

Workshop Report

# The Role of U.S. Natural Gas Exports in a Low-Carbon World

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April 2023

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The EFI Foundation advances technically grounded solutions to climate change through evidence-based analysis, thought leadership, and coalition-building. Under the leadership of Ernest J. Moniz, the 13th U.S. Secretary of Energy, EFI Foundation conducts rigorous research to accelerate the transition to a low-carbon economy through innovation in technology, policy, and business models. EFI Foundation maintains editorial independence from its public and private sponsors. EFI Foundation's reports are available for download at **[www.efifoundation.org](http://www.efifoundation.org)**

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# EXECUTIVE SUMMARY

Two unprecedented events—the COVID-19 pandemic and Russia's invasion of Ukraine—have severely disrupted global energy markets. Countries, mainly in Europe but also throughout the world, have struggled to deal with the ensuing shocks to their energy

**Natural gas, as a cleaner alternative to coal and oil, can help countries meet both energy security needs and decarbonization goals.**

supplies, which have, once again, placed energy security as a central focus of global energy discussions and debates. At the same time, the threat of climate change remains and demands that energy solutions address both energy security needs and deep decarbonization goals. While the energy transition dictates cleaner fuels, renewable energy technologies cannot currently provide

the reliability, redundancy, resilience, and affordability that countries need to meet their energy security objectives.

These paired crises underscore the important role of natural gas in the transition to a low-carbon future. Natural gas, as a cleaner alternative to coal and oil, can help countries meet both energy security needs and decarbonization goals. As the world's biggest natural gas exporter, the United States plays a crucial role in helping countries address both goals on a global scale.

To discuss opportunities and challenges related to energy security and decarbonization goals regarding policy, finance, environmental impact, and global markets, the EFI Foundation convened a workshop, *"The Role of U.S. Natural Gas Exports in a Low-Carbon World."* on Jan. 19, 2023. The workshop in Washington, D.C., was attended by

78 senior executives and experts from a variety of backgrounds, including the natural gas industry, the U.S. government, consulting firms, law firms, financial institutions, non-government organizations, think tanks, and foreign governments. This workshop is part of a larger EFI Foundation research effort to explore the role of natural gas in energy security and decarbonization, with special consideration given to the impacts in Europe and Asia.

In preparation for this workshop, EFI Foundation commissioned four white papers (included as appendices to this report) to discuss various subtopics, including:

- *The Current State of Natural Gas Supply and Demand*
- *The Effect of U.S. LNG Exports on U.S. Domestic Prices: A European Perspective*
- *U.S. LNG Exports: Supply, Sitting, and Bottlenecks: The U.S. Natural Gas Market in a Global Setting*
- *European and Asian Energy Security in the Context of LNG*

This workshop report distills the most important issues discussed at the workshop to inform decision-makers and stakeholders of the challenges, opportunities, and considerations associated with the crucial role U.S. natural gas plays in domestic and international energy security and climate goals. To generate valuable and candid dialogue between participants, the workshop was held under Chatham House Rule. As a result, this workshop report includes direct quotes and comments from participants; however, it does not attribute these remarks to any participants outside of EFI Foundation, nor does it include a list of participants. Any text in quotations refers to a direct quote from a workshop participant unless otherwise specified.

The conclusions from the workshop discussion and whitepapers are outlined in key takeaways on the next page. ■

# Workshop Key Takeaways: The Role of U.S. Natural Gas Exports in a Low-Carbon World



**1**

Climate goals and energy security—both affordability and availability of supply—need to be addressed in the same conversation.



**2**

Natural gas will continue to be crucial for fulfilling global goals for decarbonization, energy security, and food security.



**3**

The deployment of current technologies and additional regulations are needed for the natural gas industry to address its greenhouse gas emissions, including methane.



**4**

Federal, state, and local government permitting issues are a major challenge to meeting deep decarbonization and energy security goals.



**5**

The timelines for financing and building energy infrastructure may not be sufficient to meet global energy security and decarbonization needs.



**6**

Natural gas prices in the U.S. are affected by the dynamics of global energy markets as well as domestic politics and concerns.



**7**

The United States must decide what role to play in supplying natural gas and enabling global decarbonization goals.



**8**

Although Europe needs gas in the near term, it may not be a long-term market for U.S. exports.



**9**

In Asia, developing nations are primarily concerned about the affordability of natural gas, while developed nations worry more about the reliability of supply.



# INTRODUCTION

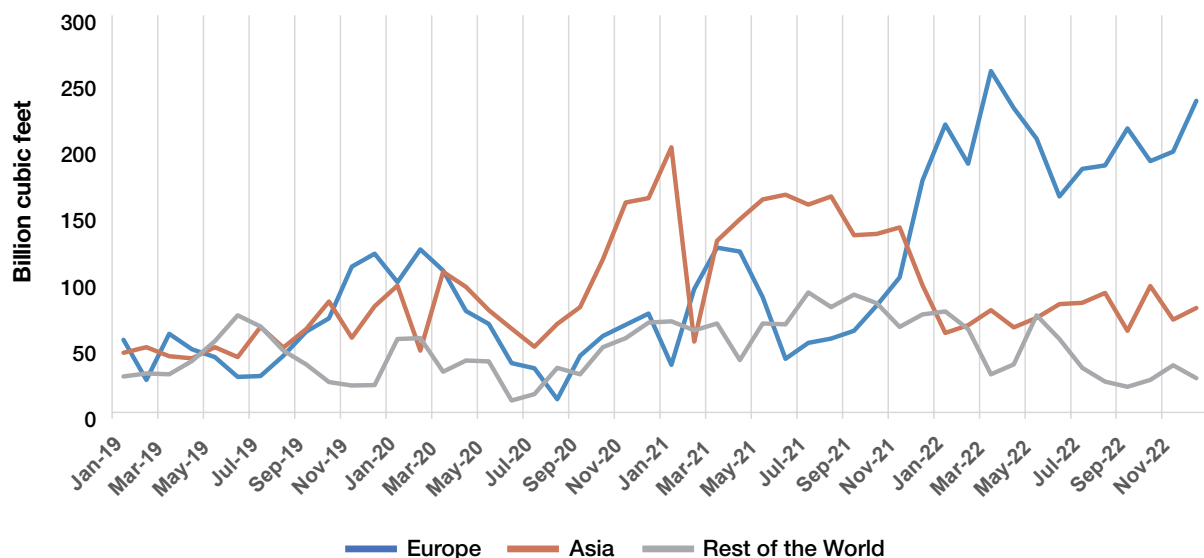
Russia's invasion of Ukraine not only heightened geopolitical tensions but also resulted in a major refocus by many nations on energy security issues in the context of decarbonization goals. Russia, the world's third-largest crude oil and second-largest natural gas producer, weaponized its energy supplies. In response to the humanitarian and energy crises in Europe, the EU and its allies have worked to weaken Russia's

ability to finance its war in Ukraine through targeted sanctions on Russia's exports of oil, natural gas, and petrochemical products.

U.S.-origin natural gas has largely filled the gap left by Russia's weaponization of its energy supplies and the sanctions imposed by the U.S. and European nations. Even before the conflict in Ukraine, the United States already had dramatically increased its liquefied natural gas (LNG) exports to Europe at the same time that it was increasing exports to other crucial regions, such as Asia (Figure 1).<sup>1</sup> As the world's largest LNG exporter, the United States exported more than double the amount of LNG to Europe in the first three quarters of 2022 than it did in all of 2021.<sup>2</sup> The United States is expected to continue increasing its LNG export capacity because of the growth in demand for natural gas internationally.

**U.S.-origin natural gas has largely filled the gap left by Russia's weaponization of its energy supplies and the sanctions imposed by the U.S. and European nations.**

**Figure 1 | U.S. LNG exports by region 2019 - 22**



Source: Energy Information Administration.<sup>3</sup>

Alongside the growth in global demand for natural gas, countries will continue to compete for gas as the main producers—the United States, Australia, and Qatar—increase their production and export capacities. As seen in Figure 1, Europe replaced Asia as the primary destination of U.S. LNG exports even before the invasion of Ukraine. This sharp increase in European demand severely disrupted global LNG trade flows as shipments were diverted to Europe to capitalize on high prices and new demand.<sup>4</sup> Faced with potential energy shortages, European countries paid high prices to secure gas for their domestic needs. U.S. LNG exports met this unexpected demand because most U.S. LNG contracts do not have destination clauses and allow buyers to divert and resell cargoes to other buyers. Many Asian buyers, especially China, resold LNG to Europe for a profit.<sup>5</sup> Although these high prices have allowed Europe to secure its energy needs during a period of crisis, the costs have been passed on to households and businesses.<sup>6</sup>

Meanwhile, because of macroeconomic, geopolitical, and climate concerns, Asian markets will likely be challenged by another year of uncertain gas supplies despite having the largest regasification capacity in the world.<sup>7</sup> Many Asian countries have been confronted with declining local natural gas supplies, and their demand is beginning to outstrip supply. As a result, the power and industrial sectors in these countries are looking to import LNG to meet their supply needs. At the same time, Asian countries have been challenged by delayed timelines for investment in gas infrastructure, including the construction of import terminals, pipelines, and gas-fired power plants.<sup>8</sup> As U.S.-origin LNG exports were diverted to Europe, Asian countries, especially developing nations that could not afford high prices, have had to use more accessible, affordable, and higher-emitting fuels, such as coal and biomass. The uncertain future of natural gas supply may diminish its role in helping Asian allies meet their own economic and

decarbonization goals and cause energy security concerns for LNG import-dependent nations in Asia, including important U.S. allies, such as Japan and South Korea.

These geopolitical and macroeconomic forces and the need to balance energy security and decarbonization goals underscore the importance of U.S. natural gas supplies and their essential role for U.S. allies and trading partners. Competing forces in the United States—those focused on the energy security of our allies and those who do not want to increase extraction of fuels—complicate the path forward for U.S. gas producers and policymakers. The latest Intergovernmental Panel on Climate Change (IPCC) report, which states that global natural gas will have to decline by 45% by 2050 (compared to 2019 levels), highlights that the speed of the energy transition and how quickly deep decarbonization can occur is a major challenge.<sup>9</sup> At the same time, pragmatism delivered at speed is better than perfection that comes too late.<sup>10</sup> In regards to the important role of natural gas, three factors have emerged that may constrain the ability of the United States to help meet mounting demand from Europe and Asia:

1. Decarbonization policies to meet climate goals that may reduce long-term demand for hydrocarbon-based fuels and inhibit investments needed to meet short and mid-term needs.
2. Limited infrastructure capacity at export (liquefaction), interconnected pipelines, and import (regasification) facilities.
3. Domestic pressure to slow production in the United States due to high prices for consumers, political polarization, and climate change concerns.

To meet global demand for natural gas for both decarbonization and energy security, the United States will need to address regulatory challenges, overcome market competition, reassure investors that assets will not be stranded, and navigate constraints throughout the value chain.

