Global Voice of Gas

BY THE INTERNATIONAL GAS UNION

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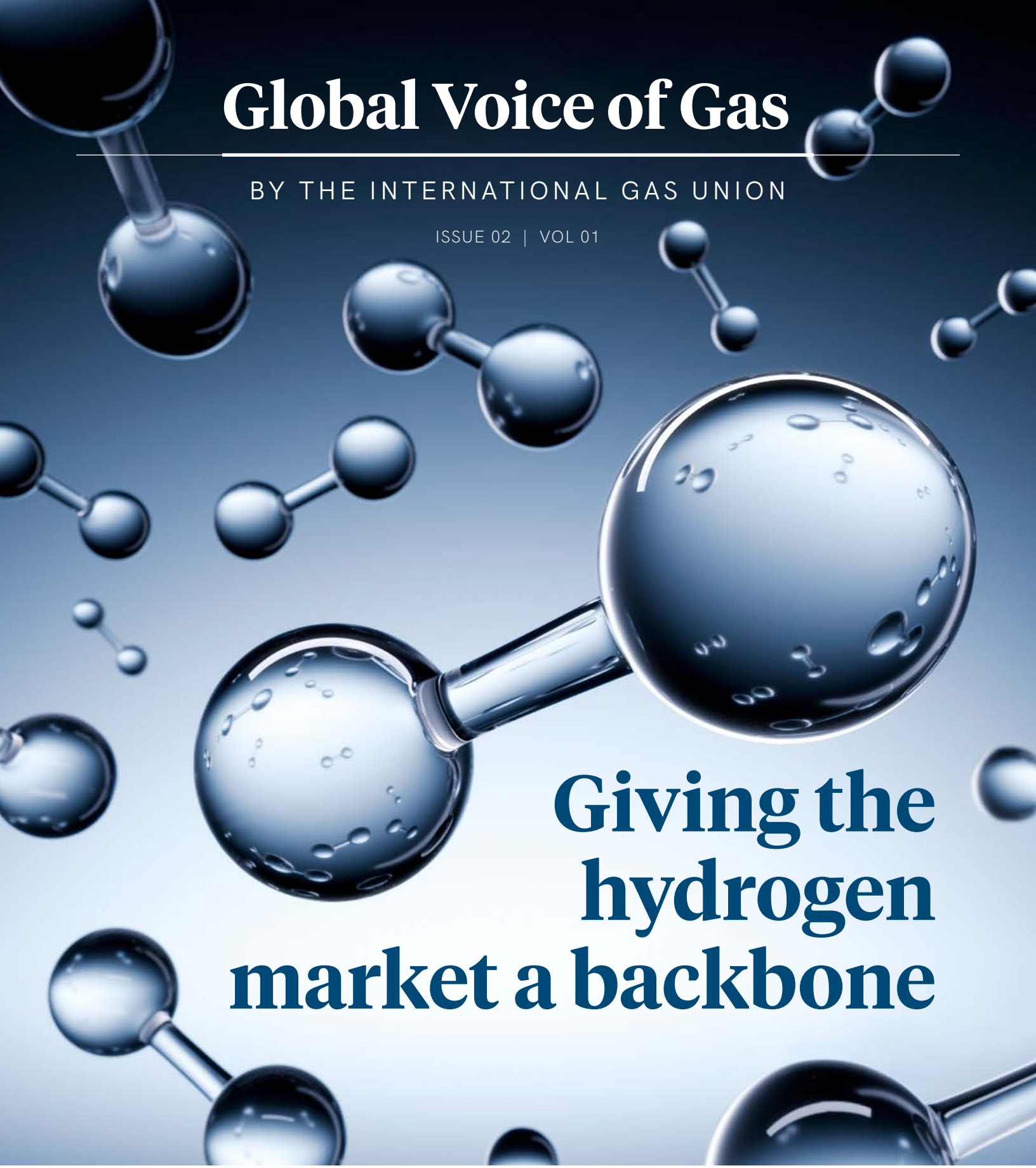

Giving the hydrogen market a backbone

Natural gas and the Covid-19 crisis: strength in adversity

Case remains strong for Mozambican LNG

Brazil's ongoing gas reform

Europe makes strides in CCS

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Contents

GAS SECTION

Natural gas and the Covid-19 crisis: strength in adversity

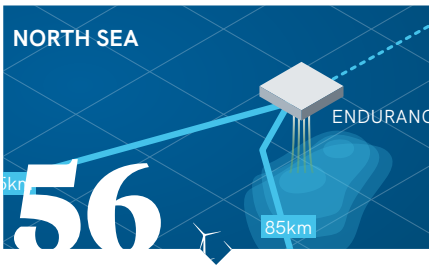
Gas trends in 2020-21: looking back, looking forward

Making the case for Mozambican LNG

Brazil's ongoing gas reform

HYDROGEN SECTION

EU sets its course on hydrogen



Europe makes strides in CCS

Giving the hydrogen market a backbone

Cleaning up heavy industry: how gas and hydrogen will help

Japan's hydrogen plans may need creative touch

DEPARTMENTS

From the President 4

Editor's Note.....6

Events

From the IGU Events Director 7

28th World Gas Conference Rescheduled to 2022.....8

Regional Update

North Asia-Australasia.....10

South & South-East Asia 11

Latin America & Caribbean ... 13

IGU News.....61

Messages

From the President

Dear reader,

Welcome to the second issue of the *Global Voice of Gas*, the digital magazine of the International Gas Union.

The six months since the first edition have seen many challenges and some exciting developments for the global gas industry.

The pandemic has truly shaken up the world, taking lives and crippling livelihoods.This year has not been kind to the most vulnerable. According to the World Bank, over 100mn people could be pushed into extreme poverty. Budget deficits reached levels not seen since World War 2, and the global economy will likely be almost one tenth smaller in 2030, than it would have been otherwise.

It has also had an historic impact on the energy sector – a dramatic 20% decline in investments, something we have never experienced.It threatens the sustainable development agenda, setting energy access back and forcing people to switch to dirtier fuels because of an affordability crisis. That in turn contributes to worsening air pollution, a major contributor to premature mortality, including from COVID-19.

There was a positive impact, with emissions dropping to levels not seen in a decade – also the biggest single cut in history. But it came at a great cost and unless significant actions to retool our economies for a sustainable recovery are planned in the coming months, it will be short-lived.Even though this current picture is looking pretty grim, I think that it highlights the value of the opportunity that lies ahead of us. The value is to rebuild better. And gas will play a key role in that.

Just last week the 7th IEF-IGU Ministerial Gas Forum heard a strong message from virtually every speaker on emissions reduction, including the need for real action on methane, but constant reminders on the reliability and affordability of energy, and the economic activity our industry underpins.

As you will see elsewhere in this edition of the *Global Voice of Gas*, the last six months has been a very busy period for the IGU. We have made the important decision to reschedule the next edition of the World Gas Conference from June 2021 to May 2022. We are confident this is the right move for our members, exhibitors and all participants, and that WGC2022 will again demonstrate our conference is *the* meeting place for the global gas industry.

Aligned with this change, the Korean presidency of the IGU will be extended until we hand over to China at WGC2022. China's Triennium will run from 2022 until 2025, when they will hand over to Italy – who was chosen by our full Council meeting last month to hold the Presidency from 2025 to 2028.

Also over the last few months we have completed the process to choose our next Secretary General, and we are delighted that experienced energy executive Mr Andy Calitz will lead us from the establishment of new permanent headquarters in London in August next year. Andy will join us as Deputy Secretary General for a four-month transition period from 1st of April 2021, working with our current Secretary-General Luis Bertran, who will step down in August and be named an Honorary Secretary-General for his six years' service to the global gas industry.

Another significant departure from our team was the resignation of our long-serving Public Affairs Director Mel Ydreos in July. Mel brought many innovations to our advocacy and outreach efforts in his time in the role – including this digital magazine – and we wish him well in his future endeavours.

On behalf of the entire Korea Presidency team, I wish you a happy ending to 2020 and a prosperous New Year and beyond.

We have risen to the challenge this year – and will do so again in 2021.

— Prof. Joe M. Kang
President, International Gas Union

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Editors' Note

Welcome to the second issue of *Global Voice of Gas (GVG)*, an International Gas Union publication, produced in collaboration with *Natural Gas World* (*NGW*), that sets a new standard in communication for the natural gas community worldwide.

The global natural gas market is recovering from what has been a turbulent year, during which Covid-19 has cut into demand and pushed prices to historic lows. This said, gas has proven more resilient to the crisis than other fuels like oil and coal, which saw greater declines in demand.

While the pandemic is far from over, positive developments in vaccine research are beginning to feed into cautious optimism, both for the gas industry and the broader global economy. Gas is helping economies bounce back from the crisis, by providing an affordable and secure source of energy. The gas market should tighten in the coming few years, spurring investment in new supply.

Next to the challenge presented by the pandemic is the one posed by climate change. Covid-19 restrictions led to the largest ever annual fall in emissions, but such reductions will be short-lived without structural changes in the way energy is produced and consumed, as well as prudent policy decisions. The gas industry has a vital role to play here, helping countries deliver quick and significant cuts in their carbon footprint.

Under such unprecedented circumstances, drastic cuts in investment across the industry are inevitable. But across the world, key upstream, midstream and downstream projects have nevertheless made progress. In this edition, we take a look at some of the bright spots in what has been a very testing year for the sector.

While the industry has come under significant pressure in 2020, the outlook for 2021 is better, with demand set to rebound and the market expected to tighten. Also, as part of this edition, we evaluate the trajectory of the market recovery.

The turbulence has also failed to dampen the longer-term prospects for Mozambican LNG exports. We profile the Total-led Mozambique LNG development, which earlier this year secured almost $15bn in debt financing, as well as other liquefaction projects underway in the southern African nation.

Meanwhile, Brazil is pushing ahead with the liberalisation of its gas sector – another topic we explore in depth in this edition. The government has chalked up some achievements under this reform effort, but there is more work yet to be done.

Hydrogen has garnered significant interest this year as a solution to decarbonising heavy industry and transport. As such, we devote a section of this edition to investigating the prospects for hydrogen as a source of energy and the ways in which natural gas can play a critical role in its development.

We take a look at the key goals outlined in the European Commission's landmark hydrogen strategy, which was published in July, leading European businesses and governments to announce a flurry of new hydrogen projects. The EC recognises the need for gas-based, so-called blue hydrogen, to achieve near-term emissions targets.

To make blue hydrogen a reality, though, there needs to be a significant upscaling of carbon, capture and storage technology, which is another area we investigate. We also weigh up the prospects for hydrogen's use in heavy industry, and how the contest will play out between blue hydrogen and renewable energy-derived, so-called green hydrogen. Last but not least, we explore Japan's ambitious targets for hydrogen, as part of its drive to become carbon neutral by 2050.

— Matthew Doman
Interim Public Affairs Director, IGU

— Joseph Murphy
Editor, Natural Gas World

From the IGU Events Director

RODNEY
COX
Director of Events, IGU

In our last edition I wrote about "Our History Creating our Future" and 2020 will be remembered as the year when we were put to the test ensuring our future was protected and enhanced. The breadth and depth of experience and wisdom in the IGU family has been a major factor in framing the vision of how we move our event portfolio to certainty and to facilitate pro-active event planning.

There is no better example than the rescheduling of the 28th World Gas Conference to WGC2022. Already, the certainty provided by this announcement can be measured by the industry re-engagement - See our major article on following pages. For further details visit our new website www.wgc2022.org and Frequently Asked Questions.

Other exciting developments include the announcement that Italy will the host the 30th World Gas Conference (WGC2028) in Milan following Italy's successful bid to hold the IGU Presidency from 2025 until 2028 – Check out the details here.

The Chinese Presidency will now run from 2022 to 2025 and culminate in their hosting of the 29th World Gas Conference (WGC2025) in Beijing.

Later this month we will announce details on the rescheduling of the 20th International Conference and Exhibition on Liquefied Natural Gas, to be held in St Petersburg.

Next month IGU announces the hosting of the 17th International Gas Union Research Conference (IGRC2024) following our successful IGRC2020 held earlier this year in Muscat.Full updates on all the IGU events will be in the next edition of the *Global Voice of Gas* magazine or at www.igu.org.

If you need any further information assistance on the IGU's portfolio of global gas events please email me, Rodney Cox, IGU Events Director.

28th World Gas Conference Rescheduled to 2022

Following an extensive industry wide review, the International Gas Union (IGU) in agreement with the Korean National Organising committee has rescheduled the 28th World Gas Conference in Daegu, Korea to May 23–27 2022. The event will be rebranded as WGC2022.

In announcing the decision, IGU President Professor Joe M. Kang said that the aim is to protect and enhance the role of the World Gas Conference as the premier global event for natural gas.

"Rescheduling until 2022 facilitates pro-active planning and innovation opportunities with a goal to present an event that reflects the evolving needs of participants and the industry," Professor Kang continued. "WGC2022 will be the first world-scale energy conference and exhibition in 2022."

Mr. Bong Kyu Park, Chairman of the WGC2022 National Organising Committee echoed Professor Kang's sentiments. "As we have one more year to prepare, we are committed to ensuring every effort to deliver a hugely successful World Gas Conference. We will enhance the program to be more dynamic and innovative featuring key themes around the ever-changing gas industry. We look forward to welcoming you," said Mr Park.

The WGC2022 rebranding sees a new website www.wgc2022.org which provides the latest details from the theme of the Korean Presidency "A Sustainable Future – Powered by Gas" through the latest Key-note speakers and Current Debates topics to the revised Call for Papers deadline. Another great resource for practical questions, including rescheduling details, is at our FAQ page.

PHOTO: ISTOCK.COM/YULENOCHEKK

PHOTO: ISTOCK.COM/YULENOCHEKK

The response to the rescheduling until May 2022 has been very positively received including from key exhibitors and sponsors who have been able to confirm participation decisions immediately upon receiving the news. In addition, reservations and inquiries have spiked in recent days, and a general sense of optimism is being observed in the market. Similarly, there is momentum with the confirmation of key-note speakers, further reflecting the important and unique role the industry places on face-to-face meeting opportunities at the World Gas Conference.

