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Methane Emissions and the Gas Ecosystem

Buyers, Sellers, and Banks

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Reducing methane emissions is one of the fastest ways to slow the pace of global warming. Since the oil and gas industry produces more than 20 percent of the world's anthropogenic methane, cutting methane emissions from the sector will be critical. These efforts will focus on producing countries, where cost-effective fixes at well sites and transmission and storage facilities can deliver quick wins in the coming decade. But changing the way that natural gas is traded and consumed can also play a role, even if these innovations take more time.

To engage global gas players in this effort, it is important to identify policy and market levers that might alter their mandates and commercial drivers. Equally important is to look beyond Europe and the United States to regions where national oil companies (NOCs) and state utilities are common. These companies have different mandates and stakeholders, so new strategies and approaches may be required to encourage them to cut methane emissions.

There are several ways to incentivize global gas players to reduce emissions. First, rules such as the proposed methane performance standard for gas in the European Union could spur changes in producing countries that want to maintain access to export markets. Second, greater market demand for "differentiated" or cleaner gas could provide incentives for suppliers, encouraging them to monitor and reduce their emissions footprint from wellhead to delivery. Policies and regulations will have a larger impact than voluntary, market-driven changes, but it is important to consider how both could spread.

These trends could converge in the liquefied natural gas (LNG) sector, which accounted for around 17 percent of total natural gas emissions in 2020 (including supply and end-use). If policy signals from buyers spread through the global gas system, the LNG industry is the most likely vector, since it connects disparate policy environments and markets. Still, it could take years for the industry to significantly lower methane emissions.

Mapping out some of the most important actors in global gas—LNG sellers and buyers, regulators, financial institutions, and insurers—as well as their mandates can shed light on how these changes may occur. This exercise is especially important because many players such as state gas and power utilities and NOCs still lack clear methane-related targets.

This paper covers three broad topics and offers several conclusions on methane emissions and global gas. First, the paper analyzes how companies make commercial decisions on gas projects, including how buyers judge project risks and viability, as well as the most important elements of contract negotiations. It also considers how the methane intensity of gas supply might fit into the array of issues that buyers and sellers negotiate. Second, the paper outlines several important aspects of LNG project finance to show how projects are typically funded, as well as the types of public and private companies and financial backers that play a role. Details from selected LNG projects around the world provide a sense of the financial institutions that are active in this space. A third section offers a typology of major players in global gas, outlining their commercial scale, key projects, role in the domestic gas sector, and climate and methane commitments. Finally, the report offers conclusions and preliminary suggestions on how to engage this diverse array of actors on methane emissions, and what incentives might change their gas purchasing and investment decisions.

Due Diligence: How Companies Make Commercial Decisions on Gas[1]

Most LNG is still traded through long-term contracts. These contracts typically last for 15 to 20 years and are often renewed upon expiry. As a result, buyers and sellers conduct extensive due diligence before entering into a long-term agreement. Buyers considering where to source natural gas consider several risk factors. When all else is equal, a buyer might prefer gas that has lower methane intensity, but it is important to understand the backdrop against which these decisions are made. For buyers, these concerns fall into five major categories.

- **Will the supply of gas be predictable and reliable?** Supply reliability is the most important factor when signing a long-term purchase agreement; if the gas is not available, what is the point of a long-term deal? But evaluating reliability is a complex task. Partly the question comes down to geology: the size and quality of the resource base underpinning the transaction, the degree of certainty (all reserves estimates are probabilistic), and the technical factors that might affect production—for example, unique challenges that could lead to interruptions.

  Reliability is also partly affected by broader geography. Some LNG crosses the Suez or Panama Canals, exposing delivery to bottlenecks. Some countries export all their gas through one location; others have multiple export channels. Natural disasters can also impact exports; an earthquake in Papua New Guinea shut down production for several months in 2018. The International Energy Agency has noted that over 50 percent of the world's LNG plants in 2020 were "heavily exposed to risks from violent storm surges." These are all risks that weigh heavily on buyers.

  Politics also affects reliability. Several LNG exporters have experienced civil strife and outright war (such as Indonesia, Nigeria, Algeria, and Yemen), interrupting LNG exports or cutting them off entirely. Civil strife does not always affect production and exports, but in many cases it does. Understanding how civil strife might impact production requires a detailed understanding of the source country and

1 This section draws heavily from Janak Mayer and Nikos Tsafos, Alaska LNG (AK LNG) seminar, Presentation for State of Alaska Legislature, Friday, September 25, 2015, https://lba.akleg.gov/wp-content/docs/oil-gas/none/enalytica,%20AK%20LNG%20Seminar,%20September%202015.pdf.

its geography. Even in the absence of conflict, domestic politics can impact exports—for example, when a government prioritizes domestic consumption over exports.