# PREVIOUS WORK

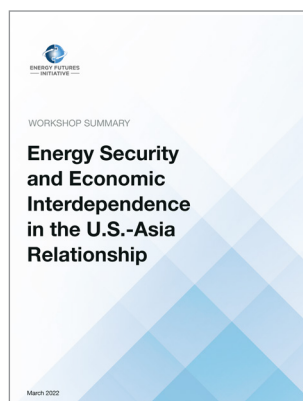


The Energy Futures Initiative (EFI) has analyzed global natural gas markets and dynamics over the past several years. EFI published a report in June 2021 titled “The Future of Natural Gas in a Deeply Decarbonized World” summarized

key findings from eight regional workshops with local experts and stakeholders around the world. Each regional workshop focused on the role of natural gas in the transition to low- and zero-carbon energy systems and regional concerns and plans for the energy transition. The report analyzed cross-cutting themes from these regional workshops and explored a range of issues in the context of global and regional energy policy, climate policy, trade, investment options, and geopolitical and energy security implications. In general, all of the regions concluded that:

- The cost of natural gas relative to alternative energy sources, including clean energy technologies, will factor heavily into regional gas use.
- North America’s extensive domestic natural gas supply presents future opportunities and challenges for gas use in the region and around the world.
- The need for resilient, reliable, secure energy systems is growing in importance as climate risks increase.

**North America’s extensive domestic natural gas supply presents future opportunities and challenges for gas use in the region and around the world.**



EFI also held a workshop on February 8, 2022 titled, “Energy Security and Economic Interdependence in the U.S.-Asia Relationship,” to better understand the role natural gas plays in energy security, the economy, and

decarbonization goals between the United States and Asia. Though experts shared insights on the economic impacts of U.S.-Asia energy trade, the role of U.S. LNG in the energy transition of Asian economies, and the geostrategic role of the U.S. energy trade, the workshop took place two weeks before the Russian invasion of Ukraine. The invasion has affected LNG trade flows and conversations around energy security, geopolitics, and decarbonization, so the perspectives of workshop participants might have been different had the invasion preceded the workshop.

# WORKSHOP FORMAT

The first agenda items of the January 2023 workshop included keynote speeches and a panel discussion. The workshop began with introductory remarks from Ernest J. Moniz, President of EFI Foundation and former Secretary of Energy (2013 to 2017), followed by a keynote address on the state of global gas and energy security after the invasion of Ukraine. The second keynote provided a financial outlook on global natural gas markets and the role of the United States. Melanie Kenderdine, Secretary of EFI Foundation, discussed our previous work in this context and how those findings may inform current discussions around geopolitics, energy security, and decarbonization. Following the keynotes, a panel comprising experts from government, regulators, industry, and environmental groups discussed the role of natural gas in the clean energy transition and how to balance energy security and climate goals.

The afternoon portion of the workshop included three breakout sessions, a recap of the findings of the breakout sessions, and a closing conversation featuring Moniz and former members of Congress. Each breakout session consisted of a diverse group of participants and focused on a specific component of the opportunities and challenges for natural gas on a global scale. Discussions in each breakout session were framed by a white paper written specifically for the workshop and provided to participants in advance. In addition, EFI Foundation authored a foundational paper to set the scene for the workshop.

## Foundational Paper

This white paper reviewed the role of the United States in producing and supplying natural gas to meet demand both domestically and internationally for its allies and trading partners in Europe and Asia. While the United States has the potential to help countries around the world meet both energy security needs and decarbonization goals, it must simultaneously address the domestic challenges in permitting and financing production, transport, processing, liquefaction, and the associated infrastructure. In the context of U.S. LNG, Europe will be a destination market in the short term, and Asia is poised to be a long-term growth market as it continues its economic development while simultaneously working to meet its decarbonization goals.

The breakout sessions were centered on the following themes:

## Session 1: The State of Global Gas Supply and Economics

The white paper for this session provided insight into the effect of U.S. LNG on domestic prices through the lens of investor motivations in the natural gas sector against the backdrop of the COVID-19 pandemic and Russia's invasion of Ukraine. Both government and industry need to balance competing objectives along with political and economic considerations that directly impact price formation and investment decisions in the natural gas sector.

Because of the Russian invasion of Ukraine and infrastructure bottlenecks, European gas supply is expected to remain tight, and gas prices will remain relatively high. This situation likely will continue until global LNG supply increases in 2025, with the completion of new liquefaction and export facilities in the United States and Qatar. European gas markets and prices will undoubtedly affect the dynamics of gas prices in Asia and, to a lesser extent, in the United States.

## **Session 2: Enabling LNG Exports While "Greening" the Value Chain**

The white paper for this session analyzed the current state of supply, siting, and bottlenecks of the U.S. natural gas export infrastructure across the associated value chain. Prospects for U.S. LNG exports are good as long as market forces are enabled and not impeded. Infrastructure to support regional and international trade is paramount, but regulations should not necessarily be lax. Rather, regulation should encourage transparency and competition so value propositions can be identified. As global energy markets continue their inexorable transition to a lower greenhouse gas (GHG) future, sources of energy supply that are competitive, accessible, and environmentally responsible will thrive. U.S. natural gas can play an important role if it is accessible, if its environmental performance is managed and verifiable, and if the market continues to operate with the transparency that has driven the United States to become the largest and most liquid gas market in the world.

## **Session 3: EU and Asian Energy Security in the Context of LNG**

The white paper for this session examined the future of LNG trade while recognizing

that the market is at a crucial juncture following Russia's invasion of Ukraine on Feb. 24, 2022. The war has led to a sharp increase in European LNG demand to compensate for the disruption in Russian pipeline flows, resulting in extreme gas and LNG price volatility, and has reduced LNG supply available to other markets. Energy security now sits more prominently alongside decarbonization, with both as important imperatives for global energy markets. In the short term, the market likely will remain tight until the second half of this decade, when more LNG supply capacity becomes available, led by the United States and Qatar.

The longer term outlook is less certain. Emerging markets in Asia that were encouraged to switch to gas (via LNG) when it was relatively cheap and plentiful from 2015 to 2020 may no longer see gas as the ideal transition fuel. For Europe, moving away from gas is now as much an energy security issue as it is one of decarbonization. As a result, investors now face more uncertainty regarding long-term demand. Combined with the risks inherent to the LNG industry (on account of the cost, size, and complexity of projects often in unstable regions), investment in new capacity could slow despite the current supply shortages.

Because participants were able to attend only one of the three breakout sessions, each session moderator participated in a panel following the breakout sessions to share key takeaways from the discussions. To close the workshop, Moniz was joined by three former members of Congress to discuss challenges and opportunities in the regulation of the natural gas industry and how the 118th Congress might approach legislation for issues relevant to natural gas infrastructure and exports.





## KEY TAKEAWAY

# 1

**Climate goals and energy security—both affordability and availability of supply—need to be addressed in the same conversation.**

### HIGHLIGHTS

- Energy security, climate goals, geopolitics, and economics are all part of the same conversation.
- The global energy transition is disruptive to current energy paradigms.
- Policymakers should plan for different scenarios given the conflict in timelines for investment, infrastructure, energy security, and decarbonization.
- Diverse stakeholders need to collaborate with one another to address energy security and climate goals.

The Russian invasion of Ukraine and its fallout have emphasized that economics, security, climate, and geopolitics should be part of the same conversation, and integrated solutions are paramount to addressing each challenge.

In his introductory remarks, Moniz said, “Energy security was not to be viewed individually, country by country, but that it was a collective responsibility, particularly of allies and friends.” He underscored the point that international partnerships are vital to driving the long-term success of energy security and decarbonization goals. While the solutions seem simple and straightforward when climate and security issues are siloed, global energy systems require integrated solutions that can address both needs. As one participant said, “If anyone had

any doubts about the necessity for integrated solutions that address both climate and security, the war in Ukraine evaporated those doubts.”

Integrated solutions to build successful energy systems rest on the pillars of reliability, redundancy, resilience, and affordability. Natural gas is an energy source that can address all four pillars with sufficient infrastructure, and one participant noted that the nascent technologies of battery power and hydrogen are not yet ready to supplement intermittent power at scale.

While integrated solutions attempt to balance energy security and decarbonization, participants were clearly concerned that the ongoing global energy transition is disruptive to the status quo. According to the latest IPCC report, global

natural gas use will have to decline by 10% in 2030 and by 45% by 2050 (compared to 2019 levels) to meet the 1.5 degree targets by 2050.<sup>11</sup> The U.S. government's long-term goal is to “decline the use of fossil fuels as a primary energy resource in the energy system,” and while the U.S. may be seen as hypocritical because it invests in both fossil fuels and renewables, it is investing for both short-term (2030) and long-term (beyond 2050) goals. Fossil fuels are currently needed to power the world to ensure energy security and economic prosperity in the near term. “The timelines are all conflicting,” one participant said. “[But] we have to have the supply today, and that’s why the U.S. government fully supports LNG exports.”

These timelines are further complicated by unforeseeable geopolitical events, such as the war in Ukraine. One participant noted that “as long as the war in Europe continues, we have a distorted market in both oil and gas.” The participant went on to comment that while the world needs to increase oil and gas production to meet short-term energy security needs, these resources may not be needed in 2040, which is a challenge for infrastructure and investment timelines.

The conflict in timelines for investment, infrastructure, energy security, and decarbonization goals will require planning for different scenarios. A participant posed a question during the third breakout session, which focused on Europe and Asian LNG demand: “Do we assume that we will not need gas in the future and relax because we don’t have to think about entering into long-term commercial off-take arrangements? Or should we operate on the basis that we may very well not get to that point, and therefore should have a backup plan?”

As has been demonstrated by the conflict in Ukraine, planning and preparing for a variety of outcomes is essential for ensuring both energy security and climate action. Europe was fortunate that LNG trade flows were able to shift

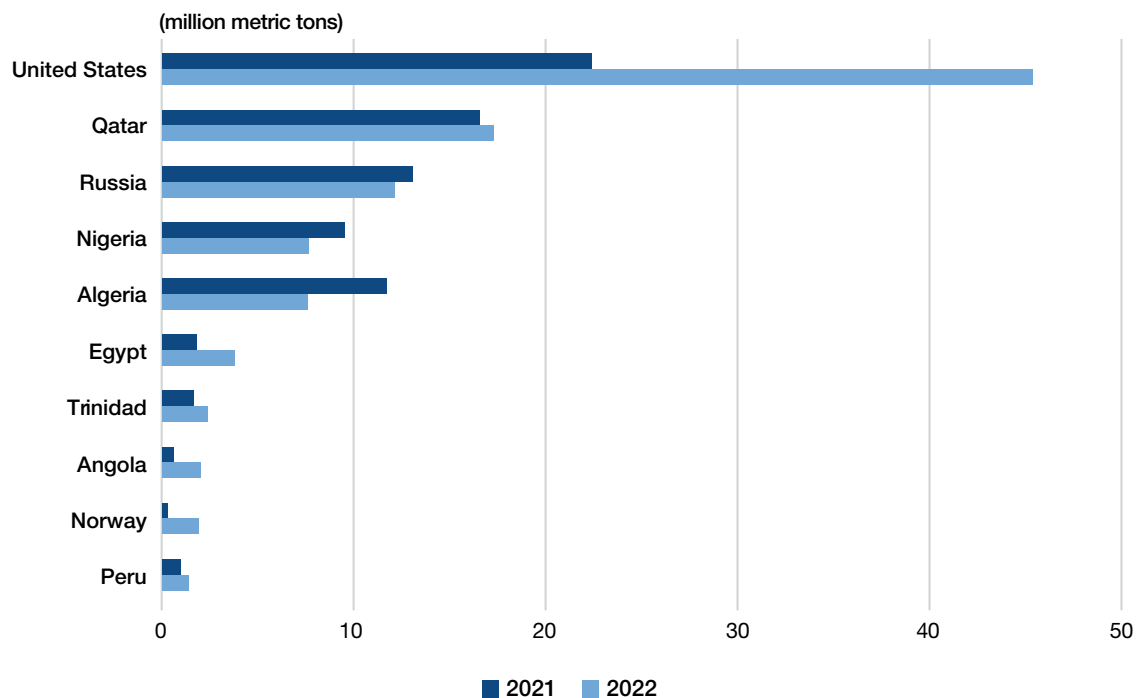
to accommodate their energy security needs (Figure 2), but many participants pointed out that the market may not support this shift in the long term.<sup>12</sup> During the past year, allies agreed to sell surplus LNG to Europe at a premium after filling their winter reserves. China’s demand was dampened because of COVID-19 and surrounding policies, but as its economy begins to bounce back, its demand for natural gas is expected to grow this year, which could be problematic for Europe next winter.<sup>13</sup>

Another element of the disruptive nature of the energy transition is that the development and implementation of renewable energy technologies still involve raw materials transported across global supply chains. Participants noted the energy security implications of renewable energy supply chains, specifically regarding critical mineral supply chains: “Although there is no ownership of the wind and sun, there is ownership of materials needed to harness the energy from these resources,” said one participant. “If we want to develop a manufacturing base [in the United States], then we need to invest in upstream supply chains and compete with China in developing economies in Africa, Latin America, and Asia.”

