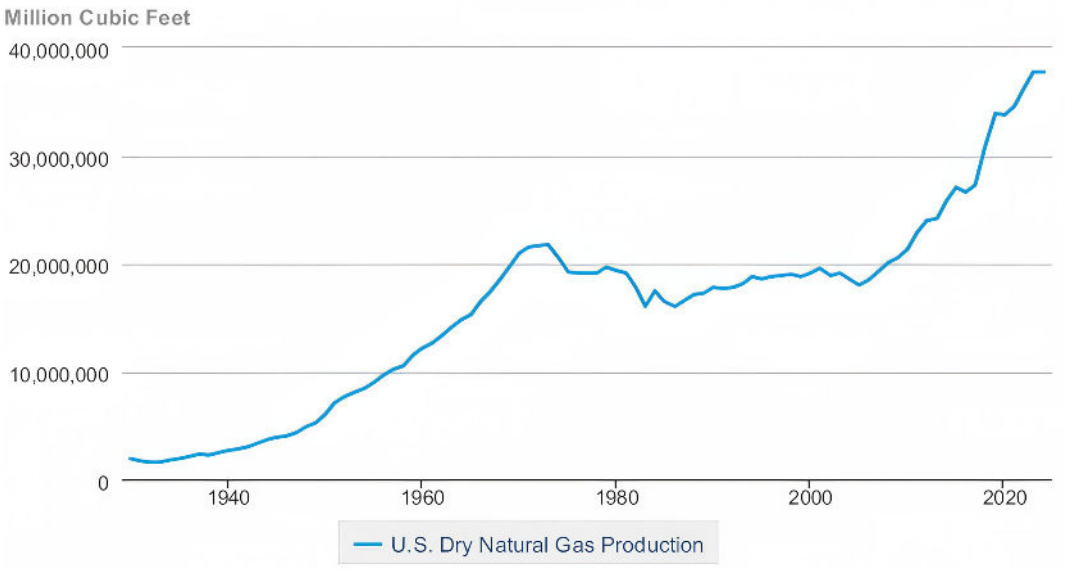

Image sourced from the U.S. Energy Information Administration. Available at: https://www.eia.gov/dnav/ng/hist/n9070us2A.htm.

Today, in addition to the extensive pipeline and storage network that exists to deliver natural gas to U.S. consumers, the industry is building new liquefaction facilities to enable large-scale exports in the form of LNG. This expansion has had workforce benefits: According to an S&P Global study, the U.S. LNG industry alone has supported an average of 273,000 direct, indirect, and induced jobs since 2016.[4]

Importantly, the commitment to seek ways to drive down emissions associated with natural gas use remains strong, even where analyses differ as to the effect of natural gas on overall emissions. For instance, clear consensus has not been reached on the global GHG emission impacts of increased U.S. LNG exports. A study released by DOE in December 2024 found that the expansion of U.S. LNG export availability by approximately 32 billion cubic feet per day would increase global cumulative emissions by over 700 million metric tons of

carbon dioxide equivalent by 2050.[5] Even when factoring aggressive upstream and downstream GHG abatement policies into its analysis, DOE's conclusion was that increasing the availability of U.S. LNG exports would result in a net increase in in global emissions.[6] By contrast, in an early 2025 analysis, S&P Global calculated that increasing U.S. LNG export capacity by 40 million metric tons would lead to a decrease in cumulative global emissions of 780 million metric tons of carbon dioxide equivalent over 2028-2040.[7]

Still, innovation in the form of efficiency gains and reduced leakage has made U.S. gas, on average, relatively cleaner and more competitive than other LNG available in the global marketplace, despite wide variations in GHG intensities.[8] The United States also has the data to back up its emission claims, as it leads the world in terms of the quantity and transparency of emissions data collected across the natural gas supply chain.[9]

Looking to the future, nearly all scenarios for an economically and politically sustainable path to net-zero emissions incorporate the continued utilization of natural gas as an energy resource.[10] To drive down overall GHG intensity, these scenarios typically assume large-scale use of CCUS technologies to curtail direct emissions from gas processing and combustion in industrial and power sector applications, together with strategies such as increased leak detection and repair, hydrogen blending, and renewable natural gas (RNG) production. Natural gas generation can also facilitate and complement the deployment of intermittent renewable sources of power generation, smoothing out interruptions and providing on-demand backup power and heating to ensure grid stability and improve reliability and affordability for consumers. Developing the technologies needed to enable natural gas to play these roles will require significant and sustained investments in R&D.

Stable and predictable federal policy is needed to unlock U.S. natural gas potential and its related economic and security benefits while also helping to reduce emissions from the domestic energy system. Such stability has not been the calling card of U.S. energy policy in recent decades, but a rational path for natural gas usage that is consistent with our nation's economic and sustainability needs demands it. This report outlines the first steps on such a rational path forward.

Infrastructure

Without attempting to identify or characterize infrastructure needs in specific regions or localities of the United States, discussions among members of the Future of Natural Gas Policy Initiative pointed to the overarching conclusion that strategic investments in U.S. natural gas infrastructure are needed, now and in the future—both to maintain energy accessibility, reliability, and affordability, and to achieve maximal mitigation of upstream, midstream, and downstream GHG emissions.

A core insight embedded in this statement is that climate goals and investments in natural gas infrastructure are not at odds and can be mutually supportive if the right policy frameworks are in place to allow the gas system to continue delivering reliable and affordable energy services while also supporting efforts to continue to reduce emissions across the value chain (see Figure 2). It is not useful to reduce debates about the future of natural gas to a simple binary framing—i.e., that because natural gas is a fossil fuel, any enhancement of gas system infrastructure is inherently detrimental to climate progress.

Instead, it will be important for policymakers to recognize the nuances and complexities of the role that natural gas plays in the U.S. and global economies, and in America's ability to achieve multiple goals of economic development, climate leadership, and energy security, affordability, and resilience.