Amidst numerous challenges in 2020, the world has seen the continued focus on an energy transition that reduces carbon emissions while ensuring affordable, reliable and environmentally sustainable energy supply to communities right around the world.The IGU, leading the way in advocating for the political, technical and economic progress of the global gas industry, recognises this as an opportune time to continue to drive the energy conversation forward and reinforce the vital economic and environmental role of gas in a sustainable energy future. This advocacy will continue through 2021 and be showcased at WGC2022.

The dynamic and innovative WGC2022 program will feature key themes around gas as an essential resource in the delivery of reliable, affordable and sustainable energy. Energy leaders will examine the ever-evolving gas industry, the opportunities and challenges in technology and innovation, green finance, energy security, energy performance and clean air strategies across the globe.

The conference will also debate ways to reduce carbon intensity through alternative transportation fuels, the developing role of hydrogen and discuss environmental policies, economic development, leadership and much more.Policymakers, stakeholders and top decision makers from all sectors will be involved in a collaborative energy discussion and will determine the political and economic energy agenda for 2022 and beyond. WGC2022 will unite the entire gas supply chain with an expected 12,000+ attendees and 350 exhibitors, representing 500 companies from more than 90 countries, generating top headlines from international press present at this high-profile event. Throughout 2021 we will keep the industry fully updated on our innovations at the rebranded website wgc2022.org.

Professor Kang concluded: "It will be a truly unmissable experience and we look forward to reconvening with the leaders and experts from both within and outside the gas industry from across the globe under one roof in Daegu in 2022."

Keep up to date at www.wgc2022.org and save the date: May 23-27 2022 and join us at the state-of-the-art EXCO Convention Centre in Daegu, South Korea to drive your business forward and shape the future of the energy industry at the 28th World Gas Conference.

Regional Update

North Asia-Australasia Region

GRAEME BETHUNE
Chairman, Australian Gas Industry Trust, Australia

» The IGU's North Asia-Australasia Region includes China, Japan, South Korea, Australia and New Zealand and is one of the world's largest gas markets.

CHINA

» China is the largest regional gas consumer, and based on imports, its gas demand remained strong, despite Covid-19. In Q2 2020 total Chinese gas imports (LNG and pipeline) were up 4.8% year on year. This contrasts with Japan and Korea where imports were down by 8.3% and 8.9% respectively.

» After overtaking Korea in 2017 to become the world's second-largest LNG importer, China is now overtaking Japan, until now the biggest buyer. In Q2 China imported 16.1mn metric tons of LNG, compared with 15.0mn mt imported by Japan.

AUSTRALIA

» Australia is the world's largest LNG exporter and while prices have fallen, Q2 export volumes were only down 0.8% on a year earlier. Neither demand nor production have been badly impacted by the pandemic. Notwithstanding the challenges like restricted labour mobility and shipping caused by Covid-19, LNG production and trade continued to operate reliably.

NET-ZERO TARGETS

» Countries across the region are increasingly setting decarbonisation targets.

» On September 23, Chinese President Xi Jinping announced a commitment to reach carbon neutrality before 2060. China also has a Paris commitment to achieve peak CO_2 emissions at the latest by 2030. Under these plans the use of coal will be reduced, but there is no indication at this stage that China will reduce gas consumption.

» On October 26, Japanese Prime Minister Yoshihide Suga announced that Japan would pursue net zero-carbon emissions by 2050.

» On September 28, South Korea followed Japan with a pledge to achieve net zero emissions by 2050, as well as phase out nuclear power by 2060.

» Prior to these recent announcements, in November 2019 legislation was passed in New Zealand to reduce net emissions of greenhouse gases other than biological methane to zero by 2050.

» The Australian Federal Government does not have a carbon neutrality target although every Australian state has such a target. The Government supports gas development and has announced a number of measures to increase natural gas supply as part of an economic recovery package.

» The Australian gas industry has recently released *Gas Vision 2050*, which outlines a roadmap to decarbonising the natural gas sector to reduce emissions.

South & South-East Asia

HAZLI SHAM KASSIM
President, Malaysian Gas Association, Malaysia

MALAYSIA

» Petronas supplied the first cargo of LNG via its Virtual Pipeline System (VPS) in Peninsular Malaysia in September 2020. This paved way for more participation in LNG VPS by other local players.

» Malaysia is on course to becoming an LNG bunkering hub, with Petronas' first LNG bunkering vessel (LBV), MV Avenir Advantage, having undertaken its first ship-to-ship LNG bunkering transfer in November 2020.

THAILAND

» Natural gas demand dropped by 9% from about 4.8 to 4.3bn ft^3/day because of the lockdown and the comparatively low oil price. This was driven by a 30% decline in demand in the transportation sector.

» Natural gas accounts for 42% of primary energy and 60% of gas supply is consumed by the power sector. Thailand's economy is expected to recover gradually and reach the pre-Covid-19 level by 2022 or 2023.

» PTT used the Covid-induced low price environment as an opportunity to reduce costs and optimise its supply portfolio by importing more LNG spot cargoes at lower prices. In 2020, PTT imported seven spot LNG at an average price of around $2.5/mn Btu.

» Thailand has positioned gas as a critical transition fuel. The government is promoting gas as major generating fuel in its Power Development Plan (PDP), in which it accounts for about 50-60% of the fuel mix of the power sector for the next 20 years.

» Although some projects were deferred, the core business investments such as gas pipeline and LNG receiving terminal projects are still proceeding.

» Thailand is striving for regional LNG hub status and has prepared LNG-related facilities for services such as reloading, break bulk, bunkering and now they are ready to do commercial cargoes and services.

PHOTO: ISTOCK.COM/NIKKYTOK

INDONESIA

- Indonesia's energy policy calls for renewables to account for 23% of the national energy mix by 2025 but it expects coal to maintain its 60% share.
- In April 2020, PLN (Perusahaan Listrik Negara) launched a transformation programme called "Power Beyond Generations". Its focus is on renewable energy (geothermal, hydro, wind & small-scale renewables) and coal. Indonesia is pursuing clean coal technology and co-firing with biomass.
- Oil and gas companies in Indonesia will revisit their investment plans, including Pertamina, to determine which investments will proceed, and which will be deferred.
- Almost all industries have seen weakened performance due to the pandemic. Industry is the biggest consumer of electricity, which has seen consumption fall by around 20%.

VIETNAM

- In 2019, 33% of the country's power mix was met with gas and the rest by renewables and coal.
- Vietnam's gas-fired power generation capacity is expected to grow from 7.2 GW at present, to 15 GW by 2025 and 19 GW by 2030.
- The pandemic crisis and low oil prices postponed the development of more than 200bn m^3 of Vietnam's undeveloped natural gas resources.
- Vietnam has at least six major LNG import terminals planned, with construction starting on the Thi Vai LNG Terminal in October 2019.

SINGAPORE

- The first LNG bunkering vessel in Singapore is expected to become operational by the end of this year, providing ship-to-ship bunkering services in the port for the first time.

PHILIPPINES

- The Philippine energy secretary said four LNG import terminal projects worth about 65bn pesos ($1.34bn), which are at various stages of approval or financial closure, are still on track.

BRUNEI

- Oil and gas production declined by 1.3% year on year in Q2 2020. But gas output was more or less unchanged yr/yr at 34.3mn m^3/day, despite a decrease in LNG production.

INDIA

- India meets about half of its 160-170mn m^3/day of gas demand through imports. Consumption has been recovering since restrictions were eased in May.

Latin America & Caribbean

ORLANDO CABRALES SEGOVIA
President, Naturgas Colombian Gas Association, Colombia

» The Covid-19 crisis created significant challenges for the natural gas industry. However, the industry has shown resilience under the difficult circumstances and the region continues the efforts to increase demand and to bring affordable energy to families, better air quality to cities, and greater competitiveness to economies.

» The World Energy Outlook 2020 projected a 1.3% annual increase in energy demand in this region through 2030.

» Although countries in Latin America and the Caribbean are working on natural gas reactivation and encouraging production in the short and medium term, some of them might be facing uncertainties as lower GDP could delay gas projects.

ARGENTINA

» A new plan to incentivise natural gas production is being developed by the national government to offset the subsidised tariffs granted to households during the pandemic. Oil and gas activity plummeted this year because of the drop in the international oil price.

» The contract between YPF and the liquefaction floating facility was terminated, due to the low price that made difficult to justify LNG imports.

» Transmission companies plan to invest around $400mn in increasing the capacity of their gas pipelines and transport more production from Vaca Muerta.

BOLIVIA

» Between January and August 2020, the country's foreign trade contracted by almost a third compared to the same period in 2019, due to decreases in natural gas exports to Argentina and Brazil.

BRAZIL

» Brazil's government is considering opening up the gas market to private competition. This change, if it passes the Senate, might bring a new distribution and transportation regime that leads to higher competitiveness and attracts new investors (See article on page 33).

» There will also be new rules for construction, expansion and operation of pipelines and storage that require authorisation from the regulator.

» Petrobras is selling its distribution assets. A new framework has been agreed with gas producers to treat and transport the natural gas produced from the offshore fields. Brazil is expected to contribute to the growth of global production over the next five years as deep-water projects start to come online.

COLOMBIA

» During the lockdown, the natural gas industry ensured the supply to end users, and took measures to alleviate the economic impact of the pandemic on low income families, such as the free of charge reconnection of 117,000 families

to the service, the financing of gas bills for several months at 0% interest, and the contract renegotiation across the value chain to mitigate the impact of price increases on consumers.

» Colombia is advancing pilots to test the appropriateness of current regulations for shale gas reservoirs. If successful, the addition of shale production could expand Colombia's reserves fivefold.

CHILE

» Imports from Argentina have been irregular. Also, the government has announced an earlier phase-out of coal-fired generation which has created challenges to the gas industry to expand infrastructure to meet the new gas demand.

» Chile has established a long-term green hydrogen strategy to enhance renewable energy capacity, diversify its export-oriented economy, and meet its emissions targets.

MEXICO

» US natural gas exports to Mexico have been growing gradually following an expansion of cross-border gas pipeline capacity, and the country is still one of the US' largest trading partners in the gas sector.

» It was recently announced that gas infrastructure projects worth $4bn are coming to expand Mexico´s gas market.

PERU

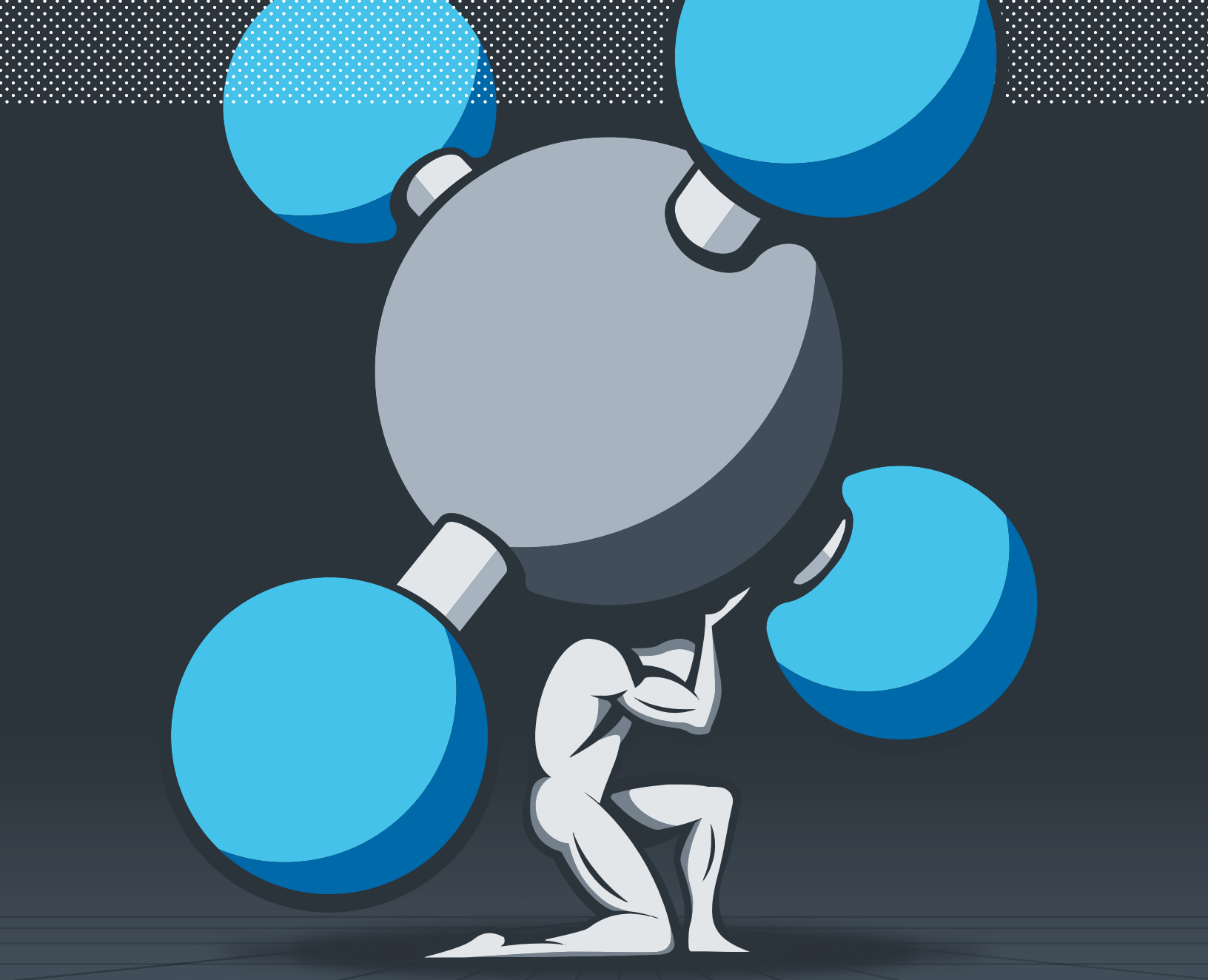
» Peru's government is implementing six energy projects in different regions of the country, which include initiatives to extend the penetration of natural gas in households and public transport.

» The government has announced a new gas pipeline in the south of the country and different fixed rates will apply to each demand segment.

TRINIDAD & TOBAGO

» The Caribbean island is still a major exporter of LNG, although its offshore production has been declining in recent years.