Many participants agreed that the United States should continue to depend on natural gas as a pillar of its energy security strategy and use it to develop international partnerships to secure supply chains needed for the energy transition. In such a strategic partnership, the United States could supply emerging economies in Africa and Asia with natural gas in exchange for critical minerals needed for clean energy technologies.

Developing solutions to difficult questions around climate, security, and geopolitics will require collaboration with diverse stakeholders, including disadvantaged communities, labor, industry, government, and other groups. Many participants, including Moniz, expressed their enthusiasm for the 2023 United Nations Climate Change Conference (COP28) because all

**Figure 2 | Change in European LNG supply sources from 2021 to 2022 (January-October of 2022).**



Source: S&P Global Commodity Insights.<sup>14</sup>

stakeholders could be brought to the table to discuss pragmatic solutions to the climate crisis. Diverse coalitions will be crucial to addressing domestic challenges. For example, one participant suggested forming a decision-making body for energy development, such as a federal, state, tribal, and local commission, which could be beneficial for reforming the permitting process and build the infrastructure necessary for the energy transition. Other recommendations included engaging the Congressional Black Caucus to build a legislative coalition for permitting reform and engaging labor groups, because a just transition involves creating high-quality jobs, especially in geographic areas that may lose jobs during the energy transition.

Several participants said the Biden administration could do more to engage with and incorporate industry as part of the solution. Participants generally shared the view that the government should be taking a technology-neutral approach

and collaborating with industry to ensure a secure energy supply with the lowest emissions possible: “We shouldn’t be focused on the fuel. We should be focused on the emissions.” Another participant expressed that environmental organizations and energy incumbents “can certainly learn from each other. And I think if we weren’t talking past each other, and placing [energy sources] in a good or bad pile, we could get a long way and get a lot done.”

Another area identified as a way to remove conflict from the conversation “is the notion that somehow addressing the environmental side of these questions of the natural gas issues is fundamentally in conflict with our national and international security needs.” Participants discussed that good-faith efforts to reduce overall emissions by deploying carbon capture, utilization, and storage (CCUS) and increasing monitoring and data transparency efforts could build public trust in the gas industry.



## KEY TAKEAWAY

# 2

**Natural gas will continue to be crucial for fulfilling global goals for decarbonization, energy security, and food security.**

### HIGHLIGHTS

- Natural gas can contribute to meeting decarbonization goals by helping countries switch from coal to gas and enabling the production of clean hydrogen.
- Renewable energy-based grids can benefit from the stability and security provided by natural gas.
- Food production depends on natural gas as a feedstock for nitrogen-based fertilizers.

**Many shared the sentiment that helping other countries to fuel switch from coal or oil generation is essential to reducing global emissions.**

An important theme throughout the workshop was that natural gas can play an important role in helping meet global decarbonization goals. Some participants felt that the United States should do a better job of emphasizing the fact that it was able to lead the world in emissions reductions since 2005 largely because of fuel switching from coal to natural gas. Many shared the sentiment that helping other countries to fuel switch from

coal or oil generation is essential to reducing global emissions. As one participant stated, “The best way to address climate change is to export as much LNG as we can.” Countries at different stages in their development have different priorities, and they will have different approaches to decarbonization. For example, China and India have stated net zero goals of 2060 and 2070, respectively.

Others noted that natural gas will remain a critical feedstock for heavy industry, such as steel, cement, and chemicals, which are difficult to electrify because of high temperature requirements and economic factors.<sup>15</sup> While hydrogen is a potential feedstock for these sectors, natural gas is still essential for affordably producing hydrogen because it is a

“physical fact that it’s a lot easier to break up a methane molecule than a water molecule to get hydrogen,” as one person put it.

A concern for participants was the rhetoric around decreasing the use of fossil fuels, prompting the question, “What problem are you trying to solve? If you are trying to solve the problem of too much carbon in the atmosphere, we need to have a different approach.” A program of performance-based results, which are measured on reliability, resilience, redundancy, and affordability, may be a pragmatic way to meet both security and decarbonization goals instead of prescriptive regulation that seeks to decide which fuel sources to use.

Alongside the crucial role of natural gas for global decarbonization, the other major theme that participants highlighted throughout the workshop was the importance of natural gas for energy and economic security as a complement to renewables. As one participant said, “Natural gas is complementary and actually needed for the increase in renewables” precisely because of its ability to balance the grid. Current battery technologies and green hydrogen are insufficient to balance the intermittency of renewable generation at scale and will likely remain so for at least the next decade, but “natural gas can turn on and off,” so it can fill this role. Lack of a reliable backup source can result in consequences that are even more harmful to the environment. This past December and January, the Northeastern United States was forced to burn fuel oil when it was not able to obtain gas for heating purposes, and the cost was higher emissions. Fuel oil combustion emits about 50% more carbon dioxide (CO<sub>2</sub>) than natural gas combustion, and it also emits considerably higher criteria air pollutants.<sup>16</sup> One participant noted that Europeans, who are perceived as more aggressive in pursuing climate goals, were forced to turn on all coal power plants when their natural gas supply was interrupted during the Russian invasion of Ukraine. Developing countries also

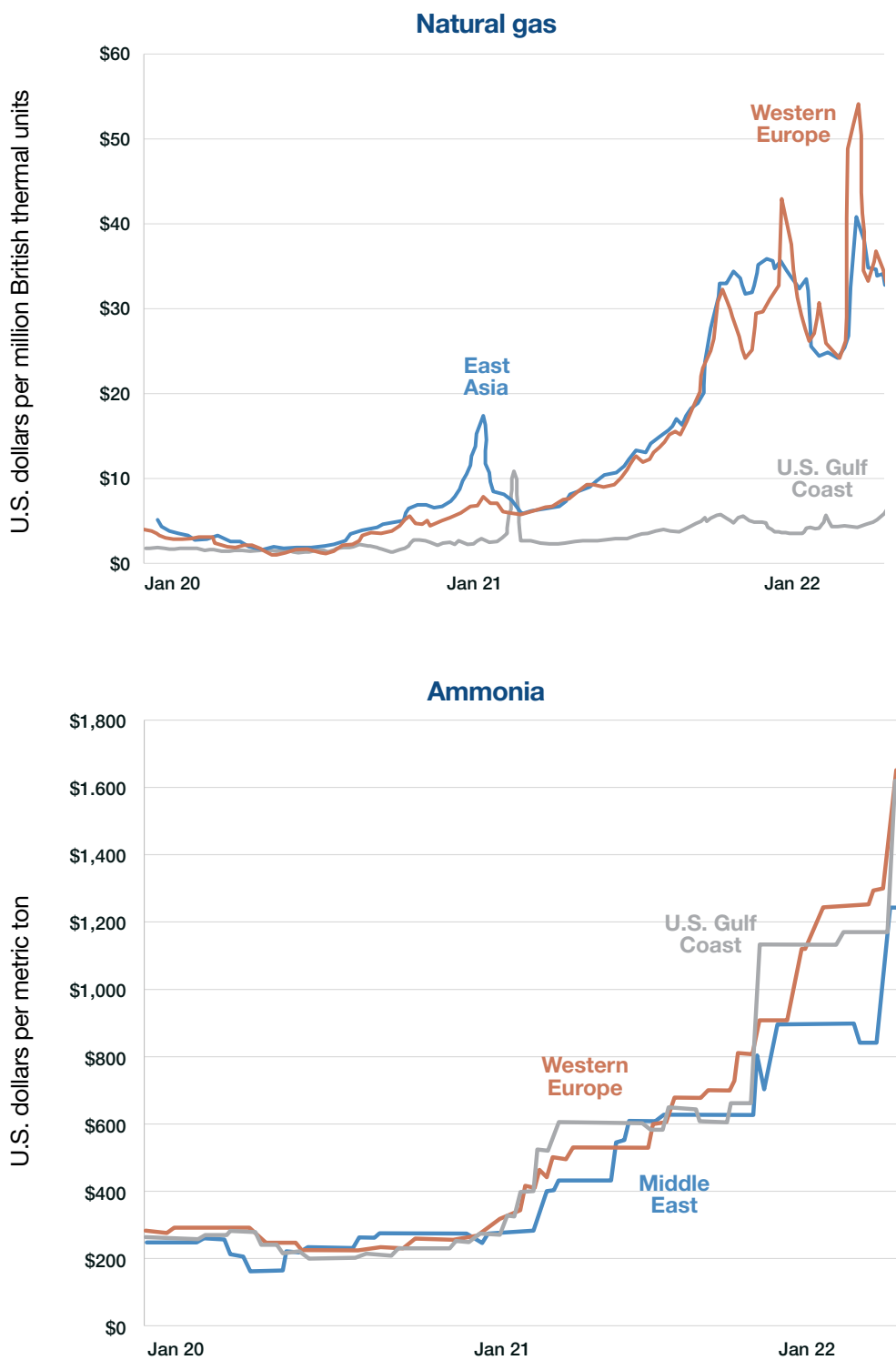
are interested in natural gas as essential for power generation, as well as for industry, as electrification increases. One participant noted that, similar to the United States in the 1970s, India had banned the use of natural gas for power generation but recently lifted this ban despite not having robust domestic supplies of natural gas.

**While decarbonization and energy security are at the forefront of discussions on natural gas, several participants underscored the importance of natural gas for agriculture and food.**

While decarbonization and energy security are at the forefront of discussions on natural gas, several participants underscored the importance of natural gas for agriculture and food. As one participant wryly observed, “I think you do eat natural gas, just like you eat good-quality soil, just like you eat the rainfall. These are all inputs that are essential” to growing food. Natural gas, which is primarily comprised of methane (CH<sub>4</sub>), is reduced to hydrogen and carbon monoxide during steam methane reformation, and the resulting hydrogen is combined with nitrogen to produce ammonia (NH<sub>3</sub>), an important ingredient of nitrogen-based fertilizers. As seen in Figure 3, domestic and global ammonia prices rose concurrently with international gas prices, highlighting the importance of natural gas for ammonia production worldwide and the linkage between prices.<sup>17</sup> Another participant contrasted the perspectives of developing and developed countries on food security stating, “Food security is not something that we worry too much about in the West, but it’s something that is very much acutely on the minds of Indian policymakers.”