Figure 2: The Natural Gas Production and Delivery Value Chain

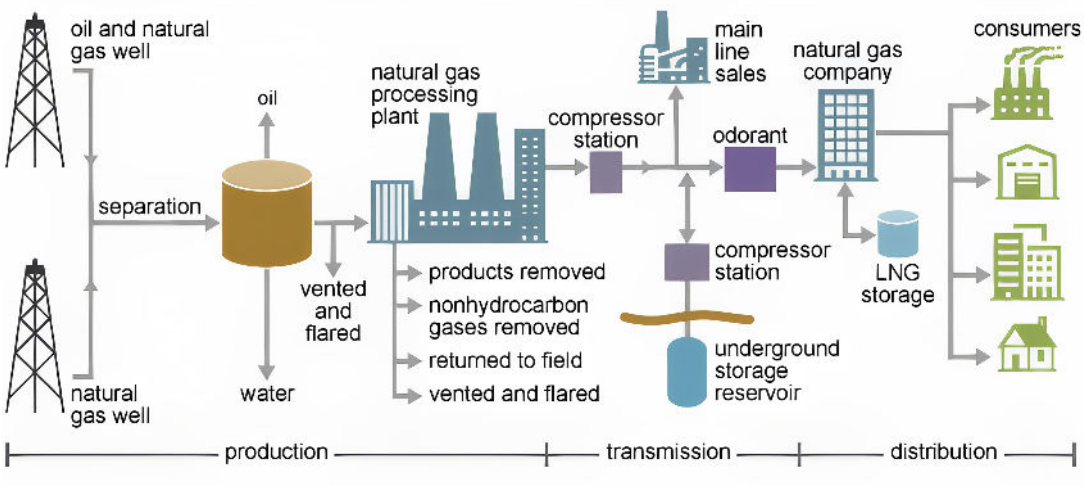

Image sourced from the U.S. Energy Information Administration. Available at: https://www.eia.gov/energyexplained/natural-gas/delivery-and-storage.php.

INFRASTRUCTURE RECOMMENDATIONS

BPC has identified three federal policy recommendations for natural gas infrastructure that seek to balance economic and environmental priorities.

Infrastructure recommendation #1: Congress should pass comprehensive permitting reform legislation to reduce the time it takes to deploy infrastructure.

The natural gas industry's infrastructure challenges are part of a larger national dialogue about how long it takes to build infrastructure in the United States. In the face of rising energy demand, the need to rapidly build all types of energy infrastructure has become increasingly clear. While it is outside of the scope of this report to weigh in on individual policy proposals in the broader permitting reform debate, permitting processes in the United States must be reformed to expedite the deployment of more infrastructure that is consistent with reliability and affordability goals.

Infrastructure recommendation #2: Congress should reauthorize the Pipeline and Hazardous Materials Safety Administration (PHMSA) and continue robust implementation of and oversight over key natural gas infrastructure safety and enhancement programs.

Robust oversight of and enhancements to the existing natural gas pipeline network are critical to enabling reliable energy supply while addressing methane leakage, with positive knock-on effects for public safety, efficiency, and GHG emissions. The bipartisan Protecting Our Infrastructure of Pipelines and Enhancing Safety (PIPES) Act of 2020 strengthened the safety authority of PHMSA, which oversees domestic natural gas and CO_2 pipelines. The PIPES Act instructed PHMSA to update its decades-old rule on methane leak detection to reflect new tools and technologies, paving the way for improved leak reduction. Finalization of this rule would enable industry players to move forward with critical investments in pipeline maintenance and leak detection. Congress should also reauthorize PHMSA programs in the PIPES Act, with a focus on advancing leak detection technologies.

At the same time, policymakers should continue to support efforts to enhance the existing pipeline network for natural gas. Recent pipeline investments have focused on upgrading existing infrastructure. Of all completed pipeline projects in 2024, eight were for new pipelines, while 22 were to upgrade, expand, convert, or add laterals—smaller pipelines that branch off of larger ones—to existing pipelines. The Bipartisan Infrastructure Law established an infrastructure grant program, housed at PHMSA and known as the Natural Gas Distribution Infrastructure Safety and Modernization program (NGDISM), to support efforts by municipal and community-owned utilities to repair or replace distribution pipelines. To date, the grant program has disbursed more

than 75% of its total $1 billion, five-year funding allocation to replace aging pipes and retrofit gas infrastructure to address GHG leaks.

Infrastructure recommendation #3: Congress should build on the concepts in the bipartisan Next Generation Pipelines Research and Development Act, which has not yet been passed, to strengthen public-private partnerships and improve federal research, development, and demonstration activities related to advanced, next-generation pipeline technologies and systems.

The U.S. gas pipeline network spans more than 3 million miles, much of which is distribution, and supports all facets of the U.S. economy. This infrastructure is aging, making investments to upgrade the network an urgent priority for energy and economic security reasons. These upgrades would also reduce fugitive methane emissions.

At the same time, investment is needed to develop new pipeline technologies capable of meeting future energy system needs, including the need to transport a wider variety of fuels and energy carriers, including natural gas, RNG, hydrogen, LNG, CO_2, and more. The Next Generation Pipelines Research and Development Act, H.R.2613, supports key R&D programs that will help modernize current pipeline networks and ensure the continued resiliency, reliability, and efficiency of this critical part of the nation's energy infrastructure.

Coordinated Planning across Gas and Electric Systems

As energy technologies and energy use continue to evolve in the United States, there is increasing overlap between the services provided by natural gas and electric systems. With electricity demand forecasted to rise dramatically, demand for natural gas to provide at least some of the needed new generation can also be expected to increase. At the same time, natural gas utilities must maintain the same level of supply adequacy, reliability, and affordability across their service territories.