» Covid-19 made LNG projects scheduled after 2021 less certain of arriving on time. Meanwhile, the National Gas Company of Trinidad & Tobago is working on micro-LNG and is doing some research to modify Atlantic LNG facilities in order to accept smaller ships that can serve Caribbean regasification terminals.



Natural gas and the Covid-19 crisis: strength in adversity

The gas industry ensured stable energy supply during the crisis, and has a vital role to play in the economic recovery process

JOSEPH MURPHY

"There have been no reported cases of Covid-19 in Australia's oil and gas sector."

Global gas demand has held up relatively well this year, despite the unprecedented blow dealt out to economies by the Covid-19 pandemic.

The lockdown measures have put pressure on suppliers, both in terms of operational restrictions and financially, owing to the resulting drop in gas prices. With very few exceptions, though, suppliers were able to continue operating their facilities without disruption, unless forced to curtail output temporarily due to weaker demand.

The market should tighten in the coming years, supporting suppliers' bottom lines. But in the meantime, the increased affordability of gas will help drive economic recovery and strengthen the fuel's case as the most realistic means of scaling back emissions.

It is worth exploring the industry's experience through the crisis and the outlook moving forward in select countries and regions.

The view from Australia

While Australia's oil and gas sector was severely impacted by the Covid-19 pandemic, the industry continued to ensure stable energy supply while protecting the health and safety of workers, contractors and the communities in which it works, Andrew McConville, CEO of the Australian Petroleum Production & Exploration Association (APPEA), told *Global Voice of Gas (GVG)*.

Australia's resources sector notably worked with the government to develop national Covid-19 frameworks, principles and protocols, enabling employee movement despite travel restrictions. Notably the government sees a big role for the sector, promoting a so-called "gas-led recovery."

"These protocols built trust and respect from government at all levels because of the industry's responsiveness and initiatives – and to date, there have been no reported cases of Covid-19 in Australia's oil and gas sector," McConville said.

And while demand destruction and excess supply created "once in a generation challenges, the industry also continued to contribute strongly to the economy through ongoing trade and new investment," he added.

A recent report from EY found that the industry's contribution to Australia's GDP was up 24% through the pandemic on the previous year. Incremental investments also continued across the country, including Beach Energy's acquisition of Senex's Cooper Basin projects in South Australia, upgrades to Cooper Energy's plant in Victoria and supply chain developments with Chevron's acquisition of Puma Energy. →

PHOTO: ISTOCK.COM/NIELUBIEKLONU

Supply also continued to both domestic and international customers, with new supply agreements reached with local refineries, the mining sector, clean energy companies such as CleanCo, residential wholesalers and manufacturers. Gas accounts for nearly 24% of primary energy in Australia, with almost a third consumed by manufacturers.

Exports have also remained strong, McConville said, with East Coast LNG terminals shipping a record 6.7mn metric tons of LNG in October. Australia was able to retain its massive lead over other LNG exporters in the Chinese market.

McConville also pointed to positive developments on the regulatory front this year, including the approval of Santos' major new onshore project in Narrabri, the lifting of a moratorium on onshore exploration in Victoria and strong support for the development of the world class Beetaloo Basin in the Northern Territory.

"To facilitate ongoing investment and the industry's long term development, APPEA is now working with the Australian government to further improve our attractiveness as a home for scarce global capital," McConville said. "With a number of key final investment decisions pending for both major onshore and offshore projects in the coming months, these improvements will be critical to delivering on a real gas-fired recovery for Australia."

Australian prime minister Scott Morrison announced a series of policy measures in September to reinvigorate the country's oil and gas industry, in order to help drive economic growth.

"This is about making gas work for all Australians," he said. "Gas is a critical enabler of Australia's economy. "

With right policies and fiscal conditions in place, McConville said the oil and gas industry was "uniquely positioned to drive Australia's recovery." The industry has linkages across the economy, playing a role in almost all Australian industries. Indeed, the National Resources Australia government research centre has found that every direct job in the oil and gas sector sustains 10 others elsewhere.

The industry has also built up a strong track record in bringing in international investment. Over the last decade it has invested some A$473bn ($348bn) in projects for both domestic supply and exports to partners in Asia. Furthermore, the industry relies very little on direct investment or subsidies from the government.

"The overall prize for Australia is a stronger oil and gas industry, confidently investing in the next wave of competitive large scale, long-term projects, complementing the uptake of renewables, powering manufacturing and reducing emissions both here and overseas," McConville said. "The economic dividends from unleashing a new wave of oil and gas developments are immense."

A recent report by EY shows that this new wave could contribute as much as A$473bn to Australia's economy and create 220,000 jobs over the next 20 years. Increased gas use will also help the Asia-Pacific region deliver on the objectives of the Paris Agreement, as highlighted in the International Energy Agency (IEA)'s World Energy Outlook 2020.

"Industries such as oil and gas, along with mining and agriculture, must continue to be the engine of Australia's economy for the long-term future," McConville said. "This is our natural competitive advantage which must be leveraged with commercial pragmatism, not constrained through social ideology and unnecessary market interventions. Some simple changes to the timing of some investment allowances and reductions in red and green tape would help to make Australia much more competitive for global investment in the future."

The view from Canada

When lockdowns began in Canada, utilities were declared an essential service, underpinning the value of the energy they provide 24-7 to homes, businesses, industries and other essential facilities such as hospitals.

"From the start of the first wave of lockdowns, utility workers operated around the clock to →

“The men and women who work in Canada’s natural gas utilities are the heart of our industry.”

ensure the reliable supply of natural gas, conduct maintenance and repairs, and meet the broader needs of their customers,” the Canadian Gas Association (CGA) told *GVG*.

The CGA’s members “had pandemic plans in place before Covid-19 had even hit,” the association said. “Utility staff were well prepared to regularly engage with stakeholders and authorities on any particular concerns that arose, so as to ensure continued safe and effective delivery of energy services.”

A similar commitment to growth and innovation is guiding the industry in its future planning, the CGA said.

“As Canada contemplates how to achieve a quick economic recovery, the natural gas delivery industry has proposed a variety of significant projects that will not only create near term jobs, but also expand access to reliable and affordable energy, and reduce emissions.” the association said. “The set of projects we have proposed fall under four broad categories: the development of renewable gases such as hydrogen and renewable natural gas, retrofits and energy efficiency, infrastructure and LNG, and natural gas as an alternative transportation fuel.”

“The men and women who work in Canada’s natural gas utilities are the heart of our industry” commented Timothy M. Egan, President and CEO of the CGA. “They are committed to support their customers – the families, businesses and industries across the country that depend on reliable, affordable and clean natural gas energy, not only through crises but each and every day.”

The view from Europe

Some of Europe’s largest economies were among the first to impose lockdowns in the early stages of the pandemic. But gas demand proved more resilient to the crisis than consumption of other fuels like oil and coal.

Gas serves an important role in the continent’s energy mix, accounting for over a quarter of its total primary energy demand. In Germany, Europe’s largest gas market, “natural gas has remained the most resilient fossil fuel throughout the Covid-19 crisis,” Timm Kehler, chairman of German gas association Zukunft Erdgas, told *GVG*.

Gas “was largely unaffected by massive price drops, recessions or shortages,” he continued. “As a matter of fact, as people spent more time at home, the sales of gas boilers and new grid connections surged in the last months.”

Zukunft Erdgas is “confident that the gas consumption will grow in the coming years,” Kehler →

PHOTO: ISTOCK.COM/CWEIMER4

> **“Natural gas, as an affordable and low-carbon fuel, provides solutions to both of our most pressing current topics: recovering the economy and fighting climate change”**

said. “Natural gas, as an affordable and low-carbon fuel, provides solutions to both of our most pressing current topics: recovering the economy and fighting climate change.”

Europe’s post-pandemic recovery plan should “continue to provide reliable energy supplies, that can help to relaunch our industry, while supporting “a resilient energy system that can achieve carbon neutrality goals,” James Watson, the secretary general of European gas association Eurogas, told *GVG*.

Energy efficiency, increased electrification and the greening of the power sector will have a key role to play in the energy transition and the post-Covid-19 recovery. But Eurogas stresses that natural gas-derived hydrogen and other clean gases are needed as cost-effective solutions to decarbonise economies and help them grow back.

“Gaseous solutions are needed for relaunching the EU industry, securing jobs for European citizens and maintaining industrial leadership for European businesses, while delivering on the climate neutrality goal,” Watson said. “To reach climate neutrality, the EU has to decarbonise the gas molecule – our industry is ready to do just that.”

The view from Malaysia

In Malaysia, domestic gas supply was maintained with reliability exceeding 99% during the pandemic, the Malaysian Gas Association (MGA) told *GVG*.

“Gas ensured that operations in the two critical sectors, namely electricity and manufacturing of personal protective equipment, remain uninterrupted,” MGA said. Malaysia dominates the world’s medical rubber glove industry, commanding a market share of around 65%.

MGA pointed to several areas where the Malaysian gas industry is making progress, in spite of the pandemic. Although a major LNG exporter, Malaysia also imports LNG as well. Third-party participation in regasification capacity is expected to increase in 2021, with the committed release of 100mn ft^3/day of regasified volumes to third parties. One licenced third-party importer, Petrolife Aero, has indicated plans to bring in LNG cargoes beginning in January 2021.

Malaysia is also expected to see an increase in gas supply via its so-called virtual pipeline system (VPS). National gas company Petronas launched its first LNG VPS solution in Peninsular Malaysia via the regasification terminal in Pengerang, Johor, in September. This follows the earlier success of micro-LNG VPS facilities by Sabah Energy Corp at the Kota Kinabalu Industrial Park (KKIP) that serves the Sabah state.

Another market development is the launch of ship-to-ship LNG bunkering by Petronas in November, using its first own LNG bunkering vessel, *Avenir Advantage*.

“The strategic location within the world’s busiest shipping lane, makes Malaysia well-positioned as a future LNG bunkering hub in southeast Asia,” MGA said. ■

GAS TRENDS IN 2020-21:

looking back, looking *forward*

The global natural gas market took a battering this year and the impact of this will continue to be seen into 2021, but there are also bright spots

ANNA KACHKOVA

The global natural gas market is recovering from a turbulent year, during which Covid-19 hit demand and pushed prices to record lows. The risk of further volatility remains as a new series of lockdowns is underway in Europe, but there is cautious optimism over the trajectory of the recovery, despite warnings that certain dynamics could yet slow its pace. →

Looking back

The oversupply of natural gas that has been a central feature of 2020 had already been becoming evident prior to the pandemic. In the US, this was in large part driven by associated gas production from the Permian Basin. Moody's Investors Service estimates that in 2019, oil wells accounted for about 17% of US gas production, noting in a recent report that Permian producers "proved insensitive to the decline in natural gas prices" and continued adding to the oversupply.

Globally, meanwhile, the situation was exacerbated by a wave of new liquefaction capacity coming online – and new upstream gas projects starting up in tandem to provide feedstock for these LNG facilities.

A mild Northern Hemisphere winter in 2019-20 exacerbated the oversupply of LNG, and higher volumes of the super-chilled fuel were redirected to Europe – where storage capacity was available – as Asia struggled to absorb it.

It was against this backdrop that the pandemic hit, upending some of the expectations for 2020 and forcing the industry to re-evaluate its forecasts for this year and beyond. And while considerable uncertainty over short-term dynamics remains, some of the adjusted projections, with the pandemic factored in, are now playing out as expected. For example, US gas prices have only recently begun to rise, helped by the drop-off in Permian Basin drilling and associated gas production. However – as was widely predicted – the boost to prices is only being seen now.

"We were expecting [US gas] prices to increase to around $3/mn Btu, but only during Q4. We didn't see this happening before because we still had some volumes coming into the US market from previous investment decisions," Rystad Energy's head of gas and power market research, Carlos Torres Diaz, told *Global Voice of Gas (GVG)*. "So most of the adjustments were expected to happen during the second half of the year, and more specifically in Q4, which is also the time when demand starts to increase due to seasonality."

An Enverus senior associate and geoscience technologist, Jen Snyder, told *GVG* that the initial expectations of the pandemic's impact on US associated gas production had been met.

"US production is down 10% since the start of the year, with additional month-to-month declines possible through the end of the year," she said. "Through summer, cuts in demand outpaced cuts in supply, but in recent weeks, stronger global prices and LNG feed gas recovery mean demand is now running well ahead of supply."

LNG is an area where the collapse in demand was particularly evident earlier this year, and US exporters of the fuel saw much of the impact, given the nature of their offtake agreements. Over 110 LNG cargoes scheduled for loading from US →

terminals over June-August 2020 are estimated to have been cancelled, but the cancellation rate has since slowed.

"My feeling is that most of the pressure in the summer – natural gas prices in Europe, declining Asian LNG prices in the summer –is probably attributable to the giant oversupply of LNG," a Moody's senior vice president, Elena Nadtotchi, told *GVG*.

Overall, however, gas was not hit as hard as oil by the pandemic and the first wave of lockdowns. And this suggests the gas recovery would be relatively resilient even in the face of a new series of lockdowns.

"Gas demand is less leveraged to transportation than oil markets, and lockdowns that keep many workers home and limit commutes can add to residential electric and heating demand," said Snyder. "Unless industries again shut down, we expect demand to remain ahead of supply."

Bright spots

Even given the volatility of the gas market over most of this year – including price weakness, LNG cargo cancellations and a drop-off in final investment decisions (FIDs) on new gas and liquefaction projects – 2020 was not all bad for the industry. Some bright spots have been identified, with both Snyder and Torres Diaz separately pointing to the fact that gas has been taking market share away from coal.

"I think this has been a good opportunity for gas actually, despite the lockdown and the challenges, because this has accelerated the move away from coal and into gas because of the low prices," Torres Diaz said. He added that this served as an opportunity for gas producers to position themselves as being reliable while producing lower emissions than the coal industry.

"On the other hand, if gas prices increase a lot and coal prices remain largely at the current level, then we can see coal come back, because if countries prioritise economic development over emission policies, then they will consume coal," he noted. However, he pointed to the growing number of countries adopting stricter targets for reducing emissions, including net zero emissions goals, as a trend that could benefit gas producers.

