

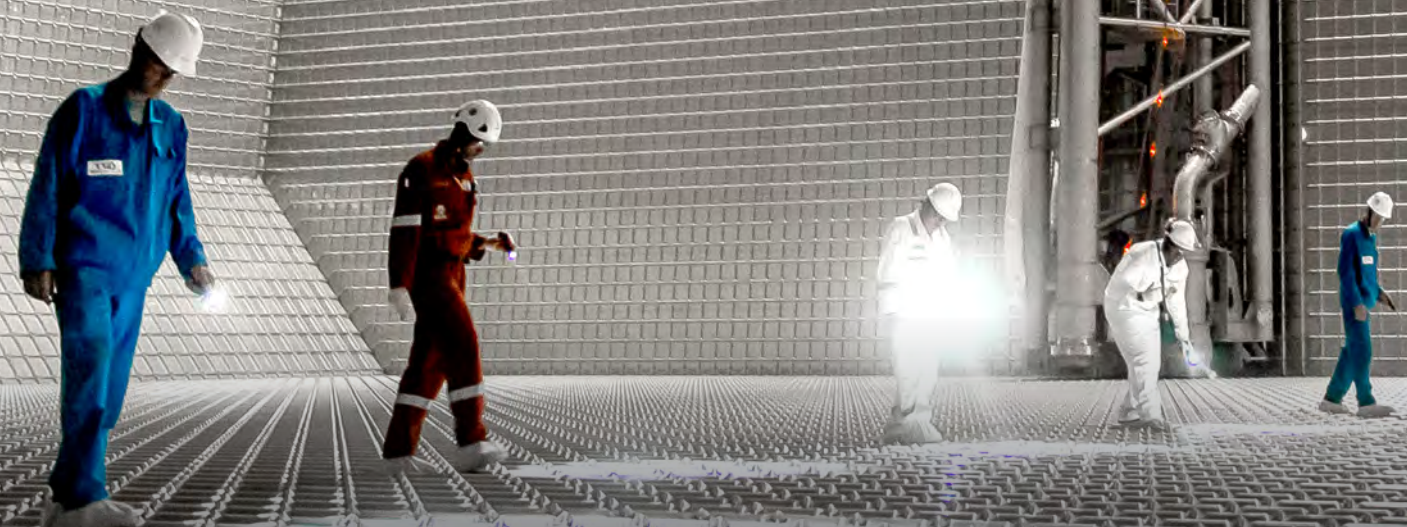


GAS IN TRANSITION

BY THE INTERNATIONAL GAS UNION  **IGU**

ISSUE 04 | VOL 05 | DECEMBER 2025

LNG: INNOVATING FOR THE FUTURE



Technip Energies is
evolving as a leader in
LNG innovation

Trends toward
decarbonisation
for LNG facilities

Oman LNG:
Positioning for
the future

Honeywell and ConocoPhillips
leading the way in advances in
liquefaction technologies



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Our LNG projects under construction and development across North America's Gulf and Pacific coasts are designed to meet rising global energy demand and strengthen energy security by connecting customers to reliable U.S. natural gas.



Sempra Infrastructure is not the same company as the California utilities, San Diego Gas & Electric company (SDG&E) or Southern California Gas Company (SoCalGas), and Sempra Infrastructure is not regulated by the California Public Utilities Commission.
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In this Issue

FEATURES

ARGENTINA SPOTLIGHT

On the cover: Inside GTT's latest tank design for LNG carriers. Source: GTT/Roland Mouron

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From the Secretary General

As we approach the end of 2025, I reflect on a year when "realism" has overtaken ideology.

This realism has been driven by the recognition that the world needs a balanced focus on energy security and affordability, and a commitment to continue evolving its energy systems towards greater sustainability.

It was a year when we recognised that, in many parts of the world, energy systems need to be transformed to lift people out of energy poverty and promote human progress and global growth.

We, at the International Gas Union, believe that Gas, in all its forms – natural, liquefied, and low-emission – is central to these goals.

Maintaining this industry position relies heavily on a relentless focus on innovation. The purpose of our magazine, *Gas in Transition*, is not only to highlight the industry's commitment to innovation but also to inspire further efforts toward higher energy efficiency,

emissions reductions, and the advancement of low-emission gases.

This is nothing new for the industry: from the early days of lighting streets to efficiently heating homes and businesses, supporting industrialisation by providing fuel and feedstock, generating electricity, and powering transport.

Innovation has always been a cornerstone of this industry. The men and women working in the sector are our greatest asset, committed to the highest safety standards and to a relentless focus on continuous improvement.

We welcome the new year with optimism and a desire to improve the world.

Menelaos (Mel) Ydreos
Secretary General, *International Gas Union*

"The global Gas industry is witnessing a renewed optimism about its future and its significant role in empowering growth and supporting social progress around the world."

ELLA MINTY, DIRECTOR, COMMUNICATIONS
SENIOR ADVISER TO THE SECRETARY GENERAL
INTERNATIONAL GAS UNION

From the editorial team

As 2025 comes to an end, the global Gas industry is witnessing a renewed optimism about its future and its significant role in empowering growth and supporting social progress around the world. What we do as an industry far supersedes the "molecules" – we are a catalyst to the innovation, integration and optimisation of the world's energy system. And we should take pride in what we do, what we stand for and contribute to: it is not a small feat to provide energy where it is needed most, when it is needed most, at a price point that is affordable and in a timeframe that is acceptable.

The December edition of our magazine is solely dedicated to LNG and its innovations, a tribute to a segment of our industry which, in less than two months, will convene its best and its brightest in Doha, Qatar for the 21st edition of the International

Conference and Exhibition on Liquefied Natural Gas, LNG2026, now in its 56th year...many of us, myself included, weren't even born then.

Please enjoy all these carefully curated features in this edition of our magazine and please do get in touch with any of the members of the editorial team for any articles you deem of interest for our global readership. May 2026 bring you joy and great pride in what you do to advance human progress and global growth!

Ella Minty

Director, Communications
Senior Adviser to the Secretary General
International Gas Union

New Member Focus



GO GAS HOLDING

Gas is the core of Go Gas Holding's business and the driver of every project we pursue. It powers our strategy to expand energy access across Africa and the Eastern Mediterranean through exploration, development, and infrastructure investments. By focusing on natural gas and its derivatives, we deliver cleaner, more efficient energy that supports industrial growth and reduces environmental impact. Natural gas development projects underpin our partnerships with all our stakeholders including governments and international technical and financial firms enabling regional integration and long-term energy security. We are proud to be leading the Consortium in Mauritania, where we are developing a fully integrated gas-to-power and small-scale LNG project. This initiative will harness local natural gas resources to provide the nation with reliable power and more affordable, cleaner industrial fuel.

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IGS

IGS is an independent storage operator in the Italian natural gas sector. Established to ensure flexibility and security of gas supply, IGS manages the Cornegliano Stoccaggio concession in Lombardy, where the company converted a depleted gas field into a modern underground storage facility. The site also includes a produced water treatment plant, designed and operated by IGS to ensure environmentally safe management of formation water. IGS provides reliable and flexible storage services with a strong commitment to operational safety, environmental protection, and ESG principles. Through technological innovation and full compliance with regulations issued by ARERA (the Italian Regulatory Authority for Energy, Networks and Environment), IGS delivers efficient and flexible storage solutions that enhance the resilience of the Italian energy system and support the energy transition.

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New Member Focus



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The Chamber of Commerce for Gas Industry (Izba Gospodarcza Gazownictwa, IGG) is a national industry organization representing companies active across the energy sectors in Poland, with emphasis being put on gaseous fuels. IGG promotes the development of a secure, sustainable, and innovative energy markets while supporting the integration of renewable gases such as biomethane and hydrogen. IGG coordinates expert working groups, contributes to standardization work within the Polish Committee for Standardization (PKN), conducts its own normalization work for the sector and engages in legislative and strategic consultations with public authorities. IGG organizes conferences, technical workshops, and sectoral initiatives fostering cooperation, knowledge exchange and innovation in the evolving Polish energy landscape.

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Tourmaline is Canada's largest Natural Gas Producer at approximately 3 BCF/d (660,000 BOE/d) and the 4th largest gas processing midstream operator. Since beginning operations in 2008, through a series of strategic acquisitions, farm-ins and land acquisitions combined with its active capital exploration and development program, Tourmaline has assembled an extensive undeveloped land position with a large, multi-year drilling inventory and operating control of important natural gas processing and transportation infrastructure in three core long-term growth areas – the Alberta Deep Basin, the NEBC Montney and Peace River Triassic oil. Tourmaline is building Canada's energy future, backstopped by 75 years of drilling inventory.

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Positioned for the next LNG cycle: A conversation with Sempra Infrastructure's President of LNG

With new supply coming online and demand projected to rise through 2050, Martin Hupka, President of LNG at Sempra Infrastructure, discusses global market trends, North America's role and how Sempra Infrastructure's dual-coast LNG strategy is purpose-built to meet market needs.



MARTIN HUPKA
President of LNG
Sempra Infrastructure



Regasification infrastructure already exceeds liquefaction capacity by a wide margin, and that gap is expected to grow further over the coming decade.

MARTIN HUPKA, PRESIDENT OF LNG, SEMPRA INFRASTRUCTURE

The global LNG market finds itself at a pivotal moment. Demand in Asia continues to grow, Europe has structurally increased its reliance on LNG to diversify supply, and importers are reshaping regional flows. At the same time, US LNG has emerged as a cornerstone of global energy security.

Gas in Transition (GiT) recently spoke with Martin Hupka, President of LNG at Sempra Infrastructure, whose team is advancing major projects on both the US Gulf Coast and the Pacific Coast of North America. He shares his perspective on market dynamics, the drivers of global demand and why a dual-coast LNG strategy offers meaningful advantages for buyers heading into the next LNG cycle.

The global LNG market has been in a period of rapid change. How would you describe the state of the industry today?

The industry has entered a new chapter defined by stronger demand signals and a realignment of global trade flows. After several years of volatility, buyers are placing greater emphasis on long-term stability, diversification and access to reliable, competitively priced supply. Asia remains the anchor of global demand, but Europe's structural shift toward LNG fundamentally reshaped the market.

Over the long-term, LNG will continue to play a central role in energy security. Ensuring secure supply has become a top priority, with buyers investing in diversified sourcing and long-term agreements to reduce exposure to market shocks. Energy security is no longer just about availability; it's about resilience, flexibility and building energy strategies that can withstand geopolitical and price volatility.

What is driving LNG demand and how does new supply factor into the market?

Global LNG demand is being shaped by several durable forces. In Asia, industrial growth and rising electricity needs continue to outpace domestic supply, making LNG an increasingly attractive complement to local resources. At the same time, Europe has undergone a fundamental shift in its

energy portfolio. Following Russia's invasion of Ukraine, the European Union is moving towards phasing out Russian natural gas imports – aiming to end LNG purchases by 2027. This move reflects Europe's drive for energy security and independence, creating space for alternative suppliers and reinforcing the bloc's long-term resilience.

New supply coming online – including projects that have taken FID – will play a critical role in meeting this new demand shift. Looking ahead, even with global liquefaction capacity forecast to roughly double by 2030 according to the International Energy Agency, the market will still require an additional 150 MTPA to 200 MTPA of new supply by 2050 to offset declining productivity from ageing assets and to meet rising demand. On the receiving side, capacity is not expected to be a limiting factor.

Regasification infrastructure already exceeds liquefaction capacity by a wide margin, and that gap is expected to grow further over the coming decade. The real challenge will be in connecting import terminals to demand centres – a priority for emerging markets where downstream infrastructure remains underdeveloped.

Taken together, these dynamics underscore the importance of strategically located, cost-competitive and operationally reliable projects to help ensure LNG supply can continue to meet the world's evolving energy needs.

How is Sempra Infrastructure positioned to help address that demand?

Sempra Infrastructure is developing projects that are strategically located and aligned with how global buyers manage their portfolios. Projects like our Port Arthur LNG facility under construction in Texas benefit from deep US resource basins, strong midstream connectivity and scalable infrastructure. Our Energía Costa Azul (ECA) LNG construction project, located on the Pacific Coast of Mexico, in Baja California, will be the only LNG terminal on North America's West Coast to export US sourced natural gas. The facility will provide shorter shipping distances to Asia, a more direct route to other Pacific →

markets and the ability to bypass congestion points such as the Panama Canal.

We're also proud of Cameron LNG, a world-class facility on the US Gulf Coast of Louisiana that continues to play a critical role in meeting global energy needs. Its strong operational performance and expansion potential further enhance our ability to provide flexible, long-term solutions for customers. To date, Cameron LNG has delivered US LNG to 37 countries worldwide.

Together, these projects are designed to help meet both immediate and longer-term energy needs, reinforcing our commitment to energy security and reliability in a rapidly evolving market.

How are global energy security concerns and shifting trade flows shaping demand for US LNG, and what makes certain projects more competitive?

Energy security has become a top priority for buyers across Europe and Asia, and US LNG is increasingly seen as the most reliable option. With abundant natural gas resources, advanced liquefaction technology and a stable, transparent market, the US offers a structural cost advantage that global buyers trust.

Access to US LNG also provides exposure to Henry Hub, the world's most liquid natural gas benchmark, giving buyers confidence in pricing and flexibility. These advantages have made the US the leading source of new LNG supply, with a growing share of global contracts signed with US projects.

Looking ahead, the market will favour suppliers that combine scale with reliability and cost competitiveness – areas where US LNG continues to lead.

What trends are you seeing in the Asian LNG market, and how is that shaping investment decisions?

Asia remains the largest and most dynamic market for LNG, with expected growth driven by urbanisation, industrial expansion and the need for flexible, reliable power generation. We're seeing a clear shift in buyer priorities: countries like India, China and emerging Southeast Asian economies are increasingly demanding flexible supply solutions, shorter delivery times and transparent pricing mechanisms.

This evolution requires US exporters to be highly responsive and adaptable. Successful projects must deliver consistent volumes, improve shipping routes and meet diverse regulatory and commercial

requirements across markets.

At Sempra Infrastructure, our dual-coast strategy positions us to capitalise on these trends. ECA LNG will be particularly well-suited to serve Asian demand – the strategic location will reduce transit times, enhance shipping flexibility and provide buyers with supply reliability. In a market where certainty and speed matter more than ever, this geographic advantage will be a critical differentiator.

Some view LNG primarily as a bridge fuel. How do you see its role in the global energy mix over the next decade?

LNG can play a critical role in helping ensure reliable, dispatchable energy as countries increase reliable power generation and accelerate the deployment of renewables and other low-carbon technologies. Its flexibility, mobility and ability to provide firm capacity make it well suited to support energy systems through this period of transformation.

We believe that long-term LNG is positioned to remain a durable component of the global energy mix. It can help strengthen grid resilience, complement intermittent forms of power generation and offers a scalable, cost-effective solution for both advanced and emerging economies. As global demand for power evolves, LNG's adaptability and proven infrastructure will continue to underpin a balanced, resilient and lower-carbon energy future.

Looking out to 2030 and beyond, what gives you confidence in the future of LNG?

LNG supports economic growth and provides firm capacity when and where it's needed. Beyond reliability, LNG can play a critical role in helping reduce emissions by displacing higher-carbon fuels.

Looking ahead, LNG's future is underscored by robust, efficient infrastructure and a well-established global supply chain. Its ability to help deliver energy security, price stability and scalability in both mature and emerging markets gives buyers confidence in a world where demand patterns and technologies are evolving.

Asia will remain the engine of LNG growth, with countries like China, India, and Southeast Asian nations driving long-term demand as they pursue electrification, industrial expansion, and cleaner energy alternatives. As energy-intensive trends like AI and digitalisation continue to create unprecedented power needs, LNG will remain a cornerstone of the energy matrix – providing the flexible, dispatchable capacity required to keep systems stable. ●

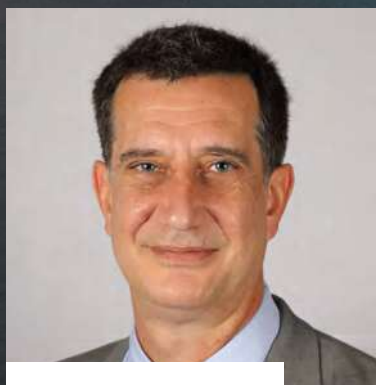
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Technip Energies is evolving as a leader in LNG innovation

For more than 65 years, France's Technip Energies has been a leader in the global LNG space. Recently, Dominique Gladelle, its Vice President, Early Engagement, sat down with *Gas in Transition* to discuss the future of LNG and its ongoing efforts to innovate.



DOMINIQUE GADELLE
VP Early Engagement
Technip Energies

Tell us, in broad terms, about Technip Energies' work on LNG?

Technip Energies has been at the forefront of the LNG industry for more than 65 years. We pioneered the sector by designing, building, and commissioning the world's first baseload liquefaction facility, Camel LNG, in Arzew, Algeria, and haven't looked back since. Today, working alongside industry partners, we have developed facilities producing 110 MTPA, which represent over 20% of the world's current liquefaction capacity of approximately 450 MTPA. Our portfolio is diverse, spanning from compact 0.3 MTPA facilities to large-scale 8 MTPA trains, including projects in some of the most remote and challenging environments imaginable – both onshore and offshore. Our group offers end-to-end capability, from initial conceptual studies right through to full EPC execution and ongoing operational and maintenance support, ensuring success at every stage of a facility's lifecycle.

How has the design of LNG facilities been evolving over recent years and how is this playing into Technip Energies' work on LNG projects?

At Technip Energies, we view the liquefied natural gas market as the predominant vector of the energy transition for decades to come. However, the future of LNG is changing, particularly, driven by the imperative to decarbonise the production of this critical fuel. Considering the LNG supply chain from the reservoir to the Gas distribution network in the consuming country, we estimate that approximately 75% of emissions occur in the LNG plant during pretreatment and liquefaction as well as in the various utilities supporting the operation. The next generation of LNG infrastructure will be low-carbon, achieved primarily through electrification powered by greener energy grids.

Delivering low- or zero-carbon LNG requires expertise across multiple domains: electrification, hydrogen production and carbon capture, utilisation and storage (CCUS), as well as renewable energy production. Technip Energies has deep expert skills in each of these areas and is ideally positioned to help the industry succeed in decarbonising its LNG production for new projects or upgrading or extending existing facilities.

The LNG landscape is also shifting toward small- to medium-capacity trains, driven by cost competitiveness and low-carbon design advantages. These projects offer more predictable, shortened execution schedule, ensuring earlier LNG delivery to the offtakers and the market. As a pioneer in modular

applications, Technip Energies has developed its own medium-capacity modular LNG plant called SnapLNG by T.EN™ launched in September 2023.

We're particularly proud that the Commonwealth LNG project, designed with the SnapLNG by T.EN™ solution, has been awarded to us. This achievement rewards our group's efforts and investments made over past years to offer the LNG industry innovative and advanced solutions.

What drove the development of the SnapLNG by T.EN™ offering? What needs does it address for the industry, and how strong is the demand for such a solution?

SnapLNG by T.EN™ is a complete 2.5 MTPA electrically driven LNG train solution composed of reproducible modules ready to be delivered and installed on-site after the verification of project-specific suitability. These modules operate autonomously and are pre-commissioned at the fabrication yard for delivery of a complete natural gas liquefaction plant, reducing the time required before LNG is brought to the market. This design allows for the processing of most feed gas compositions in various onshore environments.

Due to the scale of some projects, simultaneous construction of modules in multiple yards is necessary, as well as numerous concurrent installation and hook-up activities at the project site. To address this challenge, our group has developed and perfected project management methods that ensure the timely delivery of these large modular projects.

As noted, SnapLNG by T.EN™ uses electrical motors to drive the liquefaction refrigerant compressors. But to be more precise, our solution is a fully electrified concept. Every piece of equipment that requires a power source uses electricity. This includes, for instance, boilers and furnaces. As a result, there is no consumption of the feed gas that would be used as fuel, which would otherwise result in CO₂ emissions. This is why we can describe SnapLNG by T.EN™ as a zero-carbon solution for LNG production.

Of course, such a solution relies on the availability of a reliable, decarbonised energy source near the plant, such as wind or solar power. If this is not available, Technip Energies offers the provision of a high-efficiency power generation installation such as a cogeneration system with CO₂ capture installed at the project's inception or later.

This makes the link with Net Zero Teesside Power Project, recently awarded to Technip Energies and →

Technip Energies is a pioneer in the development of floating liquefied natural gas (FLNG) production units, having delivered the first three units now operating offshore. Developing these installations presents engineering challenges.

its partner GE Vernova and Balfour Beatty, for BP and their partners. The high-efficiency project will generate approximately 750 MW and is fitted with CO₂ capture based on Shell's Cansolv technology. To connect the dots, 750 MW is enough to operate a plant that includes five SnapLNG by T.EN™ trains and produces 12.5 MTPA. Under such a configuration, SnapLNG by T.EN™ can be labeled as a very low-carbon emission installation.

Tell us more about Technip's expertise in developing floating LNG facilities. What are the main challenges involved in producing LNG offshore today and how effective has the FLNG technology become in addressing those challenges?

Technip Energies is a pioneer in the development of floating liquefied natural gas (FLNG) production units, having delivered the first three units now operating offshore. Developing these installations presents engineering challenges. Process optimisation remains a key concept, but it must be combined with the need to operate under motions in a dynamic environment. Also, the footprint of the production units is limited by the dimensions of the hull. This requires modular fabrication as well as optimisation of space and volume without creating excessive congestion that could compromise fundamental health, safety, and environmental standards.

Construction requires precision orchestration of fabrication sequences and interfaces between major components: the hull, mooring and subsea fluid arrival systems, topsides, and product offloading stations. Once complete, the installation must be towed to its permanent destination, where it will be moored and connected to the subsea fluid arrival system. The final step is to bring it into operation. It's a remarkable four-year industrial undertaking that demands solving complex technical challenges at every stage that

our teams have successfully overcome on multiple projects.

Can you share an example of a particularly challenging project that you have worked on and tell us how you addressed those challenges?

The LNG industry has transformed through large-scale modularisation over the past 15 years. This approach solves critical challenges: enabling construction in high-cost OECD countries where local labour is prohibitively expensive, making floating LNG facilities viable, and allowing liquefaction development within the Arctic Circle. The initial wave of modular LNG projects proved the effectiveness of this approach, leading to project execution schemes fully committed to modularisation, which greatly reduces peak site manpower and risk.

A fully modularised solution mitigates risks related to resource availability and on-site site activities while its standardisation streamlines engineering and procurement cycles. The result is a derisked and shortened project execution schedule ultimately leading to earlier LNG production, a critical advantage in today's market.

Supporting this approach requires continuous engagement across the value chain. This includes securing frame agreements with main suppliers, leveraging global procurement for worldwide material sourcing, and constantly monitoring fabrication yards and construction companies' workload, performance and results.

The Yamal LNG project exemplifies what's possible when facing extreme constraints. Despite one of the harshest environments, Technip Energies successfully managed the fabrication of numerous modules across different yards while orchestrating complex transport logistics and seamless on-site installation – demonstrating our ability to deliver under the most demanding conditions.

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Events

LNG2026 - World LNG Leaders gather in Doha, Qatar. February 2-5, 2026

The 21st International Conference & Exhibition on Liquefied Natural Gas (LNG2026) is nearly upon us. Since the first edition in Chicago in 1968, the LNG Series has been the global gathering place for industry leaders, policy makers and technical experts.

The LNG2026 is set to be the largest one yet, where industry stakeholders will explore the key topics influencing today's global LNG landscape and do business.

The Executive and Technical Programme bring together industry leaders and experts to examine pricing trends, supply security, project delivery, infrastructure development, market outlooks, and evolving commercial models. Key themes include global energy demand growth, AI, ESG, methane reduction, and the role of low-carbon fuels such as hydrogen and ammonia.

Key Plenary Sessions will feature industry leaders such as:

- His Excellency Mr. Saad Sherida Al Kaabi, the Minister of State for Energy Affairs, State of Qatar; President and CEO, QatarEnergy
- Rt. Hon. Ekperikpe Ekpo Ph.D, Minister of State, Petroleum Resources (Gas), Federal Republic of Nigeria
- Ryan Lance, Chairman and CEO, ConocoPhillips
- Claudio Descalzi, CEO, Eni
- Darren Woods, Chairman and CEO, ExxonMobil
- Wael Sawan, CEO, Shell
- Patrick Pouyanné, Chairman and CEO, TotalEnergies SE
- Tengku Muhammad Taufik Tengku Kamadjaja Aziz, President and Group CEO, PETRONAS, and many more

The Technical Programme complements these high-level discussions with focused sessions on shipping and marine operations, LNG infrastructure and emerging technologies, offering attendees both strategic insight and practical takeaways.

Beyond the conference, the delegates will meet senior representatives from leading companies on the LNG2026 Exhibition floor, including the event host QatarEnergy, ConocoPhillips, Shell, Cheniere, ExxonMobil, TotalEnergies, Venture Global, Baker Hughes, and many more.

LNG2026 brings together the decision-makers, technical experts and global stakeholders who matter. To understand where the industry is heading, LNG2026 is the place to be. Register today at www.Lng2026.com!

See where the industry is headed by joining the conversation, exploring the latest innovations, and following all the highlights at www.Lng2026.com or on our social media channels!

IGRC2027

A shared vision is emerging within the global Gas research development and innovation community. The future Gas system will not just be shaped by single technologies, but by their integration and seamless operation. Gas-for-power, heat and captured carbon will operate together as an interconnected ecosystem guided by real-time data predictive analytics and advanced automation. Digital twins of transmission and distribution networks will allow engineers to model Gas behaviour test scenarios and avoid potential disruptions before they occur.

Life-cycle assessment is becoming more precise, allowing operators to track emissions from production through to upgrading transport and end use. These continuous innovations ensure that Gas delivers measurable environmental gains while scientific clarity is becoming a core foundation of market confidence, just as important as the transmission infrastructure.

Renewable Gas hubs blending corridors and multi-energy demonstration platforms will serve as living laboratories where ideas can be tested under real conditions. Digitalisation is transforming operations while real-time Gas composition sensors advanced chromatographs and AI-based prediction tools help operators anticipate fluctuations and optimise blending.

This collaborative approach, which lies at the heart of IGRC2027, will accelerate learning and shorten innovation cycles.

Subscribe to the IGRC2027 mailing list to be notified first of the Call for Abstracts and other conference news. www.igrc2027.com

Cedar LNG A New Way Forward



A partnership between Haisla Nation and Pembina Pipeline Corporation, Cedar LNG is a floating LNG facility within the Traditional Territory of Haisla Nation on Canada's West Coast. With construction well underway, we anticipate operations to commence in late 2028.