Outside of vertically integrated markets where integrated resource planning has been implemented, planning processes have often siloed the gas and electric systems, overlooking the interdependencies of these systems—interdependencies that could be leveraged to maximize benefits for consumers, the economy, and the environment. To address America's rapidly evolving energy challenges, planning processes must consider interactions across the gas and electric systems that have important implications for overall energy

system reliability and for the rate at which decarbonized fuels and clean power can be deployed.[11]

For purposes of this discussion, coordinated planning refers to the collaboration among and communication of the individual comprehensive planning efforts undertaken by the gas and electric utilities and energy organizations for each region. The coordination of planning does not change the need for each participant to meet obligations to reliably meet the demand of consumers while appropriately managing the cost of delivered energy. The planning and reporting requirements of the jurisdictional regulators must also be maintained to comply with all state laws and regulations.

PLANNING RECOMMENDATIONS

The three recommendations that follow identify specific strategies and resources for supporting the capabilities needed to implement coordinated electric and gas system planning. Implementation of these recommendations would accelerate progress toward coordination among regulatory and planning authorities around the country.

Planning recommendation #1: Regional reliability organizations should continue efforts to strengthen operational and planning coordination across the natural gas and electricity sectors.

Because ensuring reliable access to energy is core to their mission, regional reliability organizations have been at the forefront of efforts to increase coordination across electric and gas systems.

The work of the North American Electric Reliability Corporation (NERC) provides an example of a structured approach to coordinated planning. Its 2023 publication, *Reliability Guideline: Natural Gas and Electrical Operational Coordination Considerations*,[12] aims to "provide key practices and information that could assist grid operators and owners in the reliable coordination of electric operations with natural gas providers." The guideline encourages reliability organizations to identify the full suite of relevant stakeholders and then establish communication channels and information sharing to facilitate greater coordination of their planning processes.

The 2024 National Association of Regulatory Utility Commissioners (NARUC) task force on Gas-Electric Alignment for Reliability (GEAR), the subsequent Natural Gas Readiness Forum, and the 2025 Natural Gas Readiness Regional Mini-Forums in the Western and Southern Regions are examples of coordinated communication and planning efforts. These initiatives recognize the importance of the regional focus required for a robust communication and planning effort. They have successfully provided tangible benefits and should continue.

Recent reliability events have also prompted a greater focus on the importance of coordination. In January 2025, NERC President and CEO Jim Robb commented on a new Northeast Gas/Electric System Study from the Northeast Power Coordinating Council,[13] saying:

> *"This untenable situation cannot be mitigated solely by electric system operators, calling out the urgent need for tight operational and planning coordination between the two sectors."*[14]

In the same statement responding to the study, NERC said that it is "currently conducting similar assessments in other regions and encourages reliability stakeholders to incorporate these assessments into their planning and operating plans."

As the energy industry changes, including through advances in energy efficiency, the development of load flexibility programs, and the addition of zero carbon generation, the issues for planners and system operators are becoming more complex. Coordinated planning is needed to account for all resources that have a role in assuring reliability and to balance concerns about affordability, reliability and sustainability appropriately.

Planning recommendation #2: The U.S. Department of Energy and the Federal Energy Regulatory Commission should work together to encourage and aid in the development of objective forecasting and modeling data to support coordination in planning and operations between the natural gas and electric utility sectors.

In a debate that is heavily influenced by political and competitive considerations, access to a repository of objective data to inform planning would be invaluable. Load forecasts, for example, are a fundamental input into utility investment decisions. Unfortunately, siloed forecasts for electric versus gas systems may result in conflicting or inconsistent inputs to these decisions, particularly in those regions that do not have vertically integrated electric utilities. Separate modeling processes also may generate different projections for the future composition and size of demand for energy services. And notably, stakeholders may have conflicting motivations in the forecasts that they provide to regulatory bodies. At bottom, effective planning requires a sober and realistic assessment of energy needs across both the gas and electric systems. These challenges are difficult if not impossible to overcome as governmental agencies are never likely to have timely access to the detailed, accurate, and proprietary information that resides with energy industry participants.

The federal government can help support the rigorous assessments and analyses needed for successful electric–gas system coordination. A recommendation from NERC's 2023 report is also relevant here:

> *"In addition to a capacity assessment that represents only a single point in time, consideration should be given to the development of a seasonal, annual, or multiannual energy analysis that uses [natural gas] fuel delivery capability/limitations as a component. …These assessments could consider pipeline maintenance, known future outages, construction and expansion activities…"*

The federal government in general, and the Energy Information Administration (EIA) in particular, should address variability in load forecasting and modeling by encouraging coordinated regional planning efforts among all planners across the energy industry. EIA should:

- Expand its remit to provide state- and regional-level demand projections for all energy sources to be used as a supplemental reference and planning resource, in addition to the energy industry participants' proprietary data. By providing common forecasts across the natural gas and electric systems, EIA can help planners avoid inefficiencies from relying on conflicting forecasts.
- Refine its capabilities to enable integrated modeling of the gas and electric systems and dissemination of the results to inform coordinated planning processes.

Planning recommendation #3: DOE should continue to administer existing programs and work with the energy industry to identify new opportunities that support state and/or regional assessment and planning efforts, with an emphasis on cross-sector reliability.

While some planning processes are more traditionally the domain of utilities in vertically integrated, state-regulated markets, or states and regional organizations, the federal government can provide incentives to create the "space" for coordinated planning in sub-federal jurisdictions. As federal funding is deployed for relevant energy programs, some funds should be directed to encourage recipients to approach planning in a coordinated fashion. Coordination can make for more effective implementation of key programs, such as energy assistance programs, by providing better data about the distribution of loads across the gas and electric systems.

LNG and Exports

The United States has been the world's leading exporter of LNG since 2023, with Europe the primary destination market for U.S. LNG exports since Russia's invasion of Ukraine in 2022. In the coming decade, demand for U.S. LNG from Asian buyers is expected to grow significantly.