Snyder, meanwhile, also saw positives for the LNG industry in the way this year has played out.

"Global gas markets slumped hard this summer following the Covid-induced lockdowns, but the number of LNG buyers who picked up cargoes and added contracts – including India and Pakistan – proved the resilience of the market and continued to expand the playing field for LNG sellers," she said. →

PHOTO: ISTOCK.COM/DANI3315

Looking forward

Much uncertainty remains in the near term, especially over how Covid-19 will play out. However, there is optimism over 2021 being a better year for the gas industry, though this is tempered by warnings that the pace of the recovery may be slowed, including by further lockdowns that are already underway.

"I think the impact of these new lockdowns will be that the rebalancing of the global market will take longer," Nadtotchi said. She added that while Moody's was more optimistic over market conditions in 2021, she expected more of the LNG market rebalancing to take place in 2022.

"Additional volumes are so significant that it would normally take a couple of years to absorb it," she said. "And now with all the interruptions on the demand side, it's more likely to take more than a couple of years."

Nadtotchi also noted that in the US, associated gas production is a "wild card", dependent on oil price trends.

Rystad too is more optimistic when it comes to 2021, though Torres Diaz warned that additional volumes coming onto the market in the US would limit gas price increases somewhat.

"We're definitely expecting [global] demand to rebound in 2021, and maybe grow at a rate of around 3%," he said. "And this will help balance the markets even better." As a result, Rystad expects gas prices to be higher on average in 2021 than they were this year.

The consultancy is also more optimistic about new projects being sanctioned next year.

"There were a lot of investments that were put on hold during 2020," Torres Diaz said. "And we are expecting that some LNG projects that are awaiting final investment decisions could be moving ahead in 2021. Because we see higher market prices, then buyers could also be interested in starting to sign new long-term agreements that could help these projects move forward."

There was one project that did reach an FID this year: the Sempra Energy-operated Energia Costa Azul (ECA) LNG project on Mexico's Pacific coast. Under its first phase, the plant will produce 3.25mn mt/yr of LNG.

Enverus, for its part, also expects gas prices to strengthen over the coming months, though it warned that this could be undermined if this coming winter proves to be mild. Snyder also noted that "gas will likely give some market back to coal in 2021 to keep markets in balance".

Asia is expected to keep driving the global gas demand recovery. Moody's anticipates that China's gas demand will continue growing at around 10% per year between now and 2025, after slowing to a projected 4-5% in 2020. China, along with several Southeast Asian countries, was described by Moody's in a recent report as "crucial" to LNG growth over the coming years. Meanwhile, European gas demand is also expected to keep growing. And both Europe and China have set long-term decarbonisation targets that make them likely to increasingly shun coal in favour of gas. ■

Making the case for Mozambican LNG

Low LNG prices and an oversupplied market have not dampened the longer-term prospects of Mozambique's LNG projects

ANNA KACHKOVA

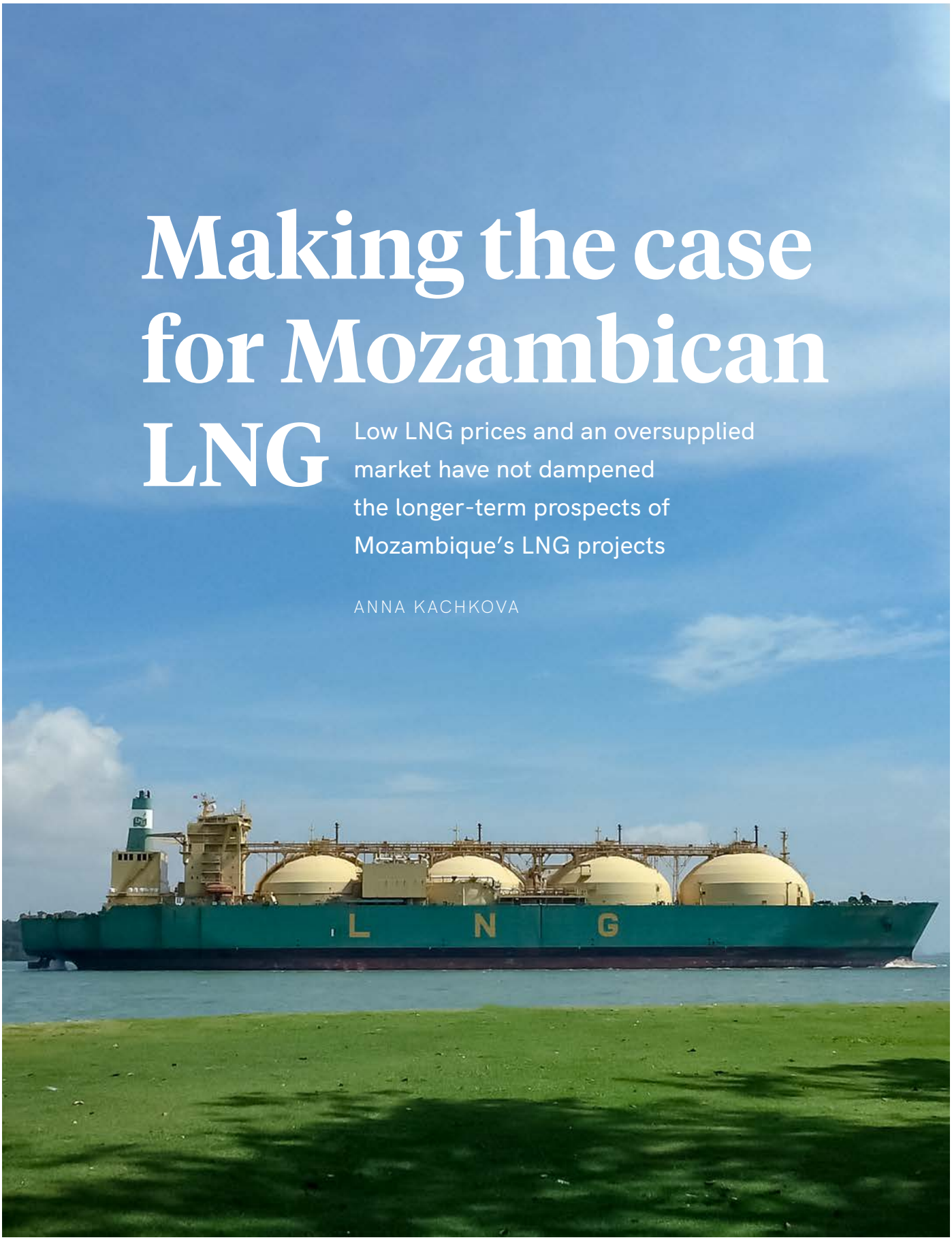


PHOTO: ISTOCK.COM/MARKSIN_TKASCHENKO

> **"Mozambique's geographic location means the country is well-positioned to meet the needs of customers in the Atlantic and Asia-Pacific markets, and to tap into the growing demand for energy in the Middle East and Indian sub-continent"**

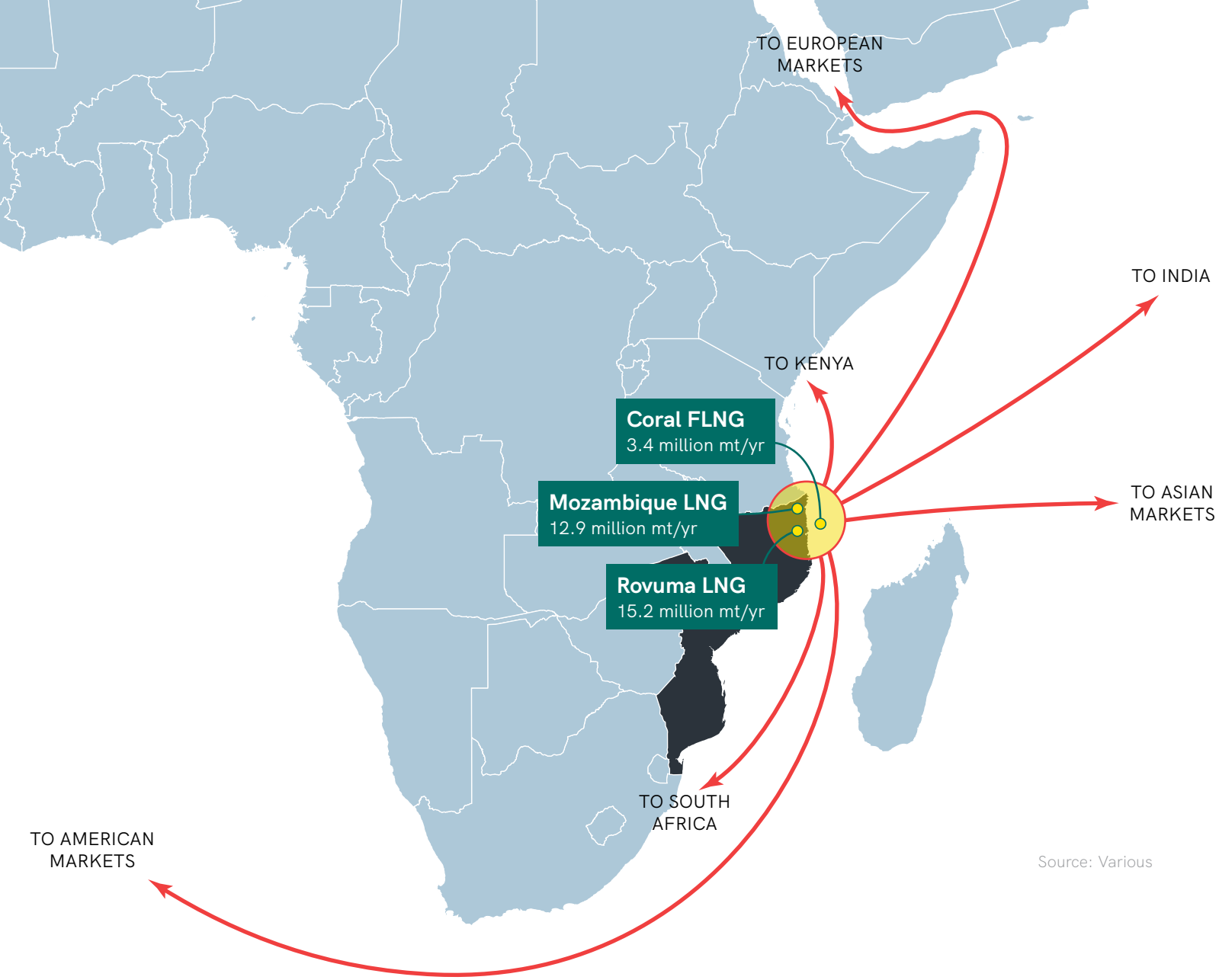
A turbulent year for the LNG market does not appear to have dimmed the longer-term prospects for Mozambique's liquefaction projects – two of which are under construction, with a third proposed. The projects are underpinned by abundant gas resources in the Rovuma Basin offshore northern Mozambique.

As things stand, the Eni-led Coral South floating LNG (FLNG) project is due to come online in Area 4 of the Rovuma Basin in 2022. It will be the world's first ultra-deepwater FLNG project, operating in water depths of 2,000 m. This will be followed by the Total-led onshore Mozambique LNG, which will use feed gas from offshore Area 1, starting up in 2024. And a final investment decision (FID) is still awaited on the ExxonMobil-led Rovuma LNG project, which would use feed gas from Area 4.

The FID on Rovuma LNG was delayed earlier this year until 2021 amid the market downturn caused by Covid-19. Meanwhile, all three projects have to contend with mounting security concerns related to the ongoing insurgency in northern Mozambique's Cabo Delgado Province. However, despite both project-specific and regional-level challenges, the project developers remain relatively bullish on Mozambique's prospects as an eventual LNG exporter, and others appear to agree.

Betting on Mozambique

In July, France's Total announced that it had secured $14.9bn worth of debt financing for Mozambique LNG – the largest ever project financing in Africa. The deal, which includes direct and covered loans from eight export credit agencies (ECAs), 19 commercial bank facilities and a loan from the African Development Bank (AfDB), covers the majority of the $20bn total investment required for Mozambique LNG. Total's chief financial officer, Jean-Pierre Sbraire, said at the time that the financing agreement demonstrated the "confidence placed by the financial institutions in the long-term future of LNG in Mozambique". →



This confidence has been attributed to a number of factors, including the size of the gas resource, as well as Mozambique's geographic advantage, which will allow it to serve multiple markets.

"Mozambique's geographic location means the country is well-positioned to meet the needs of customers in the Atlantic and Asia-Pacific markets, and to tap into the growing demand for energy in the Middle East and Indian sub-continent," a Total spokesperson told *Global Voice of Gas (GVG)*.

Brokerage and consultancy Poten & Partners' head of business intelligence, Jason Feer, agreed that even with the current downturn in the LNG market, there were still advantages to developing projects in Mozambique.

"The underlying logic for the projects remains, their geographical advantage remains in place. It's stranded gas, so the feed gas has a more stable price," he told *GVG*. "There are advantages to a project in Mozambique that other projects don't enjoy."

Feer said this was the case whether Poten's LNG demand forecast – which he described as relatively conservative at 480mn metric tons/year by 2030 – or a more bullish demand forecast was used.

"You need some chunky projects to get built to hit that target, never mind some of the more →

aggressive demand forecasts – 550-600mn mt/yr by 2030," he said.

Indeed, Poten's forecast sees the market rebalancing just as Mozambique's projects are scheduled to begin entering service. According to Feer, the LNG market is expected to be "pretty balanced" by 2022 – the year Coral South is due to start up – followed by a fairly tight market for a few years from 2023. "It depends on when projects are built, when they enter service," Feer said, adding that there did not appear to be any real incentive for developers to delay project schedules based on the events in 2020.

The Total spokesperson, meanwhile, noted that despite the challenges associated with the pandemic, Mozambique LNG "continues to make good progress".

And if the projected growth of demand plays out, this also strengthens the case for Rovuma LNG to go ahead. Feer noted, however, that ExxonMobil was under "a lot of pressure" from its partners in the project – which comprise Eni, China National Petroleum Corp. (CNPC), Mozambique's ENH, Portugal's Galp and Korea Gas (Kogas) – to cut project costs.