A Partnership Based on Shared Values

Cedar LNG is being designed and built with our partners' shared values of sustainable development and environmental protection as top priorities. Powered by Canadian renewable energy, Cedar LNG will be one of the lowest-emitting LNG facilities in the world.

Cedar LNG represents economic reconciliation in action. We are redefining how Indigenous communities and the industry can work together to bring Canadian energy to the world, with an Indigenous majority-owned project that places environmental stewardship at the forefront.

With Haisla Nation at the forefront of LNG development in Canada, we are showing the world what's possible when Indigenous communities are recognized as leaders and decision-makers in the energy sector. Cedar LNG stands as a powerful example of how Indigenous ownership can help forge our own path towards economic prosperity.

– Maureen Nyce,
Elected Chief Councillor,
Haisla Nation



We are so pleased that Pembina is the chosen partner of Haisla Nation. Cedar LNG is more than a project or an LNG facility – it represents a new way of working towards a common goal based on shared values.

– Scott Burrows,
President and CEO,
Pembina Pipeline Corporation



The Cedar LNG Advantage

Cedar LNG is strategically positioned to deliver a lower-carbon energy option to global markets. Our West Coast location provides one of the shortest shipping routes to key Asian markets, and the Douglas Channel, where our facility is located, offers an established shipping route and deepwater marine inlet, with year-round ice-free conditions.

Follow our Journey

Follow us on our journey as we work towards the world's first cargo of Indigenous-led LNG in 2028.

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Canadian LNG: Strategy for a world of cheaper Gas and less coal



ROBERT J. JOHNSTON
Director, Energy and Natural Resources, University of Calgary School of Public Policy

With LNG development moving after a decade of darkness, Canadian LNG can help bridge the gap to Asian decarbonisation.

The theme of a looming supply glut has been a major narrative in natural gas markets over the past few years. The ramp up in US and Qatari production has been the main catalyst, but Canada is also poised to provide additional upside, which looks like it will exceed earlier expectations.

After more than a decade of regulatory impasses and project delays, LNG Canada, Canada's first major LNG project, was commissioned in the summer of 2025. Now, Canadian Prime Minister Mark Carney is talking about up to 100 MTPA of supply. This would include the 14 MTPA from phase one of LNG Canada, plus several other projects, including a second phase of LNG Canada (14 MTPA) and Ksi Lisims LNG (12 MTPA), both of which have been placed on the government's Major Projects list.

Canada's LNG sector benefits from proximity to Asia-Pacific markets, strong environmental performance (including methane intensity reduction), and experienced operators. The growing participation of Indigenous First Nations as financial and strategic partners in the sector has been arguably the most important catalyst in driving Canadian LNG growth

and redressing, while not entirely eliminating, regulatory and social challenges.

Canadian LNG is ramping up as the prospect of an extended period of lower prices for LNG is taking hold in markets. Lower prices will add another facet to the long-running debate over the role of natural gas in displacing the consumption of coal, particularly in Asia-Pacific markets. We argue that Canada can be a key player taking advantage of the potential for lower natural gas prices to help stimulate additional demand for fuel-switching from coal.

Specifically, the Canadian LNG sector and government can leverage price-driven momentum for fuel-switching with continued rigorous action on methane abatement on the supply side and efforts to support emerging carbon markets and financial support for new Gas infrastructure among consumers.

The convergence between Canadian LNG sector momentum and a well-supplied global market is highlighting a debate between industry supporters and environmental sceptics about the economic viability and the risk of stranded assets.

The Canadian LNG sector and its supporters in the

PROJECT	OPERATOR	STATUS	CAPACITY (MTPA)	FEDERAL MAJOR PROJECT DESIGNATION	METHANE INTENSITY (CO ₂ E/MT OF LNG)
LNG Canada I	Shell, Petronas, KOGAS, Mitsubishi, CNPC	Operating	14	No	0.15
Cedar LNG	Haisla First Nation/ Pembina Pipeline	Construction	3.3	No	0.08
Woodfibre LNG	Pacific Energy Corporation, Enbridge	Construction	2.1	No	0.04
Ksi Lisims LNG	Western LNG/Nisg'aa First Nation/ Rockies LNG	Pre-FID	12	Yes	0.02
LNG Canada II	Shell, Petronas, KOGAS, Mitsubishi, CNPC	Pre-FID	14	Yes	TBD

policy community have argued that natural gas is an under-utilised climate solution and that it is one of the shortest and most effective pathways to achieving greenhouse gas (GHG) emissions reductions when it displaces coal consumption in power generation or industry. The Chinese push to displace residential coal consumption for heating with natural gas is cited as an example of what is possible, along with coal plant retirements in the US driven by cheap natural gas (and renewable power).

Canadian environmentalists counter that LNG supply is too expensive in many cases to displace coal, particularly in emerging Asian markets. Solar, wind, and batteries are presented as cheaper alternative to coal and indeed there is some evidence to support this, particularly in China but also increasingly across emerging Asia.

Environmental groups also flag potential risks associated with fugitive emissions and high methane-intensity LNG that translates, according to some (disputed) models, to a life cycle emissions footprint that offers little, if any, improvement to coal. An expanding share for LNG in a period of low prices could lock in long-term fossil fuel dependence while exposing developing economies to higher prices in the future, given the past history of volatile prices. The prospect of an LNG supply glut is said to compound these risks for Canadian LNG developers, leading to scenarios of under-utilisation amid weak Gas prices.

The International Energy Agency (IEA) has

weighed in on these questions in its most recent *Gas Outlook* published in October 2025. The *Outlook* suggests that the high levels of supply growth through the balance of the decade will drive a convergence of Asian natural gas prices with marginal US LNG supply costs, meaning a landed LNG price of around \$8/mn Btu to \$8.50/mn Btu. At this price range, the IEA suggests additional upside of 65bn (billion) m³ of Gas demand, on top of an already robust Gas demand forecast. 65bn m³ is equivalent to over 50% of total US total LNG production in 2023. The demand would be driven, in the words of the IEA, by "price-elastic demand across the power sector, Gas-intensive industry and the transport sector" with a particular focus on South Asia and Southeast Asia.

South Asia and Southeast Asia, along with China, are the centre of global coal demand, accounting for 77% of global coal consumption in 2024. Coal-to-gas switching is a promising but elusive target in all three regions. China's fuel-switching, as mentioned earlier, has been driven by the residential/commercial sector with natural gas less competitive than renewables, particularly outside coastal areas. Southeast Asia and South Asia represent high energy consumption regions but are characterised by price sensitivity and, in many cases, a lack of Gas infrastructure, from regasification and import facilities to storage and distribution.

With a surge of new projects in search of new customers, Canadian LNG developers have much at



stake with respect to whether a period of sustained lower natural gas prices can change these market dynamics and drive new market penetration for natural gas at the expense of coal. We would agree with the IEA assessment about the potential upside from price-elastic demand but would further argue that Gas market penetration would be enhanced by additional policy measures. The Canadian federal and provincial governments can coordinate with the LNG sector to support diplomatic, regulatory, technological, and financial support to backstop the following areas:

- A. Continued focus on methane abatement
- B. Gas infrastructure financing
- C. Carbon market development

Methane abatement plays an indirect, but critical role, particularly given the Canadian LNG sector's incumbent advantages as a low-methane intensity supplier. The link between expanding Gas supply, energy security, and decarbonisation is clouded by conflicting reports and assessments of the methane intensity of LNG supply. Canadian natural gas and LNG have been less affected by this critique, thanks in large part to strict and effective methane regulation, particularly in British Columbia. Canadian support for continued development of ambitious methane standards, such as the OGMP 2.0, will help ensure high-quality measurement, verification, and reporting of methane intensity, allowing buyers and investors to target the least GHG-intensive sources of LNG. Combined with strong government commitments through the Global Methane Pledge, much of the controversy around LNG versus coal, from a climate perspective, should be put to rest.

Strong Canadian leadership for global action on methane will also be the key to unlocking public sector support for Gas infrastructure. Investment in

Gas infrastructure will be a key element of supporting the displacement of coal in emerging Asian markets. While the US, under President Donald Trump, is fully embracing trade finance and loan guarantees for LNG, other G7 members remain ambivalent. Yet the Carney government has strong incentives to support Gas infrastructure investment both to bolster LNG development at home but also as a means of supporting trade diversification as hedge against protectionism in the US.

The past efforts around programmes such as the Joint Energy Transition Partnerships (JETP) largely excluded Gas, in large part due to opposition from EU governments and a lack of support from Canada as well. France will hold the G7 Presidency in 2026 and has indicated that it will prioritise action on methane.

Strong Canadian action on G7 methane commitments should be linked to an agreement to support Gas infrastructure linked to supply from countries with the corresponding commitments to programmes such as OGMP 2.0. This would help expand the opportunity for countries such as Pakistan, Indonesia, and Vietnam to get public sector financial backing for Gas infrastructure that can support coal displacement.

Carbon pricing is the third and arguably most contentious piece of the coal-to-Gas fuel switching puzzle in Asia. Even in a Gas glut scenario, coal prices will remain lower than LNG in most countries on a pure market basis. Coal retirements in regions such as the EU have been accelerated by the presence of carbon pricing and cap and trade. Emerging Asian economies are focused overwhelmingly on affordability and, as such, are hesitant to embrace policies that effectively seek to tax coal consumption out of existence. Yet countries such as India are launching nascent policy frameworks to introduce carbon pricing for GHG-intensive sectors.

At an initial \$10/metric ton (mt) price, the Indian

Strong Canadian leadership for global action on methane will also be the key to unlocking public sector support for Gas infrastructure.

emissions-intensity based scheme will have little direct impact on industrial fuel switching in the short term. Other coal-intensive economies, such as Indonesia, have even weaker carbon markets. But in the longer term, these carbon markets should become more stringent, as it has been done through an intermittent process in the EU.

The Canadian LNG sector should encourage carbon regulation and pricing in coal-intensive Asian economies as it would target coal first and encourage both Gas and renewable usage. Ultimately, as renewables grow, Gas will compete with coal as a primary complementary source of firm power capacity. Eventually, this will become a competition between Gas and batteries should carbon prices rise. Carbon pricing will also support the eventual adoption of carbon capture and low-carbon fuels, which could

provide further Gas-based substitution pathways for coal.

Canada has much to offer its emerging Asian partners through its own industrial carbon pricing market experiences as well as its technological leadership in CCUS and low-carbon fuel technologies. Support for strong methane regulations and performance and financing for emerging Asian Gas infrastructure will further support Canadian LNG growth, as well as parallels goals such as market diversification and Indigenous economic development. Smart alignment between policy leadership and commercial engagement can provide a path for Canadian LNG to not only survive but prosper in the well-supplied natural gas markets to come. ●

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Regional Update

GAS NEWS FROM AROUND THE WORLD



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Natural Gas: The Greatest Energy Opportunity for Latin America and the Caribbean

Latin America and the Caribbean are regions abundant in resources, including sunlight, wind, water, natural gas, biogas, biomethane, lithium, and copper. However, we still face significant inequalities in energy access. The *Just and Inclusive Energy Transitions Action Plan* emphasises that over 70mn people continue to live in energy poverty. This demonstrates that the transition to sustainable energy must consider the social realities of our territories and communities.

In this context, natural gas has established itself as a vital pillar for ensuring energy security, reducing emissions, and supporting power systems that depend on intermittent renewable sources such as solar and wind. Our region possesses the resources, infrastructure, and technical expertise to utilise natural gas effectively while also advancing the production of low-emission gases like biomethane, biogas, and hydrogen. The key to success lies in aligning stable policies, sustaining investments, and fostering a regional vision centred on equitable growth.

Recent data confirm this trend. According to the International Gas Union's *Global Gas Report 2025 (GGR 2025)*, regional demand increased by 1% in the first three quarters of 2025, mainly driven by Brazil, Argentina, Chile, and Caribbean countries. Although 2026 might see slight stabilisation, the core message remains clear: natural gas is – and will continue to be – the dependable energy source that supports greater integration of renewables while maintaining security and reliability.

The existing infrastructure further highlights the importance of natural gas. Latin America and the Caribbean currently have 22 liquefied natural

Natural gas has solidified its role as a vital pillar for ensuring energy security, reducing emissions, and supporting power systems that rely on intermittent renewable sources like solar and wind.



gas (LNG) terminals either operational or under development across 11 countries. In 2024, Brazil, Argentina, and Colombia increased their use of regasification terminals in response to severe droughts that limited hydropower generation. This demonstrates that LNG has become a vital tool for reducing climate risks and strengthening the resilience of electrical systems, particularly during periods of hydrological stress. *GGR 2025* also predicts that Central and South America could shift from being net LNG importers to small exporters in the coming years, driven by the expansion of Vaca Muerta in Argentina and pre-salt developments in Brazil.

Certain countries are advancing quite rapidly. Argentina is on track to become the region's main growth driver in natural gas, with production expected to increase by 60% by 2035, according to *GGR 2025*.

The ongoing development of Vaca Muerta and the expansion of the Presidente Néstor Kirchner pipeline are turning Argentina from a traditional importer into a potential net exporter.

Brazil is also making notable progress; in 2025, its primary natural gas supply grew by over 10%, driven by a 20% increase in domestic production and the commissioning of the Petrobras Rota 3 pipeline. This growth has supported an electrification system impacted by a 5.5% decline in hydropower generation.

Chile, meanwhile, increased its gas demand by 8% in 2025 to support a rapidly expanding solar and wind infrastructure. The Caribbean also experienced a 7% rise in LNG imports, aiding the replacement of costly, high-emission liquid fuels.

Colombia experienced a unique situation, with natural gas demand declining by 15% from January 2025 to August 2025 due to a temporary spike in hydropower generation. This should not define Colombia's future, as the country has historically relied on natural gas to address El Niño events, prolonged droughts, and energy stress episodes that threaten system reliability. With one of the strongest regulatory frameworks in the region, strategic infrastructure, and significant potential to

produce biogas and biomethane from agricultural and livestock waste, Colombia is well-positioned to become a regional leader in renewable gases.

To capitalise on these opportunities, the region must accelerate energy investments. *GGR 2025* warns that Latin America will need to quadruple its investment in clean energy over the next decade to meet global goals. This will only be feasible if the energy base is solid and reliable. Natural gas will continue to play a critical role in this process, enabling greater penetration of renewables without compromising supply security or access for vulnerable communities.

Additionally, the expansion of low-emission gases presents a strategic opportunity. Analyses by IRENA indicate that global biomethane production surpassed 10bn (billion) m³ in 2024. With this context, Latin America has the potential to become a leading player by driving projects that utilise agricultural, urban, and livestock waste, among other resources.

Latin America and the Caribbean possess abundant resources, talent, environmental awareness, and a strong social conscience. The stakes are high, as the goal is not merely to diversify the energy sector, but to ensure equitable access to energy for all. ●



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Trends toward decarbonisation for LNG facilities



DOUG ARNELL
CEO, Cedar LNG



NATHAN TUNGSETH
Senior Vice President, LNG
ABB Energy Industries

Around the world, LNG developers are taking steps to make their projects more sustainable.

ANNA KACHKOVA

LNG developers have certain options at their disposal for decarbonising their facilities. Against the backdrop of the energy transition, some developers are designing facilities to have low emissions from the outset, while others are exploring ways to add a decarbonisation component to LNG terminals that are already operational. Some can achieve this more easily than others, however.

Looking at the liquefaction component of the LNG value chain alone, there are two main areas where greenhouse gas (GHG) emissions can be significantly reduced, according to Wood Mackenzie's Senior

Vice President of Emissions and Low-Carbon Fuels Consulting, Gavin Law. The first is the turbines that power the refrigeration process and the second is addressing the carbon dioxide (CO₂) content in feedstock gas, which has to be removed prior to liquefaction.

"Most reservoir gas will have some level of CO₂ in it," Law tells *Gas in Transition (GiT)*. For CO₂ that has been removed from the feedstock gas, he says there are two options – vent it or capture and sequester it. But whether an LNG developer will be able to deploy carbon capture and storage (CCS) depends on a

variety of factors, including geology and regulatory and policy support.

"If you're in the Gulf Coast (US), it's possible that it wouldn't be too hard to do, but it's still a cost," Law says. "You're going to have to have compressors. You're going to have to have wells that allow for injection. It's an additional cost, and that cost could be quite significant if the number of wells and the complexity of the wells is quite high."

Law points to the example of the Gorgon project in Australia, where CCS is used to decarbonise the LNG facility but where he says the cost has run into billions of dollars because of the challenges involved in that particular CCS project.

"It really depends on where you are as to whether CCS is really viable and whether you can do it at a reasonable cost," Law says. He adds, however, that the incentives to add CCS capability are "not necessarily that great" given costs that could run into hundreds of millions of dollars.

On the turbine side of things, Law points to efficiency gains made over the last few decades, from when steam turbines in the 1970s would burn around 13% of the natural gas fed into a plant during the liquefaction process.

"As turbine efficiencies have got better, you've started to use things like aero-derivative turbines, in which the consumption of natural gas can be 6% or 7%," Law says. "Then you've got electric drive turbines. There are two scenarios there – one is that you have an electric drive turbine, and you generate the power yourself using a combined cycle power plant. You build your own power plant that will run the electric drive turbines. That's pretty efficient – some of the most efficient projects are like that. Or you can buy the electricity from the grid."

Electrification can have a particularly significant impact as replacing natural gas turbines with electric motors accounts for the largest scope of emissions on an LNG facility, according to ABB Energy Industries' Senior Vice President of LNG, Nathan Tungseth.

"You're able to reduce the amount of emissions that you produce, and equally, you're also able to produce more LNG and produce it more efficiently," Tungseth tells *GiT*. "You get about 10 days extra each year of LNG production because you don't have the down days that a natural gas turbine would require for maintenance."

There have been some concerns about electrified facilities experiencing outages in recent years, but Tungseth attributes this to issues with the power supply, rather than issues with the technology itself.

"The big thing is having reliable power," Tungseth

"One of the most important decisions made early in Cedar LNG's development was to power the facility with Canadian renewable electricity."

DOUG ARNELL, CEO, CEDAR LNG

says. "Anytime you're reliant on grid power, you're going to have to ensure that you have complete, uninterrupted power. And that's the big problem that a couple of these LNG facilities are having, like here on the Gulf Coast, where the grid power that they're getting is seeing disruptions – whether it's from lightning strikes, from storms or from the resilience of renewable power on the grid."

Even brief disruptions to the power supply can result in outages for an LNG plant.

"If the drive can't handle that and doesn't have a ride-through capability, it basically shuts down for a very short amount of time, which turns your motor into a giant brake, which then sends your compressor into potential surge characteristics," Tungseth says. This triggers anti-surge control processes, and these can take eight to 24 hours to resolve, he says, but adds that there are ways to mitigate this. These include providing automated ride-through capability, which can prevent anti-surge controls from triggering during brief interruptions to the power supply.

Law agrees that the reliability of power supply is the challenge, rather than the technology.

"Electric drive turbines are no less reliable than any other type of turbine," Law says. "It's the power supply that would be your issue."

Canada's low-carbon projects

Both Law and Tungseth point to Canadian LNG projects that are under construction or close to it as examples of projects that are well-positioned to decarbonise. The focus on decarbonisation among those projects is thanks in large part to abundant hydroelectric power resources in the province of British Columbia.

LNG Canada, the country's first LNG export project, uses electricity for auxiliary power, accounting for around 20% of its total power demand. The project's first phase has a capacity of 14 MTPA →



Cedar LNG's on-shore infrastructure under development
Source: Cedar LNG

and LNG Canada executives have previously voiced ambitions to initially build a second 14 MTPA phase with Gas-powered turbines and then switch to electric motors as more power becomes available. However, there has been no firm commitment on this.

Meanwhile, construction is underway on two smaller export projects – the 3 MTPA Cedar LNG and the 2.1 MTPA Woodfibre LNG – while the 12 MTPA Ksi Lisims LNG project has been targeting a final investment decision (FID) by the end of 2025. All three projects will be powered by renewable hydroelectricity, with their developers touting the impact this will have on their emissions profiles.

Cedar LNG

Cedar LNG is a floating LNG (FLNG) project being developed by a partnership between the Haisla Nation, an Indigenous community, and Pembina Pipeline. It bills itself as the world's first Indigenous majority-owned LNG project and given that social licence to operate has been a challenge for other major Canadian energy projects in recent years, having community buy-in can make a significant difference. With environmental protection prioritised from the start, access to hydroelectricity played a role in how the project was developed.

"The availability of renewable energy certainly helped shape the project into what it is today," Cedar LNG CEO Doug Arnell tells *GiT*. "One of the most important decisions made early in Cedar LNG's development was to power the facility with Canadian renewable electricity."

There has never been an alternative to the electrification of the facility, he says, adding that it was up to the project partners to make it economically viable and attractive to customers.

Cedar LNG expects to produce 0.08 tons of CO₂

equivalent/ton of LNG when it comes online, targeted for late 2028, which Arnell says is "considerably less" than other proposed LNG facilities and "well below the global average of 0.35 tonnes CO₂e/tons LNG".

Aside from this, Cedar made several design decisions at the outset to minimise its environmental footprint, according to Arnell.

"A floating facility ensures that the project footprint and potential impacts on the land were reduced to the greatest extent possible," he says. "Cedar LNG's onshore footprint, including our transmission line and pipeline rights-of way, is approximately 70 hectares – approximately 80% less than many LNG facilities, including LNG Canada. In fact, the onshore footprint of our marine terminal has been reduced by nearly 50% since the partnership between Haisla Nation and Pembina was formed."

Black & Veatch and Samsung Heavy Industries (SHI) are the contractors building the liquefaction facility for the project. Black & Veatch is responsible for complete topside design and equipment supply, including its PRICO SMR liquefaction technology, while SHI is providing the hull with the containment system and handling the fabrication and integration of all topside modules.

"Cedar LNG is designed to be one of the world's lowest-carbon-intensity LNG facilities, and that commitment starts with its core technology choices," Black & Veatch's President of Fuels and Natural Resources, Narsingh Chaudhary, tells *GiT*, citing his company's PRICO SMR technology in particular.

"Unlike traditional gas turbine-driven systems, Cedar LNG uses motor-driven refrigeration compressors powered by renewable hydroelectricity from British Columbia's grid. This eliminates direct combustion emissions and significantly reduces the carbon footprint of liquefaction operations,"



Welding underway on the Cedar Pipeline
Source: Cedar LNG

Chaudhary adds. "Beyond electrification, the facility incorporates air-cooled heat rejection systems instead of water cooling, which helps reduce the environmental impact of the facility. We've designed the modular topside with a view to minimising construction emissions and accelerating deployment."

In Chaudhary's view, there are several factors that make Cedar well-suited for "deep decarbonisation" compared to other LNG projects.

"First, its location in Kitimat provides access to abundant renewable hydroelectric power, enabling full electrification of critical systems such as refrigeration compressors, boil-off gas compressors and auxiliary pumps. This is a differentiator from prior LNG facilities that rely on gas turbines," he says. "Second, the floating LNG design offered by Black & Veatch allow for complete topside modularisation and integration of advanced technologies in a shop floor environment away from the project site, reducing lifecycle emissions from construction through operation."

Big ambitions

Cedar, Woodfibre and Ksi Lisims are all targeting particularly low emissions for their facilities, with Woodfibre and Ksi Lisims saying they are aiming for net zero emissions. While it remains to be seen whether net zero emissions can be achieved, Law and Tungseth agree these projects are better-positioned than rivals in other parts of the world to pursue particularly ambitious levels of decarbonisation.

"I think if you're going to achieve net zero, then you've got to be producing the LNG using full renewable power, and that is possible in certain areas, but that largely means that you're going to have to have renewable, reliable power, and the only

real way to get that at 100% would be coming from hydroelectric," says Tungseth. "If you're somewhere like Cedar LNG, Ksi Lisims or Woodfibre in Canada, where they have a large amount of hydroelectric power, I think then you can achieve net zero."

By contrast, other regions such as the US Gulf Coast only have intermittent sources of renewable power, Tungseth says. As a result, power there has to be supplied another way, "which means you have to get reliable power coming from rotating equipment – either from a gas turbine or steam turbine".

Law, for his part, sees the ability to achieve net zero even with a renewable power source as "unlikely" unless a project is also buying carbon credits.

"If you're offsetting your emissions with credits, yes, you can have net zero, but it's unlikely that you're going to be completely net zero because you're still going to use some fuel, but you could probably get pretty close," he says. "With the likes of the Canadian projects the emissions from the reservoir CO₂ will be a problem. You'll have to either capture those or they'll have to be next to zero coming in," Law adds.

Nonetheless, the Canadian projects are well-placed to lead the way on major LNG decarbonisation initiatives. While developers in other regions may struggle to achieve similar levels of decarbonisation without reliable, renewable power, Tungseth is confident that technology for cutting emissions has potential to achieve significant gains in the future.

"I think we're just getting started, with the introduction of AI and what advanced computing is able to do," he says. "We have all these solutions today. We're just learning how to implement them and how to put them in in a cost-effective way. But with the introduction of AI and what it's able to do, it's astounding." ●

Japan's place in a decarbonised energy world

Gas in Transition recently discussed Japan's energy transition, and the role LNG will play in that transition, with Hiroshi Hashimoto, Senior Fellow, LNG and Gas at the Institute of Energy Economics, Japan (IEEJ)



HIROSHI HASHIMOTO
Senior Fellow, LNG and Gas
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The Japanese government undertook the 14th edition of its globally recognised LNG Producer-Consumer Conference (LNG PCC) in June 2025. How has the role of LNG and the LNG marketplace evolved over the period of time since the first of these conferences was held?

The role of LNG and the global LNG marketplace have changed dramatically since 2012, when the Japanese government launched the annual LNG Producer-Consumer Conference (LNG PCC). Japan's LNG demand surged after the shutdown of all nuclear reactors by 2013, making LNG the primary fuel for power generation. The demand spike tightened global LNG markets, redirected cargoes from Europe to Asia, and drove up spot prices to record highs at that time. Prices of LNG under long-term contracts then were even more expensive, with linkage to crude oil prices

of more than \$100/barrel, putting enormous pressure on the Japanese economy.