As global demand for LNG continues to rise—current forecasts point to a substantial increase over the next several decades—LNG and LNG exports will remain a major part of the national conversation about natural gas policy. With global liquefaction capacity also expected to grow considerably in coming years, ensuring that the market can reliably distinguish between LNG sources of different GHG intensities will be an important topic within that conversation, as upstream emissions can vary widely across producing countries and companies. U.S. companies' ability to accurately measure and report on the GHG intensities of their LNG is likely to be an important advantage in international trade, with the collection of emissions data across the supply chain of the exported gas an important tool in demonstrating and enhancing U.S. competitiveness (see LNG and exports recommendation #1 below). DOE may find that an official publication of emissions intensity is useful in promoting U.S. LNG to trading partners.[15]

LNG AND EXPORTS RECOMMENDATIONS

BPC recommendations for future policy with respect to LNG and LNG exports aim to balance domestic and global priorities for economic growth, energy security, and environmental protection while supporting continued progress toward a net-zero economy. Policy should also ensure that gas exports help lower global emissions to the extent possible, for example by displacing higher-emissions fuel sources or through the integration of carbon capture technology.

LNG and exports recommendation #1: Congress should direct the Trump administration to form international gas partnerships to facilitate market access for U.S. LNG exporters.

Europe

Russia's invasion of Ukraine in 2022 dramatically changed the geopolitical landscape and sparked an energy affordability crisis in Europe. In an effort to reduce dependence on Russian energy imports following the invasion, European Commission President Ursula von der Leyen committed to purchasing an additional 50 billion cubic meters (bcm) of U.S. LNG until at least 2030. Europe's U.S. LNG imports had grown from 21 bcm in 2021 to 51 bcm in 2024, or about 30 bcm of the 50 bcm commitment. Meanwhile, European Union imports of Russian gas had fallen to a nearly identical 52 bcm (19% of total EU

gas demand). In May 2025, the European Commission proposed legally binding measures to completely eliminate Russian gas imports by the end of 2027, noting that it would rely on the United States as a key partner in replacing Russian molecules.

At the same time, however, the implementation of the EU's methane import regulation is likely to complicate European offtake of gas from the United States and other exporters, prompting some to raise security of supply concerns. Beginning in 2027, European importers must prove that all new gas imports comply with EU methane regulations' monitoring, reporting, and verification (MRV) rules for imports. Exemptions are permitted if the exporting country has regulatory equivalence. The complexity of U.S. supply chains brings unique implementation challenges for these regulations for U.S. exporters, relative to exporting nations with more vertically integrated gas industries. Many stakeholders are actively seeking to address these challenges; such efforts should be supported by agencies such as DOE. While the introduction of the EU methane regulations for LNG imports creates a significant new regulatory requirement for potential suppliers to the European market, it also presents an opportunity for U.S. exporters to differentiate their LNG from other sellers that lack the capacity and institutions to facilitate credible MRV.

Historically, the United States and European Union have shared energy, economic, national security, and environmental goals, which has set the stage for increased collaboration on gas trade. An international gas partnership with Europe should feature government and industry participation and be guided by goals of continuing transatlantic engagement, facilitating the exchange of emissions performance data, and achieving regulatory equivalence. In cases where U.S. gas exports are less emissions-intensive than gas from other European suppliers—and producers can back that up with verifiable emissions data—imports of U.S. LNG can help meet European demand for lower-emissions, secure, and reliable gas. Long-term LNG contracts that meet the EU's methane import standards will allow European buyers to rely less on the spot market and diversify away from exporters with less credible emissions data, simultaneously advancing energy security and emissions performance goals.

Asia

With Asian demand for LNG expected to grow significantly in the coming decades, opportunities for greater collaboration between the United States and its Asian partners are also ample. In 2023, Japanese and South Korean importers launched the CLEAN Initiative, with the goal of verifying the emissions profile of imported LNG. This suggests that, as in Europe, collaborative regulatory efforts can play a role in making relatively cleaner U.S. gas more accessible to Asian markets.

LNG and exports recommendation #2: The United States should continue efforts to increase the transparency and accuracy of emissions measurement, monitoring, reporting, and verification.

Several government and industry initiatives, including the U.S. GHG Reporting Program (GHGRP), the United Nations' Oil & Gas Methane Partnership (OGMP), and GTI Energy's Veritas, among others (see **Text Box 1**), have helped advance MMRV for natural gas and LNG supply chain emissions. In the United States, all producers should be required to continue reporting credible, transparent, and verifiable emissions data under the GHGRP, including calculations and inputs, alongside ongoing efforts by the U.S. Environmental Protection Agency to strengthen the GHGRP by developing and incorporating improved MMRV methodologies. The MMRV Framework Initiative, led by DOE's international MMRV working group, is laying the groundwork to drive standardization in MMRV protocols. The initiative is focused on developing a broader consensus MMRV framework for the industry as a whole, including by establishing minimum performance standards; identifying key support mechanisms, such as documentary standards and digital repositories; ensuring cooperation with third-party verification requirements; and establishing uniform standards for verifiers. This work is important and should continue under DOE leadership.

TEXT BOX 1: THE MMRV INDUSTRY IS YOUNG, BUT DIFFERENT MODELS HOLD PROMISE FOR THE FUTURE OF CERTIFICATION.

EQT Corporation, a major U.S. natural gas producer, is collaborating with MiQ, a not-for-profit certifier focused on methane emissions, to assess and quantify the emissions intensity of its natural gas operations under MiQ's methane performance certification standard. The process involves MiQ independently certifying the emissions profiles of each segment of the natural gas supply chain and grading each segment's emissions performance on a scale from A to F. EQT and MiQ recently announced a proof-of-concept MMRV transaction to supply emissions-certified natural gas to a European LNG importer, Uniper. This transaction showcases one model for enabling European importers to document the emissions profile of gas shipments.

Other MMRV models, such as Cheniere's quantification, monitoring, reporting, and verification (QMRV) framework, take a different approach. Cheniere uses ground and aerial monitoring technologies to collect data on supply chain emissions. Measurement data receive technical review and verification by the Energy Emissions Modeling and Data Lab (EEMDL).