Hurdles

There are additional hurdles for all projects to overcome, including short-term measures in response to Covid-19 and also steps to ensure the security of staff and infrastructure given the risks related to the insurgency in the region.

In late October, Total announced that it had signed a new memorandum of understanding (MoU) with the Mozambican government on ensuring security for its liquefaction project through a joint task force. →

PHOTO: ENI

> **"Whether it's security, whether it's Covid, whether it's a partner who wants them to cut costs more – none of those things really change the underlying logic of the projects. It's just obstacles you have to get over."**

"The Mozambican government has deployed a military presence in certain areas of Cabo Delgado province affected by the insurgency. As we understand the situation, this presence is intended to address the insurgency and protect the local population," Total's spokesperson said. "Total is working in collaboration with the government and all stakeholders to promote an enabling environment in which the catalytic potential of the project can be channelled to address the security and social challenges of the region." The spokesperson noted that details of the MoU could not be disclosed owing to its confidential nature.

Feer said that whether the security situation would affect the timelines of the projects depended on a number of factors, including how adept the government is at maintaining security, and what the companies themselves are able to do. This will become clearer further down the line, however.

"I think it's a little early in that process of bolstering security to know what kind of delays they will see – if any," Feer said.

He went on to identify one further obstacle for Rovuma LNG specifically as it awaits FID, which he said was more of a longer-term trend, though the pandemic has been playing into it to some extent.

"The problem that a lot of project developers are having is getting those long-term contracts, finding credit-worthy offtakers," he said. It does not necessarily have to be 20-year contracts, he continued, as demonstrated by Mozambique LNG, which has certain offtake agreements in place for 13-year terms. Nonetheless, Feer said that terms of around 15-20 years were what developers are looking for to help underpin projects and secure financing.

"That's something that everybody's wrestling with – you have buyers who are reluctant to sign long-term contracts, because they don't feel that they can predict demand as accurately. Prices have been cheap for a while – some people think prices are going to stay cheap forever."

However, ExxonMobil is already proceeding with Golden Pass LNG in the US without having disclosed any offtake agreements for that project. While the FID on that project was taken last year, prior to the downturn, it illustrates that bigger players have options available to them. Nonetheless, locking in buyers remains important, but is not necessarily an insurmountable obstacle.

"There are a lot of things that have to be overcome to get to FID," Feer said. "But I think the logic of the projects still stands up. And every strike – whether it's security, whether it's Covid, whether it's a partner who wants them to cut costs more – none of those things really change the underlying logic of the projects. It's just obstacles you have to get over." ■

Sempra Energy's Energia Costa Azul import and regasification terminal in Mexico, where the ECA LNG project will be developed.

Sempra LNG is First Bi-Coastal LNG Developer

With its mid-November final investment decision (FID) on its $2bn Energia Costa Azul LNG (ECA LNG) project planned for Mexico's Pacific Coast, Sempra LNG has become the first US LNG developer with projects on two North American coasts.

Last summer, it began full commercial operations at the 12mn metric tons/year (mt/yr) Cameron LNG project (50.2%-owned), where it continues to advance the development of a fully permitted expansion of the facility with the Cameron LNG partners. Additionally, Sempra LNG is moving towards commercialization of the 13.5mn mt/yr Port Arthur LNG project in Texas.

With just weeks left in the calendar year, Sempra LNG and IEnova, Sempra Energy's subsidiary in Mexico, are the first global LNG developers to take FID on a major export project with direct access to Texas and western US basins in 2020. To reach the milestone, the two companies overcame several unique challenges, including complex tax rules across jurisdictions, the oil market crash and regulatory uncertainty in the Mexican oil and gas sector, including the need for a first of its kind 20-year export permit.

"This project would be the first LNG export facility on the Pacific Coast of North America that can help connect abundant natural gas supplies from Texas and the western US directly to markets in Mexico and countries across the Pacific Basin," Sempra LNG CEO Justin Bird said. "This important milestone is a testament to the resiliency of our team and marks the latest step toward our goal to be North America's premier LNG infrastructure company."

ECA LNG's location on Mexico's Baja California coast gives it a significant competitive advantage over US Gulf Coast export terminals. Bypassing the Panama Canal, LNG can be delivered to key Asian markets in as little as 11 days, as opposed to 21 days from the Gulf Coast.

And while it fulfills Sempra LNG's goals of promoting the use of natural gas as an important source of energy in a lower-carbon economy, ECA LNG is also a critical component in Mexico's energy future, IEnova CEO Tania Ortiz Mena says.

"As one of the largest private investments in the history of Baja California, ECA LNG's liquefaction-export project is expected to help support the Mexican economy through investment, tax revenue and jobs," she says. "The project is also expected to positively impact the local community through social investment programs as well as help position Mexico as a key player in the global trade of natural gas."

ECA LNG is initially being developed as a single-train, 3.25mn mt/yr (nameplate) liquefaction project, although a potential second phase of the project could boost capacity to 12mn mt/yr. TechnipFMC was awarded a lump-sum turn-key engineering, procurement and construction contract in February, and is targeting first LNG production in late 2024.

Japan's Mitsui & Co and France's Total have committed to taking all of ECA LNG's initial offtake capacity of 2.5mn mt/yr under 20-year contracts.

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Brazil's ongoing gas reform

Brazil is pushing ahead with the liberalisation of its gas sector, having already effected significant change

JENNIFER DELAY

Brazil took the next step towards liberalisation of its natural gas sector in early September. Members of the lower house of the country's Parliament voted 351-101 in favour of a reform bill that is designed to promote competition and eliminate red tape.

As of early November, the legislation was due to go to the upper house, where it must gain majority approval before it can be sent to President Jair Bolsonaro for signature. It may lose some momentum there, as a number of Brazilian senators are reportedly pushing for revisions that would subsidize regional pipeline construction projects. Nevertheless, the bill is expected to pass.

Assuming that it does, it will mark the continuation of a process that began more than a year ago. Bolsonaro's administration unveiled its "New Gas Market" policy in April 2019, and the National Energy Policy Council (CNPE) gave a green light to the new regulatory framework the following June. Since then, the Brazilian government has begun implementing the policy, which is designed to loosen state-run Petrobras' hold on the gas industry. →

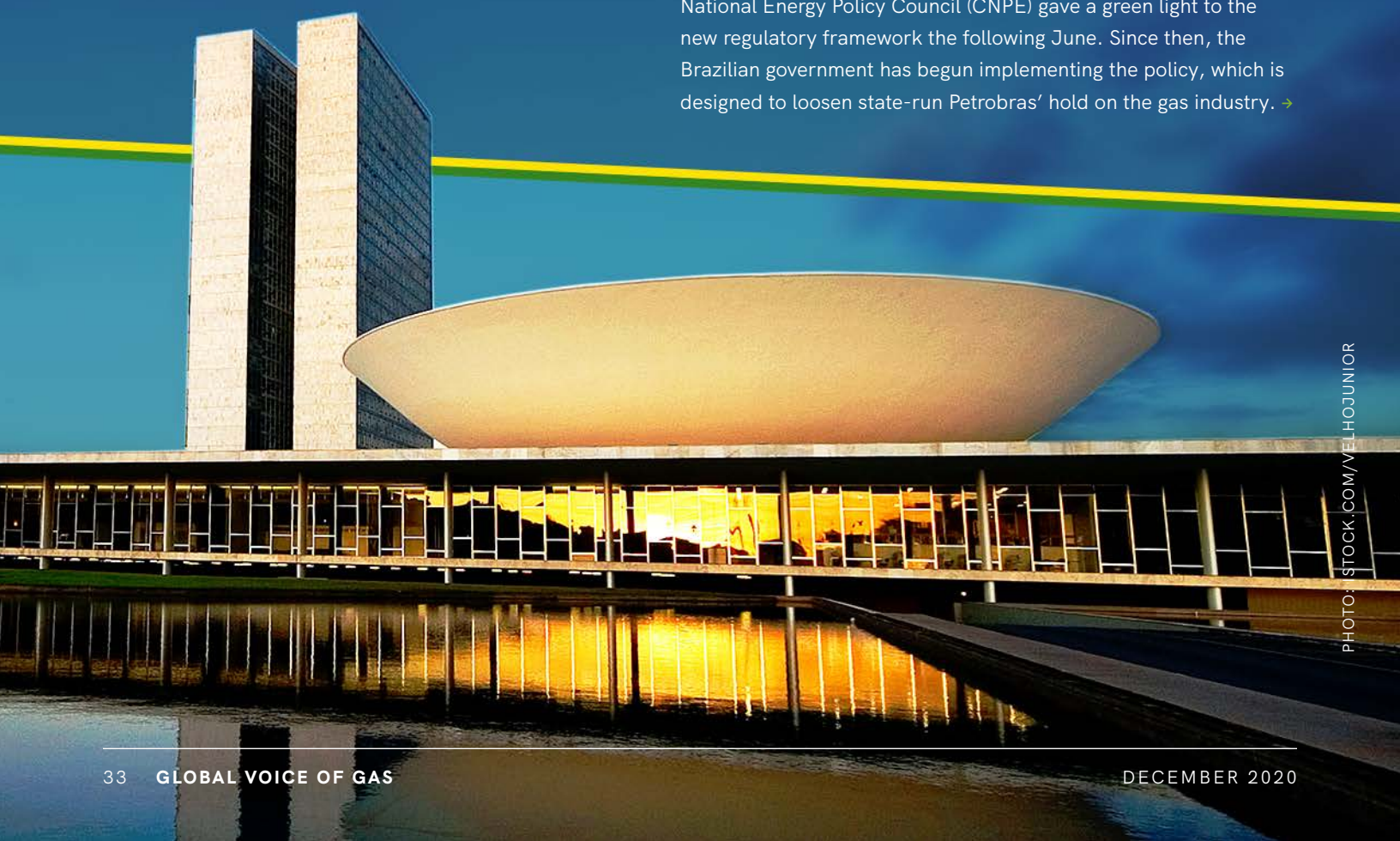

PHOTO: STOCK.COM/VELHOJUNIOR

> **"Brazilian industry faces some of the highest natural gas prices in the world, paying up to seven times as much for gas as companies in the United States"**

In more concrete terms, the reforms serve to eliminate Petrobras' monopoly on gas production, transmission and distribution operations, and they do so with the aim of optimising production levels, prices and consumer satisfaction. This article will outline the government's policy goals and take a brief look at how the reforms are playing out along the upstream, midstream and downstream sections of the gas value chain.

Policy goals

During his campaign for the presidency in 2018, Bolsonaro made clear that he favoured reform in the energy sector. In general terms, he expressed support for the privatisation of Petrobras, saying he was willing to let the company be sold to private investors so long as the state retained a blocking stake. He called for giving international oil companies (IOCs) more access to offshore oil and gas deposits. He also pushed for market-driven policies, saying he backed the elimination of price controls on fuel and reductions in local content requirements.

With respect to gas, Bolsonaro backed calls to end Petrobras' monopoly on the sector. He argued that the company ought to grant third parties access to gas pipelines and other infrastructure facilities such as processing plants. Taking these steps, he declared during the campaign, would make gas more widely available and drive demand upwards, thereby supporting efforts to promote the use of gas as a lower-emissions fuel. His administration argued that reforms "could result in a 'shock of cheap energy' that will support industry recovery and economic growth," Henrique Anjos, a gas and research analyst with Wood Mackenzie, told *Global Voice of Gas (GVG)*.

The New Gas Market policy was broadly in line with Bolsonaro's positions during the campaign. After the election, the president continued to stress his conviction that reforms would help the industry by attracting investment. He and his supporters also asserted that the proposed changes would help consumers by increasing competition and thereby bringing prices down.

This has been an attractive argument, given that the South American state's gas market has traditionally been anything but competitive. As Lisa Viscidi, the Director of Energy, Climate Change & Extractive Industries Program at the Inter-American Dialogue (IAD), told *GVG*: "Brazilian industry faces some of the highest natural gas prices in the world, paying up to seven times as much for gas as companies in the United States. The gas sector has long been dominated by Petrobras, which controls pipeline infrastructure, deterring other companies from entering the market and thus stifling competition."

Since his election, Bolsonaro has argued that one way of fostering this competition was to promote supply diversity through such steps as facilitating gas imports from Argentina. He has also come out in favor of unbundling – that is, preventing companies involved in upstream gas production from also carrying out downstream activities such as distribution. Additionally, Viscidi noted, he has backed plans to require that third parties be given access to transportation infrastructure such as offshore pipelines and LNG import terminals.

Upstream

The New Gas Market reforms have not had an extensive upstream component. Instead, they →

have largely focused on the issue of access to infrastructure.

Nevertheless, the government has taken steps such as lifting restrictions on the development of unconventional reservoirs, which yield far more gas with the application of hydraulic fracturing (fracking) and other new techniques. Fracking projects have generated no small amount of controversy in other Latin American countries; Colombia, for example, has seen its plans to launch pilot fracking projects tied up as a result of court cases.

And for its part, Petrobras is unloading some of its mature gas fields within the framework of its divestment campaign. In mid-October, Reuters reported that the company was discussing the sale of the offshore Peroa cluster to a consortium of Norwegian and Brazilian companies. If the deal goes through, Peroa will become one of the first assets sold by Petrobras to consist entirely of gas-bearing sites.

Midstream: Pipelines

On the midstream end, the New Gas Market policy has had a greater impact. It has served to open the country's trunk pipeline system, previously under the exclusive control of Petrobras, in at least two ways.

On one hand, it has facilitated the sale of certain midstream assets. Just a few short weeks after CNPE approved the reform programme in mid-2019, Petrobras announced plans to sell off stakes in the country's two largest gas transport operators – Transportadora Asociada de Gas (TAG) and Nova Transportadora do Sudeste (NTS). Together, these two companies operate about two thirds of Brazil's gas pipeline network.

The state-owned company had already sold off 90% of NTS to Canada's Brookfield Asset Management in 2016. Last year, though, it said it wanted to auction off a 90% stake in TAG, along with the remaining 10% of NTS. It quickly arranged to sell the majority TAG stake to a unit of France's Engie and the Canadian investment fund Caisse de Depot et Placement du Quebec (CDPQ) and agreed to put the minority NTS stake up for sale in late 2019.