- **What is the commitment level and track record of the project sponsors?** Any deal to buy gas is ultimately a bet on certain counterparties and a belief that those counterparties can deliver the gas on time without challenges that might lead to a contract renegotiation. As such, buyers spend a great deal of time weighing the credibility, track record, and commitment of the sellers. Buyers ask whether the project's sponsors have done similar projects before, whether they have a good team in place, whether this project is a priority for them, and if they have the resources to push this project forward in addition to partnerships to help them address shortcomings.
- **Do the various project stakeholders support the project?** Sponsors, of course, only control so much. Projects are built in a specific place and during a specific time. Buyers look closely at the various stakeholders: the host government, local communities, workers, non-governmental organizations, and so on. Alignment between these parties is key. Projects without host government support rarely succeed, and misalignment with local communities can lead to trouble down the line. Naturally, not every stakeholder will support the project. In that case, it is essential to have a clear, transparent, fair, and relatively quick regulatory, political, and judicial process to mediate disputes. In its absence, disagreements can fester and undercut project development, occasionally derailing projects completely.
- **Is the broader ecosystem favorable to project development?** Understanding the ecosystem in which a project will be constructed—including the regulatory structure, availability of labor, and suitability of the environment—is essential. Buyers ask questions such as: Can the state review, negotiate, and execute contracts? Is the environment safe? To what extent is new infrastructure needed, and how easy might it be to construct that infrastructure? Can local workers support the project, or will a project need to attract workers from elsewhere? If so, are there physical, political, or legal challenges to doing so?
- **Will the project make money?** Commercial viability is a relative term. What is commercially challenging one day might be attractive the next. But buyers try to understand whether the relative allocation of risks and rewards makes sense and whether the state is projected to make a sufficient return for its resources (in areas where the state owns the resources). In general, the buyer and the seller negotiate over contract parameters such as volume, price, duration, flexibility, commercial structure (who is responsible for shipping, for example), and penalties for non-performance. The result is a sales and purchase agreement that could easily top 100 pages. These factors are important for commercial negotiations and create a foundation on which all discussions take place.

This is not an exhaustive list, but it should underscore a key fact: long-term transactions depend on a careful balancing of several forces, and buyers weigh many factors before they decide what gas to buy and under what terms. Methane intensity could eventually become one of those terms, but it is likely to be part of this broader calculus.

Gas quality specifications are already a component of long-term contracts. Not all gas is the same when it comes out of the ground, and pipeline systems can accept different kinds of gas qualities. Although gas quality is often summarized based on its calorific value or Wobbe Index, the actual specifications set by pipeline operators vary considerably across the world. Negotiating over the

specific kind of gas to be delivered is a long-standing practice in the industry. (It is also standard practice in oil, where gravity and sulfur content are key variables that affect the price for various types of crude oil.)

However, one important note is that gas quality has a clear bearing on price. Gas needs to be processed, and this can either add costs or create revenue. For example, if processing takes out ethane, propane, or butane, these are valuable products that can be sold. The same is true for oil, which comes in different quality crudes that can be processed by different refineries at different costs.

All these considerations in buyer decisionmaking suggest several possible ways methane intensity can become a greater factor for buyers. At one extreme, methane intensity could become a standard variable over which buyers and sellers negotiate, such as calorific value or the Wobbe Index. In this world, buyers and sellers could set boundaries for acceptable products or negotiate along a spectrum, perhaps paying a premium for lower values of methane intensity. In such a scenario, it may be easier to include methane intensity in the price even in short-term or single-cargo transactions, as opposed to solely long-term contracts. At the other extreme, methane intensity could be one of the factors in the complex calculation over which buyers and sellers negotiate. In this case, its impact on price would be less visible but still important.

LNG Project Finance

To analyze how concerns over methane emissions may affect the global gas industry, it is important to consider how LNG projects are financed. A brief explanation and some illustrative examples will show the range of actors involved in bankrolling LNG projects, including commercial banks, state banks, export credit agencies (ECAs), and multilateral development banks. These institutions have various commercial and strategic reasons for supporting LNG projects, and they also have varied sensitivity to emissions and sustainability factors.