LNG and exports recommendation #3: Congress should support financing for LNG import infrastructure and for CCUS technology in destination markets.

In the context of a growing global market for LNG, the United States has an opportunity to leverage its leadership in the research, development, and commercialization of end-use emissions-reduction technologies (e.g., CCUS, high-efficiency gas turbines). Federal policy can help remove barriers to the diffusion of these technologies, including in less developed countries that are growing destination markets for U.S. LNG.

Emissions-reduction opportunities will be largest in cases where importing nations can use LNG to supplant higher-emitting sources of energy, such as coal. To realize these opportunities and maximize climate benefits, importing countries must have access to financing to deploy end-use emissions-reduction technologies. Reauthorization of the U.S. Export-Import Bank (EXIM) in 2026 represents an opportunity for Congress to expand global financing for technologies like carbon capture utilization and storage.

EXIM has previously supported LNG export projects and provided financing for oil and gas projects that included emissions-reduction measures. New investments to build LNG import facilities and deploy CCUS technology can support the U.S. LNG industry, deliver clean and reliable energy to importing nations, and bolster America's global leadership in clean energy technologies. Other financing opportunities should also be explored, including through the World Bank and Development Finance Corporation (DFC). The United States could, for example, leverage its status at the World Bank to increase global support for the financing of carbon management projects.

Measurement, Monitoring, Reporting, and Verification

Accurate and trusted methods for measuring, monitoring, reporting, and verifying GHG emissions across the full natural gas supply chain are essential to meeting regulatory and market demand for lower-carbon natural gas and promoting technologies and operational practices that drive down the GHG intensity of natural gas wherever it is produced, transported, and used.

Depending on its source, natural gas can vary significantly in composition and quality. First, gas from different geologic basins will have different proportions of methane and other hydrocarbon components, resulting in different emissions profiles. Varied extraction, processing, and transportation practices will also affect the overall GHG intensity of natural gas. Finally, methane leaks—both from wells, pipelines, and other gas infrastructure, as well as during operations spanning upstream gas production and processing to midstream use and export—are another key factor. The varying scale and scope of those emissions determine the GHG profile and GHG intensity of natural gas delivered to end users and drive the need for consistent and reliable MMRV across the supply chain.

U.S. operators in each natural gas industry segment (i.e., upstream, midstream, and distribution) have deployed various methane emissions-detection and measurement tools and are using the emissions data obtained to guide operational change to reduce methane emissions from their systems. High-integrity, transparent MMRV increases the confidence of private-sector actors and markets in actions taken to reduce GHG emissions and can help incentivize operators to pursue emission reductions that go beyond minimum regulatory requirements.

Domestic buyers and regulators are also creating demand for consistent and reliable MMRV, via policies like low-carbon fuel and clean heat standards and other market-based mechanisms that are designed to promote lower-emission natural gas use. There is also interest in harmonizing MMRV for lifecycle emissions from natural gas alternatives that achieve lower carbon intensities. These alternatives include hydrogen and renewable natural gas (RNG), the latter of which is sourced from biogas that has been upgraded and used in place of or alongside conventional natural gas. Conversely, a lack of uniform MMRV criteria could limit confidence in existing voluntary mechanisms for promoting GHG reductions. Measurement standards also help private actors improve their tracking of GHG emissions and increase confidence that such tracking is accurate.

TEXT BOX 2: EXISTING U.S. FEDERAL EFFORTS ARE CRITICAL TO ADVANCING MMRV GOALS.

There are several federal initiatives that should be maintained and, in some cases, strengthened to advance MMRV goals. For instance, the current reporting requirements of the EPA's GHGRP provide rigorous and consistently applied standards for data collection and reporting. These standards serve to undergird policies and market mechanisms for achieving GHG reductions across the natural gas supply chain. To improve the accuracy of emissions reporting, EPA could strengthen the GHGRP by collaborating with academic, industrial, and NGO partners to develop appropriate criteria for reporting measurements collected with proven technologies, such as aerial and continuous sensors, as a supplement to current reporting requirements, while also developing criteria by which the agency would confirm the accuracy of supplemental measurements. In addition, the DOE Office of Fossil Energy and Carbon Management's MMRV Framework Initiative and the National Petroleum Council's recommendations regarding GHG mitigation in the natural gas industry serve to advance MMRV goals. Notably, the National Petroleum Council's recommendations provide the basis for many of BPC's MMRV recommendations contained herein.

Longer term, strong MMRV practices could enable the development of policy and market instruments that inform GHG intensity-based targets for the natural gas supply chain that decrease appropriately over time to continuously drive and reward further innovations in emissions avoidance, control, and mitigation. In time, an intensity-based approach that facilitates lower natural gas-related GHG emissions are important for driving innovation, as well as for informing and maintaining natural gas's role in a low-carbon energy system.

MMRV RECOMMENDATIONS

BPC's MMRV recommendations focus on making it possible for market participants and regulators to confidently differentiate natural gas based on its GHG intensity, including by providing transparent measurement-based attributes, frameworks, and standardized metrics for documenting energy and environmental attributes. The United States has made considerable progress toward increasing the transparency and accuracy of emissions MMRV and should continue to do so.

It is important to note that the bulk of these recommendations align with recommendations contained in the National Petroleum Council's 2024 *Charting the Course* report.[16]

MMRV recommendation #1: Congress should fund efforts to facilitate consistent measurement and reporting practices; streamline processes for the reporting, collection, and sharing of emissions data across federal agencies and programs; and recognize alternative detection and measurement technologies and procedures.

MMRV is vital to promoting U.S. natural gas efforts to reduce GHG emissions associated with the use of natural gas, including the development of new technologies, and their swift deployment across the natural gas value chain. The establishment of such a framework requires a uniform approach for monitoring, reporting, collecting and aggregating emissions data and a scientifically proven approach to share and evaluate data to continuously improve emissions-control practices.