Then in July 2020, Petrobras agreed to let Engie and CDPQ acquire the other 10% of TAG. Around the same time, it also moved ahead with plans for the sale of the last 10% of NTS. As of press time, it had not yet named the top bidder for the NTS stake, but Brookfield is believed to be interested in bringing its holdings up to 100%.

Initially, these midstream divestment plans only concerned onshore pipelines. However, Petrobras has said it wants to unload its share in Rota-1, -2 and -3, the gathering pipelines that serve offshore fields in the Santos basin. This could prove tricky, Anjos said. "Regarding the offshore infrastructure sale, Petrobras will need to find a balance to recover past costs and, at the same time, not hinder the economics of its [gas sales]," he commented.

On the other hand, Petrobras has also made capacity in midstream networks available to third parties. In the late summer of 2019, for example, it declared open season on bidding for capacity in Gasbol (TBG), a cross-border pipeline used to import gas from Bolivia. This did not yield much in the way of immediate change, as Petrobras swept the first open season, laying claims to 18.08mn m^3/day in the pipeline for 2020 and 8mn m^3/day for 2021.

However, Petrobras remained hopeful. In August 2020, it restart the open season process for Gasbol, which has a capacity of 31.15mn m^3/day. The company had hoped to announce contract awards in October, but as of press time it has not yet done so. However, it is working to drum up interest in its system by offering short-term transportation contracts. (Government regulators approved that plan in early September 2020.)

Meanwhile, Gasbol itself is also slated for privatisation, as Petrobras has announced plans to sell its 51% stake in the pipeline. →

Midstream: LNG

The changes in the midstream arena have not just affected pipelines. They have also had an impact on Brazil's LNG business.

As has been the case in other parts of the gas sector, LNG has traditionally been under Petrobras' exclusive control. The state-owned company was the only entity in Brazil allowed to import LNG – and the only entity permitted to build and operate the facilities needed to bring the fuel into the country. In this capacity, it built three regasification terminals in Bahia, Guanabara and Pecem.

None of these terminals has ever performed as well as expected. The Bahia and Pecem facilities have consistently operated below capacity, and the Guanabara terminal went idle in 2018 and has not yet resumed operations.

Against this backdrop, Petrobras drew up a plan for leasing the LNG terminals out to third parties last year under an agreement with CADE, the Brazilian government's anti-trust agency. The first facility to be offered up for lease was Bahia LNG, which is capable of handling the equivalent of 20mn m^3/day of gas. Petrobras revealed earlier this year that it had pre-qualified nine entities for the lease contract and had hoped to reveal the winner in October. Of these nine, however, Bermuda-registered Golar Power was the only party to submit a binding offer – and its bid has been disqualified, owing to questions about its ability to comply with risk-related requirements.

So far, Petrobras has not said what it intends to do next about its own LNG terminals. This will be a crucial matter to address, Anjos remarked. "Petrobras has to release the idled contracted capacity of transport infrastructure to be further bid in a public call," he said. "This is pivotal to trading imported gas in Brazil, as transport pipelines are fully contracted, being the main bottlenecks to reach demand centres."

At the same time, though, it has continued to leave room for independent companies to make their own arrangements. →

Golar Power has been very active on this front. The firm has committed to building a new LNG import terminal in the northern port of Barcarena through Hygo Energy, its joint venture with Bermuda-registered Stonepeak Infrastructure Partners. It has also provided UK-based Centrica and its Brazilian partner Centrais Eletricas de Sergipe (CELSE) with a floating storage and regasification unit (FSRU) that will serve as an import terminal in Sergipe. Additionally, it has expressed strong interest in setting up pipelines and other infrastructure to support LNG terminals. It remains to be seen whether it can realise these ambitions, however, given that it is weathering a certain amount of fallout from bribery charges against its CEO, Eduardo Antonello.

"Granting open access to pipelines will enable multiple players to market natural gas and allow private companies that produce natural gas associated with pre-salt oilfields to sell to the domestic market for power generation and industrial use."

Downstream

As in other areas, Petrobras has committed to giving up its monopoly over downstream gas distribution. It is not starting from scratch, in that it had already sold off part of its holdings in Gaspetro, its natural gas distribution subsidiary, prior to Bolsonaro's election. (Japan's Mitsui took a 49% stake in Gaspetro in 2015.)

Now, though, it is looking to go much further. Earlier this year, the company unveiled plans to sell off its 51% stake in Gaspetro, which is in turn a shareholder in 19 of Brazil's regional gas distributors. It invited a number of foreign and domestic firms to submit offers, including Mitsui, as well as Marubeni (Japan), Naturgy (Spain), Engie (France) and Cosan (Brazil).

In late October, Petrobras reported in a securities filing that it had received multiple binding offers for the stake in Gaspetro. Around the same time, Cosan confirmed that it had submitted one of these bids through Compass Gas & Energia, its subsidiary for investments in gas and power generation.

As of press time, Petrobras had yet to declare a winner in the contest. Once it does, however, it will be on the way towards exiting the gas distribution business entirely. It will be doing so in line with the recommendations made by CADE, which has pushed for the state-owned company to withdraw from gas transportation and distribution so that it can focus on upstream exploration and development. In fact, it has signalled that it intends to apply the proceeds of the sale to its investment programme, which envisions the sale of $20-30bn worth of midstream and downstream oil and gas assets between 2020 and 2024.

The details of that investment programme are still unfolding. Nevertheless, the company has already effected significant change in the gas sector, and both consumers and investors are set to benefit as a result.

"The [New Gas Market] policy will support domestic gas production and gas-to-power [projects] because it will open up access to Brazil's natural gas pipeline network," said Viscidi. "Granting open access to pipelines will enable multiple players to market natural gas and allow private companies that produce natural gas associated with pre-salt oilfields to sell to the domestic market for power generation and industrial use." ■

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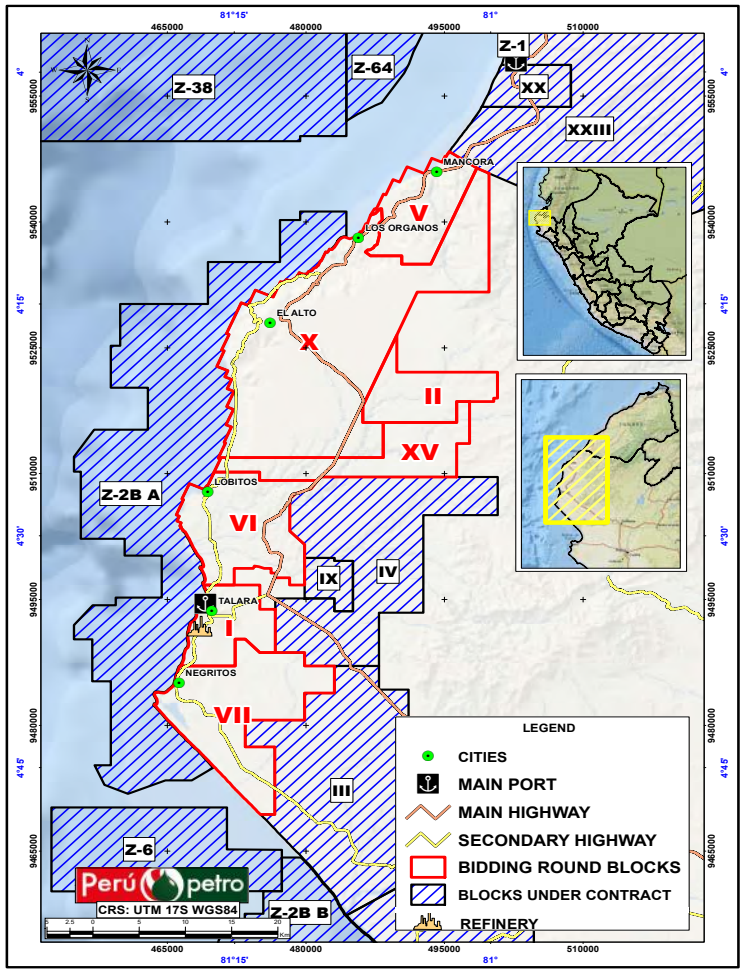

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SPECIAL FEATURE

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Hydrogen

Hydrogen has become the subject of intense focus by governments and companies alike in recent years, with advocates hailing the fuel as the solution to decarbonisation in heavy industry such as the manufacturing of steel, cement and chemicals. It has also been pitched as a clean solution for fuelling vehicles and ships and heating buildings.

A growing number of countries have published national hydrogen strategies, but policy directions vary greatly. Some governments have prioritised so-called green hydrogen, produced from water using electrolysis. The process is powered by renewable sources such as wind and solar.

Others are leaning more towards blue hydrogen, created from natural gas via steam reforming. The carbon created as a by-product can then be captured, transported and stored underground. There are other less developed technologies using gas as feedstock such as methane pyrolysis, which produces solid carbon that is easier to store and has uses in industry.

The main drawback in green hydrogen is its high cost compared with blue hydrogen. Substantial extra renewable energy capacity is also needed to produce green hydrogen on the scale envisaged. On the other hand, blue hydrogen can readily make use of available gas supply and the infrastructure that carries it. The needed technologies are already available and CO_2 storage is becoming increasingly viable. Blue hydrogen can begin the job of decarbonising the non-electricity sector right away, helping to expand what is now a niche industry into a major energy source.

The risk is that aspirations for hydrogen could falter if policies are unrealistic, based more on political rather than commercial and technical realities.

In this second edition of *Global Voice of Gas (GVG)*, we have devoted a section to the prospects for hydrogen, with special features on the development of carbon, capture and storage (CCS) in Europe, hydrogen's use in energy-intensive industry and Japan's aspiration of becoming a leader in hydrogen energy.

EU sets its course on hydrogen

The European Commission sees hydrogen as the means of bridging the gap in decarbonisation efforts

JOSEPH MURPHY

PHOTO: ISTOCK.COM/AUDIOUNDERBUNG

The European Commission's publishing in July of an EU hydrogen strategy was a watershed moment, leading European businesses and governments to announce a flurry of new hydrogen projects.

In the strategy, the EC said hydrogen was "essential" for reaching carbon neutrality by 2050. Europe is well-positioned to gain from a hydrogen revolution, the EC said, as it is highly competitive in clean hydrogen technologies. Renewables should decarbonise a large share of EU energy consumption within three decades' time but not all of it, according to the EC, and hydrogen can bridge this gap.

The EC wants to prioritise the green hydrogen production using mostly wind and solar. But it acknowledges that there is a considerable cost gap to overcome between green and blue hydrogen. Blue hydrocarbon costs only €2/kg, according to the International Energy Agency, while renewable hydrogen costs vary between €2.5 and €5.5/kg.

Blue hydrogen will therefore be vital in achieving short- and medium-term emissions goals. Europe already produces unabated, so-called grey hydrogen, and applying carbon capture and storage at these sites will be an initial priority.

The EC wants to see Europe deploy at least 6 GW of electrolyser capacity between 2020 and 2024, to produce 1mn metric tons/yr of hydrogen. During this period, the bloc intends to create regulation to support the establishment of a fully-functional hydrogen market, providing both supply- and demand-side incentives.

Under the second phase, which will run until 2030, electrolyser capacity will be expanded to 40 GW to produce 10mn mt/yr of hydrogen. Over these years, the EC hopes that green hydrogen will gradually become cost-competitive against other types of hydrogen, although some demand-side incentives will still be necessary.

"Many of our members are developing both blue and green hydrogen projects, which guarantee Europe's leading role on clean gas technologies and provide jobs for Europeans."

— **James Watson,** Secretary General, Eurogas

Feedback

Commenting on hydrogen, European gas association Eurogas said recent years had seen a "fundamental shift" in the mindset of the natural gas industry.

"One can hardly find a purely 'natural gas company' any more as the business portfolios were diversified to include renewable assets," Eurogas secretary general James Watson told *GVG*. "Many of our members are developing both blue and green hydrogen projects, which guarantee Europe's leading role on clean gas technologies and provide jobs for Europeans."

Eurogas calls for both renewable-based hydrogen and hydrogen produced via methane reforming and methane pyrolysis to be urgently scaled up, to help meet Europe's climate goals.

"We must start the hydrogen economy already in the 2020s. If you don't build now, you're missing our chance of getting to carbon neutrality in any cost-effective way," Watson said.

Europe currently produces some 33bn m^3/yr of grey hydrogen. "We could try and work that into blue hydrogen quickly, which would be a big win," Watson said.

Eurogas wants to see a binding target for reducing greenhouse gas intensity and a 11% EU-wide target for renewable gas by 2030.

"Establishing the target will provide incentives for the uptake of renewable and decarbonised gases, including blue hydrogen, across the EU and set a →

“With natural gas and its infrastructure, the hydrogen economy can be kicked off in a climate-friendly and affordable manner”

clear path to achieve climate neutrality by 2050,” Watson said. “We need to create investor confidence and create demand for renewable and decarbonised gases to start scaling production. Additionally, we need to ensure to cost-effectively leverage the existing gas infrastructure to deliver renewable and decarbonised gases to all sectors.”

Others in the industry are less enthused with the EC’s green hydrogen direction, however. Commenting at the time of the strategy’s release, the International Association of Oil & Gas Producers (IOGP) urged a “more inclusive approach to all clean hydrogen production sources, and to recognise the long-term, cross sectoral role of gas as well as that of carbon capture and storage and its significant scale-up potential.”

German gas association Zukunft Erdgas said the EC’s prioritisation of green hydrogen was a “missed chance.”

“Producing hydrogen CO_2 neutrally with natural gas bears a large potential,” chairman Timm Kehler said. “Researchers and the gas industry are working together to scale up technologies such as steam reforming with carbon capture and storage as well as methane pyrolysis. With natural gas and its infrastructure, the hydrogen economy can be kicked off in a climate-friendly and affordable manner. Also, continuing to invest in technologies ‘made in the EU’ will push the continent’s power of innovation and generate jobs during those difficult economic times.”

Other nations, other paths

Hydrogen has garnered serious attention outside of Europe as well. Australia is exploring hydrogen production using electrolysers but also through steam methane reforming and the gasification of coal. It aspires to become one of the leading exporters of the fuel to Asian markets by 2030. The country only published its hydrogen strategy in November last year, but already boasts over 30 hydrogen-related projects in place or under development.