LNG PCC was launched in 2012 by METI (Ministry of Economy, Trade and Industry) as a platform for dialogue on supply security and pricing transparency, aiming to stabilise markets and promote cooperation between stakeholders. Nuclear restarts in Japan began in 2015, gradually reducing LNG imports. The LNG market has evolved from rigid, oil-indexed long-term contracts toward greater flexibility, shorter tenures, and destination-free clauses, with greater shares of spot and short-term LNG trade. During the period, new and large LNG supply sources emerged: the shale revolution in the US drove LNG export growth, introducing Henry Hub-linked pricing in the international LNG market and increasing liquidity. Australia completed major LNG projects, becoming a top exporter alongside Qatar. The LNG market has seen increasing volatility and instability since 2020,

when COVID-19 caused LNG demand and prices to collapse temporarily, followed by a sharp rebound. Russia's invasion of Ukraine in 2022 triggered an energy crisis. At that time, Europe shifted massively to LNG, pushing prices to historic highs. LNG has increased its strategic role for energy security, not just as a transitional fuel. Japan's role in the LNG market has shifted, as its domestic Gas demand has fallen due to nuclear restarts and renewables growth and as some Japanese companies have become LNG portfolio players.

During the period LNG evolved to a globally traded, flexible, and increasingly decarbonised commodity by 2025. Japan transitioned from the largest importer to a market influencer and portfolio player, while LNG PCC has become one of the key fora shaping global LNG strategies.

What role does the IEEJ see natural gas and LNG playing in balancing energy security with stable and affordable access to energy, as the world moves towards net zero?

LNG is expected to play a critical balancing role in the global energy system as countries pursue net zero goals while maintaining energy security and affordability. LNG is widely recognised as a transition fuel because it emits less CO₂ than coal and oil when burned as the cleanest fossil fuel option. It enables significant displacement of coal in power generation, especially in Asia. LNG supports grid stability by complementing intermittent renewables like wind and solar, providing flexible backup power. LNG enhances energy security by diversifying supply sources and reducing dependence on pipeline Gas from geopolitically sensitive regions. LNG can be shipped around the world, making it a critical buffer against supply shocks, ensuring resilience in energy systems. The LNG market has evolved toward shorter-term and more flexible transactions, helping consuming countries manage price volatility and optimise procurement strategies.

LNG producers have been challenged to quantify the "true" emissions discharge related to LNG production and regasification, and these vary tremendously across different geographies. This is a complex issue. Some steps, such as the Coalition for LNG Emission Abatement toward Net zero (CLEAN) initiative introduced at LNG PPC 2023 have been taken. Can you discuss what steps are being

LNG is expected to play a critical balancing role in the global energy system as countries pursue net zero goals while maintaining energy security and affordability.

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taken or potentially should be taken regarding the availability and reporting of emissions data?

It is yet difficult to accurately quantify methane emissions from LNG production and transport, as they can differ significantly depending on upstream practices, liquefaction technology, shipping distances, and regasification methods. There has been no global consensus on measurement protocols yet. Launched at LNG PCC 2023, CLEAN aims to increase transparency and reduce methane emissions across the LNG value chain. Actions include: Questionnaires to LNG producers on methane management; Project-level disclosure of methane emissions; and Publication of CLEAN Annual Reports showcasing best practices and benchmarking. CLEAN is supported by governments, UNEP's International Methane Emissions Observatory (IMEO), and industry players to harmonise data and develop verification mechanisms. In addition to CLEAN, the OGMP 2.0 Framework for many LNG operators, the EU Methane Regulation, as well as partnership efforts like the SGE Methodology and cargo emission tags can play roles to promote more transparency of data. From the technical aspect, in recent years, satellite monitoring technologies (Japan's GOSAT series, for example) have advanced to help provide information.

In October 2025, the IEEJ released its 2026 Outlook. What do the findings from the 2026 Outlook mean for the natural gas and LNG industry? Were there any surprises in the latest annual Outlook, or are things moving in line with your previous expectations? →

The IEEJ 2026 Outlook confirms LNG's important role during the outlook period but warns of deep uncertainties – geopolitical, technological, and policy-driven – that could reshape demand patterns. One of the notable points is the scale of emerging Asia's demand growth and the persistence of fossil fuels, even under the aggressive decarbonisation scenario. More specifically, even under the Advanced Technologies Scenario, natural gas demand declines only modestly (about 7% by 2050 compared to 2022), while in the Reference Scenario, demand continues to grow steadily. LNG is reaffirmed as a critical component of energy security and decarbonisation, especially for Asia, where coal-to-natural gas switching remains a major emissions reduction strategy. Global LNG demand is projected to increase until around 2040, even in the Advanced Technologies Scenario, before stabilising at current levels by mid-century. Under the Reference Scenario, LNG demand could rise by 74% by 2050, requiring 10 MTPA to 20 MTPA of new capacity additions annually. India and ASEAN emerge as major demand drivers, surpassing China in incremental energy demand growth by 2050. Japan and Korea see declining overall energy consumption but maintain LNG as a strategic energy source for balancing renewables and nuclear restarts. The report stresses a widening gap between ideal and reality: while net zero ambitions remain, fossil fuels – led by LNG – will still account for over half of global primary energy in 2050 under the Reference Scenario.

What shifts – if any – do you see in where Japan procures its LNG from and do you expect any changes in terms of the mix of sellers in the future? How are current geopolitical developments playing into this?

Japan is expected to continue prioritising diversification, flexibility, and decarbonisation in LNG procurement. North American and Middle East suppliers are expected to gain prominence, while Russia's role diminishes until the military aggression in Ukraine ends. Long term contracts remain essential for stability, but with more flexible terms. Emissions transparency and risk management tools are expected to become integral to procurement decisions. Australia should remain key with its declining share in the future. North American LNG is expected to grow substantially. The Middle East is expected to renew its importance. Southeast Asia is expected to maintain its role. Despite future uncertainty, Sakhalin LNG remains strategically

important. In addition, Japan's procurement strategy effectively includes GHG intensity criteria and methane abatement commitments. CLEAN partnership and LNG emissions certification are expected to influence future supplier selection.

The Japanese government issued the 7th Strategic Energy Plan in February 2025. Has the position on LNG changed compared to the previous (6th) Plan? Or does it still project a gradual decline in LNG demand in Japan as before?

The outlook for LNG in the 7th Strategic Energy Plan shifted drastically from a shrinkage in the 6th Plan to a steady increase. It is expressed in the following explanations: "The use of LNG-fired power generation is essential as a means of transition to decarbonisation of power sources"; "Advancing the shift to natural gas through fuel switching should contribute to reducing environmental impact" and "Decarbonisation of [natural] gas is expected to realise thanks to future technological advances, and its use as a source of clean energy such as hydrogen is expected to expand, making it an important energy source even after carbon neutrality is realised." The latest strategy also emphasises the importance of making clean LNG even cleaner.

JERA is Japan's largest power generation company and one of the world's largest LNG buyers. It is currently developing power generation using ammonia as a co-firing fuel for their coal-fired power plants. Could this initiative influence future world LNG supply and demand? What is your perspective?

The Japanese government is supporting the demonstration project of the development of technology for power generation using ammonia. The technology aims to reduce emissions by co-firing ammonia with coal in power generation. The ammonia co-firing is expected to coexist with LNG-fired power as a clean power generation method. It is important to utilise every available energy source in cleaner power to make contributions to energy supply security. No adverse impact on the LNG market is anticipated.

City Gas supply companies in Japan are also important players in the LNG market, and their efforts in e-methane and biomethane aim to transition to

carbon-neutral city Gas supply. Cost is one of the major challenges. What other challenges do you think need to be overcome?

Japan's city Gas operators are aiming to commercialise biomethane and e-methane, recognising that the existing LNG value chain can be used as it is. The city Gas operators hope to make the transition using a drop-in solution (a solution that works with existing systems), so customers won't need to upgrade their equipment, and overall social costs can be minimised. Besides cost challenges, as the clean new sources of LNG are expected to be supplied and distributed in a mixture with the traditional fossil natural gas-based LNG, it is necessary to ensure traceability of e-methane and biogas in the mixed Gas flows, and in case of e-methane, to verify the eligibility of CO₂ as the source of e-methane. At this moment there is no international common rule to verify the eligibility. Consideration has been underway to establish such a standard at the ISO to overcome the challenges.

As the International Maritime Organization (IMO) moves to strengthen GHG emission regulations for marine fuels, how do you foresee the outlook for the positioning and demand of LNG as a lower-carbon marine fuel evolving?

As Japan's city Gas companies have started LNG bunkering projects and interest is increasing, the proposed fuel regulation is expected to lead to an increase of LNG-fuelled vessels. On the other hand, if the regulatory standard becomes stricter year-by-year as proposed, it would be increasingly difficult to satisfy the rules with fossil LNG alone. In

the future, however, by mixing drop-in fuels such as e-methane and biomethane according to the degree of regulation, it should be possible to meet the tightening of regulations while using existing LNG-fuelled ships. The competitive advantage of LNG-fuelled vessels over other low-carbon fuel vessels could be maintained, at least until 2050, and possibly beyond.

How do you see Japan's role in the broader Asian Gas market evolving both in recent years and in the future?

Japanese LNG companies can become regional orchestrators – providing supply security, market liquidity, and decarbonisation leadership. To succeed, they must embrace flexibility, transparency, and innovation, while managing geopolitical and ESG risks.

Some Japanese LNG buyers have already evolved from pure buyers to portfolio players, engaging in global trading. They can expand the role by: acting as regional aggregators for smaller Asian buyers; providing flexible supply solutions; and supporting the development of Asian LNG hubs and price benchmarks. Japanese companies can invest in shared LNG infrastructure in emerging Asian markets and enable hub-and-spoke models for LNG distribution to smaller economies. Japanese companies can drive adoption of cleaner LNG, methane abatement technologies, and certification schemes, setting standards for emissions transparency and cleaner LNG. Japanese companies are expected to collaborate with ASEAN and South Asian companies for infrastructure development and joint procurement and engage in capacity-building programmes to support LNG market maturity in emerging economies. ●



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Rethinking LNG's well-to-tank baseline as the market evolves

As LNG's role as a marine fuel grows, new research suggests the regulatory tools used to measure its climate impact are struggling to keep pace with how it is actually sourced and transported.

ANDREW KEMP

The EU's FuelEU Maritime regulation assigns a fixed Well-to-Tank (WtT) emissions factor of 18.5 g CO₂e/MJ to LNG, a value developed when regional averages were the only practical way to approximate upstream and liquefaction emissions. Asset-level tracking now allows for far greater precision, and the gap between historical assumptions and current data is becoming harder to ignore.

Rystad Energy's recent white paper, *Well-to-tank emissions assessment 2025*, commissioned by SEA-LNG, places the global WtT intensity of LNG bunkering at 13.9 g CO₂e/MJ. The findings presented in the study reflect Rystad Energy's own modelling and do not represent an IGU policy position.

Speaking with *Gas in Transition*, Rystad senior analyst and report author Patrick King argues that the gap matters because default factors drive compliance exposure and influence how operators choose fuels. In his view, greater precision in WtT measurement

helps ensure LNG is assessed on its demonstrated performance, allowing policy decisions to reflect where Gas can make a sustained contribution to maritime decarbonisation.

He contends that failing to update the 18.5 g CO₂e/MJ default risks distorting investment signals in a sector that needs clarity to decarbonise, particularly as supply-chain emissions continue to diverge from the assumptions embedded in legacy models.

The case for granularity

Industry assessments of LNG's supply-chain emissions have historically relied on regional averages of upstream emissions, processing intensity, shipping distances and so on. While it is a straightforward approach, it obscures the reality that LNG plants do not draw natural gas from entire countries. Instead, they draw from a small set of specific upstream assets, each with its own emissions profile and



PATRICK KING
Senior Analyst, Rystad



technology mix. The same applies to processing hubs, liquefaction trains and shipping routes. Averages blur these differences into a single, generic baseline.

Rystad's analysis replaces that approach with a bottom-up, asset-level model built from its GasEmissionsTracker database. Instead of treating LNG supply chains as regional abstractions, the study maps the actual molecules that upstream assets feed into each liquefaction plant, how those facilities operate, which carriers load each cargo, where bunkering occurs and in what volumes.

King says a more granular approach was necessary to reflect how individual value chains actually operate.

"Regional averages often assign emissions to assets that don't feed an LNG plant at all," he tells *GiT*. "Tracing actual feedgas tells a very different story."

The result is a reconstruction of cargo-level value chains rather than modelled averages, with the study focusing on LNG bunkered rather than the much larger pool imported for power or heating.

Rystad identifies bunkering volumes by tracking individual LNG carriers using automatic identification system (AIS) shipping data and satellite imagery, pinpointing where fuelling operations occur and which import terminals supply those ports. Those terminals are then linked back to specific liquefaction plants and their upstream assets. Because bunkering draws on a different mix of cargoes, often from different origins than a region's wider LNG supply, the sourcing pattern has a material effect on WtT intensity. Rystad's approach captures that distinction

in a way regional averages cannot.

One of the clearest illustrations of why this is important is the Hammerfest LNG project in Norway, which is fed entirely by subsea fields, resulting in near-zero upstream emissions. Rystad's data places Hammerfest's WtT intensity at around 6.8 g CO₂e/MJ, compared with the European bunkered average of 12.9 g CO₂e/MJ.

Beyond the project level, this difference is also reflected at a regional level, King says.

"You have huge variation of more than 50% between different producing regions. One single number to try and capture that isn't fair."

What Drives Regional Variation

Rystad's dataset confirms what regional averages have long masked: the WtT emissions profile of LNG varies sharply depending on where the natural gas comes from and how it is liquefied and transported before being bunkered. In 2024, bunkered LNG ranged from Russia's 9.3 g CO₂e/MJ to Asia's 15.9 g CO₂e/MJ, with North America coming in at 12.8 g CO₂e/MJ and South America at 14.4 g CO₂e/MJ. What drives that regional spread is the structure of each supply chain. Upstream performance explains much of the spread: low-leakage assets and subsea tiebacks drive intensities down, while higher-intensity basins push them up. Liquefaction adds a further layer, with modern electrified plants and cooler ambient conditions outperforming older facilities or warmer locations. →

WELL-TO-TANK INTENSITY FOR LNG BUNKERED IN 2024

Value Chain Stage		Emissions intensity (g CO ₂ e/MJ)	CH ₄ Impact (% of stage total)
	Upstream	4.2	38%
	Transport & Processing	1.3	7%
	Liquefaction	5.9	1%
	Shipping	1.8	8%
	Bunker operations/ Distribution	0.7	37%
	Well-to-Tank	13.9	16%

CH₄ impact denotes the percentage that stages overall GHG emissions methane responsible for (i.e. a 10% value with an intensity of 10 g CO₂/MJ, denotes a methane contribution of 1 g CO₂e/MJ)

These structural differences matter because upstream production and liquefaction together account for almost three-quarters of global WtT emissions. Most of the gap between Hammerfest’s 6.8 g CO₂e/MJ and the 15.9 g CO₂e/MJ recorded in Asia can be explained by these two stages alone.

Market dynamics reinforce the variation. Bunkering relies on a small number of import terminals and a limited set of cargoes, making its supply mix far narrower and more volatile than the broader LNG market. Because the underlying pool is so small and intensities vary sharply by cargo origin, even modest shifts in sourcing can move regional WtT values by several grams.

Europe, for example, bunkers proportionally more Russian LNG than its overall import mix, while Asia’s bunkering profile changes more sharply year-to-year as spot cargoes move in and out of the region.

Shipping distance adds a further layer, with fuel loaded directly at the point of production able to avoid roughly 2.5 g CO₂e/MJ in transport emissions. Together, these commercial patterns sit atop structural upstream and liquefaction differences, amplifying the spread across regions.

King also notes that these patterns evolve as technology shifts the intensity of parts of the supply chain. Newer liquefaction plants, including several recent US builds with electrified drives, are materially more efficient than older trains.

He also points to improved methane detection and mitigation as lowering upstream intensity in some basins. These effects are not yet captured in legacy default values, which remain fixed even as emissions intensity continues to decline across parts of the supply chain, widening the gap between default factors and real-world performance.

“Just having one number that stays constant year on year hides how dynamic the market actually is,”

PATRICK KING, SENIOR ANALYST, RYSTAD

The Decision Ahead

Policymakers have long relied on conservative defaults as a risk-management tool, and there is a strong case for retaining the EU’s 18.5 g CO₂e/MJ factor. A single value provides administrative simplicity, reduces the risk of underestimating emissions, and offers a protective buffer in a market where upstream practices vary widely and supply chains shift constantly. When regulators cannot feasibly track cargo-by-cargo behaviour, a conservative default functions as a pragmatic hedge against uncertainty. The question is whether that logic still holds now that asset-level data is available.

Rystad’s analysis does not dismiss that logic, but shows that the buffer is now systematically misaligned with observable reality. If the asset-level global average for bunkered LNG is around 13.9 g CO₂e/MJ, then applying 18.5 g CO₂e/MJ as a blanket value effectively penalises every operator beyond their demonstrated intensity. Even if a single default remains necessary, there is a difference between simplification and distortion. Whether that

warrants revising the default value remains a live question, given the trade-off between accuracy and regulatory simplicity.

“Just having one number that stays constant year on year hides how dynamic the market actually is,” King says.

The EU’s default was developed when regional averages were the only practical way to estimate upstream and liquefaction emissions. However, the availability of asset-level data has since exposed how far it diverges from observable supply-chain performance.

Today, bunkering supply chains can be characterised with far greater precision, and their emissions profiles differ meaningfully from the assumptions embedded in the 18.5 g CO₂e/MJ factor. The study presents the issue as one of methodological accuracy rather than a policy prescription, highlighting a tension for policymakers: whether to maintain a default rooted in an earlier modelling era or adjust the baseline in line with the evidence now available. ●



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GAS NEWS FROM AROUND THE WORLD



Middle East

Amor Al Mataani PhD

Oman State Council Member
Muscat, Oman

The latter half of 2025 reinforced the Middle East's role as a cornerstone of global natural gas and energy security. Amid persistent geopolitical uncertainty and evolving market dynamics, the region continued to demonstrate resilience by expanding capacity, safeguarding supply reliability, and accelerating diversification into lower-carbon technologies.

Oman

Oman continued to strengthen its position as a regional energy integrator, leveraging natural gas as a foundation for industrial development, export reliability, and long-term transition objectives. The Sultanate's integrated approach – linking upstream natural gas production, midstream infrastructure, and downstream demand – has enhanced system resilience while supporting broader economic diversification goals.

Natural gas remains central to Oman's energy mix, underpinning power generation, industrial growth, and LNG exports. Continued investment in upstream development and infrastructure optimisation helped ensure supply reliability throughout 2025, even during periods of peak seasonal demand. Integrated Gas-to-industry planning in hubs such as Duqm and Salalah supported downstream industries while improving overall system efficiency.

At the same time, Oman made further progress in positioning itself as a regional leader in hydrogen development. National planning efforts advanced hydrogen infrastructure concepts designed to connect future production zones with industrial and export centres. These initiatives are closely aligned with Oman's renewable energy resources and existing Gas infrastructure, creating a pragmatic

pathway toward a lower-carbon energy system while maintaining near-term energy security.

Qatar

Beyond Oman, Qatar advanced construction across its North Field expansion phases, reinforcing its position as the world's leading LNG supplier. Long-term partnerships with buyers in Asia and Europe continued to underpin global supply stability and reflected sustained confidence in Middle Eastern natural gas resources.

Saudi Arabia

Saudi Arabia progressed its unconventional natural gas development, maintaining momentum in large-scale projects designed to support domestic power demand, industrial growth, and emerging hydrogen and ammonia initiatives. Gas development remains a critical enabler of the Kingdom's broader energy transition strategy, helping to optimise the energy mix and reduce emissions intensity.

UAE

In the United Arab Emirates, ADNOC strengthened natural gas output through enhanced recovery programmes and strategic upstream investments aligned with national decarbonisation objectives. The integration of Gas growth with carbon management initiatives reflects a coordinated approach to balancing energy security with sustainability.

Iran

Iran maintained steady production levels, prioritising domestic utilisation and regional pipeline engagement despite ongoing external constraints. Continued focus on domestic efficiency and infrastructure remains central to managing seasonal demand and maintaining supply stability.

LNG

The Middle East's LNG sector remained resilient throughout 2025. Long-term contracting continued to dominate market activity, providing stability to global LNG markets even as maritime security challenges intermittently affected shipping routes. Regional exporters demonstrated a strong ability to manage logistical risks through route diversification and coordinated security measures.

At the same time, LNG offerings increasingly incorporated emissions transparency and carbon management considerations. Buyers showed growing interest in lower-carbon LNG solutions, and producers responded by integrating efficiency improvements and emissions-reduction strategies into their commercial frameworks.

Low-carbon gas

Hydrogen emerged as a defining pillar of the region's longer-term energy transition. Oman continued to advance hydrogen infrastructure planning, Saudi Arabia progressed landmark green hydrogen developments, and the UAE accelerated blue hydrogen and carbon capture initiatives. Collectively, these efforts signal the gradual formation of a regional hydrogen ecosystem linked to existing Gas infrastructure and industrial hubs.

Gas demand across the Middle East remained robust during 2025. Power sector consumption increased due to sustained cooling demand during periods of extreme heat, while industrial Gas use remained resilient, particularly in petrochemicals, metals, and refining. Pricing mechanisms continued to evolve, with greater exposure to international natural gas benchmarks alongside traditional oil-linked structures.

By the end of 2025, the Middle East had reaffirmed its position not only as a reliable supplier of natural gas and LNG, but as an active architect of the evolving global energy system. Through coordinated investment, infrastructure development, and policy alignment, the region continues to balance energy security, market stability, and decarbonisation as it looks toward the next phase of the energy transition. ●



The Middle East's LNG sector remained resilient throughout 2025. Long-term contracting continued to dominate market activity, providing stability to global LNG markets even as maritime security challenges intermittently affected shipping routes.

Shipping's role as a transporter of commodities



NELSON MOJARRO
Head of Energy Transition,
International Chamber of Shipping

Decarbonising shipping transportation is a vital link in broader efforts to reduce emissions across the globe.

Shipping has always been the quiet enabler of global energy systems, and as the world enters a decisive phase in its transition towards low-carbon fuels, the maritime sector's role becomes even more indispensable. For the Gas industry in particular, shipping is not merely a link in the chain. It is the primary means by which future energy molecules from the Gas sector will reach the markets that depend on them.

According to the International Renewable Energy Agency, at least half of the trade of all net zero fuels will be transported by sea. Meanwhile, according to data from DNV's Alternative Fuels Insight, a total of 151 alternative-fuelled vessels were ordered in the first half of 2025, with 87 of these being LNG carriers. This places maritime transport at the centre of the global energy transition and highlights the need for closer strategic alignment between the shipping and energy communities.

Over the past few months, the maritime sector has been at the centre of the thinking around the energy transition to new net zero fuels. Shipping's global

regulator, the International Maritime Organization (IMO), held an extraordinary meeting of its Member States in October 2025, looking to adopt a net zero framework which would create the world's first global market-based measure for any industry. Member States at the IMO, a UN body, delayed the adoption of the IMO Net Zero Framework at the Marine Environment Protection Committee (MEPC) extraordinary session after a very tense week of negotiations. The shipping industry remains fully committed to decarbonisation and is pushing for clear global regulation to enable the scaling of production of zero or near-zero fuels, which currently remains limited.

The postponement by a year on these negotiations creates uncertainty, hence shipping's decarbonisation may not accelerate until there is clarity. This is not good for investor confidence, and we may see a proliferation of national and regional carbon taxes such as the EU's Emissions Trading System (ETS) and Fuel EU schemes.

Despite an investment climate marked by

uncertainty, shipowners continue to move global trade. Like natural gas-fired power plants, ships have a typical 35+ year lifecycle, and clarity from governments is essential if the industry is to invest with confidence in new fuels, new vessels and new technologies that will be compatible with the goals of the IMO greenhouse gas strategy.

It is also crucial to note that the life cycle of any owner's assets will affect the speed of the transition – those with newer ships will be less inclined to reorder so soon.

The challenge is straightforward. There are currently very few net zero fuels available and what exists comes at considerable cost. Ambition presently outpaces capability and availability of low-carbon fuels. Yet, this does not diminish the determination of the sector to reduce emissions now and prepare for an era in which low-carbon fuels become commercially viable. A global mechanism is required to create a level playing field and encourage large scale production of future fuels.

Although the widespread adoption of new fuels will take time, shipping is pursuing every opportunity to reduce emissions today. Efficiency is an essential pillar of this progress. Vessel optimisation, digital and AI tools, hull improvements and advanced engine technologies continue to deliver tangible reductions in fuel consumption and emissions. Yet efficiency alone will not bridge the gap between current capability and reaching net zero emissions in 25 years.

A promising technology that can serve as an example and opportunity for the net zero transition is onboard carbon capture and storage (OCCS). While onshore carbon capture and storage (CCS) is not a new concept, meaningful implementation of this technology by the maritime industry has become more visible only recently. Onboard systems allow vessels to continue using conventional fuels while capturing a significant proportion of CO₂ emissions until renewable alternatives become commercially scalable. In its role as a transporter, shipping has the chance to adopt OCCS and further engage with the wider CO₂ ecosystem and transportation network. An example of this is for projects like Norway's ongoing Northern Lights CO₂, a storage initiative that requires cross-border liquid CO₂ transportation by ship.

Despite its promise, OCCS faces challenges, particularly the lack of government support to incentivise early adoption. The technology requires investment in both onboard systems and the infrastructure needed to offload, transport and store captured carbon as well as the development of international regulation.

Nevertheless, OCCS is becoming increasingly

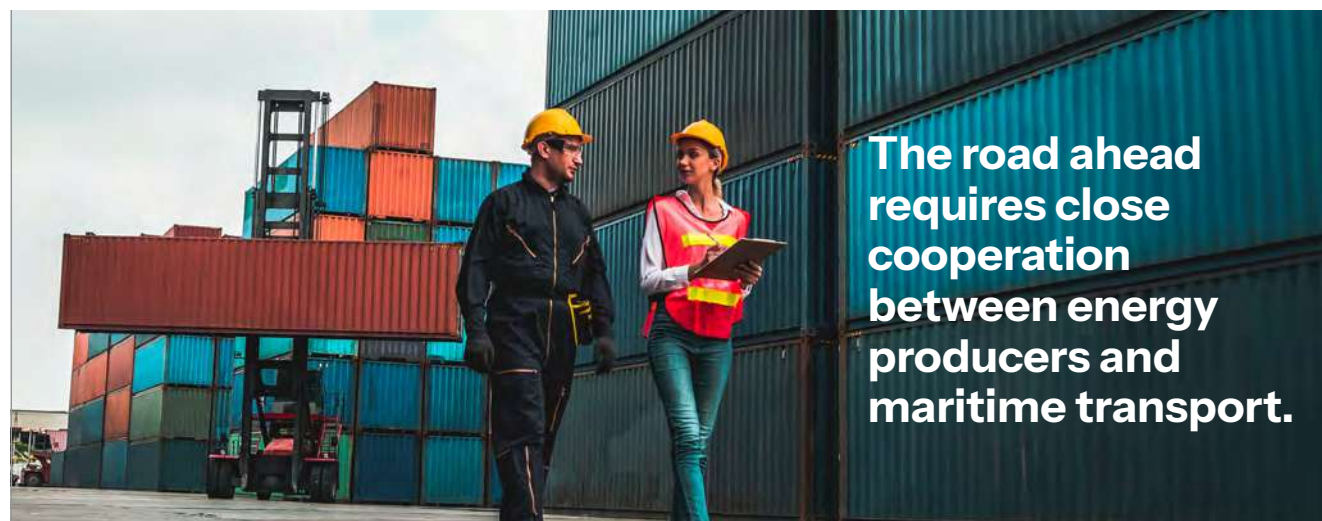
What distinguishes the initiative is its recognition that shipping is both an end user and an enabler. CEM-Hubs looks beyond maritime demand and focuses on the entire energy maritime value chain.

viable for projects and pilots. It represents a potential near-term method to reduce emissions and maintain progress towards decarbonisation during a period in which alternative fuels remain scarce.