A host of federal agencies, including EPA, EIA, DOT, and the U.S. GHG Center (a multiagency collaborative), collect and aggregate supply chain-specific data from operators and provide tools to track and report GHG emissions at a supply chain level. These data can be used to determine GHG emissions intensity at a segment, basin, regional, and national level.

Continuously improving measurement technologies and monitoring protocols is also critical. We recommend that the work of federal agencies related to data collection for the natural gas industry be aligned and integrated with broader federal investments in GHG data-gathering initiatives, such as remote sensing, data assessment and aggregation, reporting mechanisms, and research and development. Relatedly, the U.S. government should allow the use of alternative detection and measurement technologies and consider funding DOE R&D into deploying advanced quantification techniques and methodologies. Moreover, Congress should continue to fund DOE and EPA programs that support public–private cooperation to advance innovations in monitoring, detection, and measurement (see **Text Box 2**).

MMRV recommendation #2: Federal emissions standards based on the best technologies and approaches to address new and existing sources for natural gas producers and midstream operators are necessary.

Comprehensive emissions standards for natural gas producers and midstream operators adopted in 2024 under Section 111 of the Clean Air Act (CAA), including requirements to address existing sources and leak detection and repair nationwide, are important to support U.S. credibility as a low-emissions producer. These standards complement MMRV rules under the GHGRP and therefore are also important to the credibility of U.S. MMRV. Many operators have indicated that they intend to continue investing in methane-abating technologies, regardless of whether the standards remain

legally enforceable. These voluntary actions are welcome, important, and can complement regulatory efforts. Maintenance of the implementation of Clean Air Act Section 111 standards for new, modified, and existing sources, however, would further bolster the position of the United States as an exporter of relatively cleaner LNG.

Further, Section 113 of the Pipes Act of 2020 mandates that PHMSA develop regulations containing standards for the use of advanced leak detection (ALD) technologies on natural gas systems. The use of ALD technologies would allow for natural gas leaks to be more effectively located, quantified, and repaired, minimizing emissions. Some operators are already implementing ALD to various degrees, even without the PHMSA regulations being in place.

MMRV recommendation #3: Congress should support public-private collaboration to standardize GHG intensity measurements for natural gas.

Significant advances in GHG measurement technologies, together with greater harmonization of measurement methodologies, are needed to lay the groundwork for the production and sale of lower GHG intensity natural gas and natural gas alternatives. Policymakers should encourage investment in GHG measurement technologies and other MMRV innovations.

Agencies such as DOE and EPA can also help define measurement methodologies, including recognized measurement-based standards, frameworks, and metrics, that buyers and sellers can use to structure gas contracts. Greater interoperability between registries or the emergence of a lead registry to enable the streamlined tracking of environmental attributes would also facilitate the development of robust markets for lower GHG intensity natural gas.

Finally, DOE, EPA, and FERC could play useful roles in developing accepted measurement and certification standards for differentiated gas, including appropriate metrics and/or transaction structures to correlate to certified emissions reductions and approaches for tracing the origins of natural gas. Where possible, federal, state, and local governments could use procurement commitments to create additional demand for lower GHG-intensity gas.

MMRV recommendation #4: Congress should support DOE's efforts to standardize MMRV protocols to help verify the emissions profiles of U.S. natural gas exports.

Policymakers should continue to support DOE's efforts to drive standardization in MMRV protocols across international and domestic supply chains, including seeking collaboration with international governments. Congress should support public-private collaboration with trading partners to establish a

consistent MMRV framework for LNG as described in our recommendations for LNG and exports in the foregoing section.

Potential elements of a standardized MMRV framework include:

- **Common criteria** to ensure rigor in the quantification and reporting of GHG emissions along with a process for independent certification or verification.
- **Data collection tools and transparency requirements** to establish baseline expectations for collecting and reporting data consistent with the needs of market participants and to provide a consistent tool for calculating supply chain emissions.
- **A process for attestation** to confirm that certifiers are employing consistent data quality requirements and estimation protocols, together with a mechanism to provide independent oversight of the accreditation process.
- **Support** (and/or funding) to provide guidelines and oversight of the MMRV conformity assessment scheme and transparent reporting to stakeholders.

These MMRV recommendations are intended to build off each other to create the market signals needed to sustain investment in natural gas, natural gas technologies, and applications that are compatible with maintaining energy system reliability, affordability, and safety, while also advancing the goal of long-term decarbonization. Making it possible for operators to prove that their actions to reduce emissions are actually lowering the GHG intensity of their natural gas products gives companies the opportunity to differentiate themselves in the marketplace.

Innovation and Decarbonization

Continued leadership in energy innovation will be critical to ensuring that natural gas can continue to help meet America's energy needs in the coming decades while the economy also makes rapid progress in reducing GHG emissions. Federal support has played a vital role in helping to advance new decarbonization and energy efficiency technologies, from R&D investment to commercialization and deployment.

Opportunities for decarbonization span the full natural gas supply chain, including upstream, midstream, and downstream end uses. Decarbonization opportunities for upstream natural gas production include process optimization to minimize venting and flaring and upgrades to improve equipment efficiency, while methane leak detection and repair (LDAR) constitute an essential tool for protecting against the release of fugitive methane emissions along the entire supply chain. Nascent decarbonization

approaches for residential, commercial, and industrial end uses include the development of integrated and flexible energy systems driven by natural gas, utilization for breakthrough power generation, and novel technologies for process heating.

Advances in carbon capture, utilization, and storage could enable application of these technologies at several points along the gas value chain. For example, CCUS can be employed to reduce emissions from natural gas-fired power plants, including new facilities likely to be needed to power new data centers. CCUS could also help unlock lower-carbon hydrogen. Pairing hydrogen production from natural gas with CCUS is already the lowest-cost option for creating new supplies of low-carbon hydrogen—in fact, some studies find that CCUS-supported natural gas-based hydrogen compares favorably to renewables-based hydrogen generation.[17] CCUS can also be deployed to address emissions from existing hydrogen projects that rely on natural gas.