LNG projects are large, expensive ventures that often take five years to construct and provide a long-term payoff over 15 years or more. Like other infrastructure projects, they call for long-term investment that entails significant risk. Companies typically fund projects through a mix of equity—direct financing from project shareholders from their own balance sheets—and debt financing. Given the cost of large LNG projects, which can exceed $20 billion, a 70 percent debt to 30 percent equity split is common. LNG project finance often takes the form of limited recourse debt, or borrowing by the project itself as opposed to the project sponsors, with the creditor able to seize only certain predefined assets in the event of a default. Aside from traditional loans, LNG project bonds are becoming a more common instrument to raise capital, with more than $10 billion in issuances in 2019 (pre-Covid).

Because these projects require so much debt, they attract a wide range of financial backers. Commercial banks provide most of the lending, but state institutions play a significant role. LNG projects provide long-term gas supplies that help bolster energy security, so governments—particularly in import-dependent Asian countries—have historically taken a strong interest in backing LNG projects. Japan, South Korea, China, and other countries support global liquefaction projects through direct equity investment, lending from state institutions, and trade insurance.

State development banks and ECAs are key players in LNG project finance, and multilateral development banks sometimes invest as well. ECAs such as the Japan Bank for International Cooperation (JBIC) and U.S. Export-Import Bank (EXIM) provide loans but also help reduce risk through loan guarantees, while insurers such as Nippon Export and Investment Insurance (NEXI) provide trade insurance cover and political risk insurance. These institutions help shield projects from political and commercial risk that might otherwise

make borrowing prohibitive, and they play an important role in attracting other financial institutions. For example, eight ECAs as well as the African Development Bank provided direct loans and loan cover for Mozambique LNG—a project subject to significant political risk—which encouraged 19 commercial bank facilities to back the project. Yamal LNG also attracted substantial support from ECAs and state banks, although the project has a very different risk profile. Table 1 shows selected lenders for a variety of LNG projects.

Table 1: Selected LNG Projects and Key Investors

Project	Capacity mmtpa*	Equity Stakeholders	Cost $ billion**	Selected Lenders and Insurers $ billion***	
Yamal LNG Russia	17.4 (Trains 1-4)	Novatek, TotalEnergies, CNPC, Silk Road Fund	$27 billion (Trains 1-3)	• China Ex-Im Bank • China Development Bank • National Welfare Fund of Russia • Japan Bank for International Cooperation (JBIC)	$10.6 $1.5 $2.3 $0.21
Mozambique LNG Mozambique	13.1 (Trains 1-2)	TotalEnergies, ENH (Mozambique), Mitsui, ONGC, ONGC/Oil India, Bharat Petroleum, PTTEP	$20 billion	• U.S. Ex-Im Bank • JBIC • Nippon Export and Investment Insurance (NEXI) • SACE (Italy) • African Development Bank	$4.7 $3.0 $2.0 $0.95 $0.4
Sabine Pass United States	30 (Trains 1-6)	Cheniere, Blackstone Infrastructure, Brookfield Infrastructure	$20 billion	• **T1-4:** Bank consortium • **T 1-4:** Korea Eximbank (KEXIM), Korea Trade Insurance Corporation (K-SURE) • **T5:** Syndicated bank loans • **T5:** KEXIM • **T5:** K-SURE • **T6:** Bank consortium, including MUFG	$4.4 $1.5 $2.85 $1.0 $0.75 $1.5
Cameron LNG United States	13.5 (Trains 1-3)	Sempra, TotalEnergies, Mitsubishi/NYK, Mitsui	$10 billion	• Project bonds • Commercial banks, insured by NEXI • JBIC	$3.0 $2.0 $2.5
Freeport LNG United States	15 (Trains 1-3)	Freeport, Jera, Osaka Gas, Zachry Hastings, DOW Chemical, Buckeye Partners	$12.5 billion	• **T1:** Bank consortium *including $2.5 billion from JBIC* • **T2:** Bank consortium • **T3:** Bank consortium	$4.37 $4.03 $3.64
LNG Canada Canada	14 (Trains 1-2)	Shell, Petronas, PetroChina, Mitsubishi, KOGAS	$31 billion	• Bank consortium • JBIC	$1.0 $0.85