Safety and regulatory standards will be paramount as Gas transportation increases. The LNG sector has operated with strong safety records based on rigorous training, robust technology and a culture of constant risk assessment. These principles must apply equally to the future handling of hydrogen, ammonia, methanol and CO₂ cargoes. Clear international standards are essential to ensure safe ship design, port operations and fuel transfer procedures. The IMO will remain the organisation best placed to deliver these global regulations for a global industry.

A key point often overlooked by some policymakers is that shipping will not be a major consumer of alternative fuels in absolute terms but a key enabler for other sectors. What truly matters is the transportation capacity of all fuels – including the smaller amount required for the shipping industry itself.

The sector represents only 4% of global liquid fuel demand and our analysis suggests that this will not increase as an overall percentage beyond 10% as a maximum by 2050. Although ships will eventually →



**The road ahead
requires close
cooperation
between energy
producers and
maritime transport.**

transition to low-carbon fuels, the volumes required for maritime propulsion are small in comparison with those carried for the wider global economy. It follows that investment in future fuel infrastructure cannot be planned around shipping alone. If the world succeeds in ensuring that the remaining 96% of these fuels can reach the markets that need them, the infrastructure required to supply shipping will naturally follow. Ignoring this broader context risks fragmenting supply chains and making life significantly more difficult for every sector attempting to decarbonise.

This is precisely why the Clean Energy Marine Hubs (CEM-Hubs) initiative, which was created by the International Chamber of Shipping and the International Association of Ports and Harbors, is important. The initiative is a cross-sectoral, public-private platform that brings together energy producers, shipowners, port authorities, governments and financial institutions. Its purpose is to accelerate the deployment of infrastructure that will support low-carbon fuel production and distribution close to ports. Valuably, this initiative reports to energy ministers and is coordinated under the Clean Energy Ministerial which means CEM-Hubs can have direct influence on energy strategy.

CEM-Hubs aims to derisk the investment required to ensure that all regions of the world have the potential to access these future fuels. It is designed not only to help shipping procure the fuels it will eventually need but also to ensure that the vast majority of new energy molecules can be transported safely and efficiently to global markets.

What distinguishes the initiative is its recognition that shipping is both an end user and an enabler. CEM-Hubs looks beyond maritime demand and focuses on the entire energy maritime value chain. It ensures that new fuels can reach consumers everywhere while also creating the conditions for shipping to transition when the market for these fuels

has been established. It is a collaborative effort based on shared expertise between the energy and shipping industries and the alignment of regulatory decisions across sectors. These strategic partnerships are essential for the development of scalable and cost-effective supply chains as well as for the infrastructure required to support the uptake of green fuels.

The Gas economy will continue to rely on maritime transport. LNG already plays a vital role in providing energy security and flexibility to global markets through the maritime sector. As new energy carriers emerge, the shipping industry will continue to provide the critical and flexible link needed to move them to regions where production cannot meet demand. Gas and future fuels will be moved by sea because no other mode of transport can match the scale, reach and cost efficiency that shipping provides. Strategic thinking and infrastructure planning will create opportunities for Gas transportation.

The road ahead requires close cooperation between energy producers and maritime transport. The world will need enormous volumes of new fuels to meet climate goals, and many of these fuels will be shipped. Through initiatives such as the Clean Energy Marine Hubs, the International Chamber of Shipping is working to ensure that shipping is fully integrated into the future energy landscape. By focusing on infrastructure, investment certainty, efficiency and transitional technologies, the maritime sector is positioning itself not only to decarbonise but to accelerate the global energy transition that depends upon it.

As part of this close collaboration between industries, we are working towards deeper alignment between the energy transition plans and the transition of the maritime sector and its role in transporting low-carbon fuels. This is critical if we are to transition to a low-carbon economy while still delivering affordable access to energy for all. ●



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Oman LNG: positioning for the future

A key goal of Oman's ambitious energy transition is to reduce the share of its internal energy demand met by natural gas in favour of solar and wind. This will allow it to sustain and expand its LNG exports, reducing its dependence on oil. The country also aims to take a lead role regionally in facilitating maritime transport decarbonisation via LNG. Natural gas thus provides the foundation for Oman's individual path to a more sustainable future.

ROSS MCCRACKEN

Oman's first two LNG trains will be 25 years old this year, having been inaugurated at the turn of the millennium with a combined capacity of 7.1 MTPA. A third 3.3 MTPA train was completed in 2006 and incorporated into Oman LNG.

In 2018, the company undertook a modernisation programme to debottleneck production, which resulted in a significant jump in output, using increased natural gas supply from the offshore Khazzan field. As a result of these efforts, in 2023 and 2024, the company achieved record LNG exports of 11.43mn metric tons (mt) and 11.32mn mt respectively, according to International Gas Union data.

Since the start of LNG exports in 2000, natural gas has provided a means of economic diversification away from the country's heavy dependence on oil. Although varying depending on oil and natural gas prices, natural gas revenues are projected to account for 16% of the Omani state budget in 2025, compared with 52% for oil.

The country has proved natural gas reserves of 658.5bn (billion) m³, while domestic requirements last year stood at 56.5bn m³, including LNG for export, according to Oman's National Centre for Statistics and Information.

Now, Oman LNG, which is majority owned by the Oman Investment Authority, is embarking on a major rejuvenation of its LNG facilities, which will both expand capacity and extend the operations of its existing facilities for the years ahead. A fourth LNG train is planned with a capacity of 3.8 MTPA. Feedstock gas is expected to be sourced from Oman's Block 61. A final investment decision (FID) has not yet been taken, but construction is expected to take four years from the point of FID.

Embarking on a new LNG train today is a complex calculation. The LNG market globally is in the midst of its largest ever expansion, driven by the US and Oman's neighbour Qatar. The energy transition implies a peak and then fall in the demand for fossil fuels. Many market observers expect a slump in LNG export prices as a tsunami of new liquefaction plants come onstream pre-2030. There are thus both short- and long-term headwinds flying in the face of a

decision to add to the world's LNG capacity.

However, there are other perspectives. Natural gas is cleaner than either oil or coal. It is making significant inroads into the transportation market, and it is a potential feedstock for hydrogen production combined with carbon capture and storage, which looks capable of providing bulk hydrogen more economically and earlier than electrolysis. It is thus well placed to play a long-term role in the energy transition, one which complements rather than competes with renewables.

"Oman's path toward a sustainable energy future demonstrates how natural gas can serve as both a foundation and a bridge – supporting industrial growth, enabling renewable integration, and accelerating maritime decarbonisation," Amor Al Mataani PhD, a member of the Oman State Council, tells *Gas in Transition (GiT)*.

The developing markets of Asia, in particular, expect fast rates of energy demand growth and LNG is a flexible, cleaner option for both power and industrial energy demand than coal. In this scenario, in which demand responds strongly to a period of lower prices, excess LNG will be a temporary phenomenon accounting for a small part of the lifetime of these long-lived assets.

Near-term opportunities

While it mulls the risks and opportunities of expansion, Oman is already moving ahead to seize near-term opportunities presented by the energy transition. A final investment decision was taken on the 1 MTPA Marsa LNG facility in April 2024. Construction has already started with completion targeted for 2028.

The project, which is being undertaken by a joint venture between France's TotalEnergies and Oman's OQEP, is a demonstration of LNG's complementary role within the wider global energy transition.

Situated at the port of Sohar in northern Oman, Marsa LNG will not only be all-electric, but powered by a dedicated 300-MW solar PV plant. Using all-electric drive to power the compression of natural gas into LNG results in much lower CO₂ emissions from plant operations and maximises the amount of natural gas available for export as LNG.

However, Marsa LNG goes further. Sited at the entrance to the Persian Gulf, the facility will provide LNG for the first marine LNG bunker hub in the Middle East. By producing low-carbon LNG for use in marine transport, Marsa LNG will play a role in the reduction of carbon emissions from maritime transport.

"Through initiatives such as the Marsa LNG project →

and the planned rejuvenation of existing LNG assets, Oman LNG continues to position itself as a key enabler of the nation's Vision 2040 and its Net Zero 2050 ambition," Al Mataami says.

The planned LNG bunkering hub is well timed and situated. According to the classification society DNV, the number of LNG-powered ship orders jumped 38% in 2024 to a total of 515, suggesting the LNG-powered fleet will double by the end of the decade. DNV forecasts a growing deficit in the supply of LNG as bunker fuel, which Marsa LNG aims to address.

Oman's LNG bunkering hub will cater to the fast-expanding fleet of LNG-powered container ships, but also the growing fleet of LNG-powered crude oil tankers, which will rise from 81 currently to 124 in the next few years based on the existing order book. As no Middle Eastern cruise is complete without a port call at the country's capital Muscat, Marsa LNG will also be able to serve LNG-powered cruise ships, 30 of which are already in operation globally with another 26 on order.

LNG produced by Marsa LNG will have one of the lowest carbon intensities globally and will push forward the decarbonisation of maritime transport in the Middle East and, in particular, the transport of crude oil in the world's busiest oil shipping lanes. The project developers expect the carbon intensity to be less than 3 kg CO₂e/boe of Scope 1 and 2 emissions, which is 90% lower than the average carbon intensity for LNG production globally. The Monte Shams LNG bunkering vessel is already under construction and will be stationed in Sohar from 2028.

Economic foundations

This is not the first time that natural gas has taken a leading role in the country's development. Alongside the creation of an LNG export industry, Oman's economic and social progress requires ever more electricity, which has, to date, been provided almost entirely by natural gas. Oman's electricity generation rose more than ten-fold between 1990 and 2024 to 49.1 TWh. Natural gas-fired power plants accounted for the majority – 44.8 TWh.

Today, wind and solar power are starting to contribute, but modernising the electricity grid to incorporate more renewable power requires investment, not least in transmission lines to open up new areas of the country to solar and wind.

State-owned Oman Electricity Transmission Company has allocated \$2.2bn to complete up to 32 new projects, modernising and expanding the national grid in the period to 2028. With natural gas-fired generation as a stable and flexible baseload provider, in a country that lacks hydro power, the

The planned LNG bunkering hub is well timed and situated. According to the classification society DNV, the number of LNG-powered ship orders jumped 38% in 2024 to a total of 515

government aims to increase renewables' share of electricity generation from 5.9% in 2024 to at least 30% in 2030, with an ambitious target of 60% to 70% by 2040. If achieved, this would be an extraordinary transition within the space of less than 20 years, highlighting the country's ambition to combine Gas, LNG exports and renewable power as the primary engines of its energy transition.

Electricity generation is of more than ordinary importance in Oman because the country suffers from extreme water scarcity. Natural gas-fired electricity has provided the power for desalination plants to provide some 89% of the country's potable water with the remaining 11% sourced from groundwater wells. As part of Oman's Vision 2040, the aim is to transition this power load to renewables, reducing emissions and sustaining the supply of natural gas for export as LNG and use in other high value-added activities.

An example is the Sur desalination plant in Oman's Sharqiyah region, which processes over 200,000 m³/day of seawater and was the first to be fully powered by solar power during daylight hours. In all, total water production in 2024 amounted to 519.7mn m³.

Water provision, in turn, underpins not just the supply of drinking water, but growth in the country's agricultural sector. Agriculture's share of GDP rose from 1.85% in 2019 to 2.60% in 2024, improving the country's food security, another key aim of Oman's Vision 2040.

As such, Oman is pursuing an individual path towards net zero using the resources at hand. Natural gas provides a base for power, water provision and LNG exports, creating the foundations for the fulfilment of Oman's vision of an economy that embraces technology, knowledge and innovation, one in which oil dependency gradually gives way to a more sustainable, diversified future. ●

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Bio-LNG charts a course for maritime decarbonisation

Although chemically similar to fossil-based LNG, bio-LNG faces numerous challenges to widespread adoption, including volatile cost structures and a lack of regulatory certainty and policy support.

TOM YOUNG



ILYAS MUHAMMAD
Head of Green Fuels
Hapag-Lloyd



MICHAEL SCHAAP
Commercial Director
Titan Clean Fuels



LEON VAN BOSSUM
CEO
Nordsol



“As with all alternative green fuels, high production costs remain a challenge for LBM, but processes like physical mass balancing are helping to lower supply side costs.”

MICHAEL SCHAAP, COMMERCIAL DIRECTOR, TITAN CLEAN FUELS

The shipping sector's push to meet European Union (EU) regulations is increasingly encouraging the adoption of liquefied biomethane (LBM), also known as bio-LNG, in Europe as an alternative low-emission fuel.

LBM is produced by upgrading raw biogas – typically derived from organic waste streams such as agricultural residues, manure, sewage sludge and food waste – into high-purity biomethane, before liquefying it. The renewable fuel has the same chemical composition as liquefied natural gas (LNG) and can be substituted for it in most existing engines, storage systems and distribution networks without significant modifications.

Following the introduction of the 'FuelEU Maritime' legislation at the beginning of 2025, many shipping firms that operate in Europe are eyeing LBM as a cost-effective short-term measure for compliance.

The EU legislation requires all commercial ships above 5,000 gross tonnes calling at EU ports to lower the yearly average greenhouse gas (GHG) intensity of the energy they use, starting with a 2% reduction from the 2020 baseline in 2025 and escalating to an 80% reduction by 2050.

Currently, shipping firms looking to decarbonise their operations can switch to one, or a mix of, four key alternative fuels to power their vessels – ammonia, green methanol, liquid biofuels or LBM.

German shipping company Hapag-Lloyd has chosen LBM as part of a portfolio of alternative fuels – reflected in its new-build ship orders of green methanol and LBM dual-fuel vessels, as well as the use of drop-in biofuels for its existing fleet.

“Ammonia dual-fuel technology is maturing, but it is not there yet. It is still in the development phase,” Ilyas Muhammad, Hapag-Lloyd's Head of Green Fuels, tells *Gas in Transition* (GiT). “In the short term, LBM provides a cost-effective solution for decarbonisation, as it is as competitive on price as drop-in biofuels.”

In September 2025, Hapag-Lloyd signed a multi-year offtake contract with Shell to supply it with waste-based LBM to power its new-build LBM dual-fuel vessels, as well as its 13 existing dual-fuel LNG vessels.

LNG-based fuels such as LBM offer a number of advantages. Chief amongst them is the ability for operators to use existing Gas infrastructure for transportation, liquefaction or re-condensation of the fuel.

LBM also offers a higher relative energy density than other alternative fuels, meaning less tank space and fewer bunkering stops. LBM has an energy density of over 45 MJ/kg compared with under 20 MJ/kg for both ammonia and methanol, according to a 2022 study led by the China-EU Institute for Clean and Renewable Energy.

“All LNG-pathway fuels provide a higher relative energy density than other alternative fuels,” Michael Schaap, Titan Clean Fuels' Commercial Director, tells GiT. “Energy density should not be overlooked when considering which fuel to use.”

Titan has already seen growing client adoption of the fuel and has been bunkering nearly all United European Carriers' LNG-powered vessels with LBM since mid-2024, with the partnership now extended through to the end of this year (2025).

Eye on emissions

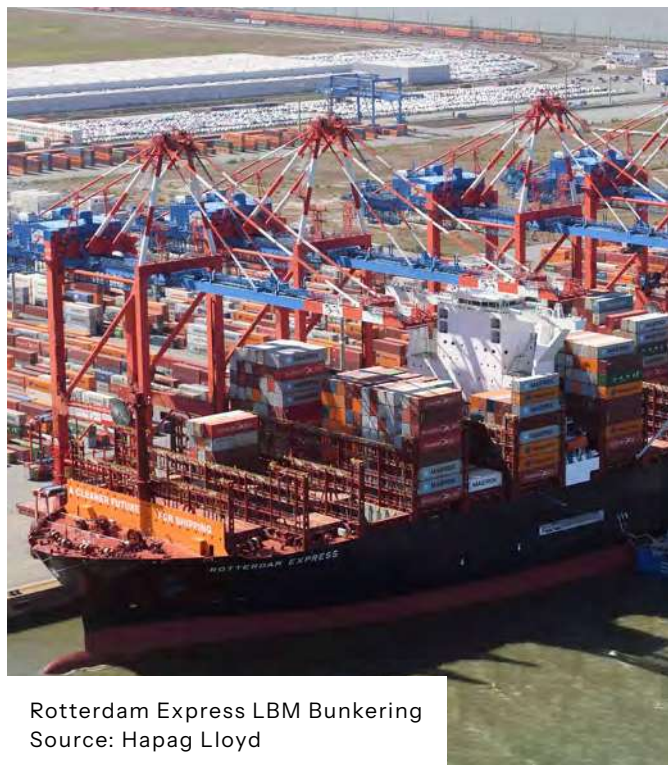
Using domestic and agricultural waste in biomethane production can capture methane that would otherwise be vented into the atmosphere, meaning LBM can offer shipowners close to net-zero, or even negative, GHG emissions on a well-to-wake basis.

LBM also reduces local emissions of nitrogen oxide (NO_x) by 95%, while achieving virtually zero sulphur oxide (SO_x) and particulate-matter emissions.

“These local emissions reductions improve air quality and support the health of people working in, or living near, the maritime industry,” Schaap says.

Another advantage of LBM is that it uses different feedstocks to produce liquid biofuels, helping shipowners that use both fuels – such as Hapag-Lloyd – to hedge upstream supply risks. LBM is produced from solid organic-waste feedstocks, whereas biofuels are produced mainly from used cooking oil or other liquid-based waste feedstocks.

“The widespread availability of LBM through local production is a clear advantage: the fuel is derived →



Rotterdam Express LBM Bunkering
Source: Hapag Lloyd



TT Line Green Ship Peter Pan
Source: TT Line

from continuously occurring waste streams such as manure, agricultural residues or household organic waste,” shipping firm TT-Line’s COO Andreas Schaerli tells *GiT*. “This not only ensures a stable and regionally accessible supply but also delivers near-zero lifecycle greenhouse gas emissions.”

Challenges on the path to deployment

The market for LBM is potentially very large. Data from DNV’s Alternative Fuel Insights (AFI) platform show there are 1,406 LNG-fuelled vessels in operation and on order.

And according to a recent study by the Maritime Energy and Sustainable Development Centre of Excellence, the potential availability of LBM for the shipping sector is estimated to cover up to 3.1% of the total energy demand for shipping fuels by 2030.

But if the sector is to grow to match these levels of demand, more needs to be done to scale production on the supply side, according to Muhammad.

“We do think LBM can be scaled up, but there are barriers, especially on the regulatory side,” he says. “There is currently no clarity for project developers to make major investments in these types of new technologies.”

Recent delays to the International Maritime Organisation’s (IMO) Net-Zero Framework, approved earlier in 2025 and intended to provide an incentive for shipowners beyond Europe to switch to alternative fuels, have added to uncertainty for developers.

Further uncertainty is caused by the large cost gap between LBM and traditional LNG, and the fact that

the price of LBM can be extremely volatile.

This cost gap has been narrowed by carbon prices in the EU emissions trading scheme (ETS) and subsidy regimes to incentivise LBM production in the EU, but the fuel still carries financial risks when compared with conventional LNG.

“The price of credits under subsidy regimes can change and impact LBM prices across sectors, and there are no futures, options or forwards available to hedge prices as you can for fossil-based LNG,” says Muhammad.

Hapag-Lloyd is trying to de-risk its deployment of the fuel through its ‘Ship Green’ product, which enables its customers to pay for varying levels of supply-chain decarbonisation and receive corresponding carbon credits in the voluntary market.

But for LBM to compete with other alternative fuels in the long term, costs must come down. The best way to do this is to produce biomethane in a more scalable and cost-efficient way before it is liquefied.

“If anaerobic digestion technology, which can process waste biomass as feedstock, improves and yields do increase, this fuel can play a long-term role,” says Muhammad.

Balancing the books

In Europe, problems around the key regulatory issue of grid-mass balancing are also preventing the sector from scaling up. This system allows biomethane producers to inject the fuel into the existing natural gas grid and have it accounted for via certificates, rather than tracking physical molecules.

Titan FlexFueler002 bunkering the UECC
LNG fueled Auto Aspire with BioLNG
Source: Titan Clean Fuels



“The widespread availability of LBM through local production is a clear advantage: the fuel is derived from continuously occurring waste streams such as manure, agricultural residues or household organic waste.”

ANDREAS SCHAERLI, COO, TT-LINE

The EU allows grid-mass balancing across member states, but Dutch policymakers are currently blocking producers from doing this for LBM imports and exports from Dutch terminals.

Hapag-Lloyd and LBM supplier Titan Clean Fuels are part of a group of firms that have written to the Dutch government in an attempt to address the issue.

“As with all alternative green fuels, high production costs remain a challenge for LBM, but processes like physical mass balancing are helping to lower supply side costs,” says Schaap. “Titan recently called on Dutch policymakers to align with other European nations on mass-balancing regulations.”

Furthermore, the EU does not currently allow grid-mass balancing for biomethane production outside the EU. This decision threatens to limit availability and increase the cost of LBM for EU transport applications.

“Harmonisation of rules within and outside the EU for grid mass balancing – or even allowing a region-specific book-and-claim system – would definitely help scale up biomethane use,” says Muhammad.

Such a book-and-claim system would allow producers and users of biomethane to account for usage via certificates rather than physical delivery.

Other sectors

In addition to the maritime sector, heavy-duty road transport is another sector being targeted by LBM suppliers.

“Many shippers do not want to wait for affordable, practical zero-tailpipe solutions and are choosing to

cut their fossil footprint now, driving steady uptake of LBM,” says Nordsol CEO Léon van Bossum.

Nordsol supplies production plants that enable producers to upgrade their biogas to high-quality LBM, and has worked with a number of fleet operators to develop LBM road transport fuelling infrastructure.

The technology is starting to become more widely used in the sector. The ‘BIOLNG4EU’ demonstration project has successfully trialled the use of LBM refuelling stations for heavy-goods vehicles in north-west Europe and aims to establish 50 LBM refuelling stations in the region over the next few years.

But, as with the maritime sector, regulatory hurdles remain.

“The real bottlenecks are policy support and lengthy permitting procedures,” van Bossum tells *GiT*.

EU regulation for long-haul road transport still focuses on tailpipe emissions rather than well-to-wheel performance, overlooking the very low lifecycle emissions possible with LBM, according to van Bossum.

“Recognising these benefits and strengthening policy support would accelerate adoption and unlock further investment,” he says. ●

Africa Rising: Gas innovation and infrastructure projects as a growth engine

An Interview with Eng. Bayo Ojulari,
Group CEO, NNPC Limited.



ENG. BAYO OJULARI
Group CEO, NNPC Limited

GLOBAL & CONTINENTAL OUTLOOK

Natural gas is still described as a “transition fuel,” but Africa is betting on it for industrialisation. How do you see Africa using Gas not just as a bridge, but as the backbone of its economic transformation?

For Africa, the term “transition fuel” is a misnomer; it is a destination fuel for our economic transformation. While the developed world transitions away from something, we are transitioning to something – to industrialisation, to energy access, to economic dignity. Natural gas is the bedrock. It provides the stable, baseload power needed to run factories and cities, displacing diesel generators that are expensive and polluting. It is the primary feedstock for fertilisers to achieve food security, for petrochemicals to launch manufacturing, and for industries that create jobs. Our vision is to use natural gas not as a temporary bridge, but as the permanent backbone of a diversified, resilient African economy.

With Europe diversifying supply and

Asia’s demand surging, how can Nigeria – and Africa – position themselves as indispensable players in global natural gas markets over the next decade?

Nigeria and Africa have a unique opportunity to become indispensable players in the global natural gas market, especially as Europe seeks supply diversification and Asia’s demand continues to surge, given that the geopolitics of energy have created a generational opportunity. To be indispensable, we must be reliable, strategic, and agile. For Nigeria, this means:

- **Accelerating Final Investment Decisions (FIDs):** We are working tirelessly to unlock stalled deep-water and non-associated natural gas projects to expand our LNG export capacity, by up to 8 MTPA.
- **Embracing Flexibility:** The global market demands flexibility. We are exploring opportunities in small-scale LNG and virtual pipeline systems to serve smaller, emerging markets.
- **Championing African Integration:** We are pushing for the actualisation of the Trans-Saharan Gas Pipeline (TSGP), the African Atlantic Gas

Pipeline (AAGP) and promoting West African LNG collaboration. A connected Africa can aggregate supply to meet large-scale global demand, making the continent a unified energy powerhouse.

Africa faces a paradox: huge natural gas reserves but persistent energy poverty. How do you reconcile global decarbonisation pressures with Africa’s urgent need to use natural gas for growth?

Reconciling Africa’s vast natural gas potential with global decarbonisation pressures – and its own urgent development needs – is one of the continent’s defining energy dilemmas. We don’t see a deadlock but rather an opportunity for a strategic balancing act that can be navigated with bold, pragmatic choices.

Over 600 million (mn) Africans lack access to electricity. Natural gas offers a scalable, relatively low-emission solution to power homes, industries, and hospitals. Global climate goals must account for equity; Africa must be allowed to use its resources to lift its people out of poverty while gradually integrating renewables.

You cannot tell a patient in critical condition to go on a diet before they have had a meal. For Africa, energy poverty is the primary crisis – it is a threat to health, education, and stability. Our natural gas is the antidote. Using our natural gas for domestic power and industry is our fundamental right and our most logical path to development. Furthermore, African natural gas, when it displaces coal and biomass in energy use, is a net win for the global climate. We ask for a just and equitable transition – one that recognises our minimal historical emissions and allows us to use our resources to build a foundation upon which a renewable future can later stand.