In parallel, expanded investment in low-carbon fuels such as RNG and hydrogen presents another promising pathway to decarbonize gas utility supply and support emissions-reduction targets. Accelerating the production and integration of RNG and hydrogen into gas distribution systems can help diversify energy supply while reducing lifecycle emissions, complementing advancements in CCUS and other technologies.

INNOVATION AND DECARBONIZATION RECOMMENDATIONS

Our innovation and decarbonization recommendations focus on maintaining a supportive environment for the development and deployment of new technologies for low-carbon utilization of natural gas, including R&D, energy efficiency standards, and enabling infrastructure.

Innovation and decarbonization recommendation #1: Congress should support R&D to advance U.S. global leadership in technology innovation and decarbonization across the natural gas value chain.

Sustained investment in R&D at DOE and other federal agencies should target new energy efficiency approaches, lower emissions technology, and CCUS advances across the natural gas value chain, as well as technologies related to renewable natural gas.

Policymakers should continue to support R&D in energy efficiency, which remains the most cost-effective way to reduce energy use and associated

emissions, and novel lower emitting technologies. In line with the National Petroleum Council, for example, we recommend that DOE undertake new research, development, demonstration, and deployment (RDD&D) on supporting technologies that could reduce energy requirements in the natural gas supply chain for compression, heat, and power activities. Examples of promising approaches to decarbonize downstream end use include:

- Resilient and flexible integrated energy systems driven by natural gas to address energy demand growth and winter peak heat, including behind-the-meter microgrids, dual fuel space and water heating systems, gas utility-driven thermal energy networks, and advanced controls.
- Breakthrough power generation, cooling, and energy storage options for buildings and data centers, for increased competitiveness and speed to deployment before 2030.
- Novel integrated and reliable process heating technologies, involving emerging high temperature heat pumps integrated with on-site energy and thermal energy storage.
- Medium- and heavy-duty natural gas and natural gas hybrid vehicles, natural gas, RNG, and alternative fuel powered aviation, rail and marine equipment.

This work can build on existing activities being undertaken by DOE's offices of Energy Efficiency and Renewable Energy and Fossil Energy Carbon Management, as well as the National Labs, Department of Defense, and other agency offices.

R&D is also needed to improve efficiency and lower costs for CCUS, as well as to develop new pathways for CO_2 utilization, making its capture more cost effective and enhancing U.S. technology leadership and economic competitiveness. DOE's National Energy Technology Laboratory is funding research into new CO_2 capture solutions through its Point Source Carbon Capture Program. Policymakers should ensure that federal resources continue to be available for this and other lab bench R&D programs. Other DOE programs to advance the large-scale testing, deployment, and commercialization of nascent CCUS technologies, including the Carbon Capture Large-Scale Pilot Projects, Carbon Capture Demonstration Projects Program, and Regional Clean Hydrogen Hubs, could play an important role in moving these technologies toward commercialization. DOE is undertaking crucial R&D on CO_2 utilization. For example, CO_2 and CO_2-derived carbon monoxide (CO) can be used to produce low-embodied-carbon products. Such products include fuels (including but not limited to hydrogen), chemicals, and building materials. These efforts could turn CO_2 into a valuable economic input, further incentivizing its capture.

Additionally, support is needed for critical research to convert abundant, low-cost natural gas, natural gas liquids and other gas streams to sustainable products, including chemicals and fuels, such as hydrogen, ammonia and methanol. Funding should support ongoing and new work at the National Energy Technology Laboratory related to sustainable fuels and chemicals, including leveraging digital innovation, modeling, and artificial intelligence, for progress in this area.

Finally, government agencies should continue to support investments in RNG production technologies that mitigate fugitive methane emissions from biomass sources. This includes capturing and upgrading biogas from agricultural operations and landfills, as well as larger-scale RNG production using gasification technologies—in both instances producing pipeline-quality gas. For instance, the U.S. Department of Agriculture should continue providing grants and guaranteed loans, as well as technical assistance, to agricultural producers and rural small businesses for RNG project development through programs such as Rural Energy for America and the Conservation Innovation Grant program. With respect to agricultural and other biogas sources—such as landfills—that can be converted to RNG, EPA also should continue to fund RNG work through several programs, including the Landfill Methane Outreach Program (LMOP), AgSTAR, and the Renewable Fuel Standard (RFS) program. DOE should continue funding R&D for gasification of wastes and co-gasification of fossil and mixed wastes feedstocks, biomass, plastics and other traditional feedstocks that need to be realized to dramatically expand RNG and hydrogen production, as well as to open up new pathways for chemicals production.

Innovation and decarbonization recommendation #2: The United States has made significant progress in energy efficiency over the past few decades, due in part to integrated applications of federal standards and incentives. While sustaining that progress, DOE, EPA, and other relevant federal agencies should ensure that energy efficiency standards for end-use applications are drafted in a fuel-neutral manner, reflecting bipartisan statutory mandates that were signed into law by then-President Ronald Reagan.

Energy efficiency is a practical tool to achieve greater affordability and energy savings as well as associated emissions reductions. Policies should be focused on increasing energy efficiency for consumers and not be designed with the additional goal of shifting away from natural gas.

A fuel-neutral approach should ensure that energy savings achieved through efficiency improvements are real, verifiable, and based on measurable performance. This would help safeguard affordability by protecting consumers from increased costs associated with equipment conversions, infrastructure changes, or limitations in product availability. It also would ensure a level

playing field for innovation across all fuel types, encouraging manufacturers to pursue advancements that provide true value to consumers.

Innovation and decarbonization recommendation #3: Congress should support programs to scale up and ensure the safety of a complementary CO_2 pipeline and storage network to support natural gas system decarbonization.