**Figure 3 | Weekly natural gas and ammonia prices (Jan. 1, 2020 to April 29, 2022)**



Source: Energy Information Administration.<sup>18</sup>



## KEY TAKEAWAY

# 3

**The deployment of current technologies and additional regulations are needed for the natural gas industry to address its GHG emissions, including methane.**

### HIGHLIGHTS

- Clear and incentives-based regulations are needed to reduce natural gas emissions.
- Technology can help improve emissions data to increase transparency and accountability.
- The industry can demonstrate good faith to the public by reducing methane emissions.
- The U.S. natural gas industry can demonstrate global leadership by reducing its emissions throughout the value chain.

Addressing methane emissions would position the United States to be a global leader in aligning energy security, geopolitical, and decarbonization goals. “On a per unit basis, we really want to be the lowest emitter,” said one participant. Another participant evoked Sen. Joe Manchin’s position on this issue, saying that some people may be surprised to hear that Manchin believes the “definition of decarbonization starts with producing U.S. oil and gas as cleanly as possible.” From a geopolitical perspective, taking action and promoting awareness of methane emission reductions would incentivize other countries to prefer U.S. gas to other alternatives, such as Russia, which “is emitting more methane than any other country and has no incentive whatsoever to cut back.” Figure 4 shows that the intensity of methane per unit of U.S. LNG exports is lower than some countries, but not

**The United States could do a better job of emphasizing that it was able to reduce its emissions more than any other country from 2005 to 2020, largely because of switching fuels from coal to gas.**

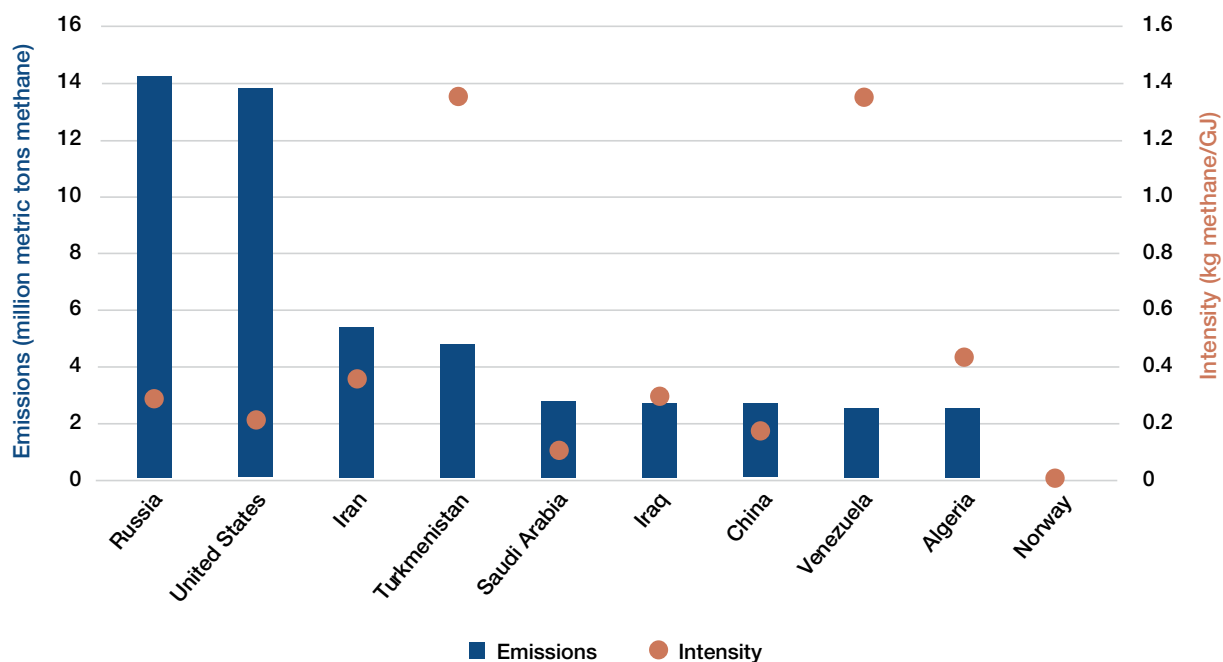
the lowest worldwide.<sup>19</sup> As mentioned earlier, other participants raised the point that the United States could do a better job of emphasizing that it was able to reduce its emissions more than any other country from 2005 to 2020, largely because of switching fuels from coal to gas.

Through much of the discussions, participants, regardless of expertise, position, or affiliations, shared the perspective that clear and incentive-based regulations are needed to address emissions, including carbon dioxide (CO<sub>2</sub>), methane, and criteria air pollutants, in the natural gas supply chain. In particular, representatives from the natural gas industry welcomed additional regulations: “My company can get comfortable with some sort of methane or carbon tax if that’s the incentive we needed because we’re going to bet that we can beat it.” The three bills (Bipartisan Infrastructure Act, Inflation Reduction Act, and CHIPS and Science Act) passed in the past two years authorize \$20 billion for methane mitigation, “and that doesn’t include the first ever price on methane emissions” in the form of the methane fee. According to one participant, a major missing piece is still that “there is no new mandatory requirement for [methane] leak detection,” but the participant expressed optimism that even

without regulation, as companies voluntarily start to engage in this practice, other companies will follow suit since it will become “obvious that it’s a good thing to do.” At the same time, “We should be careful to ensure that we are not creating incentives to build unnecessary infrastructure.” One participant cited the case *Spire v. Environmental Defense Fund* in the U.S. Court of Appeals for the District of Columbia Circuit as an example of how pipelines should not be built if they create perverse incentives for developers; they should be determined to be necessary and beneficial prior to approval.<sup>20</sup>

Along with the need for clear regulations, participants agreed that the natural gas industry needs better data to measure, report, and verify pollution and emissions. New technologies will be vital in tracking emissions, and one participant expressed optimism that “satellites, drones, and detection technologies will expose the bad actors soon enough.” For example, the Environmental

**Figure 4 | Total methane emissions and methane intensity of production in selected oil and gas producers, 2021.**



Source: International Energy Agency.<sup>21</sup>

Defense Fund will be launching its own methane detection satellite, MethaneSAT, later this year.<sup>22</sup> This satellite will help inform the United Nations Environment Programme’s International Methane Emissions Observatory’s efforts to track methane emissions around the world. Several participants expressed hope that this international effort would create more transparency and accountability in other nations. In the United States, one participant also expressed interest in giving more money to the Energy Information Administration (EIA) and requiring it to publish data on methane emissions. While the EIA does track and report CO<sub>2</sub> emissions, it has no ongoing efforts for methane.

Because of pushback from environmental organizations—which often make no distinction between natural gas and higher-emitting fossil fuels, such as oil and coal—participants agreed that addressing methane and emissions could be the primary means of obtaining the “social license to operate” in the United States, since methane is currently the “Achilles’ heel for the industry.” The industry could aim to decline methane emission across the entire lifecycle down to value of 0.3% across the entire life cycle by the end of the decade from a current value of 1.7% to be able to justify increasing domestic gas production.<sup>23</sup> While methane has a higher global warming potential than w, its residence in the atmosphere is 10 to 12 years compared to 1,000+ years for CO<sub>2</sub>, offering the potential for early gains in GHG emissions reductions.<sup>24</sup> This difference offers a potential opportunity because, according to one participant, “What you need to do over that [shorter lifespan of methane] is decrease the methane emissions and then you really address climate change.”

Methane emissions reductions also were discussed as an area of overlap between economic, environmental, and national security goals. Capturing the methane emissions from venting and flaring actually could generate supplies, and the associated revenues could

**Capturing the methane emissions from venting and flaring actually could generate supplies, and the associated revenues could help support the energy needs of U.S. allies and trading partners in Europe and Asia.**

help support the energy needs of U.S. allies and trading partners in Europe and Asia. Participants also were optimistic about the role of CCUS to reduce GHG emissions at production sites, viewing it as another area of overlap between environmental and energy security goals: “Success of CCUS is key to the long-term future of natural gas.” Because environmental justice groups largely oppose future applications of natural gas, such as blue hydrogen, which is produced from natural gas with CCUS, one participant expressed hope that “acting in extremely good faith on methane reductions would be a nice way of building trust.”

Importantly, natural gas use can help reduce criteria air pollutants in countries and regions where air quality issues from coal, oil, and biomass use could provide additional incentives for increasing natural gas use. Though some participants expressed pessimism about achieving consensus on this issue, largely based on local resistance, others see this administration’s emphasis on environmental justice not just as a challenge but also an opportunity to “find overlaps in our goals” by cleaning up emissions in the industry and demonstrating good-faith efforts to have a dialogue on equity and justice with local communities.



## KEY TAKEAWAY

# 4

**Federal, state, and local government permitting issues are a major challenge to meeting deep decarbonization and energy security goals.**

### HIGHLIGHTS

- Markets should be the primary decider of which natural gas infrastructure projects are constructed.
- Permitting challenges at the federal, state, and local level hinder the construction of natural gas infrastructure.
- Stakeholders, including investors, communities, companies, and governments, need a stable and predictable permitting and regulatory framework to make long-term decisions.

Throughout the workshop, participants continually cited permitting as the biggest challenge to building natural gas infrastructure, and several participants shared the view that the market should have a more prominent role in dictating which projects will be completed. This view was brought up independently by participants in all three sessions. In the first breakout session, one participant recalled that the U.S. Department of Energy's (DOE) role previously was to approve projects based on their merit and ability to meet safety and environmental standards, but today "the government doesn't want to look like they've permitted all this extra fossil fuel." Similarly, a participant in the second breakout session suggested that government agencies should go back to this policy and the Federal Energy Regulatory Commission (FERC) and DOE "should continue to approve projects that meet their

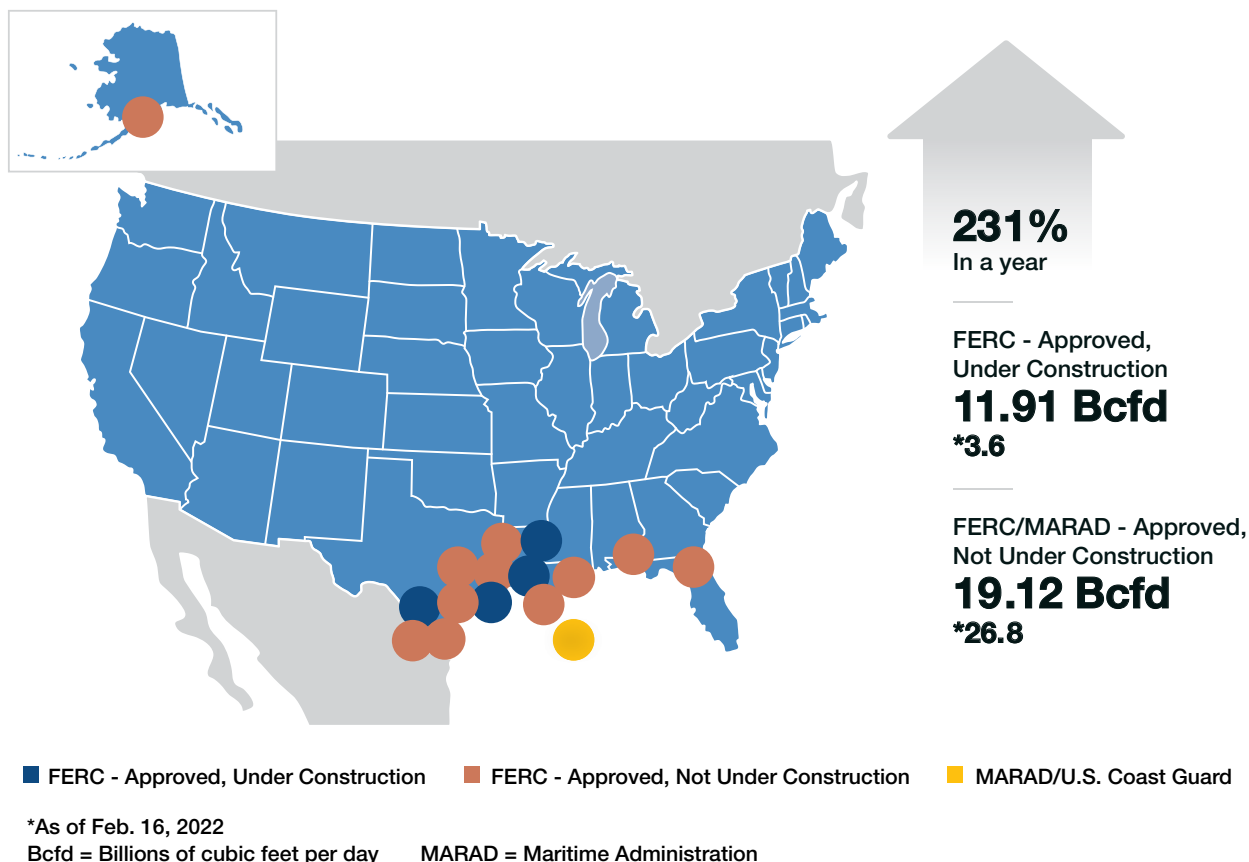
standards and let the market decide which ones get finished."