NIGERIA’S REALITIES & NNPC’S RESPONSE

Nigeria is still flaring large volumes of natural gas despite decades of pledges to stop. What makes this challenge so persistent, and what specific measures is NNPC taking to end routine flaring once and for all?

The persistence is due to a historical combination of a lack of infrastructure, regulatory gaps, and misaligned fiscal terms. NNPC is tackling this head-on. We are no longer just setting targets; we are executing a clear strategy:

- **Gas Infrastructure Push:** The Ajaokuta-Kaduna-

Kano (AKK) pipeline and OB3 natural gas transmission line are critical for creating a viable evacuation route for stranded natural gas.

- **Commercialisation Drive:** We are aggressively pursuing natural gas commercialisation projects and compelling operators to see flared natural gas as a revenue stream, not a waste product. Our “Gas Flare Commercialisation Programme” is key here.
- **Strict Enforcement and Partnerships:** We are working with regulators to enforce flare-down regulations and collaborating with partners on dedicated natural gas gathering projects to capture and utilise this natural gas for power, LNG, or as feedstock for Gas Based Industries (GBI).

These efforts mark a significant shift from pledges to performance, ultimately targeted to end routine natural gas flaring in all our operations.

Reports show that Nigeria’s natural gas exports have dropped significantly in recent years. What explains this decline, and how does NNPC intend to restore Nigeria’s reputation as a reliable supplier?

The decline is primarily attributed to feedstock constraints due to upstream security challenges, production shut-ins, and delayed investments. Our restoration plan is three-fold:

1. **Security and Production Assurance:** We are working with government and community stakeholders to ensure a secure operating environment and restore production to optimal levels.
2. **Unlocking New Investments:** We are prioritising FIDs on key natural gas projects, and working assiduously to bring onstream the NLNG Train 7, which is expected to increase NLNG’s capacity by 35%, adding 8 MTPA to the current 22 MTPA, and these are a clear demonstration of our commitment to growing our export capacity.
3. **Gas Supply:** We are enabling third party natural gas supplies to NLNG to provide another layer of natural gas supply assurance, to ensure that the NLNG plants are continuously natural gas sufficient.

We are engaging our long-term partners with honesty about the challenges and our concrete plans to address them, rebuilding trust through action, not just words.

The AKK pipeline and other critical natural gas projects have seen delays. Which projects are now top priority, and when should Nigerians expect →

them to be operational?

Our top priority is the AKK Gas Pipeline, intended to transport natural gas from the south Niger Delta to the North, powering industries and advancing regional exports. The successful completion of the River Niger crossing was a major milestone, and we are pushing hard to achieve mechanical completion and stream-filled status. Alongside this, the OB3 Gas Pipeline interconnection is a critical priority to link the East with the West. We are also driving the NLNG Train 7 project to final completion. Nigerians can expect to see these projects delivering natural gas within the coming 18-24 months, marking a tangible new chapter for our natural gas economy.

Millions of households still rely on firewood and kerosene. What is NNPC’s plan to expand access to affordable LPG and CNG so ordinary Nigerians feel the benefits of the “Decade of Gas”?

The “Decade of Gas” must be felt in the kitchens and on the roads of Nigeria. Our strategy is to create a multi-pronged domestic natural gas penetration plan:

- **LPG (Cooking Gas) Expansion:** We are increasing our involvement in LPG storage and distribution infrastructure across the country and advocating for the removal of taxes on LPG equipment to make it more affordable.
- **CNG for Transportation:** We are championing the Presidential CNG Initiative, working to convert public transport and establish a network of CNG stations. This provides a cleaner, cheaper alternative to premium motor spirit (PMS), putting money back into the pockets of Nigerians.
- **Decentralised Solutions:** We are promoting small-scale and mini-LNG solutions to bring natural gas to industries and communities outside the main pipeline grid.

STRATEGY, FINANCING & INDUSTRIAL GROWTH

Non-associated natural gas remains underdeveloped in Nigeria. What is NNPC doing to unlock this resource, and how will you attract the scale of investment required?

Unlocking non-associated natural gas (NAG) is the key to our long-term natural gas security and export ambitions. NAG fields require dedicated, capital-intensive development. Our approach is to de-risk these projects for investors. We are doing this by:

- **Leading with our Balance Sheet:** NNPC is taking a greater equity stake in strategic NAG projects to provide investor confidence.
- **Advocating for Cost-Reflective Pricing:** We are working with regulators to ensure a domestic natural gas price that provides a fair return on investment, making NAG projects commercially viable.
- **Streamlining Approvals:** We are committed to working with our partners to shorten the cycle time for FIDs on these critical projects.

With global financiers retreating from fossil fuels, what innovative funding strategies is NNPC exploring to finance large-scale natural gas infrastructure?

We are moving beyond traditional project finance. Our toolkit now includes:

- **Infrastructure Funds and Private Equity:** Engaging with specialised funds that understand the long-term value of natural gas infrastructure in an emerging market.
- **Collaborations with Export Credit Agencies (ECAs):** Tapping into ECAs that support development-focused projects.
- **Corporate Finance and Bond Issuances:** Leveraging NNPC's improved creditworthiness as a commercial entity to raise capital directly from the market, as seen with our recent corporate bond issuances.
- **Partnering with IOCs on Carry Arrangements:** Structuring deals where partners provide initial capital, recovered from future production.

How do you balance Nigeria’s need to monetise natural gas through exports with the equally urgent need to ensure steady, affordable supply for local industries and power generation?

This is a core strategic question. Our answer is not “either/or” but “both/and”, guided by a domestic Gas delivery obligation (DGDO). We will continue to grow our export portfolio because it brings in vital foreign exchange and makes large-scale natural gas projects economically feasible. We are revising the Gas Master Plan in a way that allows the interconnection of the export and domestic markets.

Aside from the DGDO provision in the Petroleum Industry Act (PIA), we are working to enable a willing buyer/willing seller Gas pricing for Gas Based Industries and other commercial customers. The infrastructure we are building, like the AKK pipeline, is designed specifically to serve this purpose.

By expanding the overall natural gas pie, we can simultaneously be a global LNG leader and the engine of Nigeria’s industrial revival.

Beyond exports, how is NNPC using natural gas to spur industrialisation – fertilisers, petrochemicals, and manufacturing – that can create jobs and grow GDP?

Natural gas is the seed for multiple industrial trees. We are actively promoting and investing in:

- **Fertiliser Production:** The success of Indorama and Dangote Fertiliser, which rely on our natural gas supply, is a blueprint. We will support more such plants to make Nigeria a West African fertiliser hub.
- **Petrochemicals:** We are looking beyond fertilisers to methanol, polypropylene, and other derivatives that can spawn entire value chains in plastics, pharmaceuticals, and textiles. These projects have replaced imports and boosted exports of fertilisers and petrochemicals, strengthening Nigeria’s trade balance and industrial base.
- **Direct Industrial Clusters:** We are planning to develop gas-based industrial parks along the pipeline corridors, providing guaranteed, affordable natural gas to attract manufacturing companies.

TECHNOLOGY & INNOVATION

Technologies like carbon capture, small-scale LNG, and digital monitoring could reshape Africa’s natural gas future. Where is NNPC investing, and how quickly can these solutions scale?

We are actively exploring all three:

- **Small-Scale LNG:** This is an immediate priority. We see it as the fastest way to deploy natural gas to off-grid industries and for virtual pipeline systems. We expect to see operational small-scale LNG projects within the next two to three years.
- **Digital Monitoring:** We are deploying advanced analytics and IoT sensors across our network to optimise pipeline efficiency, reduce losses, and enhance safety. This is already underway.
- **Carbon Capture:** We are in the pilot study phase for CCUS, particularly for our upstream operations and large-point emissions sources. While scaling will take longer, perhaps five to seven years, we must start laying the groundwork now.

How important is hydrogen-readiness

in Nigeria’s long-term Gas strategy, and does NNPC see hydrogen as a competitor or a complement to natural gas?

Hydrogen is a complement, not a competitor. Our natural gas infrastructure and expertise are strategic advantages for a future hydrogen economy. We are positioning ourselves to be “hydrogen-ready”. This means designing new LNG trains and pipelines with the capability to handle hydrogen blends in the future. Our vast natural gas reserves can be used to produce blue hydrogen, while our renewable potential positions us for green hydrogen. It is the next frontier, and NNPC intends to be a leader, not a follower.

PARTNERSHIPS & REGIONAL INTEGRATION

What types of partnerships – finance, technology transfer, or co-development – does NNPC find most impactful with global energy players?

The most impactful partnerships are integrated partnerships. We seek partners who bring more than just capital. We want those who bring cutting-edge technology for efficient extraction and decarbonisation, project management expertise for complex infrastructure, and a commitment to co-develop the entire value chain with us, including local content development.

Africa needs cross-border natural gas markets to unlock scale. What practical steps should governments and companies take to make this a reality?

We need to move from rhetoric to action. The practical steps are:

1. **Harmonise Regulations:** Create regional agreements on natural gas pricing, tariffs, and standards.
2. **Develop Anchor Projectss:** Focus on one or two key cross-border pipelines, like the Nigeria-Morocco pipeline, to demonstrate viability.
3. **Pooled Procurement:** African nations can aggregate their natural gas demand to negotiate better terms and give investors the confidence of a large, unified market.

Regulation often scares off investors. What reforms in Nigeria and Africa are most urgent to create a stable, attractive investment climate?

The most urgent reforms are: →

- **Clarity and Stability:** Investors need to know the rules of the game and trust that they won't change arbitrarily. The PIA in Nigeria was a giant leap in this direction.
- **Streamlined Approvals:** We must reduce bureaucratic bottlenecks for permits and FIDs.
- **Cost-Reflective Pricing:** Implementing a transparent and market-responsive pricing framework for the domestic market is non-negotiable to attract gas-specific investments.

VISION & LEADERSHIP

Beyond infrastructure, what investments in skills and local capacity are critical to ensure Africans – not just foreign firms – capture value from natural gas development?

We are investing heavily in the NNPC Academy to specialise it in natural gas technology, project finance, and ESG. Furthermore, we are enforcing our Nigerian Content Development and Monitoring Board (NCDMB) mandates to ensure skills transfer, local contracting, and in-country fabrication. We want African engineers, African financiers, and African service companies to be the primary beneficiaries of this natural gas boom.

You've called Nigeria the "Gas Capital of Africa." What hard milestones in the next five years will prove this is more than a slogan??

By 2029, we will be measured by:

1. Elimination of Routine Flaring. This is non-negotiable.
2. Completion of the AKK & OB3 Pipelines, with natural gas flowing to industries in the North.
3. Doubling of LPG/CNG penetration in the domestic market.

4. FID on at least two major non-associated natural gas fields.
5. A significant increase in natural gas-based industries and a measurable contribution to GDP from the natural gas value chain beyond exports.

Looking toward 2030 and 2050, what is your vision for Africa's Gas sector, and how will NNPC shape that future?

My vision is that of an interconnected, innovative, and inclusive African natural gas sector. By 2030, we will have a functioning regional natural gas market. By 2050, Africa will be a global energy hub, using its natural gas not just for export, but as the foundation for a diversified, industrialised, and low-carbon economy. NNPC will be at the centre of it all, being a leading advocate, reliable partner, and the most innovative operator on the continent.

If you had one message to send to global investors about why natural gas in Nigeria and Africa is a growth story – not just an energy story – what would it be?

Nigeria, under the leadership of President Bola Amed Tinubu, GCFR, is open for business. Invest in the Nigerian Gas value chain, and you are not just investing in molecules, but in delivering value to Nigerians and ensuring that natural gas becomes the cornerstone of Africa's sustainable energy future. You are investing in the foundation upon which a continent of 1.4 billion (bn) people will build its prosperous future. The returns will be measured not only in financial dividends but in the immense multiplier effect of building nations. This is the most compelling growth story of the 21st century.

*For more information on the opportunities and challenges of the Gas sector across Africa, see the 2025 edition of IGU's "Gas for Africa" report available at www.igu.org/reports ●



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Natural Gas in Africa's transition – striking the right balance between development and climate goals

Africa's vast natural gas assets present a bridge between the continent's development aspirations and long-term sustainability ambitions.

Africa stands at a defining moment in its energy journey. Nearly 600 million (mn) people still live without electricity, and close to 1 billion (bn) lack access to clean cooking solutions. These realities stifle industrialisation, limit economic growth, and compromise human welfare. At the same time, the continent faces mounting pressure to align with global climate goals.

The challenge is immense, but so is the opportunity. Natural gas – abundant and cleaner than coal or oil – offers a pragmatic bridge between Africa's urgent development needs and its long-term sustainability ambitions. With reserves exceeding 18 trillion m³ – almost 9% of the world's total – Africa possesses the resources to power its transformation. The question is how to deploy them wisely.

In Africa's net-zero transition, natural gas remains a relevant resource for industrialisation because of its dual role as a raw material for industrial processes and a source of energy. The Boston Consulting Group (BCG), in its report *South Africa's Net Zero Transitions*, notes that future Gas demand will likely be driven by

four sectors – electricity, synthetic fuels, industry, and transportation – all of which have established use cases for natural gas as a transition fuel or low-emission feedstock. Within the broader context of global decarbonisation, natural gas plays a particularly important role in hard-to-abate industries such as steel, chemicals, cement, glass, and refining.

For decades, African natural gas has largely flowed outward, fuelling industries abroad while domestic markets remained underdeveloped. That model is no longer tenable. The future demands a decisive shift toward domestic monetisation, ensuring that natural gas powers African homes, factories, and clean cooking solutions rather than serving only export markets. This is not merely an economic imperative, it is a moral one. Policies must mandate natural gas allocations for electricity generation and industrial feedstock, creating the backbone for inclusive growth and energy security.

Yet ambition alone will not attract investment. Confidence is built on predictability, which requires stable regulatory frameworks. Transparent contracts,

In Africa's net-zero transition, natural gas remains a relevant resource for industrialisation because of its dual role as a raw material for industrial processes and a source of energy.

streamlined permitting processes, and enforceable agreements are not bureaucratic niceties – they are essential tools for lowering risk and reducing financing costs for infrastructure-heavy projects. Without this foundation, Africa's natural gas ambitions will remain aspirations.

Africa must also think beyond its borders. Many national markets are small and fragmented, making large-scale infrastructure projects uneconomical. Regional integration can reverse this dynamic. Initiatives like the West African Power Pool and proposals for a Central African Pipeline System can aggregate demand, creating larger, more resilient markets that attract investment and mitigate demand uncertainty. By connecting economies, Africa transforms scattered energy needs into a powerful engine for industrialisation.

Preserving the climate advantage of natural gas is equally critical. Methane emissions, if unmanaged, can erode the very benefits that make natural gas a transitional fuel. Regulations must move beyond voluntary pledges and enforce rigorous standards: real-time leak detection, strict repair timelines, and an end to routine flaring and venting. Nigeria's Gas Flare Commercialisation Programme offers a compelling example of what is possible – turning waste into wealth through innovative public-private partnerships. These measures are not optional; they are prerequisites for ensuring that natural gas remains competitive in a decarbonising world.

Designing natural gas projects for the future is another non-negotiable. To align with the Paris Agreement and avoid stranded assets, infrastructure must be adaptable to a net-zero world. Mozambique's Temane power plant offers a glimpse of this future, with turbines capable of blending up to 70% hydrogen – effectively future-proofing the facility as the energy mix evolves. Similarly, pipeline networks should be built with repurposing in mind, supported by emerging cross-border hydrogen-ready pipeline concepts.

Carbon capture integration is equally essential, enabling the production of blue hydrogen and supporting the continued use of natural gas in

hard-to-abate sectors while managing emissions. Nigeria LNG's plans to incorporate carbon capture, utilisation and storage (CCUS) technology into its next expansion signal a strategic move toward decarbonisation. Commercial structures must also align with climate goals; power purchase agreements should expire before mid-century to avoid locking in long-term emissions.

Developing and deploying sustainable alternatives to natural gas will be critical for supporting hard-to-abate industrial sectors, including synthetic fuels (e-fuels), biofuels, and green hydrogen. Although green hydrogen is emerging slowly as a preferred fuel in the net-zero landscape – despite existing viability challenges – Africa holds vast potential. Countries such as Mauritania, Morocco, and Namibia are advancing pioneering initiatives, including the Hyphen Hydrogen Energy project and plans for a large-scale green ammonia plant.

During the energy transition, managing climate-related risks is likely to become the final pillar of a resilient Gas strategy. Stranded assets, carbon lock-in, and demand uncertainty pose genuine threats. The antidote lies in future-proofing by design: integrating carbon capture, enforcing methane controls, and fostering regional integration. Smaller-scale, phased development – such as virtual pipelines using trucked LNG or compressed natural gas (CNG) – can help build early demand centres with lower upfront risk before committing to major infrastructure. These measures ensure that natural gas serves as a durable bridge rather than a dead end.

Africa's energy transition cannot be dogmatic; it must be pragmatic. Natural gas, supported by strategic policy, climate-aligned design, and innovative financing, offers a pathway to prosperity that complements the continent's vast renewable potential. Far from being a barrier to green ambitions, natural gas is an indispensable catalyst for an orderly, just, and sustainable transition. The choices made today will determine whether Africa's energy future becomes one of dependency and missed opportunity, or one of resilience, leadership, and shared prosperity. ●

Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the official position of the African Development Bank Group, its Boards of Directors, Management, or its shareholders.

Regional Update

GAS NEWS FROM AROUND THE WORLD



Africa

Aka Nwokedi

President, Nigeria Gas Association
Nigeria

Africa's natural gas landscape is at a critical juncture with the political economy of energy in the region also changing: nations are moving beyond reserves into full commercialisation, increased domestic utilisation, and regional trade. There is a clear shift towards strong interplay of governance and policy stability to boost investor confidence so as to enable Gas as the permanent backbone of a resilient, diversified African economy balancing at all times Africa's vast natural gas potential with global decarbonisation pressure.

There is a deliberate push for a handful of projects – Nigeria's NLNG Train-7, Senegal/Mauritania's Greater Tortue Ahmeyim project, Mozambique's Coral LNG, and exports from Algeria and Egypt – that are aimed at boosting production, broadening focus on Gas for power, clean cooking, fertiliser production, and industrialisation.

However, challenges still remain in securing patient capital, harmonising regulatory frameworks and ensuring security in frontier zones. Africa also needs to integrate and be interconnected as a connected Africa can aggregate supply to meet large-scale global demand, making the continent a unified energy powerhouse.

North Africa: Major push to boost production and secure new supply routes to Europe as it seeks diversification.

Algeria: Algeria's natural gas sector is getting a boost with the restart of a major natural gas processing train at the Skikda facility to boost exports. The government plans to invest \$50bn (billion) primarily focused on production to increase annual natural gas output. The country aims to increase natural gas production to 200bn m³ over the next five years.

Egypt: While it is currently facing natural gas supply shortages, Egypt is fast tracking new upstream investments with explorations in the Nile and Delta

regions. Fluctuations in domestic output (Zohr trends) led to increased LNG imports in 2025 even as Egypt positions its LNG plants and regasification capacity as a regional hub and a transit point for Mediterranean supplies. Policy and commercial efforts seek to stabilise supply, secure offtake agreements, and use existing infrastructure to facilitate neighbouring producers.

Libya: Libya's oil and natural gas sector is experiencing a resurgence with recent associated natural gas discoveries in the Sirte and Ghadames basins. International oil companies such as Eni and BP have resumed operations with the national oil company planning a licensing round to attract new investment into the sector.

West Africa: Unlocking supply and addressing infrastructure deficit Nigeria

Nigeria continues to prioritise infrastructure development, regulatory reforms, and investment incentives that create an enabling environment for stakeholders across the value chain. The government's mission is to bridge the gap in energy access by accelerating the deployment of infrastructure and expanding distribution networks, particularly in underserved areas of the country. The NLNG Train 7 continues to dominate the headlines with completion now over 85%. The project will see NLNG's production capacity increase by 35%, from 22 MTPA to 30 MTPA. NLNG Train 7 and associated offtakes are core to Nigeria's ambition to anchor exports while supplying its own industrialisation drive.

The AKK (Ajaokuta-Kaduna-Kano) pipeline project is a major infrastructural project to transport natural gas from the south to the northern part of Nigeria to boost power generation, CNG use and industrialisation along that corridor. The pipeline stretches 614 km from Ajaokuta to Kano with key sections connecting Abuja and Kaduna and construction currently stands at over 70% with a major river crossing milestone recently achieved.

Ghana: Growing domestic demand and the need to stabilise electricity generation is driving Ghana's recent natural gas development focus aimed at boosting domestic supply and infrastructure. There

has been an upgrade to the Offshore Cape Three Points (OCTP) project increasing non-associated natural gas processing capacity to 270mn ft³/day, which will supply about 70% of Ghana's domestic natural gas needs.

Southern Africa: Similar trend in Southern Africa, boosting production and industrialisation

Mozambique: Mozambique has been the theatre for some of Africa's largest LNG aspirations: Eni's Coral South FLNG has already delivered cargoes, and larger onshore and offshore developments (Rovuma) continue to be advanced by major international operators. Security and financing remain the pivotal variables, but the country is firmly placed as a potential LNG powerhouse with significant implications for regional employment and industrialisation.

South Africa: South Africa's energy strategy increasingly recognises Gas as essential to manage its electricity shortages and transition away from coal. The country is advancing import strategies (long-term LNG deals and potential regasification capacity) while encouraging local Gas solutions to underpin

industrial needs.

Central Africa: The natural gas sector in Central Africa is witnessing a boom driven by LNG projects and a push for regional cooperation, particularly between Cote d'Ivoire, Benin and Togo, with integrated development plans aimed at making the region a major natural gas supplier and energy hub.

Republic of Congo: The Tango FLNG and Phase 2 LNG Expansion take centre stage as Eni launches the project ahead of schedule, bringing total capacity to 3 MTPA. The first export cargo from the Nguya FLNG unit in place is expected early 2026.

Angola: The upstream sector remains active, with associated natural gas monetisation with state oil company and IOC partnerships dominating project activities. Angola is pushing for its first non-associated natural gas project with the new consortium (NGC). The project is looking to develop natural gas fields discovered over 50 years ago and will add 350mn ft³/day to the country's natural gas production by 2028, enhancing its industrial development. ●



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Honeywell and ConocoPhillips leading the way in advances in liquefaction technologies

Following Honeywell's recent purchase of Air Products' leading liquefaction technology, and recent efforts by ConocoPhillips to expand the market share of its Cascade liquefaction process, we take a brief look at the major competing liquefaction options and how the technology is advancing.

JEREMY BOWDEN

Changes have been underway recently in the global large-scale LNG liquefaction sector. In 2024, Air Products sold its leading AP-X DMR LNG process technology and equipment business to Honeywell for \$1.81bn (billion). Air Products said the move was strategic, leaving it to focus on its core industrial Gases and clean hydrogen business. Everything was transferred, including its coil-wound heat exchanger manufacturing facility in Florida.

The purchase builds significantly on Honeywell's existing LNG capabilities, which include a range of technologies (AP-C3MR, AP-C1, AP-DMR, AP-N, AP-SMR and now AP-X LNG) for all project sizes, including modular options, according to the company. It also offers integrated end-to-end LNG processing, LNG Accelerate (an end-to-end modular solution), and other services such as automation and software capabilities which, it says, it gives it an advantage over competition.

The established market leader, Honeywell, tells

Gas in Transition (GiT) that its technology is used to pretreat about 40% of the world's LNG, and the company provides liquefaction technology for around two-thirds of global capacity.

Challenging this dominance, ConocoPhillips is pushing ahead with expanding the market share of its Cascade liquefaction process, after not marketing the technology much for the last 20 years (although it was used in early Qatar trains, Darwin, Angola and Kenai). The company is already the second largest provider of large-scale LNG liquefaction solutions and should see its US market share expand further in the next few years with three new projects using advanced Cascade technology – Cheniere's Corpus Christi Liquefaction (CCL), the early stage 22.5 MTPA Coastal Bend plant on the Texas Gulf Coast and Monkey Island LNG in Louisiana.

The ConocoPhillips basic Optimized Cascade Process (OCP) uses three pure refrigerant circuits – propane, ethylene, and methane – arranged in

sequence. Each refrigerant cools the next stage, forming a cascade that closely matches the natural gas cooling curve. While the OCP achieves excellent thermodynamic efficiency, costs can be higher due to multiple compressor sets and independent refrigerant loops. Efficiency also declines when operating below design throughput.

ConocoPhillips's Optimized OCP design

ConocoPhillips' new mega-module Optimized Cascade® Process (OCP) design (used in the new US plants) refines the classic pure refrigerant cascade into a prefabricated modular, large-scale design for LNG trains of up to 8 MTPA. A ConocoPhillips and McDermott modular design will be used at the \$25bn three-train Monkey Island LNG (MILNG) plant on the US Gulf Coast, which would initially produce 15.6 MTPA but could later be expanded to five trains producing 26 MTPA.

The optimised mega module design uses less fuel than the basic OCP and has differential operational flexibility and quick restart capabilities, while using less land, according to ConocoPhillips. "This new design delivers up to 60% more LNG per acre than comparable projects," MILNG CEO Greg Michaels tells *GiT*. "By leveraging LNG mega-modules, we dramatically reduce the site footprint required for world-scale LNG production, which drives down project costs and risks."

The new technology can also start up quickly, saving lost production time. It employs multiple suppliers and uses simpler heat exchangers, which the company says makes it more flexible and resilient.

Honeywell says it is also continually innovating, including in its dominant large-train mixed-refrigerant AP-X and advanced Dual Mixed Refrigerant (AP-DMR™) variants. The technology uses coil wound heat exchangers, which the company says are more compact and efficient than other solutions. AP-X builds upon C3MR technology, with an additional nitrogen expander loop for subcooling. This is more efficient, with AP-X/DMR systems achieving specific power consumption as low as 240 kWh/mt of LNG, according to a 2022 Pereira study – although actual use depends very much on operating conditions.

Honeywell says that by using data from recent projects and ongoing plant operations, it can regularly optimise the operation of its main cryogenic heat exchangers. It claims this integration of Honeywell's digital tools and aftermarket services can boost throughput by up to 2% and extend equipment lifespan. "Honeywell has been working with LNG

customers since the 1960s and we support our customers throughout the entire lifecycle of their operations," the company says.

Honeywell's methane-based refrigerant

Most recently, Honeywell pointed to innovation in its liquefaction process using methane expansion for refrigeration, which eliminates the need for imported refrigeration. This technology represents an evolution of the nitrogen expansion technology used in the AP-N™ and AP-X™ liquefaction processes. The company said it was also expanding offerings with coil-wound flash gas exchangers and nitrogen rejection equipment, both of which have multiple units currently under construction.