One of the biggest markets for hydrogen in Asia will be China, which has plans to rapidly expand production, transport and usage of the fuel over the next three decades.

By 2030, Beijing wants to have 1-2mn vehicles on the road that run on hydrogen, and also deploy hydrogen-powered ships and trains. It also wants to have a dedicated 3,000-km hydrogen pipeline network in operation within a decade, and produce 100bn normal m^3/yr of the fuel, mostly using electrolysers.

Other major markets in Asia include Japan and South Korea.

The Canadian federal government is yet to form its hydrogen strategy, although authorities in the oil and gas-rich western Alberta province set out their plan in early October. In its Natural Gas Strategy & Vision, Alberta stated its ambition to become a major player in a global blue hydrogen economy, exploiting its abundant gas supply and large CO_2 storage capabilities.

Alberta is already among the world’s biggest producers of hydrogen for domestic industrial processes, and the province wants to leverage this position to develop it on a much greater scale. It sees opportunities to export blue hydrogen across Canada, North America and globally by 2040.

The US is likewise yet to finalise a hydrogen strategy, although California is working on its own green hydrogen-focused plan. Morocco is interested in positioning itself as a leading green hydrogen exporter to Europe, while Russia wants to develop gas-based hydrogen exports to both Europe and Asia. Its state gas supplier Gazprom has pointed to methane pyrolysis and a plasma-chemical method as highly-promising alternatives to methane steam reforming. ■

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Giving the hydrogen market a backbone

For a fully-functioning hydrogen network to emerge, the infrastructure must be in place to carry the fuel

JOSEPH MURPHY

Following on from the European Commission's release of a hydrogen strategy, some 11 European grid operators from nine EU member states presented a plan in July for adapting gas infrastructure to transport hydrogen at an affordable cost.

The paper, named European Hydrogen Backbone, was compiled by Spain's Enagas, Denmark's Energinet, Belgium's Fluxys, the Netherlands' Gasunie, France's GRTgaz and Terega, the Czech Republic's Net4Gas, Germany's Open Grid Europe and Ontras, Italy's Snam and Sweden's Swedegas. Consultancy firm Guidehouse is also supporting the initiative.

The companies see a hydrogen network gradually emerging as early as the mid-2020s, reaching 6,800 km in size by 2030 and nearly 23,000 km by 2040, at which point 75% of the system will consist of repurposed gas pipelines. To realise such an ambition, some €27-64bn ($31-73bn) will be needed in investment, according to the plan.

The paper assumes that blue hydrogen production capacity will reach 80 TWh by 2030, but it will later be overtaken by green hydrogen production, which will reach 100 TWh by 2040.

The paper estimates levelised costs for transporting hydrogen at €0.09-0.17/kg/'000 km, meaning the fuel could be delivered across Europe cost-efficiently. These costs "only represent a small portion of total hydrogen costs when considering the full value chain from production through to end consumption," the paper notes. "Even assuming future production costs of €1-2/kg for green and blue hydrogen, transport through the hydrogen backbone will add less than 10% on top of production costs for 1000 km transported."

The cost is moderate as most of the network will be retrofitted, although the range for estimates is significant due to uncertainties surrounding compressor costs, the paper states. Major modifications may be required at compressor stations as hydrogen has a lower energy density than natural gas.

Meanwhile, a cubic metre of hydrogen contains only a third of the energy of an equivalent amount of natural gas. On the other hand, though, the volume flow of hydrogen can be higher than that for natural gas, the paper argues, bringing the maximum energy capacity of a hydrogen pipeline up to 80% of the energy capacity of one transporting gas.

As such, a 48-inch pipeline, commonly used in the intra-EU gas grid, could carry 17 GW of hydrogen, while a 36-inch one could transport around 9 GW.

Design improvements could be made at a later stage, the paper states. "Exploratory analysis by gas TSOs shows that operating hydrogen pipelines at less than their maximum capacity, e.g. 13 GW (LHV) for a 48-inch pipeline and 7 GW for a 36-inch pipeline gives much more attractive transport costs per MWh transported as additional expensive high capacity compressor stations and corresponding electricity consumption can be avoided."

For new pipelines, "the picture is similar, meaning that when more than 13 GW of transport capacity is required on a route with one 48-inch hydrogen pipeline, it can be more attractive to partly build a second one with the same or even larger capacity rather than investing in expensive compressors to ramp up the capacity of the first pipeline."

The paper notes that "the concept of compression versus pipeline dimension, while considering the characteristics and availability of the existing gas network, is one of the main levers for cost optimisation." ■

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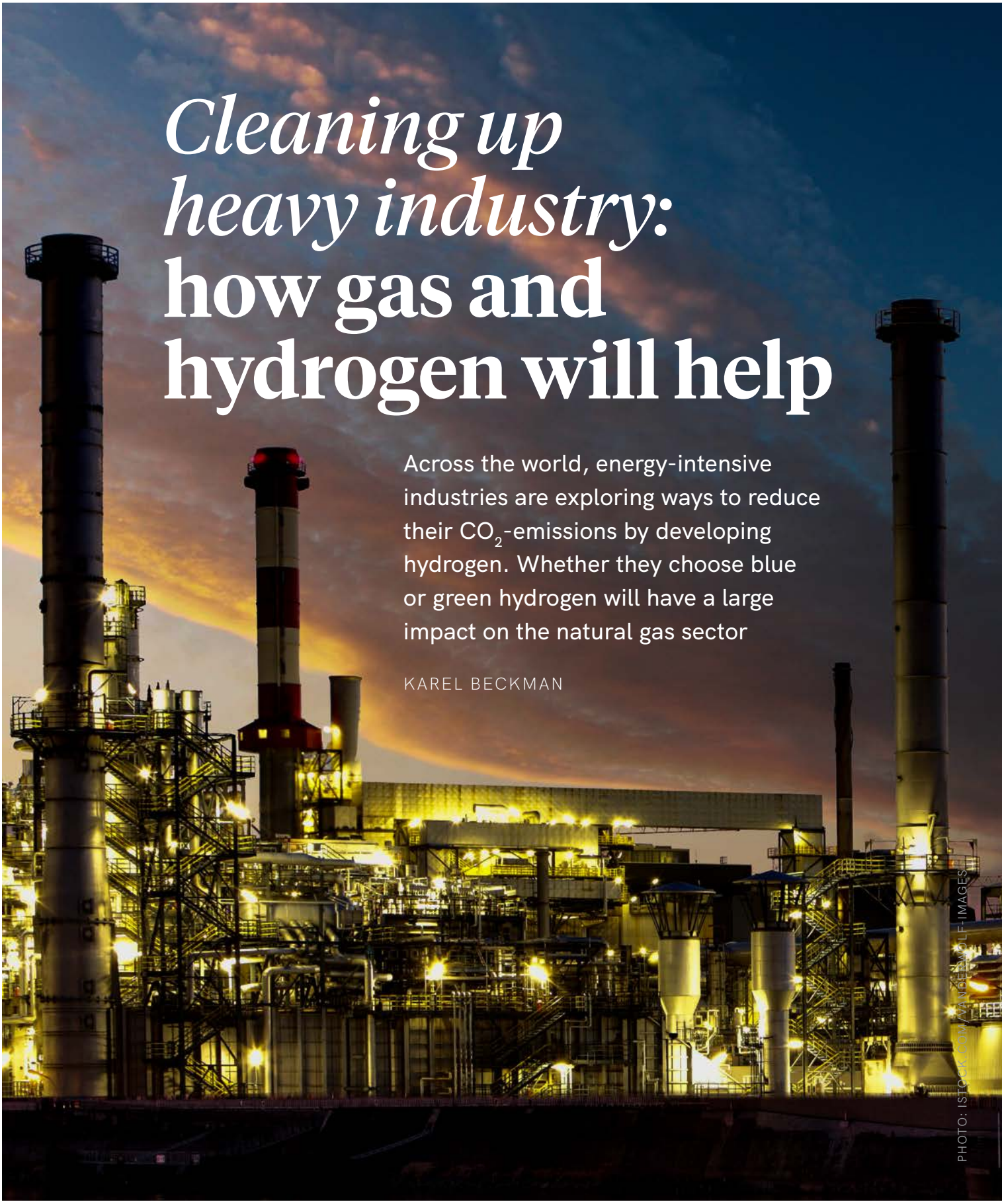


Cleaning up heavy industry: how gas and hydrogen will help

Across the world, energy-intensive industries are exploring ways to reduce their CO_2-emissions by developing hydrogen. Whether they choose blue or green hydrogen will have a large impact on the natural gas sector

KAREL BECKMAN

PHOTO: ISTOCK.COM/ANDREWOLF-IMAGES

In the coming decades, energy-intensive industries will become increasingly important for the natural gas sector. In its latest World Energy Outlook, the International Energy Agency (IEA) projects that these industries will deliver the largest growth in gas demand. That is in its Stated Policies Scenario, based on today's policy settings. (see page 49)

Interestingly, under the IEA's Sustainable Development Scenario, which is in line with the Paris Agreement, industry becomes even more important relative to the power generation and buildings sectors, as can be seen from the IEA's World Energy Outlook 2019 (see page 50).

The increasing importance of industry is mainly due to the fact that the power generation and buildings sectors can reduce emissions relatively easily by electrification, which means replacing natural gas with renewable energy alternatives. For heavy industry, the challenges of decarbonisation are more complex. High-temperature processes cannot be electrified.

Industry does have other options to reduce emissions, such as increased materials efficiency, recycling, the use of biomass and implementation of entirely new production processes. Currently the most favoured low-carbon option, however, most energy analysts would agree, is hydrogen.

European energy consultancy AFRY (formerly Pöyry) did a study back in 2018, "Fully Decarbonising Europe's Energy System by 2050," in which they concluded that hydrogen is "the key to deep decarbonisation". This was an important conclusion as the debate at the time still centred around electrification as the main road towards decarbonisation. Relying on very high levels of electrification in an 'All-Electric' future is a high-risk strategy, the study concluded, since it relies on sectors such biomass, heat pumps, energy efficiency, grid reinforcement and nuclear power, all of which entail significant risks.

> **"In the longer term...blue hydrogen is the only way for natural gas to stay in the game.**
>
> — **Richard Sarsfield-Hall**, Director, AFRY UK

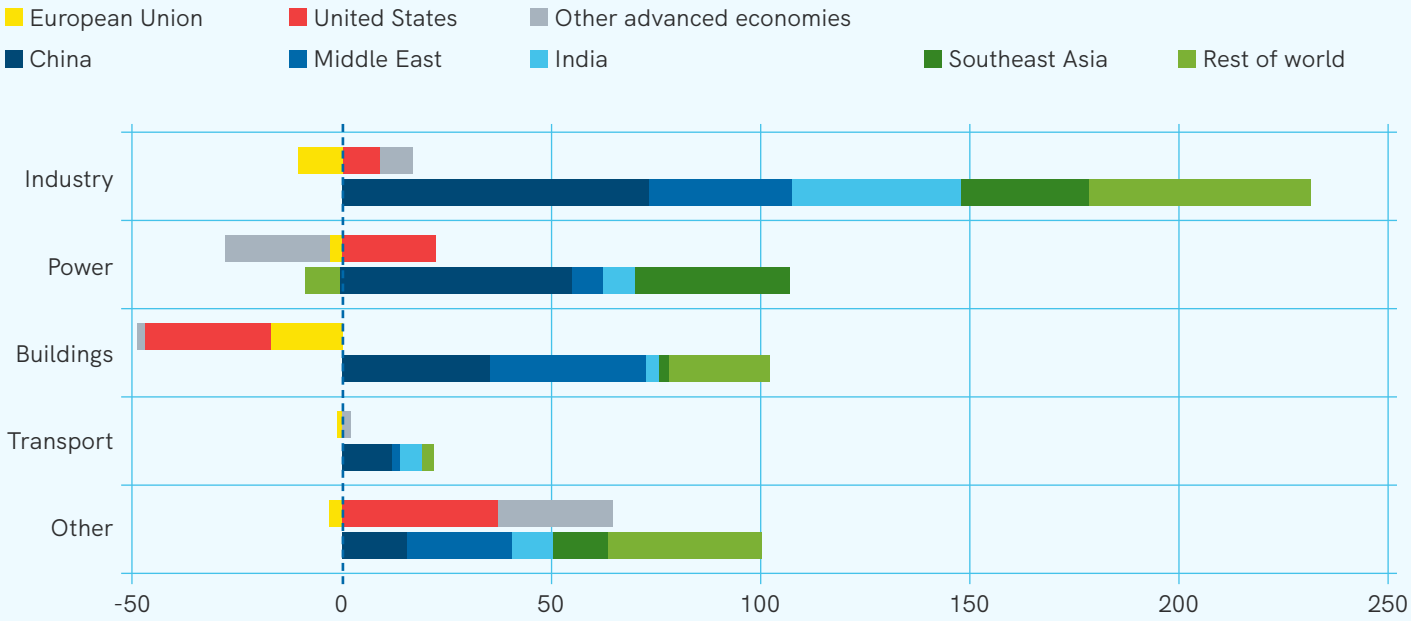
No role for gas without CCS

Today, few observers doubt that for heavy industry, hydrogen is a big part of the future. Energy-intensive industries all over the world are currently exploring the opportunities for the fuel. But this throws up another uncertainty for the natural gas sector. Hydrogen after all can be made from gas, and if carbon capture and storage (CCS) is used, it can made almost emission-free. But it can also be derived from water through electrolysis, using renewable energy. Which option becomes the favoured one – the so-called blue or green version – will be of key importance to the future of natural gas.

Richard Sarsfield-Hall, director of the UK office of AFRY, makes no bones about the life-and-death importance of blue hydrogen – and by implication CCS – for the gas sector. "In the longer term," he says, "blue hydrogen is the only way for natural gas to stay in the game."

This has another huge implication: it means that the future of natural gas will depend crucially on the success of CCS. This is by no means a given. The IEA and most other think tanks do assign an important role to CCS in their climate scenarios, but the technology has not lived up to its promises →

Change in natural gas demand by sector in the Stated Policies Scenario (2019-2030)



Gas demand in emerging market and developing economies bounces back quickly, while demand in mature markets barely recovers to pre-crisis levels

Notes: Other includes natural gas use in energy transformation sectors and agriculture, and as a feedstock in industrial processes. Buildings energy demand includes water desalination plants

Source: IEA

so far. The IEA, in a report published on September 24, said although "CCUS is up and running in some sectors," it is still "lagging in the most critical ones."