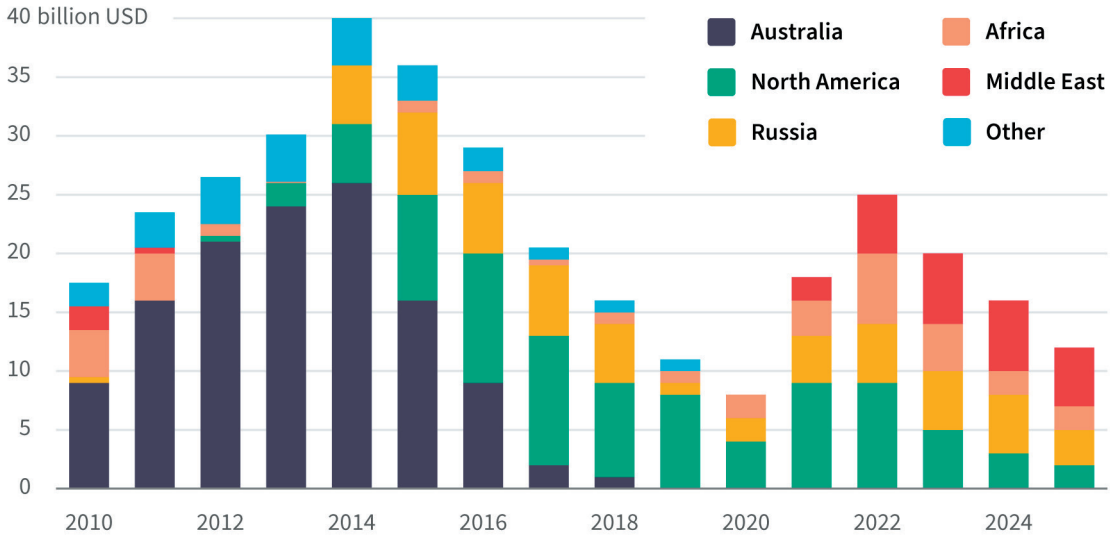
Source: CSIS research based on company reports and investor presentations as well as media reports.

*Million tons per annum.
**Some figures cited are for full costs, while some are liquefaction costs only.
***Includes loans, loan guarantees by ECAs, and trade insurance cover by insurance companies.

Some elements of LNG project finance are worth noting. First, despite the significant downturn in oil and gas investment in recent years, large projects continue to attract finance. It is true that investment in sanctioned (fully approved) LNG projects has declined significantly over the past five years, particularly in 2020 when Covid-19 decimated industry investment. But 2019 marked the largest-ever investment in new liquefaction capacity, with projects constituting 70 million tons per year (mmtpa) reaching final investment decision (FID). It can be hard for project sponsors to lock up firm sales contracts, but those with strong commercial interest are not struggling to access capital.

Second, not all projects are equally dependent on bank financing. Traditionally, securing long-term contracts has been critical for project sponsors seeking to attract finance. Companies seek firm sales contracts for most of their project's capacity to help reduce risk for potential lenders. But there are some

Figure 1: Investment in New LNG Capacity (sanctioned projects plus Qatari expansion, $ billions)



Source: "Investment in new LNG capacity (sanctioned projects plus Qatari expansion plans), 2010-2025," International Energy Agency, https://www.iea.org/data-and-statistics/charts/investment-in-new-lng-capacity-sanctioned-projects-plus-qatari-expansion-plans-2010-2025.

exceptions. Portfolio players—companies that supply LNG volumes from their portfolio of supply sources around the world, rather than specify a liquefaction facility or country of origin—can help finance projects without securing offtake deals in advance. LNG Canada is an example. The project partners include several portfolio players with strong balance sheets and access to shipping, storage, and regasification assets. Because they had the marketing and trading capacity to sanction the project without lining up sales contracts, LNG Canada was able to reach FID in 2018.[2] Aside from portfolio players, a few state companies such as Qatar Energy have strong enough balance sheets to sanction large projects without much external support.

What is the significance of LNG project finance for methane emissions in global gas? This is an industry with diverse, complex financing mechanisms and a broad array of investors. Financiers clearly will have a role to play in reducing greenhouse gas (GHG) emissions from the LNG sector. But ECAs, state and multilateral development banks, trade insurance companies, and commercial banks have varying concerns over sustainability. Changing the way lenders think about emissions intensity—and methane intensity in particular—means grappling with the drivers and preferences of these institutions.