While ideal for very large trains, AP-X technology involves high capital investment, extensive process control requirements, and long commissioning times. Advanced DMR/AP-X systems require specialised staff, turbomachinery, and vendor expertise. Price inflation and delays can result when many projects compete for the same equipment and skilled EPC teams.

Other liquefaction solution providers, such as Chart and Baker Hughes, are largely based on smaller scale, modular units where technological advances are targeting lower CAPEX risk, rapid deployment, greater flexibility, as well as efficiency. These technologies may be appropriate in given situations, including smaller or brownfield projects, but may be less efficient for larger plants.

For example, it takes 18 Baker Hughes trains at Venture Global's 30 MTPA plant, whereas Cheniere's Sabine Pass takes five trains, which means far less ongoing maintenance/risks and lower costs.

A slide to scale?

Around 5 to 10 years ago, the market was trending towards smaller modular units to reduce cost and schedule. But as real-time data accumulates, projects constructed on this basis, such as Venture Global's Calcasieu Pass LNG and Plaquemines LNG, are tending to see overall production costs at the same level or higher than larger train projects, encouraging new mega projects to move back to larger trains.

For example, the US' biggest LNG producer, Cheniere Energy, switched technology for its Corpus Christi project to the larger ConocoPhillips' Cascade technology because of greater economies of scale. Cheniere CEO and President, Jack Fusco, confirmed in the company's August 2025 earnings report that "CCL Stage 4 is being developed with four large-scale →



Source: ConocoPhillips

Innovation in LNG today lies in major gains in efficiency but also cuts in CO₂ emissions in the liquefaction process, according to François Le Scornet, President, Cleantech & Climate Tech Senior Consultant at Carbonexit Consulting

ConocoPhillips trains using the optimised cascade design. In addition, in the second quarter, we updated our FERC application on the Sabine Pass LNG Expansion Project, reflecting three large-scale trains.”

Fusco said that in 2017 his company thought the market was going to be “smaller and shorter term”, and it would take longer to commercialise a large train. “It didn’t work out that way” due to scale economies, especially in relation to power generation, he said in August 2025 on the company’s Q2 earnings conference call. “So, facilities got bigger, not smaller. And we’re learning it here, with LNG facilities, that it’s overall cheaper to build and operate larger trains than it is the smaller facilities... I can assure you that we are totally focused on being best-in-class in the ConocoPhillips optimised platform.”

Alexander Bidwell, with Weber Research and Advisory, tells *GiT* differences between midscale, larger-scale stick built and modular facilities produce a wide range of operating costs, “with Cheniere sitting on the lower end.”

According to Honeywell, there is significant growth in both large-scale facilities and mid-scale LNG plants, “and we work closely with our customers to pick the best option.”

Future focus

Innovation in LNG today lies in major gains in efficiency but also cuts in CO₂ emissions in the liquefaction process, according to François Le Scornet, President, Cleantech & Climate Tech Senior Consultant at Carbonexit Consulting. This includes the use of low-carbon power rather than burning

methane or other fuels. Both ConocoPhillips and Honeywell say their technology is fully compatible with low-carbon electrification.

In the US, the Freeport LNG facility uses Honeywell technology and was the first US large-scale all-electric liquefaction plant in operation. Electrification has reduced combustion emissions by around 90%, although some operational challenges have been reported by Freeport.

“Honeywell’s LNG process incorporated electrification at Freeport LNG and Ruwais LNG – the largest e-Drive LNG plants,” a Honeywell spokesperson tells *GiT*. “We offer integrated nitrogen rejection solutions to support projects that are sourcing power from the grid. We are also actively working with customers constructing e-drive plants in North America and the Middle East.” Price premiums may be available for lower-carbon LNG.

More flexible smaller scale options, including floating LNG (FLNG), are also seen as a future development. Brian Yoon, CCO at GasEntec, tells *GiT* FLNG technology is now proven and put together in controlled factory environments, resulting in a significantly lower risk of construction delays and cost overruns, while FLNG units can also be redeployed. He added that there was growing attention on small-scale units of 500,000 metric tons/year or less.

Nevertheless, on a per ton basis, the new larger scale technologies clearly win out on efficiency and normally represent the best choice for baseload supply where lifecycle OPEX is key. ●

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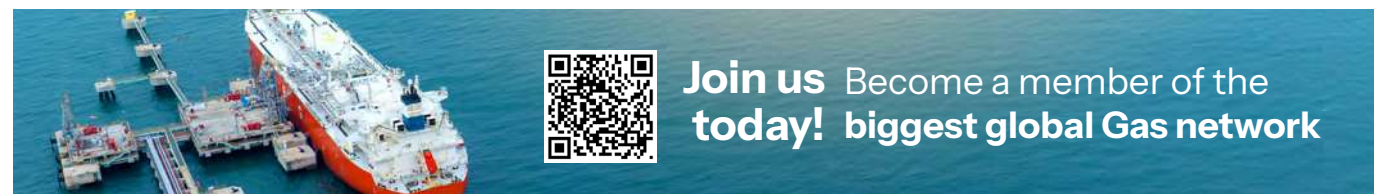
Spotlight on Argentina

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ARGENTINA SPOTLIGHT

The role of IAPG in promoting Argentina's energy sector

ARGENTINE INSTITUTE OF OIL AND GAS

The Argentine Institute of Oil and Gas (IAPG) is pleased to have organised this Country Profile on Argentina, a nation with over a century of experience in oil and natural gas production, now enjoying renewed prominence as a significant player in energy generation.

About the IAPG

Founded in 1957, the IAPG is a leading non-profit organisation dedicated to promoting the sustainable development of Argentina's hydrocarbon industry. It fosters collaboration among companies, professionals, and government entities to strengthen the country's energy sector. We are proud to have organised the 13th World Petroleum Congress in 1991 and the World Gas Congress in 2009.

The IAPG's mission focuses on supporting the growth of the industry through a balanced integration of technical, economic, and environmental considerations. It promotes the adoption of best practices, encourages research and innovation, and facilitates constructive dialogue among all sector stakeholders.

A dynamic community of more than 166 companies and 516 individual professionals participates in the Institute's activities, with access to high-quality research, specialised studies, and an extensive collaborative network.

The IAPG's key activities and services include:

- Training and professional development:

Organisation of conferences, workshops, and seminars designed to enhance skills in areas such as engineering, exploration, production, and emerging energy technologies.

- Publications, education and knowledge resources: Provision of technical reports, market analyses, industry trend reports, and up-to-date statistical data on the hydrocarbon sector. A comprehensive education programme designed to disseminate knowledge about the energy industry, with a particular focus on hydrocarbons. This programme serves a diverse audience, including the general public, media representatives, educators, students, legislative advisors, and various other stakeholders in society.
- Major industry events: organisation of Argentina Oil & Gas Expo (AOG) and AOG Patagonia, the largest and most important energy exhibitions in Argentina and the region, connecting industry leaders with local and international professionals.

Through its research and market analysis, the IAPG delivers valuable insights that support strategic and investment decision-making in the energy sector. Its ongoing commitment to sustainable practices contributes to responsible energy development and global climate action efforts.

To learn more about the IAPG's activities, or the promise of Argentina's oil and natural gas sectors, please visit www.iapg.org.ar ●

Argentina LNG

Integrated LNG Project

Is a large-scale liquefaction project designed to harness the vast natural gas resources of the **Vaca Muerta** formation to provide the world with a new, reliable **LNG** supply.



An interview with Her Excellency María Tettamanti, Argentina's Secretary of Energy

Argentina's energy sector, home to significant unconventional oil and natural gas, has stagnated, in the recent past, under less than supportive energy policies. That is beginning to change, and to help understand those changes, *Gas in Transition* discussed Argentina's energy future with H.E. María Tettamanti, the nation's Secretary of Energy.



H.E. MARÍA TETTAMANTI
Secretary of Energy, Argentina

Over the past two decades, Argentina's energy sector has operated under a state of "chronic emergency," a condition largely self-imposed through misguided public policies, both macroeconomic (fiscal and monetary) and sector-specific, particularly within the energy domain. Since 2002, the institutional and regulatory frameworks established in the early 1990s have been disregarded. The private sector was marginalised, and the State assumed a dominant role in management and investment in the energy sector.

These policies were driven by an ideology that presumed that the State is better equipped than market participants – producers and consumers – to provide goods and services and set prices. This approach also led to tariff-setting practices for public services that deviated from the principles of reasonableness established by law, favouring arbitrary and opportunistic decisions aimed at electoral gain. Such practices undermined the investments necessary to maintain service quality and expand access to energy.

Consequently, energy prices and tariffs became instruments of populism, focused on short-term political objectives rather than long-term sector sustainability. This discouraged investment, led to decapitalisation and resulted in inadequate infrastructure to meet the energy needs of end users. The financial burden shifted from service users to taxpayers and, in the context of persistent fiscal deficits, the poorest segments of society bore the brunt through high inflation rates.

Given this scenario, what are your priority objectives?

Our primary objective is to reverse these effects by fostering an environment conducive to investment, enabling efficient energy production and the development of essential infrastructure for evacuation, treatment, transportation, commercialisation, distribution, and export of oil and natural gas. This will maximise the efficient utilisation of Argentina's substantial energy resources. Restoring a reliable and predictable institutional framework is crucial for attracting investments that require long-term recovery periods. It is imperative to honour concession contract terms and conditions, and to deregulate wholesale markets. The private sector's pursuit of efficiency is fundamental to ensuring energy availability at the lowest possible cost, thereby minimising prices and tariffs.

Let's address the regulated sector: Gas transmission and distribution. What

policies will you be implementing?

Investment in Gas infrastructure – transmission and distribution – demands profitability and predictability. Of the 33-year concessions granted to licensees, only one-third of those years featured tariffs aligned with the regulatory framework, covering operational costs, maintenance, capital amortisation, and a fair return. The remaining years were marked by tariff freezes or delays, which restricted investment in service expansion and limited spending to essential safety and reliability measures.

This lack of investment affected millions of Argentines who, unable to access natural gas, had to rely on more expensive or less reliable alternatives. In May of this year (2025), the Five-Year Tariff Review (ROT) was completed, establishing the revenue requirements for companies for the 2025 to 2030 period. The decision was made to implement the necessary increases in 30 consecutive monthly instalments to mitigate the impact on consumers. Additionally, tariff adjustments were shifted from semi-annual to monthly updates to prevent loss of purchasing power and abrupt price changes.

As a result, concession contracts now respect licensees' rights while requiring them to fulfil their obligations. Licensees can forecast revenue flows, and users are assured of a progressive and predictable adjustment scheme, avoiding artificial freezes and sudden hikes. The tariff redesign is complemented by a more transparent and targeted subsidy policy, promoting rational consumption. Subsidies are directed to those who genuinely need them and for the energy they truly require. Maintaining artificially low prices for all, at the expense of greater deficits, higher taxes, and inflation, is a regressive policy.

In the past, there were distortions in the wholesale natural gas market. How do you plan to restore that market?

The natural gas market is inherently competitive and should operate freely and without regulation. Achieving this requires a transportation architecture that aligns with natural gas availability in producing basins. Distributors must have clarity on firm transportation routes to supply priority demand, and industries must know which basins they can reliably contract natural gas from. Declining production in northern and southern basins has left pipelines underutilised, while the Neuquen basin offers growth potential. However, transportation contracts have not adapted to this new reality.

Transportation capacity allocation must be revised, with regulatory priorities for user segments, ensuring →

"Rebuilding a devastated energy sector is not achievable through a single measure or in a matter of months. It requires consistency, coordination, and above all, political determination to maintain the course."

H.E. MARÍA TETTAMANTI,
SECRETARY OF ENERGY, ARGENTINA



each region reflects actual natural gas availability and the need for new firm transportation capacities to support system expansion. Gas transactions should occur between private entities, regardless of end use, and the State should withdraw from commercialisation activities currently managed by Enarsa under the Secretariat of Energy.

For distributor Gas purchases, the passthrough principle for acquisition costs in tariffs must be upheld. This year, Enargas issued a new resolution establishing a transparent methodology for applying this principle, ensuring distributors that neutrality in Gas costs will be maintained. The institutional unification of ENRE and ENARGAS, as mandated by the Ley Bases, is a positive step toward coherent and coordinated regulatory changes, especially in light of technological advances in energy production.

In conclusion, where does the Argentine government want to go?

The Gas policy we advocate is clear:

- A free, competitive, and orderly wholesale market, enabling producers, transporters, distributors, and industries to enter long-term contracts with cost-reflective prices, free from unnecessary

State intervention.

- A transportation system tailored to evacuation needs, with predictable tariffs that support expansion in response to end-user demand.
- A tariff scheme that adheres to legal principles, avoids opportunism, and incorporates update mechanisms to prevent dilution and abrupt changes.
- Targeted subsidies based on equity and efficiency.
- A State that withdraws from Gas commercialisation and focuses on responsible, intelligent regulation to ensure secure energy supply at the lowest possible cost.

Rebuilding a devastated energy sector is not achievable through a single measure or in a matter of months. It requires consistency, coordination, and above all, political determination to maintain the course: transitioning from chronic emergency to regulatory normalcy; from discretionary practices to clear rules; from pervasive State intervention to a framework that empowers investors and producers.

This is the path we have chosen, and it is the only way to ensure that natural gas – a vital resource for Argentina's economic competitiveness and quality of life – reaches its full potential. ●

Tecpetrol's Energy Revolution: Pioneering Gas and Oil Innovation in Argentina

By any measure, Fortín de Piedra has been a staggering challenge. In just 18 months, Tecpetrol transformed a patch of Neuquen shale into Argentina's top gas field, pumping out 15% of the nation's supply. It's a feat powered by the Techint Group's synergy, a coalition of expertise, grit, and relentless ambition. Over \$4 billion (bn) invested, more than 1,000 small and medium enterprises (SMEs) involved, more than 1 trillion ft³ of gas delivered, and a winter peak of 24.4 million (mn) m³/day. Fortín de Piedra isn't just a project; it's a statement.

Tecpetrol's rapid development set a new standard for unconventional gas production in Argentina. As CEO Ricardo Markous affirms, "We're the leading producer of unconventional gas, maintaining production above 24mn m³/day in winter, out of the 120mn m³/day produced by the province."

Vaca Muerta itself is a global contender. With an average annual gas cost of just \$3.50/mn Btu, Argentina is positioned as a magnet for investment. "Vaca Muerta is a resource of great relevance in terms of productivity, quantity, and quality of hydrocarbons. We're optimistic about the future and the opportunities ahead", he adds.

Los Toldos II Este: The Next Frontier

But Tecpetrol isn't stopping there. The company is now setting its sights on oil, launching an important investment in Los Toldos II Este, also in Neuquen Province, the next frontier in unconventional energy. All the expertise and operational excellence developed in Vaca Muerta is now being channeled into this new challenge, one that promises to be even greater in scale and impact.

The project is designed to reach a peak of 70,000 barrels/day of oil, supported by a Central Processing Facility (CPF) for both oil and natural gas. At the

height of construction, Los Toldos II Este will generate over 2,500 jobs, energising the local economy and supporting several SMEs from all over the country. The initial investment totals \$3bn over the first five years, \$1.8bn for wells and \$1.2bn for infrastructure. Advanced water management for fracturing and dedicated CPF facilities underscore Tecpetrol's drive for operational excellence and innovation in unconventional oil extraction.

Markous highlights the strategic leap, "We're aiming to scale up from 20,000 to 100,000 barrels of oil per day in the Neuquina Basin. Until June 2027, our goal is to keep a tight grip on cash, focusing on fast-return projects and maintaining our commitment to operational efficiency."

Innovation at the heart of Tecpetrol's operations

Tecpetrol's Real Time Operation Center (RTOC), located in the City of Buenos Aires, brings remote drilling and completion to a new level, seamlessly controlling advanced rigs like the Nabors F-36 from miles away. This technology boosts geonavigation and drilling precision, setting new standards for efficiency. Inside the RTOC, 3 mn data points are analyzed every hour, anticipating operational and safety issues before they arise. With artificial intelligence and machine learning, Tecpetrol's control room is at the forefront of energy innovation.

In field operations, VR headsets and mixed-reality simulators are used to recreate scenarios and train people in safe environments, as well as robots and drones for maintenance tasks, minimising exposure.

Tecpetrol's journey is a story of vision, investment, and the relentless pursuit of reshaping Argentina's energy landscape and opening new horizons for the country. ●



This article is brought to you by [Tecpetrol](#), a privately owned Latam energy company and part of the Techint Group.



ARGENTINA SPOTLIGHT

Country Profile: Argentina

Argentina's hydrocarbon industry, established in 1907, has evolved into a dynamic sector with a rich history of growth and innovation.



ENG. ERNESTO LÓPEZ ANADÓN
President, Argentine
Institute of Oil and Gas

Regulatory reforms in the 1990s spurred oil production, positioning Argentina as a net oil exporter by 1992. The natural gas sector began in 1949, and today, an extensive pipeline network connects production centres with domestic and regional markets, supporting exports to neighboring countries since 1997.

The industry is characterised by a diverse mix of large domestic and international companies, complemented by numerous small and medium enterprises (SMEs) that provide specialised services. Argentina's workforce is highly skilled, contributing to the sector's operational excellence.

Energy Matrix and Sedimentary Basins

Argentina's energy matrix is dominated by natural gas, which has accounted for over 50% of primary energy supply since the 1990s. The country has 24 sedimentary basins, both terrestrial and maritime, covering more than 3 million (mn) km². The San Jorge Gulf, Neuquen, and Austral basins are the primary sources of reserves and oil and gas production, while offshore basins present significant opportunities for future exploration.

Reserves and Unconventional Resources

Proven oil and natural gas reserves have grown substantially over the past decade. The Neuquen Basin's Vaca Muerta formation is a focal point for unconventional resource development, with extraction activities accelerating since 2010. Vaca Muerta is recognised as one of the world's most valuable energy assets, holding the second-largest unconventional natural gas reserve globally.

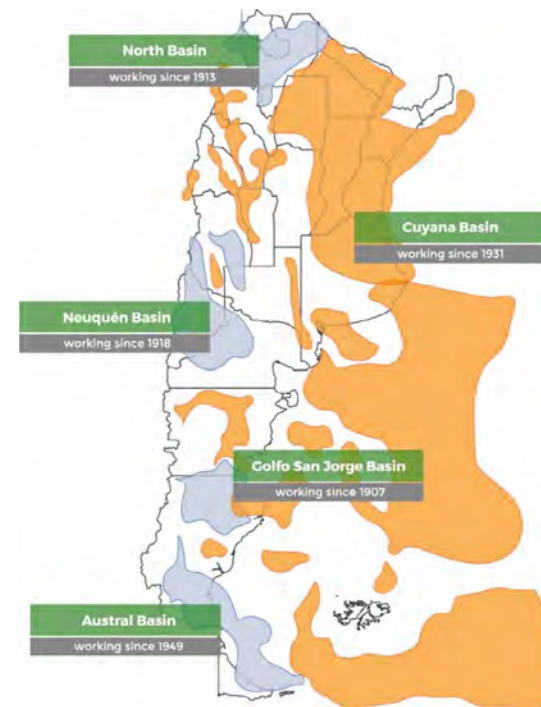
Technology, efficiency and sustainability

Over 50 companies operate in Argentina's hydrocarbon sector, leveraging advanced technologies to maximise productivity. The industry is committed to reducing methane emissions by 2030 and is increasingly integrating renewable energy sources, such as solar and wind, into its operations.

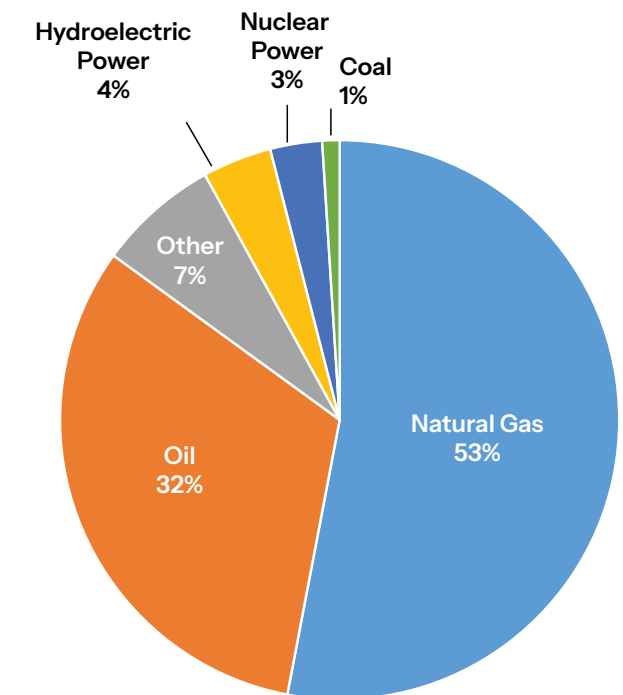
International connections and infrastructure

Argentina's natural gas pipeline network spans over 21,000 km, connecting with Bolivia, Brazil, Chile,

Key Argentine Hydrocarbon Basins



Argentina's Energy Matrix 2025



Source: IAPG

and Uruguay through nine international links. Two regasification terminals support LNG imports, while ongoing infrastructure projects aim to expand export capacity and enhance regional energy integration.

Strategic vision and economic impact

Expanding Vaca Muerta and developing new infrastructure will strengthen Argentina's role in the regional energy market, boost exports, and drive economic growth. Stable regulatory frameworks and investment incentives, such as the Bases and Starting Points Law and the Large Investment Incentive Regime (RIGI), are essential for attracting capital and ensuring long-term competitiveness.

Imports and exports

Natural gas exports to Brazil, Chile, and Uruguay peaked between 2001 and 2006. Argentina also imports natural gas from Bolivia and LNG from global markets.

Conclusion and perspectives

Argentina is poised to become a regional energy hub and a reliable global supplier. Achieving this vision requires coordinated efforts among the private sector, government, and society, as well as comprehensive planning that integrates infrastructure, technology,

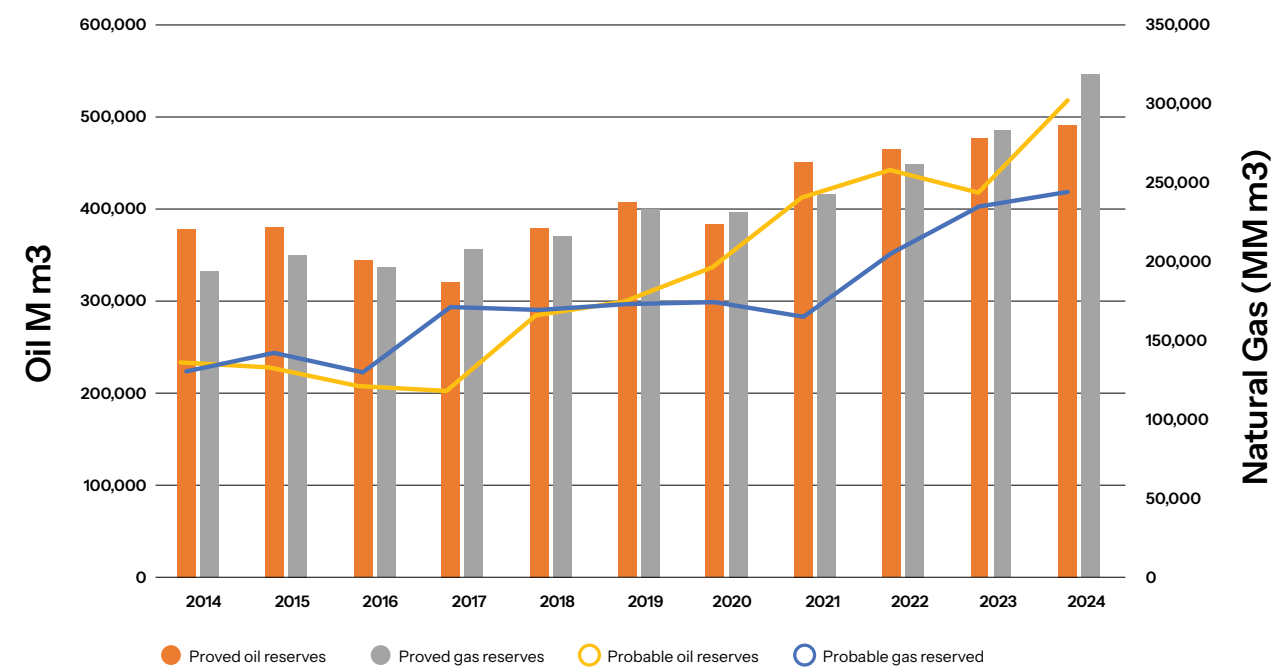
sustainability, and clear regulations. Natural gas is not only a resource but a catalyst for economic development and the transition to a balanced energy future.

The development of infrastructure linked to Vaca Muerta represents a strategic opportunity for Argentina and its regional partners. In the months ahead, updating the transportation tariff framework and adjusting aspects of Argentina's electricity regulation will be crucial, enabling the contracting of new transport capacity, defining necessary investments, and facilitating access to financing for projects that will enhance regional energy integration.

The future of the natural gas industry hinges on collaborative strategies among the private sector, authorities, and society. This synergy will drive job creation, attract investments, and stimulate economic growth, ensuring Argentina's role as a key player in a global context demanding secure, competitive, and environmentally sustainable energy solutions.