Investment in CO_2 transportation and storage infrastructure will be needed to support CCUS deployment, as the technology requires captured CO_2 to be compressed and then transported, in most cases likely via pipeline, to the point of use or storage (as shown in Figure 4). Permanent sequestration typically involves injecting CO_2 into underground geologic formations either onshore or offshore. Alternatively, CO_2 can be used to create other products that provide additional economic benefits, as described in Innovation and decarbonization recommendation #1 above.

Figure 4: Schematic of the CCUS Ecosystem

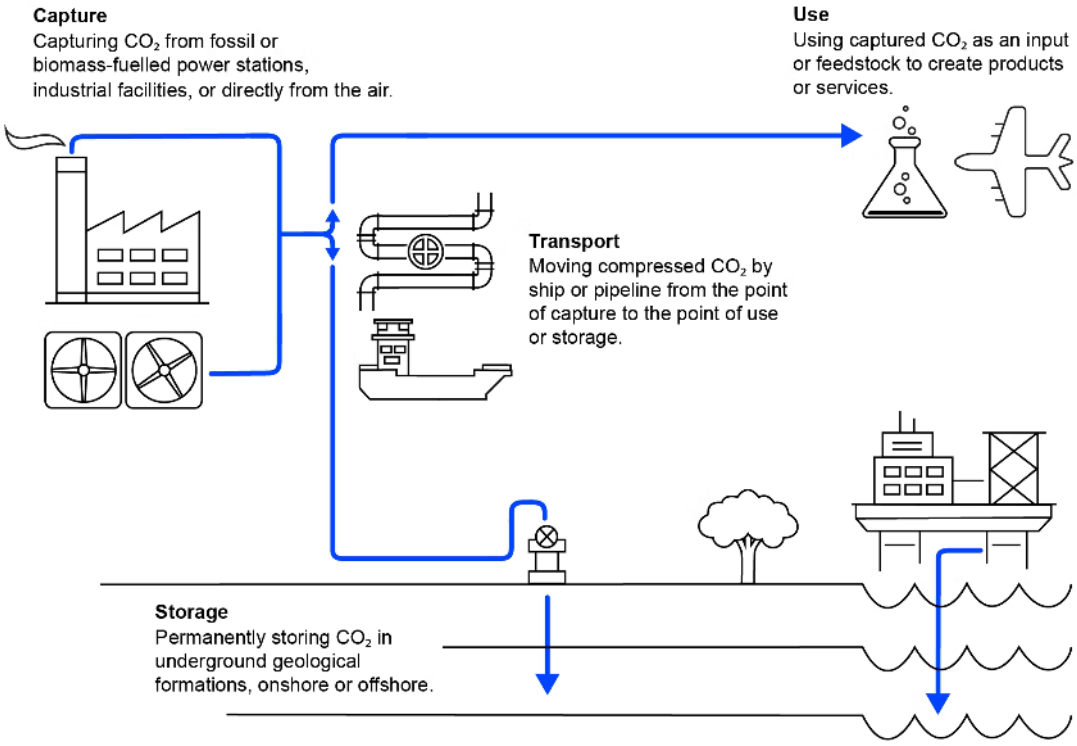

Image sourced from the International Energy Agency. Available at: https://www.iea.org/reports/ccus-in-clean-energy-transitions/a-new-era-for-ccus.

The United States has roughly 5,000 miles of existing CO_2 pipeline. PHMSA estimates that this network may need to expand tenfold by 2050 as a growing number of point-source CO_2 capture and removal projects comes online.[18] Updated regulations to enable the safe operation and efficient permitting of CO_2 pipelines are essential to create greater certainty for pipeline developers and gain the confidence of local communities. To this end, PHMSA should issue updated regulations to strengthen safety requirements for CO_2 pipelines.

Moreover, policymakers could further accelerate the development of the CO_2 pipeline network by making changes to DOE's existing Carbon Dioxide Transportation Infrastructure Finance and Innovation (CIFIA) program to encourage greater uptake by private companies. This program was established under the Bipartisan Infrastructure Law to provide public financing for CO_2 pipeline expansion projects, but no awards have been made to date.

Geologic storage for captured CO_2 is another critical piece of the CCUS infrastructure puzzle. Enhancing the transparency and efficacy of EPA's Class VI well permitting program will help make geologic storage available at the scale and pace needed. Although EPA has taken steps to improve visibility into its process—including by introducing its Class VI Permit Tracker—the time needed to issue a permit still lags far behind targets. Sufficient funding would help EPA provide adequate staffing. In addition, EPA should continue to grant primacy over permitting for Class VI wells to states where appropriate.

Congress should also provide funding to maintain the CarbonSAFE Initiative, run by DOE's National Energy Technology Laboratory. Since 2016, CarbonSAFE has offered crucial support to developers interested in understanding and mitigating potential risks associated with carbon sequestration projects by identifying and detailing the characteristics of potential geologic storage sites. This information helps project developers secure financing and move toward final investment decisions.

CO_2 is a vital tool in enhanced recovery. R&D is needed to support DOE's Unconventional Research to unlock more natural gas from the subsurface, while limiting the environmental and community effects. A focus on subsurface R&D efforts could also lead to important breakthrough opportunities in geothermal, hydrogen, natural gas storage, including long-duration seasonal storage, and critical mineral extraction (e.g., lithium produced from brine) that would strengthen U.S. energy dominance, security, and reliability.

Conclusion

Natural gas will continue to play a critical role in providing reliable, affordable, and clean energy—both domestically and abroad—as producers and consumers seek to reduce GHG emissions and, eventually, transition to a net-zero economy. The recommendations in this report seek to ensure that continued development and use of natural gas proceeds in a manner that aligns with widely shared economic and environmental goals. It is our hope that they will help policymakers and decision-makers lay the groundwork for a domestic natural gas industry that is clean and competitive, and well positioned to support U.S. economic growth and employment opportunities for decades to come.

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