This should not imply that state institutions will drag their feet. Some of the world's largest LNG-importing countries signed the Global Methane Pledge and may demand operational changes and more ambitious targets from their NOCs, state utilities, and ECAs. These institutions may also find that commercial banks are uninterested in financing LNG projects without a clear understanding of their emissions intensity. That said, state lenders are likely to weigh these considerations against other factors, including their mandate to invest in projects that enhance national energy security. It will probably take time for incentives to shift and for various lenders—private and public alike—to include methane intensity in their risk assessments.

2 The project has since secured several offtake deals as well as financial support from JBIC and Canada's Strategic Innovation Fund.

Major Players in Global Gas: Company Types and Methane Strategies

The global gas industry will limit methane emissions if individual companies make this a priority. But the gas ecosystem is diverse, and institutions have different stakeholders and mandates. A brief typology of global gas players (see Table 2 below) can shed light on how companies are responding to the imperative of reducing emissions. Some global gas players—utilities, NOCs, supermajors, LNG exporters, and trading houses—have robust targets to cut methane emissions, but others have no discernible plans. It may be useful to consider a few company archetypes and their methane strategies.

- **Gas and power utilities** are often large gas buyers and operate a range of infrastructure that may emit methane. Jera and KOGAS (Japanese and South Korean utilities, respectively) are the world's largest LNG buyers, and operate regasification facilities, gas pipelines, and power plants. They also hold equity stakes in numerous overseas projects, including liquefaction projects and power plants. Their buying power in the LNG industry means that companies such as Jera and KOGAS could be quite influential. They could send a strong signal to gas suppliers if they make emissions intensity of LNG cargoes—and methane intensity in particular—a larger part of their commercial considerations and dealmaking. Utilities also have a significant role to play in reducing emissions intensity from downstream gas facilities. Fixing leaks in transmission and storage infrastructure could have a **significant impact** on overall oil and gas emissions in certain countries. However, to date gas and power utilities such as Jera and KOGAS have generally not shared much information on their methane intensity goals. It may take more of a push from their government stakeholders and investors to shift their priorities.

- **National oil companies** will play a critical role on methane. It is difficult to generalize about NOC climate strategies, since these companies are diverse and often have multifaceted roles. Many NOCs are both domestic producers and gas importers, whether via pipelines or LNG. They often operate regasification plants and midstream infrastructure as well, and like utilities, some NOCs are global investors in liquefaction plants. By definition, these companies are ultimately accountable to governments, whether they are wholly state-owned or partly listed, so government priorities matter a great deal (see discussion of ownership structure and remit in the following section). But beyond these broad categorizations, a few trends are apparent. Gas-exporting NOCs cannot ignore the potential for tougher methane regulations. Gazprom is no doubt wary of a potential EU performance standard that will force its gas supplies to meet methane intensity thresholds. But it is difficult to tell whether Gazprom has resigned itself to making the necessary fixes to its upstream, storage, and pipeline infrastructure. Generally, Gazprom and the other Russian NOCs have made only modest climate and methane commitments to date. Other NOCs that are large gas exporters, such as **Qatar Energy**, are making concerted efforts to decarbonize their gas production, viewing this as a competitive differentiator. Some have also joined the Oil and Gas Methane Partnership, including Qatar Energy, Abu Dhabi National Oil Company, and Ecopetrol. However, most of the focus is on procuring clean power for facilities and deploying carbon capture and storage facilities to cut GHG emissions—not necessarily on monitoring the methane intensity of their exports.

- The **supermajors** face strong pressure to act on methane emissions, given the scale of their production and the investor scrutiny they face in multiple jurisdictions. These companies have issued targets and shown various levels of support for industry associations that advocate better emissions measurement and abatement, such as the **Oil and Gas Methane Partnership**. Generally, the majors are more supportive of tougher methane regulations than smaller oil and gas companies that face less investor scrutiny on methane. Less clear from investor guidance and public statements is how the supermajors