A participant in the third breakout session observed that there are abundant natural gas supplies, but developers become hesitant to take on risk if a project that has otherwise been deemed financially viable is stopped because of regulatory barriers. Because of this tension, "The cost of capital will go up with the risk of permitting." At the same time, other participants expressed concern that "overbuilding infrastructure [also] gets in the way of markets." Regulators need to walk a fine line to ensure they approve enough projects to meet demand but also provide benefit to the public and local communities.<sup>25</sup>

Participants generally agreed that markets should be the arbiter for which projects are completed,



**Figure 5 | North American LNG export terminals that have been approved but not yet built (as of Feb. 21, 2023).**



Source: Federal Energy Regulatory Commission.<sup>26</sup>

and they pointed to regulatory barriers at the federal, state, and local levels. Since FERC approves projects and then delegates authority to states for permitting, some states are averse to permitting natural gas infrastructure projects. A participant raised the concern that state policymakers may not always have the greater national interest in mind when considering these projects because they are more focused on local environmental or safety concerns. Another participant agreed, recalling that interstate gas pipelines have been difficult to build since a ruling by the Environmental Protection Agency (EPA) that deemed hydraulic fracturing safe; this decision prompted some environmental groups

to focus on opposing the building of infrastructure as an indirect way of slowing/stopping shale gas production.

State and local issues are not the only bottleneck. One participant reminded the group that hundreds of dockets are backlogged, and the process would be more efficient if FERC improved its coordination with DOE, which is responsible for authorizing imports and exports. Figure 5 shows that 11 out of 16 LNG export terminal projects have been approved by FERC but not yet built, although FERC did approve three projects in the past year that raise the export terminal capacity by 231%.<sup>27</sup>

One potential solution could be an “interstate compact that merges federal, state, and local interests into a singular decision-making body for all infrastructure projects that could consider perspectives from all stakeholders.” Though some participants thought this idea had merit, others expressed concern that increased federalization of these decisions would likely run into state-based resistance from both sides of the aisle. Another idea was that permit applicants could demonstrate that their project would enable consumers to reduce their emissions, but other participants said it would be “challenging for any single permit applicant to prove” which fuel source it is substituting when requesting a permit because the product would be distributed by a global market.

Several participants also discussed the regulatory challenge of the Jones Act, a 1920 protectionist measure that states that goods shipped between U.S. ports must be transported by U.S. flagged vessels.<sup>28</sup> Since the United States does not have any LNG vessels, it cannot transport LNG by sea to areas of the country that cannot yet be accessed by pipelines. Because it was unable to import domestic LNG by ships, states in New England were forced to burn fuel oil this past winter when other fuels were not available. Fuel oil emits more greenhouse gases than natural gas, and supplies were, in some instances, imported from Russia. Congress has tried to exempt some vessels from Jones Act restrictions, but no measures have been passed into law.<sup>29</sup>

Lack of political consensus has not just prevented changes to the Jones Act; “Politicization has really gotten in the way of the good work that could position us better today and years to come” for natural gas infrastructure. One participant expressed uncertainty that action on permitting could be accomplished in a split Congress that is off to a contentious start, but as another participant succinctly summarized, “Compromise is not a bad word.”

## **Overall, participants agreed that regulatory certainty and equal treatment of different energy sources is crucial for natural gas infrastructure projects to be built.**

In the second breakout session, participants were asked what they would change if granted a “magic wand” to fix any aspect of the industry. Given that permitting was at the forefront of the minds of participants, the common theme was a “stable and predictable permitting and a regulatory framework that allows investors, operators, and customers to make long-term decisions.” Some participants pointed to specific aspects of regulation and permitting as the thing they would change, such as:

- “Expedited siting authority for projects deemed to be in the national interest, including pipelines as well as transmission”
- “More nimble incentives, especially those that might be available to small and medium-sized enterprises, which often are frozen out from some of the existing incentives”
- “Elimination of red tape for siting, permitting, upstream, enrolling, hardware, and export authorization”
- Making the permitting system “as technical and apolitical as possible”
- “Statute permitting so the permit is issued, approved, or rejected by a given date, similar to highway or other public work projects”

Overall, participants agreed that regulatory certainty and equal treatment of different energy sources is crucial for natural gas infrastructure projects to be built.



## KEY TAKEAWAY

# 5

**The timelines for financing and building energy infrastructure may not be sufficient to meet global energy security and decarbonization needs.**

### HIGHLIGHTS

- Traditional timelines for financing natural gas infrastructure projects do not align with current needs.
- The U.S. could support long-term projects to meet global demand and reduce risk for investors.
- Investment in natural gas projects outside the U.S. is challenging because of uncertain investors and lack of incentives.
- Industry stakeholders may be willing to take on the risk of future stranded assets.

Traditional timelines for financing infrastructure projects that require large amounts of capital do not meet today's energy security and decarbonization needs. This discrepancy poses a challenge for both the natural gas industry as well as governments. In his introductory remarks, Moniz stated that policymakers should revisit the issue of finance and infrastructure to enable greater flexibility to deliver further export capacity growth while aligning with climate goals, especially as the Inflation Reduction Act (IRA) brings investment back to the United States.

Some governments are reluctant to permit 20- to 40-year projects because their climate ambitions require a decrease in fossil fuel consumption, not the addition of more capacity. To balance these

climate ambitions with short-term energy security needs, one participant suggested, "We need 20-year projects, given the capital intensity of liquefaction and capital intensity of regasification." Natural gas infrastructure projects are capital-intensive and require operations that span a project's useful life to ensure investor confidence in returns.<sup>30</sup>

Some participants argued that the United States should support long-term natural gas projects to meet global demand and ensure projects remain friendly for investors. One participant said that "we need more infrastructure here in the United States, because it's good globally," alluding to the fact that fuel switching from coal to natural gas could decrease CO<sub>2</sub> emissions and support

**The passage of the Inflation Reduction Act (IRA) provides reason to be optimistic that investment flows are coming back to the United States for energy projects, but it is important to ensure that projects from a diverse range of energy sources are built.**

global decarbonization goals. At the same time, local opposition from environmental or nationalist groups either prevents infrastructure from getting built or increases the cost of infrastructure because of higher risks and makes timelines even longer. Ironically, the lack of infrastructure and associated permitting can actually diminish options for meeting environmental goals because projects cannot be built to address venting and flaring of natural gas, which amounted to over 286 billion cubic feet (bcf) in 2021.<sup>31</sup> One participant said, “The cost of capital that is raised for the pipeline industry is just going to keep driving up the cost of the infrastructure that could reduce the amount of flaring that’s going on here in the United States.” The passage of the IRA provides reason to be optimistic that investment flows are coming back to the United States for energy projects, but it is important to ensure that projects from a diverse range of energy sources are built.

Outside the United States, financing LNG infrastructure in foreign markets is challenging because of uncertain investors and insufficient funding mechanisms. Integrated projects can be difficult in emerging markets because unlike the relationships that can form between a seller

and a utility in advanced markets, emerging markets do not have reliable partners “to get capital formation and get capital returned in that 20-year horizon that is necessary to get a project underway,” said one participant. For these emerging markets, one solution for financing may be through the World Bank or multilateral development banks, but these banks often do not want to take on large amounts of risk because of potential project failures. Similarly, some multilateral development banks may not fund fossil fuel projects because of decarbonization timelines and policies. As one participant put it, “The [global] financial sectors are very cautious about financing natural gas projects because future demand is uncertain.”

Although investors and regulators were concerned about the risks of building infrastructure, one participant suggested that the oil and gas industry “is pretty well-capitalized and pretty capable” of financing natural gas projects and is willing to take on the potential risk of stranded assets. This participant attributed the issue of finance back to permitting, stating that because the industry is so constrained on permitting, it doesn’t have anywhere to spend available pools of capital. Another participant disagreed and pointed out that “there is enough U.S. government support to build additional infrastructure, but the U.S. government is not going to supply the [final investment decisions] or contracts. ... That’s the industry’s job.” This statement suggests that the financial sector is indeed the missing link for getting projects built, likely because of the riskiness of stranded assets in the context of global energy transitions. Many participants shared the sentiment that the industry faces barriers to infrastructure development because of community opposition, which often imposes higher costs on projects from longer timelines and greater risk.



## KEY TAKEAWAY

# 6

**Natural gas prices in the United States are affected by the dynamics of global energy markets, as well as domestic politics and concerns.**

### HIGHLIGHTS

- DOE studies of natural gas have shown that an increase in LNG exports would have a minimal impact on domestic natural gas prices.
- The lack of permitting infrastructure and inflation have had a more substantial impact on prices than have LNG (or pipeline) exports.
- Political polarization, environmental concerns, and anti-export sentiments have complicated the public policy conversations on natural gas.

Since the shale revolution enabled dramatic increases in domestic natural gas production (the United States is the No. 1 gas producer in the world and its largest exporter of LNG), U.S. policymakers have been concerned about the effect of exports on domestic gas prices, especially the downstream impacts on consumers. Many participants recalled that in the early 2010s, under the leadership of then-Secretary of Energy Moniz, DOE found that an increase in LNG exports would only minimally increase domestic gas prices.<sup>32</sup> As one participant stated: “This study allowed us to understand how much LNG can be exported without affecting domestic prices.” Another participant summarized these findings succinctly: “Long story short, the answer was that the supply curve is pretty flat and there is always a positive impact of new demand.”