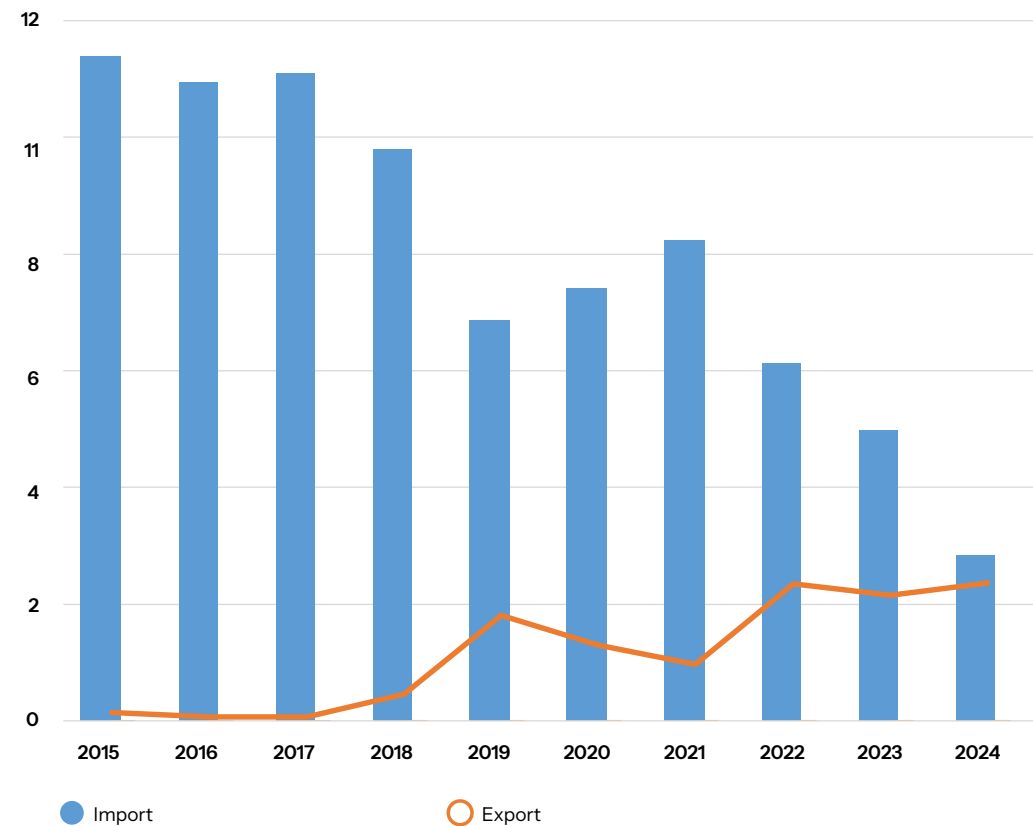
Argentina has the potential to become a regional energy hub and a reliable provider in the global market. Achieving this goal calls for comprehensive planning that integrates infrastructure, technology, sustainability, and clear regulations. Gas is not simply a resource; it is a catalyst for economic development and the transition to a balanced energy future. ●

Argentina Oil and Gas Reserves 2014-202



Source: IAPG

Argentina: Import and Export of Natural Gas (M m³)



Source: IAPG

Oil Production per basin (M m³) 2015-2024

YEAR	AUSTRAL BASIN	CUYANA BASIN	GOLFO SAN JORGE BASIN	NEUQUINA BASIN	NOROESTE BASIN	TOTAL
2015	1,246,287.7	1,614,279.1	15,249,916.9	11,573,906.2	444,002.7	30,128,392.5
2016	1,158,767.6	1,581,675.8	14,496,504.5	11,526,617.5	408,502.6	29,172,068.0
2017	1,007,326.4	1,505,396.6	13,408,866.3	11,181,352.7	366,162.9	27,469,104.9
2018	1,172,882.3	1,398,879.4	13,478,863.3	12,047,975.8	309,612.8	28,408,213.6
2019	1,256,289.9	1,355,735.5	13,327,176.3	13,299,418.6	282,866.5	29,521,486.8
2020	926,214.9	1,184,193.4	12,353,386.2	13,224,523.2	287,060.3	27,975,377.9
2021	901,859.8	1,116,561.7	11,882,803.4	15,649,849.6	249,916.6	29,800,991.0
2022	754,817.7	1,083,152.2	11,754,195.9	19,940,868.2	267,880.2	33,800,914.1
2023	633,974.7	989,442.2	11,641,555.9	23,335,011.7	267,919.7	36,867,904.1
2024	600,852.5	929,134.8	11,064,174.2	27,989,825.7	195,223.8	40,779,211.0

Source: IAPG

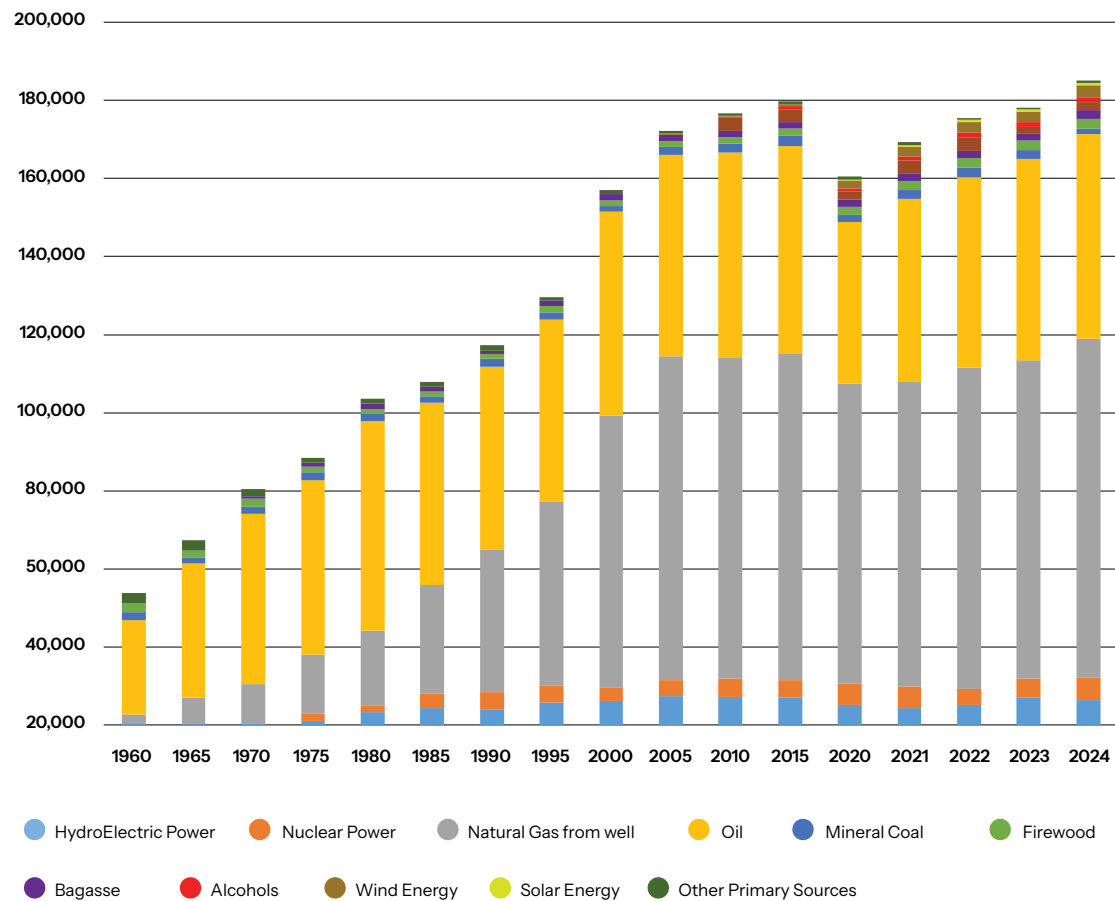
Oil Production per basin (M m³) 2015-2024

YEAR	AUSTRAL BASIN	CUYANA BASIN	GOLFO SAN JORGE BASIN	NEUQUINA BASIN	NOROESTE BASIN	TOTAL
2015	9,653,501.8	54,039.8	5,715,245.0	24,421,787.2	2,852,402.8	42,696,976.6
2016	10,591,925.6	51,298.3	5,703,562.6	25,804,462.8	2,671,244.0	44,822,493.3
2017	10,681,773.2	48,414.2	5,348,218.9	26,006,079.4	2,400,836.6	44,485,322.3
2018	11,521,439.2	48,963.7	4,948,076.5	28,414,230.5	2,108,993.7	47,041,703.7
2019	12,040,726.6	50,058.8	4,681,311.1	30,735,934.0	1,842,761.9	49,350,792.4
2020	11,534,830.6	49,104.1	4,157,534.9	27,653,989.5	1,704,148.5	45,099,607.5
2021	10,858,525.5	49,115.5	3,940,869.5	28,914,547.8	1,541,686.0	45,304,744.3
2022	9,915,176.1	50,970.6	4,077,800.6	32,973,889.3	1,402,666.1	48,420,502.8
2023	9,278,616.3	51,885.9	4,115,964.6	33,356,309.5	1,303,894.8	48,106,671.0
2024	8,859,021.2	47,240.3	3,900,297.2	36,694,075.7	1,236,793.7	50,737,428.1

Source: IAPG



Argentina's Evolution of the Primary Energy Matrix



Source: IAPG

Transportation and distribution system. Gas delivered by user type 2014 - 2024 (M m³ at 9,300 kcal)

YEAR	RESIDENTIAL	COMMERCIAL	OFFICIAL ENTITIES	INDUSTRY	POWER PLANTS	SUB-DISTRIBUTORS	CNG	TOTAL
2014	10,107,687	1,325,918	441,683	12,477,649	14,542,907	1,001,170	2,852,517	42,749,531
2015	10,229,001	1,334,006	430,631	12,632,440	14,916,184	1,047,421	2,980,874	43,570,557
2016	10,835,009	1,368,085	478,704	12,084,232	16,002,489	1,090,381	2,826,613	44,685,513
2017	9,637,658	1,262,860	442,281	12,498,756	17,257,368	1,043,463	2,553,603	44,695,989
2018	9,668,375	1,256,816	431,586	13,193,227	17,189,400	1,044,737	2,400,545	45,084,687
2019	9,224,068	1,456,003	428,812	13,752,395	15,105,114	986,074	2,462,237	43,414,703
2020	9,647,190	1,080,487	314,517	12,672,761	14,438,565	851,668	1,867,799	40,872,987
2021	9,708,923	1,152,938	408,037	10,503,981	16,152,930	817,163	2,343,108	41,087,080
2022	10,431,852	1,229,564	461,566	12,310,942	13,406,660	898,309	2,376,435	41,115,328
2023	9,840,517	1,370,136	466,017	12,848,818	13,115,129	898,211	2,247,201	40,786,029
2024	10,183,461	1,320,601	456,582	12,623,968	11,464,637	901,370	2,081,195	39,031,814

Source: ENARGAS



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ARGENTINA SPOTLIGHT

Argentina LNG: the key to exporting energy to the world



HORACIO MARÍN
CEO, YPF

Vaca Muerta is already internationally recognised as a world-class formation; it holds the second-largest unconventional natural gas reserve and the fourth-largest oil reserve globally. Today's level of competitiveness positions Argentina as a global player. This strategic resource opens the door to export opportunities, and Argentina LNG turns that opportunity into reality.

Argentina LNG is one of the most important strategic projects in the country's energy history, enabling us to connect our competitive gas with global markets that demand security and supply diversity.

In an initial stage that already shows significant progress, the Southern Energy (SESA) consortium marks the current operational phase of the project. This stage, led by Pan American Energy in partnership with YPF, Pampa Energía, Harbour Energy, and Golar LNG, will feature two floating liquefaction units scheduled to begin operations in 2027 and 2028, with a combined capacity of 6 MTPA. This stage is complemented by the one led by YPF together with Eni, XRG, and a strategic partner yet to be defined. Together, both phases optimise costs, accelerate timelines, and consolidate Argentina as a regional LNG hub.

With an estimated investment of \$35bn (billion)

over the next four years, the initiative with Eni and XRG will enable exports of 12 MTPA in its first stage, with the potential to expand to 18 MTPA. In the long term, the plan is to reach 24 MTPA by 2030 alongside the SESA consortium, positioning Argentina as a key player in the global LNG market.

The economic impact will undoubtedly be significant: \$200bn in exports over two decades, the creation of 50,000 direct and indirect jobs, and the construction of the country's largest natural gas pipeline, along with oil pipelines, multiproduct pipelines, liquid separation plants, and a port in the province of Río Negro. All of this is under the framework of the Incentives Regime for Large Investments (RIGI), which provides fiscal stability and predictability to attract capital.

The roadmap is clear: major works will begin in 2027, and the first export is scheduled for 2029. The global context reinforces this opportunity: LNG demand accounts for more than one-third of global Gas trade and is projected to double by 2050, with Asia and Europe as key markets.

Argentina LNG is not just an energy project. It is an opportunity to establish our country as a reliable supplier, drive economic development, and contribute to macroeconomic stability. The time is now. YPF is ready to lead this challenge. ●

DELIVERING THE FULL POTENTIAL OF VACA MUERTA ARGENTINA



YPF
ENERGÍA ARGENTINA

ARGENTINA SPOTLIGHT

Argentina LNG signals global ambition for Argentine Gas sector



Spurred by ongoing development of the Vaca Muerta shale gas field, Argentina is raising its LNG aspirations with hopes of becoming a significant regional player.

ANDREW KEMP

Argentina's Vaca Muerta shale has altered the trajectory of the country's Gas sector, transforming a decade of domestic revival into the foundations of a new Atlantic LNG export corridor. The country's Gas production reached 139.5mn m³/day in 2024, the highest level in more than 20 years, with Vaca Muerta contributing over half of total output.

That shale basin's expansion is now feeding into export outcomes, with the first phase of the Argentina LNG project – developed by the Southern Energy SA (SESA) consortium – securing an eight-year, 2 MTPA agreement with Germany's SEFE at the start of December 2025. With first deliveries due in 2027, the deal is the country's first large-volume LNG commitment and shows how rising production from Vaca Muerta is starting to translate into long-term export capability.

While the SESA agreement marks an important entry point into the global market, it is the acceleration of Phase 2 in 2025 that sets the longer-term trajectory. Over the last six months, YPF has reshaped the project's partner base, bringing in Italy's Eni in June and ADNOC-backed XRG in November,

with a non-binding framework agreement currently being negotiated. The updated structure targets 12 MTPA of offshore liquefaction capacity by 2030, with YPF expecting to reach a final investment decision (FID) around mid-2026, paving the way for first exports in 2030–31.

Vaca Muerta's depth

Vaca Muerta is one of the largest unconventional natural gas resources in the world, with the US Energy Information Administration (EIA) estimating it holds 308 trillion ft³ of technically recoverable shale gas. Production has increased sharply in the last few years as drilling productivity and takeaway capacity have improved, with supply climbing from almost 40mn m³/day in 2019 to around 81mn m³/day in 2024, or 55% of Argentina's total output.

Cost competitiveness is central to Vaca Muerta's ability to support LNG exports, with McKinsey estimating in 2022 a shale gas break-even of about US\$1.60/mn Btu, broadly comparable to that of major US plays. Strong initial production and sustained flow rates offset higher local drilling costs, keeping

Vaca Muerta is one of the largest unconventional natural gas resources in the world, with the US Energy Information Administration (EIA) estimating it holds 308 trillion ft³ of technically recoverable shale gas.

the basin competitive on the global supply curve and supporting the economics of long-term LNG development.

Vaca Muerta's scale and productivity ultimately determine how far Argentina LNG can grow. "The abundance of proven reserves in Vaca Muerta enables the inclusion of an additional partner...and supports scaling the project to 18 MTPA," YPF says. This combination of resource depth and development capacity is what allows the export plan to be structured as a multi-phase system.

Delivering that multi-phase plan, however, requires a development model that manages execution risk at scale. For Phase 2, this led YPF and its partners to adopt an FLNG architecture rather than a single onshore plant, reflecting the need for predictable execution and capital discipline. FLNG construction in specialised shipyards limits schedule exposure and allows units to be delivered progressively as market conditions evolve. It also reduces the complexity of coastal works, an important consideration for a country developing LNG infrastructure at scale for the first time.

Global experience reinforces this approach. Eni is one of the few operators to have delivered a deepwater FLNG project, with the 3.4 MTPA Coral Sul in Mozambique commissioned on schedule and operating reliably under long-term FOB arrangements. "Eni brings to the project the experience gained from fast-track FLNG developments such as Coral South and the recently sanctioned Coral North," the company says. "That capability allows us to contribute proven engineering and execution models to Argentina LNG's offshore design."

Coral North, taken to FID in October, extends the company's track record and demonstrates its ability to scale FLNG production through a series of offshore units. For Argentina LNG, this matters: the partners will need to manage multiple fabrication cycles, coordinated commissioning and sustained offshore

operations as capacity grows from 12 MTPA to 18 MTPA.

Together, the scale of Vaca Muerta and the flexibility of FLNG create a development pathway that can expand in line with upstream capability and buyer demand. This combination forms the spine of Phase 2 and underpins its potential to supply international markets over several decades. Realising that potential now depends on the midstream and coastal systems that will feed the offshore units.

Building the export corridor

The phase with SESA requires the construction of an interconnection with the trunk gas pipelines, two compressor stations to ensure optimal gas pressure in the vessel, an onshore gas pipeline to the coast, and two submarine pipelines connecting both vessels and mooring systems.

Initially, the project will leverage the existing capacity of Argentina's transport system to supply natural gas during months of lower domestic demand. According to YPF, "the phase involving Eni and XRG will add another gas pipeline, as exports will originate from Sierra Grande while SESA exports from San Antonio Oeste – two distinct locations within the San Matías Gulf. Each will have its own dedicated pipeline: SESA for its operations and Argentina LNG for its future expansions, which will rely on the new pipeline."

Argentina's domestic Gas grid was never designed for the continuous, high-volume operating profile required by offshore liquefaction. Phase 2 therefore relies on a purpose-built export corridor in which the gathering system, trunk pipeline and coastal facilities function as a single integrated chain rather than extensions of the domestic network.

On the coast, the project builds on an existing industrial footprint, at Sierra Grande and San Antonio Oeste, which have long been used for bulk export operations and already offer deep-draft access, established logistics routes and zoned industrial land. Redevelopment will be required, but starting →

on a brownfield site reduces the need for greenfield permitting and enables the project to work within an established coastal framework. Locating both the Phase 1 and Phase 2 FLNG vessels in the San Matias Gulf creates a single operating zone for offshore support and marine integration, rather than dispersing activity across multiple sites.

The regulatory framework supports this infrastructure build-out through the national Large Investment Incentive Regime (RIGI), which offers the legal and financial stability long-term energy projects typically require. The regime provides 30 years of tax, customs and foreign-exchange stability; exempts capital equipment from import duties; allows inflation-adjusted tax losses with no expiry; and gives qualifying ventures access to international arbitration. RIGI also phases in free availability of foreign currency for debt service and dividend repatriation, a provision relevant to financing large pipeline, port and FLNG investments. Provincial legislation in Río Negro complements the national framework by establishing the basis for coastal and port redevelopment within the selected project zone.

Taken together, the dedicated pipeline corridor, the established coastal footprint and the long-horizon regulatory framework provide a coherent structure for progressing Phase 2. They do not remove the complexity of developing multi-unit offshore liquefaction, but they do define the physical, commercial and permitting environment within which the expansion is being planned.

Argentina's market position

The commercial landscape Argentina LNG is entering is one of expansion and adjustment. A large wave of new liquefaction capacity due by 2030 is expected to ease prices, while long-term demand growth remains concentrated in Asian markets, shifting away from coal.

"Our commercial strategy focuses on securing buyers who align with the project's conditions, such as FOB sales and long-term contracts...although we analyse all relevant regions, the Asian market offers Argentina LNG strategic advantages," YPF says.

The International Gas Union's *2025 World LNG Outlook* highlights structural increases through to 2040, driven by industrial demand in Asia and by countries seeking to displace coal with Gas in power generation. LNG increasingly acts as the system-balancing component of global Gas supply, meaning new long-term projects must demonstrate reliability and competitive delivery routes.

The near-term supply picture, meanwhile, is defined by a wave of new liquefaction capacity

coming online between 2025 and 2030. The IGU expects global liquefaction to increase to more than 900 MTPA by 2030 from just under 500 MTPA in 2024 as projects on the US Gulf Coast, in Qatar and in Africa enter the market. The International Energy Agency, meanwhile, notes that this growth is likely to soften prices, which in turn could unlock demand in price-sensitive markets in South and Southeast Asia. These are regions that are already examining long-term import options to support industrial growth and reduce coal utilisation.

Within this context, Argentina's potential market fit is shaped by geography and logistics. Voyage distances from the Argentine Atlantic coast to South and Southeast Asia are generally shorter than those from the US Gulf Coast. These differences are not decisive on their own, but they contribute to lower shipping exposure and support FOB commercial structures. In addition, persistent constraints at the Panama Canal, including transit restrictions linked to drought cycles, have increased the complexity and cost variability faced by US exporters serving Asian buyers. Atlantic routes from Patagonia avoid this chokepoint altogether.

Europe also remains a potential destination, though competition from US and Qatari volumes is likely to be stronger. Argentina's relevance in this market is more about optionality than proximity: its ability to supply both Atlantic and Indo-Pacific buyers gives portfolio players flexibility to shift volumes as seasonal spreads move. For Eni, that optionality aligns with its broader supply strategy. "Europe will increase its gas consumption due to electrification and the growth of artificial intelligence, and this project positions us to meet that demand," the company says.

The broader commercial logic is that Argentina LNG is entering a market where long-term reliability and commercial optionality are both increasing priorities. Vaca Muerta's scale supports sustained production, and the project's multi-phase design allows capacity to be built in line with demand rather than in a single step. Buyer confidence also depends on the strength of the consortium behind the project. As YPF puts it, the partnership "positions Argentina as a relevant player in the global LNG market by incorporating international partners who have long-term contracts with secured offtakers."

Argentina is moving from a domestic Gas market defined by seasonal constraints to one with a credible pathway into long-term LNG export supply. Vaca Muerta provides the scale and productivity needed to sustain that shift, and the structure of Argentina LNG – phased growth and a stable regulatory base – creates a platform that can expand as demand and upstream capacity evolve. ●

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ARGENTINA SPOTLIGHT

Argentina and the strategic challenge of becoming a net structural LNG exporter



RODOLFO FREYRE
Chair, Southern Energy

In the coming years, the global liquefied natural gas (LNG) market will undergo profound shifts – marked by geopolitical volatility, an energy transition moving at varying speeds around the world, and a growing need to secure reliable supply sources. In this context, Argentina stands out as one of the few countries capable of adding new, stable, and competitive volumes to global supply.

And the reason is simple: LNG is the only way for Argentina to consolidate a structural energy exporter position. The country holds an abundance of natural gas resources – especially in Vaca Muerta – which positions it as a reliable long-term supplier, supplementing output from the US as well as from other players in the Western markets.

Argentina LNG: A three-phase strategy

Argentina's energy matrix is dominated by natural gas, which has accounted for over 50% of primary energy supply since the 1990s. The country has 24 sedimentary basins, both terrestrial and maritime, covering more than 3 million (mn) km². The San Jorge Gulf, Neuquen, and Austral basins are the primary sources of reserves and oil and gas production, while offshore basins present significant opportunities for

future exploration.

The roadmap has already been defined. The Argentina LNG initiative, led by YPF in partnership with other key industry players, maps out three development stages aimed at building an export platform of global scale. The objective is clear: by 2030, the country aims to reach a capacity of 25 MTPA, equivalent to 4% of the world's estimated market for that year.

This initiative stands as a strong example of virtuous collaboration between national and international companies to implement long-term, capital-intensive projects.

I would like to highlight the initial phase which we are leading at Southern Energy: a consortium originally formed by Pan American Energy and Golar LNG, and now comprising YPF, Pampa Energía and Harbour Energy as partners.

Backed by 20-year contracts, this phase includes the installation of two floating LNG vessels in Argentina. The first vessel is scheduled to begin operations in the last quarter of 2027, and the second one by late 2028. The investment is expected to exceed \$15bn (billion), with additional investment required for upstream development. Production will



reach 6 MTPA, with projected exports exceeding \$20bn between 2027 and 2035. Starting in 2028, both vessels are expected to operate year-round, with continuous supply via a dedicated export pipeline.

Argentina boasts several key structural advantages: proven resource quality; logistical access to certain markets; being a new global supply point in a part of the world where none currently exists – which therefore enables demand diversification; and inverse seasonality relative to the Northern Hemisphere, as natural gas surpluses generated in the summer coincide with peak winter demand in importing countries, thus enhancing the competitiveness of the country's supply.

The energy industry in Argentina is working collaboratively to position the country as a structural LNG exporter in the coming years. Argentina offers clear, predictable, and long-term regulations, now established as state policy, which have enabled the country to achieve record levels of oil and natural gas production. This joint effort is expected to drive significant industrial development and will establish Argentina as a key player in global energy security, delivering reliability and volume to a market that urgently needs them.

Recently, Southern Energy took the first step by signing a Heads of Agreement with SEFE (Securing

"Argentina offers clear, predictable, and long-term regulations, now established as state policy, which have enabled the country to achieve record levels of oil and natural gas production."

RODOLFO FREYRE
CHAIR, SOUTHERN ENERGY

Energy for Europe) for the sale of 2 MTPA of LNG per year over eight years starting in 2027, which accounts for more than 30% of the combined production capacity of the two floating LNG vessels to be installed in Argentina.

At Southern Energy, we are fully committed to this path. The construction of the first phase is already underway. Global demand for natural gas is growing, and Argentina has the capacity to supply it. Now is the time to act with determination. ●

ARGENTINA SPOTLIGHT

tgs and the Vaca Muerta challenge: Infrastructure as the engine for Argentina's energy growth



OSCAR SARDI
CEO, tgs

Argentina is going through a historic moment. The potential of Vaca Muerta is no longer just a geological promise but a reality that is transforming the country's position on the global energy map.

This structural shift unlocks unique opportunities for developing strategic infrastructure that connects the growing gas production with consumption sectors, thereby boosting competitiveness, security of domestic supply, and access to new, more demanding markets.

At **tgs**, we have taken on a central role in enabling this transformation. With over 30 years of experience in natural gas transportation, we have consolidated our position as the country's principal midstream operator and a key enabler of Vaca Muerta natural gas development through infrastructure construction.

The evolution of **tgs** has not been accidental. We were founded in 1992 as a natural gas transporter, always with a vision focused on growth and energy

integration. Today, we operate more than 10,000 km of natural gas trunk pipelines, in addition to leading the production and commercialisation of natural gas liquids (NGLs).

The turning point in **tgs**'s activity finally occurred in 2019 with the commissioning of our pioneering midstream project in Vaca Muerta for the provision of services to producers. Through an investment of more than \$700mn (million), we built an extensive network of natural gas pipelines and a conditioning plant in Tratayén, located in the heart of Vaca Muerta, which has been successively expanded by installing new modules to keep pace with the development of the reserves. We are proud to be the force that contributes investment to drive energy growth through infrastructure construction, with a high economic and social impact for the country.

In this regard, it is public knowledge that, in 2024, **tgs** proposed a private initiative project to the national

We will continue to strengthen our position as a strategic service provider, leveraging our know-how and our proven capability to execute major undertakings, operating under the highest standards of quality and safety.

government to expand the transport capacity of the Perito Moreno Gas Pipeline, with the objective of substituting fuel imports with natural gas sourced from the Neuquén basin. After being declared of National Public Interest and following instructions from the Secretariat of Energy, ENARSA called for a public tender, in which **tgs** was awarded the contract to execute the project.