Table 2: Global Gas Players

Player	Typology	Selected Liquefaction Projects	Scale of Gas Trade and Market Position	Climate and Methane Commitments
Jera Japan	Gas and power utility	Freeport LNG, Wheatstone LNG, Darwin LNG, Gorgon LNG, Ichthys LNG	Jera reported LNG transaction volumes of 40 million tons (mmt) in FY 2020 (April 1, 2020, to March 31, 2021). It is the dominant gas and electricity provider in certain regions and has a broad footprint in fuel procurement, receiving, storage, power generation, and domestic sales.	Jera is targeting a 20 percent cut in CO_2 emissions intensity by 2030 and net-zero emissions by 2050. It plans to rely on co-firing with ammonia and hydrogen to meet this target but "the use of CO_2-free LNG is also being considered."[a] Japan has signed the Global Methane Pledge.
KOGAS South Korea	State gas utility	Mozambique Area 4, LNG Canada, Gladstone LNG, Prelude FLNG, Donggi-Senoro LNG	KOGAS is the world's second largest LNG-importing company after Jera and imported about 35 mmt of LNG in 2020. It has monopoly status in South Korea's wholesale gas sector (other gas companies import about 10 percent of South Korea's LNG). It operates five regasification terminals and a gas pipeline system of nearly 5,000 km.	KOGAS is targeting a 20 percent reduction in CO_2 emissions by 2030 and net-zero status by 2045. Korea has signed the Global Methane Pledge and has a 2050 net-zero target.
CNPC China	National oil company	Yamal LNG, Arctic LNG 2, LNG Canada	CNPC produced 160 bcm in natural gas in 2020. CNPC is China's largest upstream oil and gas producer, is one of three dominant NOCs, and has extensive upstream and midstream assets in China. It also operates 19.3 mmt in regasification capacity.	CNPC's goal is to limit CO_2 emissions after 2025 and reach "near zero" net emissions by 2050. It aims to reduce average methane emissions intensity by 50 percent by 2025 (over 2019 volumes). As part of a U.S.-China statement during COP26, China aims to "develop a comprehensive and ambitious National Action Plan on methane, aiming to achieve a significant effect on methane emissions control and reductions in the 2020s."[b]
Qatar Energy Qatar	National oil company	Qatargas and RasGas LNG trains at Ras Laffan, North Field East expansion, Golden Pass LNG	Qatar Energy exported 77.1 mmt of LNG in 2020. The company has an extensive fleet of LNG vessels, has regasification capacity in several countries in Europe and elsewhere, has upstream oil and gas assets in numerous countries, and is a joint venture partner with ExxonMobil at the Golden Pass LNG project in the United States.	In November 2021 Qatar Energy, Pavilion Energy, and Chevron issued a new methodology to standardize measurement, reporting, and verification of GHG emissions for specific LNG cargoes. The SGE methodology "recognizes the importance of methane emissions in the transition to a low-carbon economy and is fully aligned with the complete and transparent reporting of methane emissions."[c] Qatar Energy has joined the Oil and Gas Methane Partnership and has committed to direct measurement-based methane emissions accounting for their operated and non-operated assets.
Gazprom Russia	National oil company	Sakhalin-2, Ust-Luga. Pipeline assets include an extensive network to Europe and the Power of Siberia pipeline.	Gazprom is the world's largest gas producer by volume and operates the world's largest gas transmission system. In 2020 it produced 454 bcm, and it exported 175 bcm to Europe (including Turkey but excluding former Soviet Union countries). The majority state-owned company accounted for 66 percent of Russia's domestic gas production last year.	In 2020, Gazprom's reported methane emissions stood at 25.5 million tons of CO_2 equivalent, or about 25 percent of its total GHG emissions, although most independent measurements suggest these self-reported numbers are a serious underestimation. Gazprom reports that it reduced methane emissions by 22 percent last year, compared to 2019. Gazprom aims to reduce methane emissions according to best practices from the Methane Guiding Principles but has not stated any specific quantitative targets.
Petronas Malaysia	National oil company	Petronas LNG (Bintulu T1-9), PFLNG 1 and 2, Gladstone LNG, Egyptian LNG, LNG Canada	Petronas's LNG sales volume in 2021 was 33.1 mmt. The company is Malaysia's key producer, licensing body for domestic oil and gas, and equity partner in all domestic oil and gas fields. A partly listed subsidiary manages domestic gas distribution.	In 2020, Petronas quantified methane emissions from its LNG facilities and its domestic gas subsidiary, Petronas Gas Berhad, but has not yet disclosed detailed data. In 2021, it planned to quantify methane emissions throughout the upstream sector. Malaysia has signed the Global Methane Pledge.