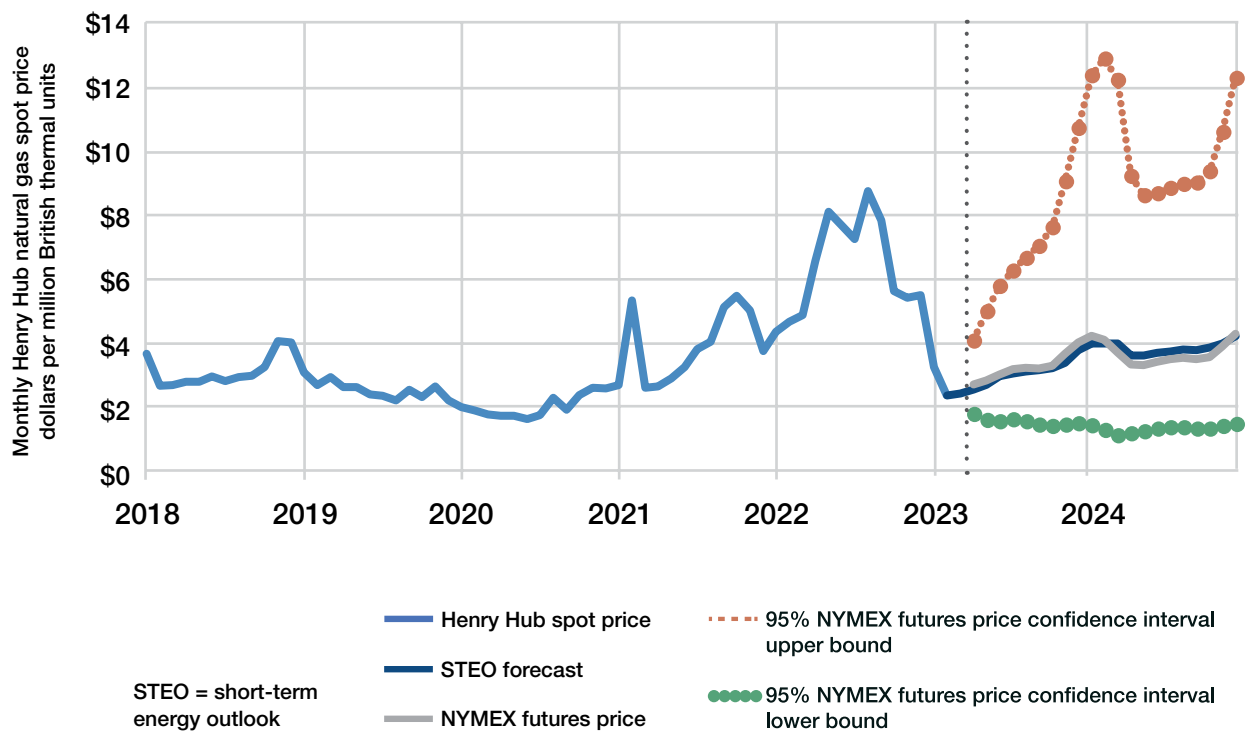
Others suggested that since the time of this study 8 to 10 years ago, the combination of factors in these markets, such as the globalization of LNG markets and the increased role of the United States (as noted, the world’s largest LNG exporter), may have negative implications for domestic gas prices moving forward. For example, one participant highlighted global fuel switching in response to global gas markets, noting that this trend would be crucial to future global gas pricing dynamics: “It’s the first time in history that we’ve had an extended period of time when the price of natural gas has been substantially higher on a British thermal unit (Btu) equivalent basis than the price of diesel,” but with the caveat being whether this trend is a temporary phenomenon due to supply disruptions associated with the war in Ukraine or if it may be a longer-term shift.

Participants sought to contextualize domestic gas prices alongside other economic factors from the perspective of the American consumer. The consumer price index rose 6.5% last year, and power and heat costs comprised 8% of that increase.<sup>33</sup> While American consumers tend to focus on gasoline prices in discussions on the economy, households still spend a third of their energy spending on heat and power, and electrification of vehicles and appliances may increase this cost burden. One participant suggested that the increasing “electrification of everything” actually makes the case for increasing natural gas production and use. Others tried to recenter the debate on prices by reminding others that although Henry Hub prices reached \$9 last summer, the markets have adjusted and prices have fallen back to an average of \$3.40, a level EIA expects to remain constant for the remainder of the year (Figure 6).<sup>34</sup>

Many participants in the first breakout session observed that domestic issues such as infrastructure bottlenecks (due to lack of permitting reform) also were primary factors impacting domestic prices and slowing the energy transition. As one participant suggested, “There’s not going to be a significant increase in gas prices and if there is, it’s because we did it to ourselves.” This comment alludes to inaction on permitting infrastructure, primarily transit pipelines, which forces gas consumers to compete for the same pool of resources. Another participant concurred and hypothesized that if the Mountain Valley Pipeline had been able to come online and produce 2 billion cubic feet per day (bcfd) when it was initially supposed to, “We would have been very long on supplies.”

The natural gas market does not operate in isolation. When gas prices at Henry Hub reached

**Figure 6 | Short-term natural gas price outlook at Henry Hub.**



Source: U.S. Energy Information Administration.<sup>35</sup>

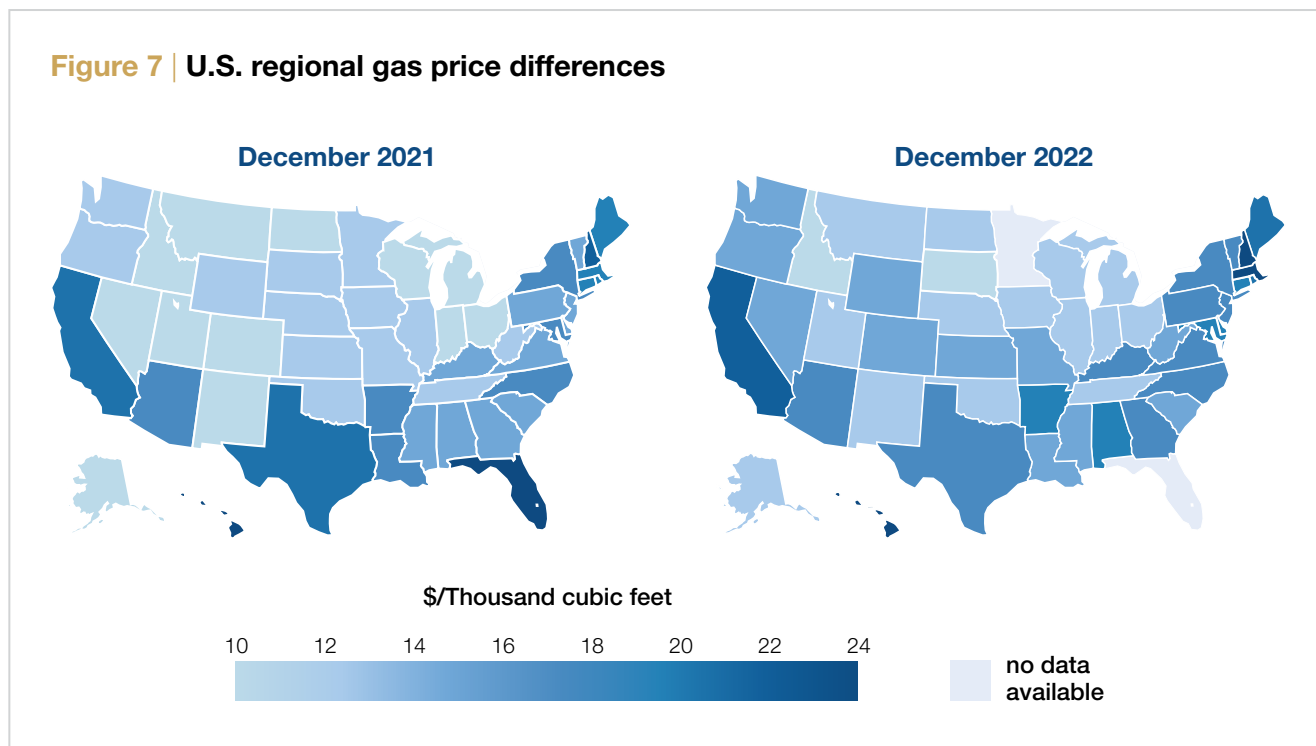


a peak of \$9 last summer, the traditional solution would have been to switch fuels from gas to coal. But in general, coal generation is no longer a grid-balancing option. Some states, including California and those in the Northeast, are voluntarily switching from natural gas to renewable generation. This switch generally leads to higher electricity prices and does not eliminate the need for dispatchable resources that still require infrastructure and the associated permitting. Figure 7 highlights that natural gas prices increased for consumers throughout the United States from December 2021 to December 2022, especially for those in the Northeast and California.

Participants noted that the current public policy environment has been volatile because of political polarization on environmental topics, as well as increasing protectionist sentiments. Several participants underscored the importance of environmental justice, especially in this administration. The Biden administration’s Justice40 Initiative has a target of 40% of the

benefits from infrastructure projects going to disadvantaged communities.<sup>36</sup> Since many Justice40 communities have been marginalized and harmed by oil and gas projects in the past, it is even more important that the industry proactively engages these communities and ensures that they can benefit from projects developing in their communities.

Other participants were concerned about a growing number of protectionist and anti-export voices: “Despite what DOE’s analysis may be and that increased LNG exports are good for the United States, as a whole we are seeing increased sentiment opposed to exports because of price and that is growing.” While some participants suggested that updating the DOE macroeconomic studies may be a good idea, others were concerned that this action would be risky because other stakeholders, including both environmental advocates and those opposed to exports, may weaponize the findings.



Source: U.S. Energy Information Administration, *Short-Term Energy Outlook*, February 2023.<sup>37</sup>



## KEY TAKEAWAY

# 7

**The United States must decide what role to play in supplying natural gas and enabling global decarbonization goals.**

### HIGHLIGHTS

- The United States should demonstrate its global leadership by supplying clean natural gas to its allies and trading partners.
- The lack of reliable gas suppliers provides an opportunity for the United States on the global stage.

**Natural gas has an essential role to play in helping the world meet decarbonization goals, particularly because it is a cleaner alternative to coal, oil, or biomass.**

In her keynote remarks, EFI Foundation Secretary Melanie Kenderdine stated that the United States, as the No. 1 exporter of LNG in the world, should use its resources to help its allies and trading partners meet their energy security needs and decarbonization goals. Natural gas has an essential role to play in helping the world meet decarbonization goals, particularly because it is a cleaner alternative to coal, oil, or biomass.

Many participants agreed that the United States also plays an important leadership role, not just by building production and export capacity but also by demonstrating greener natural gas production and transport, enhancing the value and desirability of U.S. gas exports. The methane fee in the IRA was often cited by workshop participants as a welcome change that would incentivize the industry to reduce methane emissions across the value chain.<sup>38</sup> While some LNG importers, particularly those in Europe, are concerned that U.S. natural gas is dirtier than natural gas produced in other countries, the participants, in general, did not agree with this view and, in fact, thought the opposite—that U.S. natural gas is often cleaner than natural gas from other countries. Even so, participants agreed that industry and government should still work diligently to ensure U.S. natural gas has the lowest life cycle emissions to build consumer

confidence, align with climate targets, and expand domestic production: “Unless we prove that emissions are falling that fast in methane, we will not have the social license to expand domestic production, and there will be all sorts of problems that come from not expanding domestic production.”

**While the United States has no formal or contractual obligations to provide LNG to global allies and trading partners, geopolitical issues such as energy and food security, trade balances, affordability, and geopolitical strategies and relationships are important considerations and underscore the value of U.S. natural gas exports.**

Ensuring that U.S. LNG is the cleanest in the world is crucial from both a marketing and leadership standpoint. Overall, most participants agreed that the industry has the capability and tools to address fugitive emissions, but some participants voiced the point that the regulatory environment is lacking. One participant suggested the United States should aim for a value of 0.3% life cycle methane emissions across the value chain by the end of the decade, down from a current value of 1.7%.<sup>39</sup>

In addition to demonstrating cleaner natural gas, participants generally held the view that the U.S., as a major supplier of natural gas exports, plays an important leadership role in maintaining energy security and global stability. While the

United States has no formal or contractual obligations to provide LNG to global allies and trading partners, geopolitical issues such as energy and food security, trade balances, affordability, and geopolitical strategies and relationships are important considerations and underscore the value of U.S. natural gas exports. In addition, the United States is a part of several treaties and agreements that carry implications for U.S. exports, such as the IEA, the North Atlantic Treaty Organization, the Organisation for Economic Co-operation and Development (OECD), the Energy Charter Treaty, the G-7, bilateral agreements on energy security with Canada and Mexico, and the U.S.-E.U. Task Force on Energy Security.