With an investment exceeding \$560mn, **tgs** will expand the GPM's capacity from 21mn m³/day to 35mn m³/day, which will be available in the winter of 2027. This expansion is projected to generate an annual contribution of over \$700mn to the trade balance and annual fiscal savings of more than \$450mn by substituting energy imports.

In addition to these works, **tgs** is advancing with the development phase of a project for the extraction of natural gas liquids from Vaca Muerta natural gas, the NGLs Project, with an estimated investment of \$3bn. This project includes gas processing at the Tratayén Plant of the **tgs** Vaca Muerta System, a

573-km polyduct to Bahía Blanca, fractionation and storage plants, and loading terminals in Puerto Galván to export propane, butane, and natural gasoline to the international market.

These projects were made feasible by the confidence that our shareholders place in **tgs** and in the country, as well as the financial strength that allows us access to external financing. It is noteworthy that the recent issuance of a 10-year international bond for \$500mn received offers totaling \$1.3bn, demonstrating investors' confidence in **tgs**'s capacity to execute large-scale projects.

We will continue to strengthen our position as a strategic service provider, leveraging our know-how and our proven capability to execute major undertakings, operating under the highest standards of quality and safety. At **tgs**, we achieve challenges through strategic planning, teamwork, and a long-term vision, contributing infrastructure and investment to capitalise on the energy resources that will transform Argentina. ●

Source: tgs

Regional Update

GAS NEWS FROM AROUND THE WORLD



Caspian & Central Asia

Dr Vitaliy Baylarbayov
SOCAR,
Azerbaijan

Southern Gas Corridor – Azerbaijan

Azerbaijan is securing its position as a reliable and secure natural gas supplier to Europe, while rapidly scaling up investments in renewable energy and emissions reduction. In 2024, Azerbaijan's gas exports to Europe reached nearly 13bn (billion) m³, which is a significant increase from 8.2bn m³ in 2021. SOCAR (State Oil Company of the Republic of Azerbaijan) now supplies gas to 14 countries, 11 of which are in Europe. This expansion has been supported by long-term contracts and EU-backed guarantees, reinforcing Azerbaijan's role as a key energy partner for the region.

Azerbaijan's role as a key energy partner for the region is further reinforced through the approval of the \$2.9bn Shah Deniz compression project by BP, which is expected to increase gas output by 50bn m³ and 25mn (million) barrels of condensate by 2029. BP is also collaborating with SOCAR on projects such as the electrification of the Sangachal terminal and the Shafag solar power plant. It is planned that Azerbaijan's renewable energy capacity by 2029 will reach 6,000 MW. The growing energy capacity is expected to free up more volumes for export to Türkiye and Europe.

In line with these efforts, SOCAR and ExxonMobil in June 2025, signed a memorandum of understanding to explore unconventional oil and gas resources in central Azerbaijan. This agreement aligns with Azerbaijan's broader ambition to expand natural gas production and reinforces its position as a reliable partner for Europe.

Deepening its regional role, SOCAR has started supplying natural gas to Syria, contributing to the country's efforts to rebuild its economy. So far, SOCAR has agreed to export 1.2bn m³, supporting Syria's attempts to meet its energy demand in areas affected by the conflict. This will enable a substantial boost in

electricity generation capacity, estimated at around 750 MW.

Azerbaijan is also heavily deploying its efforts into the development of green energy infrastructure. The Green Energy Corridor is a 1,200-km undersea cable connecting the Caspian region to Southeastern Europe. The project is worth €10bn (\$10.8bn). The Green Energy Corridor's target is to achieve transmission capacity of up to 6 GW of clean electricity. Despite strong political and financial backing, the Corridor faces several challenges, including technical complexity, financing hurdles, and heightened security risks in the Black Sea.

A balanced approach, of expanding its natural gas exports while investing in renewable energy and innovations, has allowed Azerbaijan to remain a key regional partner for Europe's energy security.

Türkiye's evolving energy strategy

Türkiye is facing a major reconfiguration stage in its natural gas strategy, which is driven by the expiration of major gas import contracts. Among these contracts, the one with Russia's Gazprom for 16bn m³/year delivered via the Blue Stream pipeline, expired at the end of 2025. Additionally, a contract with Iran for 9.6bn m³/year, will expire in July 2026. In response to the expiring contracts, Türkiye has announced eight LNG supply deals with BP, Shell, Eni, Sefo, Equinor, Cheniere, JERA and Hartree, securing nearly 15bn m³ of LNG deliveries between 2026 and 2028, all announced during the Gastech conference in Milan.

In terms of domestic supply, Türkiye has discovered 75bn m³ of natural gas worth \$30bn in the Black Sea, considered Türkiye's second-largest single natural gas discovery in the Black Sea. The discovery was made in the Göktepe Field, 69 km (43 miles) west of the Sakarya Gas Field and 165 km from the shore. This will boost Türkiye's Black Sea natural gas reserve to 785bn m³, up from 710bn m³ and will enhance Türkiye's capacity to meet residential gas demand in the near term.

Türkiye is also putting a lot of effort in the clean energy transition. Nearly 90% of Türkiye's 13,000 MW of new power capacity under development comes from clean energy, led by nuclear, wind, and solar. The Turkish government is also deploying utility-scale batteries to store surplus power from wind and solar farms, and the target is to reach 80 GWh.

Türkiye's maximisation of its Gas trade,

infrastructure and slow transition to clean power energy represents its diverse strategy of short-term changes and long-term energy transformation goals.

Central Asia: Turkmenistan's increasing role in regional energy affairs

Turkmenistan is emerging as a more active player in regional gas dynamics. In 2024, the country produced 77.6bn m³ of natural gas, much of which has been directed to China. While China remains the primary importer of Turkmenistan's gas, the country is actively working to diversify its export routes, including efforts to supply markets such as Türkiye.

On February 11, 2025, Turkmenistan's national energy firm, Türkmengaz, and Türkiye's state-owned pipeline operator BOTAŞ signed an agreement to permit the import of Turkmen natural gas via Iran through a swap arrangement. Under this agreement Turkmenistan began supplying natural gas to Türkiye on March 1, 2025. After almost 30 years of discussions, this agreement creates new pathways for Caspian natural gas to reach European markets and diversifies Türkiye's energy imports. However, the achievement of the full potential of Turkmenistan's natural gas exports to Europe is dependent on the realisation of the Trans-Caspian Pipeline, which would link Turkmenbashi to Baku and potentially onward to European buyers via the Southern Gas Corridor.

Turkmenistan has also experienced major developments in the offshore sector. XRG, PETRONAS and the Turkmenistan State Enterprise Hazarnebit have signed a new Production Sharing Contract (PSC) with the State Concern Turkmennebit for the offshore Block I natural gas and condensate fields in Turkmenistan. Under the terms of the PSC, PETRONAS will hold 57% participating interest as owner and operator, partnering with XRG (38%) and the Turkmenistan State Enterprise Hazarnebit holding the remaining 5%. Further exploration of the field offers significant long-term potential, unlocking access to approximately 200bn m³ of natural gas.

Despite the geopolitical and logistical impediments, Turkmenistan is signing agreements with Türkiye and Gulf investors, which underscores its efforts to become a more active player in the region's Gas sector.

Shifting natural gas dynamics amid geopolitical pressures

Russia is facing dramatic changes in its natural gas exports. Russian natural gas exports to Europe have fallen to their lowest level in half a century. Between January and June, Gazprom shipped just 8.33bn m³ of natural gas to European clients, which represents a 47% drop from the same period in 2024 and puts Russia on track to deliver less than 16bn m³ to the continent this year. The decline also reflects the EU's plan to stop all Russian energy imports by 2028, for all members – from landlocked to coastal.

While natural gas flows have declined sharply, exports of LNG have remained stable. The EU continues to remain the largest buyer of Russian LNG, accounting for 50% of its total exports, followed by China 21% and Japan 19%. In fact, EU imports of Russian LNG in 2024 increased by 9% compared to the previous year. Nearly 90% of these purchases arrived in France (7.7bn m³), Spain (5.7bn m³) and Belgium (5.1bn m³).

The lack of immediate restrictions has allowed European companies to freely sign contracts with Russian suppliers, some of which run until 2040.

Despite this, the recently adopted EU roadmap sets limits on all Russian natural gas imports to Europe by the end of 2027, raising new questions for the EU member states most reliant on Russian natural gas imports.

The European Commission has also recently confirmed that it has adopted a new sanctions package against Russia, which brings forward the banning of Russian LNG imports into the EU by one year to January 2027. What's more, Bulgaria's Prime Minister said Bulgaria will suspend Russian natural gas transit for short-term contracts in 2026, the heightening energy security concerns of Central European states, such as Hungary and Slovakia.

The war between Russia and Ukraine has wide implications for the European region. For instance, Moldova's Vestmoldtransgaz is proposing to extend the Trans-Balkan Route 1 capacity product and halve tariffs to make natural gas transport from Greece to Ukraine cheaper and more attractive. The move reflects growing urgency to supply Ukraine with additional natural gas as Russian attacks threaten its domestic production.

If approved, the discounted route could become a key corridor for southeast European natural gas flows, strengthening regional energy security and further integrating Ukraine into the European market. →

Regional Update

However, it also raises regulatory concerns about market fragmentation and compliance with EU network rules.

Sanctions on Russian companies and its implications

United Arab Emirates-based International Holding Co (IHC) confirmed in December 2025 its interest in potentially acquiring Russian oil major Lukoil's international assets, as more prospective buyers emerge.

Reuters also reported in December 2025 that the Abu Dhabi-listed conglomerate, chaired by Sheikh Tahnoon bin Zayed, who is also the UAE's national security adviser, had notified the US Treasury of its interest in Lukoil's foreign assets.

"We are looking at Lukoil's foreign assets, and we are talking to the Office of Foreign Assets Control (Ofac)," an IHC spokesperson told *Energy Intelligence*.

The company declined to comment on whether it is interested in single assets or the entire company.

Interest appears to have grown since Ofac issued a licence allowing such negotiations to take place until December 13, 2025 without running afoul of US sanctions – although any subsequent transaction or contingent contract would require separate authorisation.

Forced by the latest US sanctions into divesting its holdings, Lukoil said that it is in ongoing negotiations with "several" potential buyers over the sale of its international assets.

Lukoil did not name the companies that it is talking to, saying only that it would announce specific deals once it finalises the details and secures the necessary approvals.

The list of suitors includes ExxonMobil, Chevron, US private equity firm Carlyle and Abu Dhabi National Oil Co (Adnoc).

US sanctions also pose a threat to the operations of Russian Gazprom Neft, which was sanctioned in January.

In Serbia, it has been reported that Adnoc's international investment arm, XRG, is in negotiations to acquire the combined majority stake in oil refiner NIS held by Gazprom Neft (44.85%) and parent company Gazprom (11.3%).

Industry sources also claim that Abu Dhabi sovereign wealth fund Mubadala's oil and gas unit, Mubadala Energy, is eyeing the Russian stake in NIS.

The war between Russia and Ukraine has wide implications for the European region.

Serbian authorities earlier confirmed that the Russian shareholders had agreed to fully divest their combined 56.15% interest in NIS. The Serbian government holds the remaining roughly 30% stake.

XRG's official response to being asked if they were interested in Gazprom's and/or Lukoil's global assets was, "As a matter of policy, we don't comment on market speculation."

Mubadala Energy did not immediately respond to a request for comment.

The emergence of UAE-based companies on the list of potential bidders is not surprising given the emirate's existing footprint in Serbia and its close political and economic ties with Russia.

Russian sources confirmed that intense negotiations are ongoing on the sale of Russian stakes in NIS.

NIS submitted a new request on November 18, 2025 to the US Treasury for a special licence allowing it to continue operations based on the current status of negotiations.

Hungarian oil and gas company Mol and Belgrade itself were earlier named as the likeliest candidates to take over NIS, which owns Serbia's 4.8mn metric tons/year (96,400 barrels/day) Pancevo refinery.

Serbian President Aleksandar Vucic was quoted as saying that he knew of three potential buyers that Gazprom Neft and Gazprom are discussing the sale with, without providing further details.

Region recap

The region's energy landscape is undergoing profound transformations. Azerbaijan is expanding its role as a key energy partner in the region and is making significant advancements in renewables. Türkiye is working on diversifying its natural gas imports and increasing its LNG import volumes, while also focusing on sustainability and clean energy transition. Turkmenistan is expanding its presence in the region, signing offshore deals with Gulf investors. Finally, Russia is adapting to the geopolitical circumstances it is facing and shifting away from regional pipeline flows to global LNG trade. ●



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For forward-thinking gas investors, Peru offers what few markets can: vast underexplored basins, a transparent regulatory framework, and flexible entry mechanisms designed to reduce risk while maximizing opportunity. The Technical Evaluation Agreement (TEA) model has already attracted 18 international operators, allowing companies to conduct geological studies at their own pace before committing to license contracts.

Peru's offshore Talara, Tumbes, and Trujillo basins hold significant gas potential, backed by modern seismic data and world-class geological understanding. Add to this a stable institutional environment, direct Pacific access to global markets, and a government prioritizing energy security, This landscape has attracted the attention of high-level companies, including TotalEnergies and a Chevron - Anadarko - Westlawn consortium. The case becomes clear: Peru is open for business.

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LNG innovation in the Asia-Pacific: Four decades of collaboration and the path ahead

Brisbane will host the International Gas Union's 22nd International Conference & Exhibition on Liquefied Natural Gas (LNG2029). The conference will mark Australia's four decades of leadership in the global LNG industry, beginning with its first export to Japan in 1989.



PROF. ANDREW GARNETT PHD
Executive Chair,
Australian Gas Industry Trust

A 40-Year Milestone in a Growing Energy System

The year 2029 will mark 40 years of Australian LNG exports, and at LNG2029 in Brisbane the industry will reflect on a shared regional (and global) journey of innovation shaped by a consistent challenge: how to assure and sustain reliable, affordable and lower-emissions energy for a growing Asia-Pacific region. Demand for energy continues to rise as populations expand, economies industrialise and environmental expectations deepen.

When Australia's first LNG cargo departed the North-West Shelf in 1989 on the MHI-built Northwest Sanderling, bound for Tokyo Bay, the nation joined existing regional exporters Malaysia, Indonesia and Brunei. Together, they formed the nucleus of

an Asia-Pacific LNG ecosystem built on long-term LNG contracts, co-investment between buyers and sellers, and a high-trust model of engineering and commercial collaboration. Over time, Australia grew into one of the world's largest LNG exporters, exceeding 80 MTPA in 2024, as the Asia-Pacific became the centre of global LNG demand.

Early innovation: Engineering reliability in remote conditions

Australia's pioneering LNG developments were shaped by the challenge of building reliable offshore and onshore systems in remote, cyclone-prone environments. New engineering approaches emerged for long-distance subsea tiebacks, advanced flow-assurance methods and optimisation of liquefaction

refrigerant cycles. Barrow Island's strict conservation requirements drove world-leading biosecurity and environmental safeguards, while the early adoption of the safety-case framework shaped national offshore regulation.

Commercial innovation advanced in parallel. Japan and Korea anchored new LNG projects through long-term, oil-indexed contracts, multi-party sale and purchase agreements (SPAs) and coordinated shipping arrangements – structures that distributed risk, enabled capital formation and ensured secure energy during industrial expansion. Air-quality concerns in Japan and Korea reinforced early coal-to-gas switching policies, embedding LNG as a cleaner alternative to more polluting fuels.

These early developments mirrored advances across Malaysia, Indonesia and Brunei, contributing to a shared regional culture of common technical standards, operational learning and project co-development.

Scaling up: Mega-Projects, CBM-to-LNG and regional growth

From 2000 to 2015, innovation shifted to meeting sharply rising LNG demand at unprecedented scale. The Gorgon Project introduced new approaches to modular construction, CO₂-rich natural gas processing and carbon capture and storage (CCS) at commercial scale. Wheatstone advanced digital

engineering and large-module fabrication; Pluto accelerated the timeline from discovery to first cargo; and Prelude FLNG became the world's first floating LNG production system, enabling access to more remote offshore resources.

A parallel innovation frontier emerged in Queensland: development of the world's first commercial coal-seam-gas (also known as coal-bed methane, or CBM) to LNG industry. QCLNG, GLNG and APLNG required large-scale drilling programmes, wellfield automation and the construction of major pipelines linking inland basins to Curtis Island. These projects also drove new coexistence frameworks with agricultural landholders and Indigenous cultural heritage.

Across the region, LNG demand expanded rapidly. China accelerated coal-to-gas switching in major cities under the Blue Sky Protection Plan (2013–2020), driving large-scale development of LNG import terminals and pipeline networks. Japan and Korea deepened their reliance on LNG for energy security, particularly after the Fukushima nuclear accident in 2011. Meanwhile, Malaysia, Indonesia and Brunei continued exporting as new projects emerged in Papua New Guinea.

Post-Paris transitions: Meeting climate commitments while ensuring security

After the Paris Agreement in 2015, Asian →

governments strengthened their Nationally Determined Contributions (NDCs) in the years that followed, increasing pressure to reduce emissions while maintaining secure and affordable energy systems. LNG demand continued to grow, and Asian buyers expanded regasification capacity, renewed long-term contracts, diversified suppliers and increased storage to manage volatility – particularly during the global natural gas shock triggered by Russia's invasion of Ukraine.

Through this period, operators across Australia and the region continued and expanded long-running efficiency and emissions-management programmes. Liquefaction trains were progressively optimised, refrigerant and compressor systems improved, flaring further reduced and methane-measurement frameworks strengthened in line with evolving global norms such as OGMP 2.0. Digital technologies – including predictive maintenance, advanced process control and diagnostics – helped reduce energy intensity and improve reliability. Regulatory progress continued across Australia, including offshore CCS frameworks and onshore projects such as Moomba CCS.

Commercial structures also evolved: portfolio trading expanded; downstream flexibility increased; and buyers and sellers deepened collaboration through co-investment models and early certification concepts for biomethane, e-methane and hydrogen-ready systems. Meanwhile, the US and Middle Eastern suppliers grew their share of the Asia-Pacific market, contributing to portfolio diversification and supply resilience.

Looking ahead to 2050: Innovation for a lower carbon, multi-molecule future

Energy-system dynamics continue to shift. The ASEAN region is moving toward a net-importing position as domestic supply declines and electricity and industrial demand grows. More broadly, regional and global LNG demand remain significant, reflecting the need to balance variable renewable energy, support hard-to-abate sectors and provide reliable fuel for power generation, industry and heating. Transboundary CCS is emerging as a real option with progress on regulations and bilateral agreements. Relatively new players and familiar faces (North America and Middle East) are seeking to fill the energy gap bringing flexible destination innovations and alternative pricing mechanisms. The market is expected by many to become more liquid and flexible over the next 10-15 year, all else being equal.

The next phase of LNG innovation will unfold

The region's long history of collaboration is a strong foundation for this next stage.

in an energy system characterised by deeper electrification, variable renewable energy, more volatile Gas-demand patterns and tighter emissions expectations. Future LNG infrastructure may support multiple molecules – including biomethane, e-methane and hydrogen – but this evolution will require coordinated planning, cross-border regulatory development, new market mechanisms and sustained cooperation among governments, buyers and suppliers.

The region's long history of collaboration is a strong foundation for this next stage.

The innovation questions now in focus

The need for continued innovation is clear. Key questions now include:

- How can the region continue to access secure, reliable and affordable energy as demand evolves?
- How can we do this with ever lower emissions as climate expectations intensify?
- What new cooperation, partnerships and business-model innovations will be required?
- What new regulatory and cross-boundary rules need to be put in place?
- How quickly can methane emissions approach near-zero?
- What roles can alternative Gases or carriers – biomethane, e-methane, hydrogen, ammonia, methanol, urea – play: what could “energy-molecule” decarbonisation realistically achieve?
- How can LNG infrastructure be adapted for complementary future fuels?

These critical questions will shape the dialogue at LNG2029, where we will commemorate 40 years of LNG while anticipating the next phase in a dynamic energy landscape. The necessary social and political ‘licence to transform’ requires a foundation of energy security and affordability. To meet growing energy and LNG demand, maintaining diversity of supply will be crucial. Australia is well-positioned, with the necessary resources, trade relationships, and geographic proximity to contribute significantly. Although the precise trajectory remains uncertain, we anticipate a collaborative and innovative path forward. ●

NLNG – Path to a Sustainable Future

As global energy systems undergo unprecedented transformation, Nigeria LNG Limited (NLNG) is charting a bold and decisive course toward decarbonisation and a sustainable future. The company has activated a transformative, enterprise-wide engine designed to strengthen sustainable value creation, unlock new opportunities across the LNG value chain, and position NLNG as a future-ready player in an increasingly carbon-constrained world.

At the heart of this journey lies a clear and unwavering commitment to energy transition. With the energy sector responsible for more than 70 percent of global CO₂ emissions, decarbonising operations is no longer optional—it is an imperative that offers both strategic advantage and long-term relevance. By integrating energy transition into its corporate transformation framework, NLNG has accelerated progress and demonstrated the forward-looking vision of its leadership.

Aligned with national and global climate objectives, NLNG has made significant strides in reducing emissions across its value chain. At its liquefaction plant, a new Boil-off Gas Compressor now stops flaring of natural gas during ship loading and LNG storage operations by redirecting recompressed gas as feed to the LNG trains. Through real-time process optimisation (RTPO) and innovative direct cooldown initiatives, the company has further reduced flaring and optimised feed gas utilisation. Notably, the novel direct cooldown in the Main Cryogenic Heat Exchanger (MCHE), implemented with support from technology partner Honeywell, has cut flaring during LNG train start-ups, underscoring

the power of industry collaboration in achieving sustainable outcomes.

NLNG has also completed feasibility studies for Carbon Capture, Utilisation and Storage (CCUS), focusing on emissions from Acid Gas Removal Units and other process areas. This marks a foundational step toward long-term decarbonisation of LNG production. In addition, the company's vessel modernisation programme has introduced state-of-the-art carriers to replace older, high-carbon steamships, delivering significant gains in fuel efficiency and emissions reduction in line with best-in class industry practices.

Over the past year, NLNG has advanced substantially in the “Measure and Avoid” categories of emissions management. By enhancing Monitoring, Reporting, and Verification (MRV) systems, the company achieved the prestigious OGMP Gold Standard for methane emissions reporting. Third-party verification of its greenhouse gas inventory has been expanded, while digital MRV dashboards and emissions-tracking tools are now deployed across plant and fleet assets.

Looking ahead, NLNG's next chapter includes expanding flared gas recovery, accelerating battery storage deployment, continuing fleet renewal, and progressing toward full-scale carbon capture. Each initiative reinforces NLNG's commitment to lead Nigeria's participation in the global energy transition—one project, one vessel, one action at a time.

Through innovation, collaboration, and unwavering resolve, NLNG is not just adapting to change; it is shaping the future of energy for Nigeria and the world. ●



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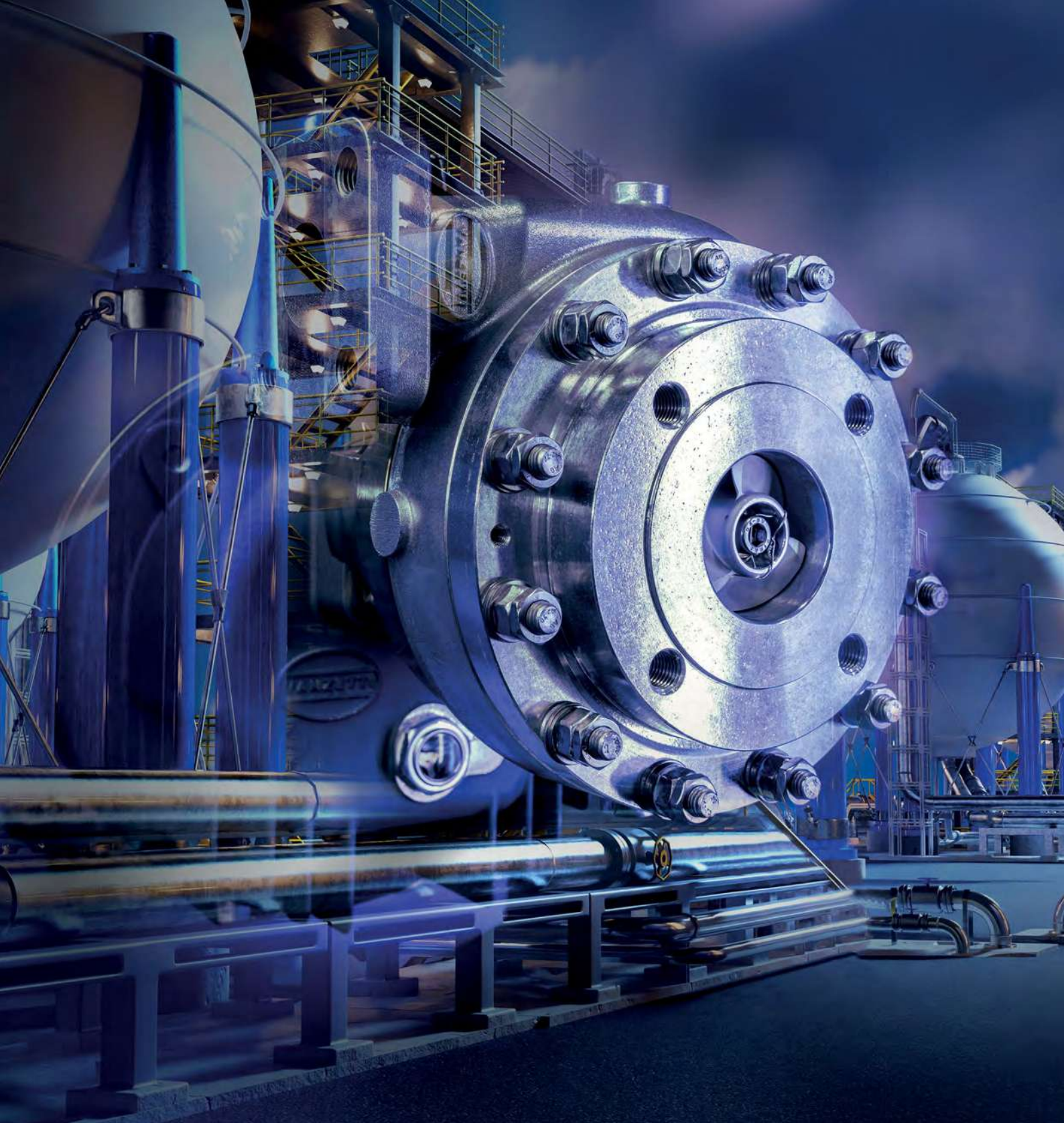
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