Player	Typology	Selected Liquefaction Projects	Scale of Gas Trade and Market Position	Climate and Methane Commitments
Shell Netherlands/ United Kingdom	Supermajor	Qatargas 4, LNG Canada, Gorgon LNG, North West Shelf, Queensland Curtis, NLNG, Oman LNG, Atlantic LNG, Brunei LNG, ELNG (Idku)	Globally, Shell's LNG sales volume in 2020 was 69.7 mmt. It holds the largest LNG portfolio among the supermajors. It is optimistic about long-term gas and LNG demand, viewing gas as an energy source that can partner with renewables and appeal to a range of customers in a decarbonizing world. Shell suggests that the LNG industry will have to offer cleaner energy supplies to help customers meet net-zero targets.	Shell's reported methane emissions in 2020 stood at 67,000 tons, compared with 91,000 tons in 2019, with 60 percent coming from flaring and venting. Shell aims to keep methane emissions intensity levels below 0.2 percent for its operated assets by 2025 (backed by empirically measured data in line with Shell's participation in OGMP 2.0). Shell shared recommendations with the European Commission on forthcoming methane regulations, and it supports EPA regulations of methane from the U.S. oil and gas sector under the Clean Air Act.
Cheniere United States	LNG exporter	Sabine Pass LNG, Corpus Christi LNG	Cheniere exported 25.6 mmt in LNG volumes in 2020. When Sabine Pass Train 6 is completed, it will have 45 mmtpa in liquefaction capacity at Sabine Pass and Corpus Christi.	In August 2021, Cheniere published a detailed life cycle analysis of GHG emissions specific to its supply chain from wellhead to delivery point. The company is offering "cargo emissions tags" to estimate GHG emissions associated with each particular LNG cargo. Cheniere published a peer-reviewed study showing its calculations. It aims to satisfy future market needs and establish a potential competitive advantage by offering this type of detailed emissions accounting to customers.
Vitol Switzerland	Commodity trader	Vitol is a large LNG buyer and trader but does not hold equity stakes in liquefaction projects.	Vitol traded 10 mmt in LNG cargoes in 2020. Vitol is a privately held commodity trading house, competing with other traders and portfolio players.	Vitol provides a "Green LNG" offering for customers to mitigate emissions, relying on market solutions such as offsets and renewable energy credits. It aims to provide "carbon neutral solutions for individual LNG cargoes or for the whole supply chain from wellhead to customer."[d]
Mitsui Japan	Trading house	North West Shelf, ADNOC LNG, Qatargas 1-3, Sakhalin-2, Oman LNG, Cameron LNG, Mozambique LNG, Arctic LNG 2	The start-up of Cameron LNG Train 3 was expected to raise Mitsui's equity LNG volumes to about 8 mmt. Mitsui is one of Japan's largest trading houses.	Mitsui has set a 2050 net-zero emissions target and aims to cut emissions in half by 2030 from 2020 volumes.

Source: CSIS research based on company reports and investor presentations as well as media reports.

a Jera, *FY2020 Second Quarter Investors Meeting* (Tokyo: Jera, 2020), https://www.jera.co.jp/static/files/english/corporate/ir/pdf/20202Q_Investors_Meeting.pdf.

b U.S. Department of State, "U.S.-China Joint Glasgow Declaration on Enhancing Climate Action in the 2020s," Office of the Spokesperson, Press Release, November 10, 2021, https://www.state.gov/u-s-china-joint-glasgow-declaration-on-enhancing-climate-action-in-the-2020s/.

c Chevron Corporation, Qatar Energy, and Pavilion Energy, *The SGE Methodology: GHG Methodology for Delivered LNG Cargoes* (Chevron Corporation, Qatar Energy, Pavilion Energy, 2021), https://www.chevron.com/-/media/chevron/sustainability/documents/SGE-methodology.pdf.

d Vitol, *Environmental, Social & Governance Report 2020* (Vitol, May 2021), https://3wy4t48t53n2zjure2oko7k3-wpengine.netdna-ssl.com/wp-content/uploads/2021/07/ESG-Report_2020_digital.pdf.

might address methane emissions via their LNG business, although companies such as Shell, BP, and TotalEnergies have offered "carbon neutral LNG" cargoes to customers.

- Other **LNG exporters** have been proactive in seeking to offer cleaner or "differentiated" gas. LNG exporters in the United States appear to be positioning themselves for a more carbon-constrained market by attempting to track the emissions intensity of gas from the wellhead to transportation to liquefaction to shipping. Cheniere, for example, published a life cycle analysis of GHG emissions

specific to its supply chain and has offered "emissions tags" for certain cargoes. At this stage, the customer demand for such cargoes is hard to gauge. But specialized LNG exporters may be seeking a differentiator in a competitive marketplace and testing the market for this product.