The Russian invasion of Ukraine—and its weaponization of its energy supplies—created an energy crisis in Europe. The U.S. government, aided by the lack of destination clauses in many U.S. LNG export volumes, was able to divert cargoes to Europe after consulting with Asian allies and other recipients of U.S. LNG supplies. The United States also asked key Asian buyers to assist in managing the crisis by reselling their cargoes under contract to European buyers. As one participant observed, “This was a lot more government intervention in the market than we would have been comfortable with, or Europe was comfortable with, and it took cutting off supply from Russia to get there.”

While participants agreed that this intervention was essential, some felt that such actions were not sustainable in the long term. The U.S. government, unlike other nations, does not control companies or production. “At the end of the day,” one participant observed, “this is ultimately a market-driven direction of traffic.” At the same time, some Asian consumers worry that the U.S. government may intercede in LNG markets again, especially if another energy crisis emerges. Many participants concurred that in the long term, the United States should avoid bidding wars by working to accurately forecast

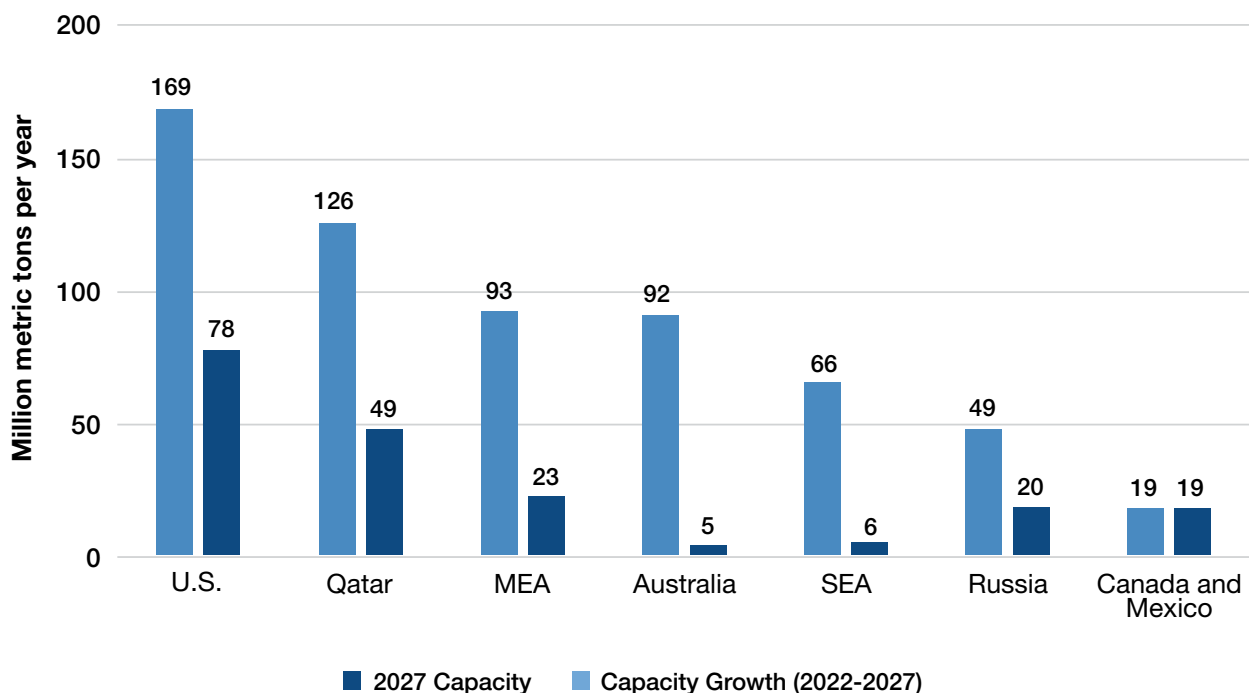
LNG trade flows. Participants expressed concern that such bidding wars strip poorer nations of their ability to import natural gas to meet their energy needs. Similarly, the United States could help create an international strategic natural gas reserve in anticipation of future crises like the current Ukraine crisis.<sup>40</sup>

Participants also expressed the view that the United States will likely need to produce more natural gas in the future to fill the vacuum created after Russia’s invasion and weaponization of energy supplies. Other producer/supplier countries, such as Mozambique, face political uncertainties that raise reliability concerns.

These and other geopolitical changes make the United States a crucial supplier of natural gas. A participant noted that, “North American gas supply is hugely, hugely important to the world, and the world knows it and views it as such.”

Another participant noted that the United States and Qatar are the leading nations in building out considerable amounts of export infrastructure (Figure 8).<sup>41</sup> Though Qatari supply is competing with U.S. suppliers, the United States still “stands out in terms of market access,” which has prompted investment flows into the U.S., even before the passage of the IRA.

**Figure 8 | Global LNG export capacity growth**



Source: BloombergNEF.<sup>42</sup>

Note: Capacity includes BNEF’s top picks for final investment decision in 2023, assumes no decommissioning, and full capacity of Artic 2. MEA is Middle East and Africa. SEA is Southeast Asia.



## KEY TAKEAWAY

# 8

**Although Europe needs gas in the near term, it may not be a long-term market for U.S. exports.**

### HIGHLIGHTS

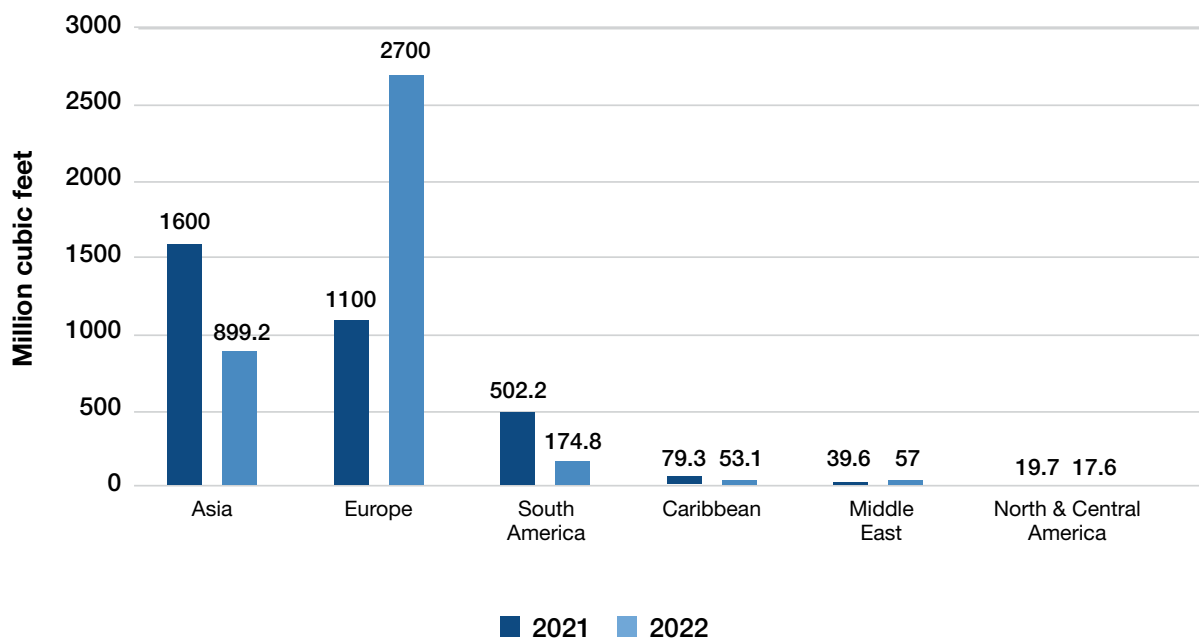
- Europe is the biggest consumer of LNG today.
- Europe's industrial sector may not be a long-term user of LNG.
- The long-term future of Europe's demand for gas is uncertain.

Europe's long-term use of natural gas is still uncertain as it weighs competing climate and security priorities in the aftermath of the Russian invasion of Ukraine. Currently, Europe is the primary consumer of LNG because it has more expendable capital to meet its energy needs than developing nations. One participant bluntly stated that Europe is "getting the gas they need because they're rich and can afford to pay whatever the highest price is on the global market to keep their economy running, and other countries simply cannot compete with that." As a result, U.S. LNG exports to Europe doubled from 2021 to 2022 (Figure 9).<sup>43</sup> Europe now accounts for 69% of all U.S. LNG exports. Conversely, the United States represents 40% of total European LNG imports.<sup>44</sup> At the same time, when Russian pipeline deliveries to Europe fell in 2022, Europe increased its imports of Russian LNG by a third to 19 billion cubic meters (Bcm) to help fill the gas supply shortfall.<sup>45,46</sup> The majority of the Russian LNG came from Novatek, which

is privately owned and is the country's second-largest natural gas producer after Gazprom.<sup>47</sup> As of yet, Europe has not implemented any sanctions aimed at limiting LNG imports from Russia, and it is unclear how the EU will meet its energy security needs without a diverse supply of LNG.<sup>48</sup>

While the economic downturn brought on by the COVID-19 pandemic enabled countries in Asia and elsewhere to resell surplus gas to Europe, this trend will likely change in 2023. Specifically, China has been re-exporting natural gas produced in other countries and exporting diesel to Europe because prices for both commodities in Europe increased after the Russian invasion of Ukraine. But China's economy is expected to rebound from the pandemic as its industrial activity ramps back up, which will require natural gas and fuel oils.<sup>49,50</sup> A participant posited that fuel pricing and trade dynamics are complicated and could lead to surges in the supply of either diesel or LNG.

**Figure 9 | Comparison of U.S. LNG exports by destination region in 2021 and 2022**



Source: U.S. Department of Energy, Politico.<sup>51</sup>

**As a result of supply shortages, many European countries shifted their consumption of gas from their industrial sectors to meet residential needs.**

As a result of supply shortages, many European countries shifted their consumption of gas from their industrial sectors to meet residential needs. One participant observed that European governments have prioritized the use of natural gas for residential heating, and European heavy industry output has declined in areas such as cement, fertilizer, and steel.<sup>52</sup> Even at \$20/million Btu, gas is too expensive to produce ammonia and smelt metal, causing an “incredible

exodus of energy-intensive industries that will never come back.” Several participants in the third breakout session concurred and concluded that “Europe is now proceeding through what you can only describe as a sort of revolutionary change in its energy system from all standpoints.” All signs suggest that Europe is minimizing natural gas consumption because of the crisis. One participant suggested that in the long term Europe’s LNG consumption would decline by 40% by mid-century because of the decrease in industrial activity, climate goals, and a 70% reduction in ammonia production for agricultural use.

Other participants were more uncertain about Europe’s long-term demand for U.S. natural gas because of energy insecurity, LNG market structures, and stated decarbonization goals. Europe needs U.S. LNG to meet short-term



energy demand but its decarbonization goals require it to aggressively reduce fossil fuel consumption and increase power generation from renewables. One participant noted that Europe's mid-century NDCs could conflict with its ability to purchase affordable gas in the short term because LNG market structures depend on 20-year contracts. Some exporters will not build capacity without long-term contracts "because lenders will not put in the money without a guaranteed revenue stream." Participants agreed that this challenge presents an opportunity to rethink the structure of contracts and LNG markets to find creative solutions where short-term demand can be met without making long-term commitments.