- Lastly, **trading houses** are more of a wild card. Commodity trading houses such as Vitol, Trafigura, Mercuria, and Gunvor have become significant players in global LNG trade, buying and selling cargoes around the world. But some commodity traders such as Vitol are privately held and their views and operations are sometimes harder to piece together. Their public commitments on methane emissions are scarce. It is quite possible that if they perceive a competitive advantage in offering lower methane intensity cargoes to customers, they will respond, but for now they have not made notable moves.

Variables Shaping Methane Strategies

Beyond company type, a few factors help determine corporate strategies on methane emissions. First, companies have **different stakeholders and investor pressures**. All gas companies need to adjust their business strategies to prepare for the energy transition, but publicly traded companies are more exposed to environmental, social, and governance (ESG) pressure from investors with significant climate commitments. By contrast, majority state-owned companies in Asia, Latin America, Africa, and the Middle East are generally more insulated from this investor scrutiny.

There is a wide variation in ownership of NOCs and utilities; some are wholly owned by governments, while others are listed either domestically or internationally. In the case of fully state-owned companies, unless their sole shareholder makes reducing methane emissions a priority, the channels of external influence will be limited.

Another key factor is **company mandates and roles**. One of the principal tasks of NOCs and state gas companies in import-dependent states is to ensure energy security. Their mandate to deliver reliable and affordable energy guides decisions on how they produce and procure gas. The carbon footprint and methane emissions intensity of supply is rapidly becoming an important issue, but it will fit into this broader context. This should not imply that these companies will not make efforts to cut methane emissions, but rather that they will respond to state directives. Governments will ultimately provide guidance on how state companies should alter their gas purchasing decisions and equity investments and balance these goals against energy security mandates.

Last, their **position in the domestic gas market** is important. Some NOCs and utilities have monopoly power in the domestic market, while others face limited competition or fully deregulated markets. Many NOCs are domestic gas producers as well as importers. Major gas buyers may operate midstream, storage, and power generation assets. For companies with a larger domestic gas footprint and a range of assets, there may be more avenues to reduce methane emissions. For example, a state utility tasked with cutting methane emissions over the next decade (in line with the Global Methane Pledge) can opt to procure different fuels for power generation or fix leaks in storage and transmission. That utility may have an incentive to buy differentiated LNG cargoes, but other measures will have a bigger impact.

Conclusion

Improving the sustainability of the global gas industry depends on changes to both supplier and buyer behavior. Most of the action will take place on the supply side, and new regulations in Europe and the United States could have a significant climate impact. Demand-side changes can also send important signals that will affect seller behavior. For now, the emissions intensity of gas is not a critical factor in how

companies buy gas or assess risks and commercial factors for their equity investments, but over time this could change. How will this process occur, and how could it be accelerated?

First, regulatory and policy changes can have a big impact on buyer behavior and incentives. In other words, companies will begin to care if governments and gas regulators make methane monitoring and abatement a priority. In turn, feedback from companies can influence policy design and new rules. For NOCs and utilities, advocates of "differentiated" or cleaner gas might have more success if they engage with regulatory agencies and policymakers rather than just the companies themselves. For a gas-importing country that has signed on to the Global Methane Pledge—say South Korea or Japan—it will soon be time for the government to think about the most effective ways to realize progress. Often that path will run through the energy sector and their state institutions.

Second, investors matter a great deal. Asset managers with extensive energy sector holdings are generally less exposed to state firms, but they hold shares in many NOCs and utilities. Are institutional investors engaging NOC management teams on methane? Is there more that could be done to signal that investors want companies to make this a more concrete priority in their sustainability plans? For LNG exporters and supermajors, institutional investors could both reward companies offering cargoes with certified emissions and encourage other companies to follow suit.

Third, it is important to engage with financial supporters of LNG projects. ECAs, state insurance firms, development banks, and others may not yet have methane intensity on their radar. But these institutions have outsized influence on the LNG industry. If they make it clear that emissions intensity of gas is an important part of their calculus in terms of which projects to support, that will incentivize project sponsors to provide more comprehensive and accurate data. Still, the drivers for these institutions are not likely to shift dramatically, given their incentives to support projects that enhance energy security.

Finally, competitive positioning in the LNG trade is dynamic, and commercial offers or innovations by companies can spread and affect industry standards. Gas sellers and traders are always searching for competitive advantages. If they spot an opportunity to help customers meet their sustainability goals, it is reasonable to assume they will seek credible emissions data and try to offer a differentiated product. ■

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