In the long term, natural gas may be replaced by hydrogen as the fuel of the future in Europe, but currently, natural gas will be needed as the primary feedstock for hydrogen production through steam methane reformation. Some

**In the long term, natural gas may be replaced by hydrogen as the fuel of the future in Europe, but currently, natural gas will be needed as the primary feedstock for hydrogen production through steam methane reformation.**

participants also thought that the existing natural gas infrastructure could be repurposed for hydrogen, but more research needs to be done to understand the implications of gas mixtures on pipeline integrity and safety. Although U.S. LNG exports to Europe may not continue in the long term, many participants thought that natural gas will still play an important role in U.S.-E.U. energy trade relationships for both hydrogen production and nitrogen-based fertilizers for food security.



## KEY TAKEAWAY

# 9

**In Asia, developing nations are primarily concerned about the affordability of natural gas, while developed nations worry more about the reliability of supply.**

### HIGHLIGHTS

- Developing countries in Asia are primarily concerned about affordability and accessibility of natural gas.
- Developing countries in Asia lack incentives to build natural gas infrastructure.
- Flexible contracts may present an opportunity for U.S. LNG export growth to developing countries in Asia.
- Developed countries in Asia plan to use natural gas as a crucial component of their transition to clean energy.

For the adoption of natural gas and ensuing emissions reduction in developing Asian economies, affordability and accessibility of the natural gas pose the biggest challenges. Participants in the third breakout session heavily emphasized the issue of affordability as the main driver in defining energy security and GHG emissions reductions in developing Asia. Figure 10 shows that high LNG prices in 2022 caused a decrease in LNG imports in some of the biggest Asian markets.<sup>53</sup>

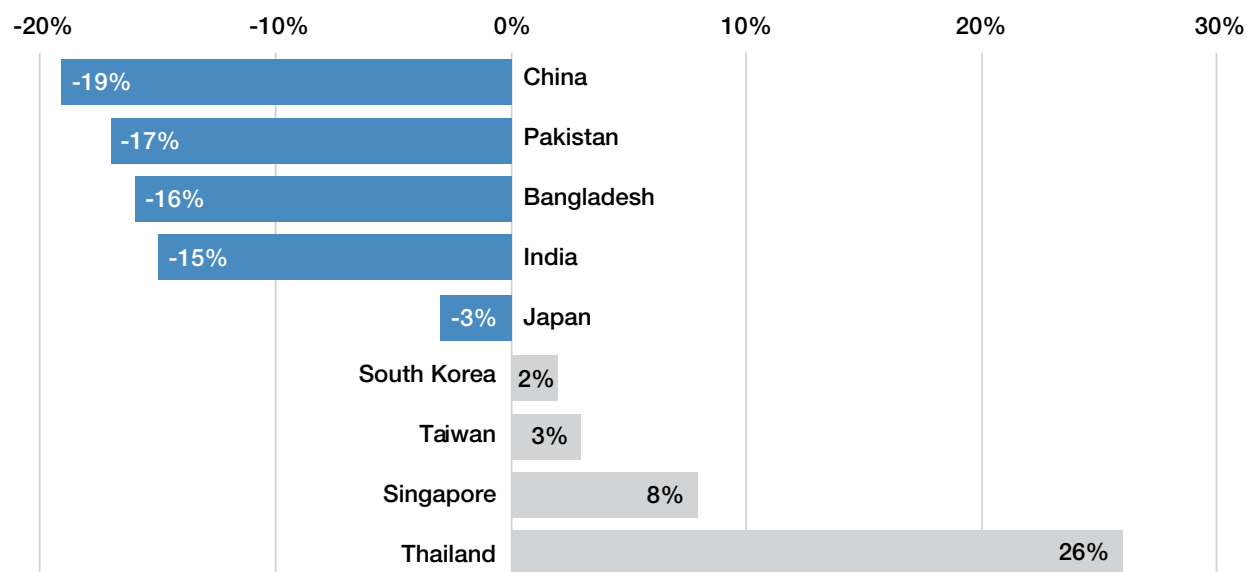
Although LNG prices are generally lower in long-term contracts compared to those in spot markets, domestic coal prices are much more affordable and supplies are more secure. One participant suggested that LNG will not get cheaper and asked other participants to

consider the position of these developing nations that want to fuel switch: “What incentives do countries have to switch from coal if LNG is out of their budget? Is there any way to reduce price sensitivities?”

Other participants concurred and were pessimistic that developing nations had insufficient incentives for fuel switching from coal to natural gas. A participant noted that “I do not think many of these countries view LNG as a secure source for their future development.”

The Chinese and Indian markets are crucial indicators as they would achieve substantial emissions reductions by switching from coal to gas. Their energy security needs, however, would not likely be met by more expensive natural gas

**Figure 10 | Change in annual LNG imports in key Asian markets from 2021 to 2022**



Source: Institute for Energy Economics and Financial Analysis, IHS Markit.<sup>54</sup>

that made them more import-dependent: “If we can’t figure out how to do cheap and clean energy, they’re going to do cheap and dirty, and we lose.” Another participant asked the group, “What price should developing nations in Asia pay? Should [developing Asian nations] be signing a 20-year contract indexed to oil, even if oil could reach \$150?” It was noted, however, that the United States is driving an increase in contracts that are gas-indexed as opposed to oil-indexed.<sup>55</sup>

Along with affordability, developing nations also face challenges to adopting natural gas because of a lack of incentives for building the requisite infrastructure. Participants noted that developing Asian nations are not incentivized to reorient their energy system to rely on imported natural gas when they lack domestic gas resources. One participant pointed out that “LNG could be a huge part of providing energy security to India, but then the whole import infrastructure

and getting it to different places in India is very complex.” Because building the midstream infrastructure to transport natural gas from a regasification facility to industrial or residential consumers requires large amounts of time and capital, emerging markets could find it expensive and challenging to fuel switch from coal to natural gas. Many participants also expressed the view that integrated energy infrastructure projects are challenging in emerging markets because of the lack of reliable partners, coupled with low-risk tolerance from multilateral development banks.

Despite the pessimism about the role of natural gas in developing nations, some participants viewed these markets as providing an opportunity for the United States to be a global leader by supplying natural gas to support their energy security needs, decarbonization goals, and growing economies. In fact, failing to provide developing nations with energy resources could have national security implications by

diminishing U.S. soft power and allowing unfriendly actors to fill the supply void. Exporting carbon capture and storage technology was also discussed as a potential opportunity for decreasing CO<sub>2</sub> emissions from coal-fired power plants in developing Asia, particularly in regions with young coal fleets, such as Pakistan and Bangladesh. Many of these countries also have air quality issues because of the combustion of coal and other fuels that emit high levels of pollutants. Switching to natural gas could help these countries reduce their criteria air pollutants and improve their air quality.

The energy transition in developed Asian countries is markedly different than in the region's developing economies. Although natural gas is included in the long-term plans of developed Asian countries as a pillar of their energy import-dependent economies, Asian buyers are worried about the security of supply and integrity of U.S. exports. As one participant noted, last fall, the U.S. government asked Asian buyers to sell their surplus gas to Europe to quell energy security issues in anticipation of winter demand. After filling their own reserves, Asian buyers obliged and capitalized on the higher prices in Europe by reselling cargoes. However, the U.S. intervention in gas markets has caused Asian buyers to be concerned that future geopolitical events could inhibit gas flows, even for supplies under contract, further underscoring the need for an international strategic natural gas reserve.<sup>56</sup>

Some participants noted that Japan and South Korea are trying to be as pragmatic as possible about their energy transitions. For example, Japan is committed to a 50% reduction in natural gas consumption by 2050 under its most ambitious decarbonization scenario.<sup>57</sup> One participant representing the Japanese point of view noted that there is a possibility Japan cannot reach this goal, and therefore, the country needs to prepare for multiple scenarios, including one in which there is consistent, ongoing supply

of natural gas. Participants agreed that Japan's decarbonization strategy is challenging due, in part, to unsuccessful nuclear restarts and the nascency of hydrogen value chains, "So as the stable fuel in their mix, I think LNG is here to stay, to play a big role," said one participant.

**Because developed nations in Asia clearly see natural gas as part of their longer-term energy futures, they could play an important role in enabling less developed countries in the region to switch from coal to natural gas.**

Because developed nations in Asia clearly see natural gas as part of their longer-term energy futures, they could play an important role in enabling less developed countries in the region to switch from coal to natural gas. One participant noted that developed nations are signing more long-term contracts, which strengthens the LNG market by reducing volatility and making it more similar to oil markets.

Several participants also suggested that creativity in global gas contracts could fulfill multiple goals. For example, future contracts could be written with destination flexibility to meet European and developed Asia's near-term demand while providing security of supply to developing nations looking to fuel switch from coal to gas in the long term.<sup>58</sup> Similarly, Japanese corporations prioritize and incentivize new energy supplies with long-term contracts and sometimes take equity positions in projects. A similar approach could be taken by Japan and South Korea to aggregate emerging demand from developing nations that could incentivize new sources of supply and help grow markets in the region's developing nations.

# CONCLUSION

This workshop focused on the role of U.S. LNG exports in helping the world meet its energy security and decarbonization goals. From the conversations in the sessions throughout the day, participants clearly articulated that U.S. natural gas exports will play a central role for global energy security, climate, and food security goals, which are part of the same conversation.

Though there are plenty of global opportunities for U.S. LNG market growth, the industry will need to overcome challenges of regulatory bottlenecks around permitting infrastructure, which affect financing and timelines. Building diverse coalitions and meeting the needs of multiple stakeholders will be crucial to overcoming this challenge. Additionally, addressing environmental concerns and reducing greenhouse gas emissions throughout the value chain will help build faith in the industry, create a social license to operate, and create more supply by eliminating losses through venting and flaring. If the U.S. can overcome these challenges, it can demonstrate its leadership and provide energy for its allies and trading partners in Europe and Asia. Though Europe will be the primary consumer in the short term, the U.S. natural gas industry should continue to engage with and provide affordable and reliable gas to both developed and developing countries in Asia who should be long-term consumers of natural gas for their own security and decarbonization goals.

To build off the thought-provoking conversations during the workshop, EFI Foundation plans to continue studying the role of natural gas in a decarbonizing world, with an emphasis on Europe and Asia. Discussions with local experts, policymakers, advocates, and industry representatives will revolve around regional issues related to energy security, decarbonization goals, and affordability. From these conversations,

EFI Foundation will provide insights and recommendations for policymakers to consider when making decisions about the role of natural gas in the energy transition.

## **This workshop raised several questions that likely will be material to future conversations and the analysis:**

- Given that natural gas is an important component for fertilizer, how do changes in global gas markets impact food security?
- How can better communication be fostered among diverse stakeholders both domestically and globally so that long-term solutions can be found that satisfy multiple goals?
- What is the appropriate level of investment in LNG, natural gas, and oil in a global energy system that is trying to become cleaner, greener, and more equitable, especially given the challenging fossil fuel infrastructure lifespans and investment needs for 20+ years?
- In response to the growth in the spot market, how are the LNG contracts in the market evolving?
- What is the ultimate role of natural gas in the European energy mix and how will an accelerated energy transition affect the demand for natural gas (i.e. hydrogen). What ultimately happens to Russian natural gas? What is the impact of the recently implemented EU price cap on natural gas?
- Where should developing Asian nations, such as China, India, and Southeast Asia, look for supplies of reliable and affordable LNG? What kind and duration of contracts should they sign?

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