Taking the plunge

Sarsfield-Hall, who worked in the gas industry before he joined AFRY, believes that when it comes to undertaking CCS projects, the energy industry has been playing a waiting game with governments. "There is no business case for CCS," he notes. "To become feasible, it either needs a much higher CO_2-price or significant government support. Neither have been forthcoming."

He warns that there is a risk for the gas industry in waiting too long. "When I speak at energy conferences about FROG, 'the future role of gas', I use the analogy of the boiling frog, which sits tight while it is being gradually heated up, and is cooked to death without realising it. The gas industry has to be careful not to get into that position."

There are signs, however, that the energy sector is getting the message and taking the plunge into CCS, with some support from governments. In October, BP, Eni, Shell, Total, Equinor and Northern Grid announced the Northern Endurance Partnership to develop CCS infrastructure in the North Sea. "A huge announcement," says Sarsfield-Hall.

Earlier, in July 2020, the full-scale Northern Lights CCS project was awarded major financing by the Norwegian government. Other CCS projects, in the UK and the Netherlands, are also moving ahead. And Sarsfield-Hall notes that there is growing interest in CCS from the gas industry in the US as well. "We are getting more inquiries from North America, where natural gas is very big of course. They clearly want to stay part of the energy mix."

Tight spot

If hydrogen is key to the decarbonisation of heavy industry, the question is how exactly industry is →

Global gas demand, production and trade by scenario (bcm)

			Stated Policies		Sustainable Development		Current Policies	
	2000	2018	2030	2040	2030	2040	2030	2040
Power	908	1,571	1,708	1,936	1,508	1,248	1,823	2,197
Industrial use	664	909	1,229	1,474	1,108	1,114	1,243	1,527
Buildings	651	846	945	998	740	557	1,011	1,131
Transport	70	137	200	295	268	330	181	249
Other sectors	257	490	639	701	568	605	681	788
World natural gas demand	2,530	3,952	4,720	5,404	4,264	3,854	4,940	5,891

Source: IEA

to go about implementing it. This is a question that the Dutch energy-intensive industry sector is grappling with in a big way at the moment, says Hans Grünfeld, managing director of the Dutch association of energy-intensive industries (VEMW).

"Dutch industry is convinced that hydrogen is essential to decarbonisation," says Grünfeld, who has been known as the spokesman for the industry in the Netherlands for over 20 years. "70% of the energy we use comes from natural gas. 100% electrification is unthinkable. Decarbonised hydrogen is also indispensable as feedstock for a variety of industrial processes in the chemical and steel sectors."

Dutch industry is also convinced that "blue hydrogen is part of the solution," Grünfeld adds. "There are many plans for electrolysers but they can't all be realised and the volumes are not there. You can import green hydrogen from elsewhere, but liquid hydrogen transport is not off-the-shelf technology. You can transport it in the form of ammonia, but that's expensive and involves energy losses on both ends. Blue hydrogen is for us an obvious route." Hydrogen is already a building block of the chemical industry, Grünfeld points out. "I see no future for industry without hydrogen."

Grünfeld says industry is in a very tight spot at the moment. "The climate targets are very high. 2030 is very close. There is an economic crisis looming. A CO_2-price on the horizon. Everyone is studying options, but there is no business case for any of them."

Binary switch

One of the challenges for industry is that decarbonising their business is not simply a matter of gradually using more renewable energy, Grünfeld notes. "In particular when it comes to process emissions, they are faced with a binary switch. They have to change their production processes completely. You can't do that unless you are absolutely certain that it will work."

And there is another big difference with other sectors, such as power generation. "In chemicals, petrochemicals and other industries, you have integrated value chains, where the output of one process forms the input of the next one. You cannot simply change one of these processes. They have to change together. In effect, you have to build an entirely new value chain."

This is the reason why Dutch heavy industry is taking a cluster-based approach, says Grünfeld. "The Netherlands has five major industrial clusters, including the Rotterdam and Amsterdam port regions. All these clusters have in October 2020 submitted an integrated plan to reduce greenhouse gas emissions by 2030, in accordance with national targets." →

> **"The country aims to have an installed electrolysing capacity of 5 GW by 2025, for which the government announced a support package of $50mn for green hydrogen projects.**
>
> — **Johan Dreyer**, energy expert and New Ventures Manager, GNA

Although all clusters have their own approach, they all rely at least in part on the use of hydrogen, says Grünfeld. Both blue and green. The Rotterdam region, for example, the largest European port and one of the largest industrial centres of Europe, has drawn up plans to replace oil and gas in industrial processes and fossil feedstock in the chemical industry with electricity, biomass and hydrogen. Blue hydrogen with CCS plays a major part in this plan – but so does green hydrogen. Half a dozen electrolysers will be built in the coming years, including a 200-MW one at a Shell refinery in Rotterdam powered by offshore wind energy Shell is developing in the North Sea.

Battle ahead

Clearly there is something of a battle between blue and green hydrogen ahead with important ramifications for natural gas. The outcome will depend in many cases on local circumstances. One example of a country that's going for green hydrogen is Chile. At this moment, natural gas still has a role to play in the Chilean energy supply, says Johan Dreyer, energy expert and New Ventures Manager at Chilean mining company GNA. "With 5 GW of renewable energy projects currently under construction and 46 GW in different stages of planning and development, the country is heading for oversupply. Green hydrogen and ammonia represent an ideal solution to export this oversupply in the long run."

Having announced its hydrogen strategy on November 3, Chile expects three development waves, says Dreyer. "The first will boost local green hydrogen demand and supply, especially in the ammonia and oil refining industries. The country aims to have an installed electrolysing capacity of 5 GW by 2025, for which the government announced a support package of $50mn for green hydrogen projects. The second wave is expected to be ruled by hydrogen transport solutions (especially in mining) as well as by the first green ammonia exports in 2030. By the early 2030s, the third wave will see Chile among the top three global green ammonia and hydrogen exporters, benefited by the world's most competitive production costs (<$1.5/kg)."

The first two flagship green hydrogen projects in Chile were announced last October. The first is the Hyex project, currently being developed by the consortium Engie-Enaex in Atacama, which expects to produce green ammonia by 2024. The second is the Highly Innovative Fuels (HIF) project in Patagonia, which is currently being developed by the consortium AME-ENAP-EGP-Siemens-Porsche and which aims to produce green hydrogen based fuels by 2022.

Overrated

Per Klevnas, energy expert and partner at Swedish consultancy Material Economics, who co-authored a major 2019 study, Industrial Transformation 2050, Pathways to Net-Zero Emissions from EU Heavy Industry, sees chances for both green and blue hydrogen in the industrial sectors, but he notes there are many complexities to consider.

"I see a lot of opportunity to implement CCS in existing steam methane reforming facilities," he →

says. "That could be the basis for the future development of a blue hydrogen industry." But there are caveats. "In northern Europe," he notes, "blue hydrogen will be cheaper than green hydrogen for quite some time. But in other places this is different. If we have learnt anything, it is not to underestimate the cost reductions that come with deployment of renewable energy and now electrolysers. Blue hydrogen will have serious competition in many places within a matter of years."

Nevertheless, although the success of CCS "depends on a lot of ifs", so does the success of alternatives such as electrification and green hydrogen, says Klevnäs. "I would be astounded if we don't see many CCS projects being announced in the coming years in Europe. It is now or never for CCS. If it doesn't fly this time around, it will not happen anymore." He notes that already many announcements of CCS projects have been made, for instance in applications such as waste-to-energy, cement production and steam methane reforming. However, there is still no European-wide policy to support export-oriented industries. "All these CCS projects still depend on governments finally offering the support that will always be needed."

A final caveat: Klevnäs cautions that hydrogen in industrial energy use will have competition, with more opportunity for electrification than many realise. "The current discussion of hydrogen is too focused on energy. In industry, hydrogen for use as feedstock is often overlooked but is often on safer ground."

He has a recommendation for the natural gas industry. "The gas industry should acquire a thorough understanding of how hydrogen can be used as a feedstock in industry, and a solid role of the alternatives to hydrogen for energy. They should really understand the industrial landscape to secure their future role in it." ■

Japan's hydrogen plans may need creative touch

The Japanese government has set ambitious targets for hydrogen, but may need to become more creative in its efforts to drive consumption of the clean fuel

ANDREW KEMP

PHOTO: TOPEAU.COM/GETTY IMAGES

Japan's goal of turning into a "hydrogen society" received a shot in the arm in October when Prime Minister Yoshihide Suga declared that the country would aim to become carbon neutral by 2050.

Suga told the Diet on October 26 that tackling climate change should no longer be considered a "constraint on economic growth". He added: "We need to change our thinking to the view that taking assertive measures against climate change will lead to changes in industrial structure and the economy that will bring about growth."

While renewable energy solutions are seen worldwide as the answer to carbon emissions, Japan has also been striving to build a hydrogen-based society.

The plan was unveiled in 2014, when the Ministry of Energy, Trade and Industry (METI) released its Strategic Energy Plan – a three-phase roadmap for the development and adoption of various hydrogen-based energy solutions.

This energy transition is not without its challenges, however, and while the country has made significant progress in the development of fuel cell technologies, questions are now being asked about the viability of hydrogen power generation.

30-year plan

Japan is on track to surpass its 2030 target of generating 22-24% of its power needs electricity from renewables, Wood Mackenzie predicted in August. However, the country's clean hydrogen targets are likely to be much harder to hit, the consultancy warned. This is owing to the persistently high cost of developing solar and wind power capacity in Japan, itself the result of limited land availability.

This will likely mean that the country has to rely on hydrogen imports to realise its ambitions. Indeed, Japan revealed in 2017 that it aimed to import 300,000 metric tons/year of hydrogen in 2030.

Australia is already lining itself up to be a key a supplier, with Kawasaki Heavy Industries' (KHI) leading a consortium behind the Hydrogen Energy Supply Chain (HESC) that will see coal-derived hydrogen shipped from Victoria to Kobe City from next year. The cargoes are to be carried by the world's first liquefied hydrogen carrier, which KHI launched in December 2019.

HESC is a key component to the Tokyo government's target of establishing a commercial maritime hydrogen supply chain delivered by around 2030, Industry Minister Hiroshi Kajiyama noted on October 15. The project also sets the country on the path towards achieving the second phase of METI's Strategic Energy Plan.

Middle of the road

The roadmap's three phases include: expanding the uptake of cell technology; establishing supply lines from other countries and introducing practical hydrogen power generation application by the late 2020s; and establishing a CO_2 free hydrogen supply system by around 2040.

While the government's efforts during the first phase of the plan have turned the country into a global leader in fuel cell technology, the goal of becoming a hydrogen society will likely be more of a struggle, warned Takeo Kikkawa, a professor of International Management studies at the International University of Japan.

In 2016, the government set a target of seeing 40,000 fuel cell vehicles (FCVs) on the road by 2020, with that figure climbing to 200,000 by 2025 and 800,000 by 2030. There are, however, only 4,000 FCVs currently on the road.

Kikkawa said the issue was bigger than simply expanding FCV and stationary fuel cell usage. He said: "Japan is a developed country when it comes →

> **"Japan is a developed country when it comes to fuel cells, but is only a developing country in terms of general hydrogen adoption."**
>
> — **Takeo Kikkawa**, Professor of International Management studies, International University of Japan.

to fuel cells, but is only a developing country in terms of general hydrogen adoption."

The professor argued that weak demand growth for the fuel remained a major hurdle to hydrogen's emergence as a mainstream alternative energy supply. He said: "The government has very few tools to stimulate demand, with carbon pricing being the most obvious. If the government raised carbon prices significantly then there would be an incentive for power companies to build hydrogen power generation."

Without that price hike, the power sector has shown little interest in building hydrogen power generation.

Power alternatives

Kikkawa said: "The power sector has been reluctant to invest in building new power generation facilities following the liberalisation of the retail power sector in 2016, which reduced margins. At this stage, the cost of building new hydrogen power plants is too prohibitive."

The high cost of hydrogen power generation also put the fuel at a disadvantage to LNG, which has long been touted as the bridging fuel to a green energy future. Bloomberg New Energy Finance's (BNEF) Hydrogen Economy Outlook, which was published in March, found that green hydrogen production in Australia could cost US$8-14/ mn Btu by 2050. While LNG prices soared to new highs in the last decade, driven partially by the Fukushima nuclear power plant (NPP) disaster, they have since retreated and are currently around US$7.50/mn Btu.

Kikkawa argued that instead of solely pursuing hydrogen power generation, given the existing array of other options, there was an economic case to be made for hydrogen use by the country's natural gas utilities.

"There are other power generation alternatives, including nuclear, but the wholesale and retail gas markets face increasing pressure from 2030 because of emissions targets. By embracing methanation, the gas sector would be able to adapt and convert existing infrastructure and create a long-term business model.

The catalytic methanation process uses hydrogen and CO_2 to create synthetic methane, which can be piped into existing gas grids. Kikkawa said: This is a very important technology and could pave the way for a switch to 100% hydrogen use in the gas grids."

Japan's targets for hydrogen uptake are ambitious, but the country has already fallen behind its own schedule with regard to FCVs – an area in which it has been crowned the global leader. Unless costs are somehow addressed then hydrogen could struggle to make much of an impact in the power generation sector in the coming decades, with nuclear, renewables and gas the preferred sources.

For Tokyo to make good on its talk of turning Japan into a hydrogen society, then it needs to think outside of the box with regard to how best develop demand for the fuel. ■

Europe makes strides in CCS

The countries encircling the North Sea are looking to capitalise on their offshore geology to decarbonise key industries

JOSEPH MURPHY

Governments across the world view carbon, capture and storage (CCS) technology as the solution to decarbonising areas of industry that would otherwise be difficult to abate.

The countries encircling the North Sea have become a hot bed for new developments. The region's offshore geological structures, including depleted oil and gas fields, can be used for storing CO_2, and existing pipeline infrastructure can be repurposed for carrying the waste gas.

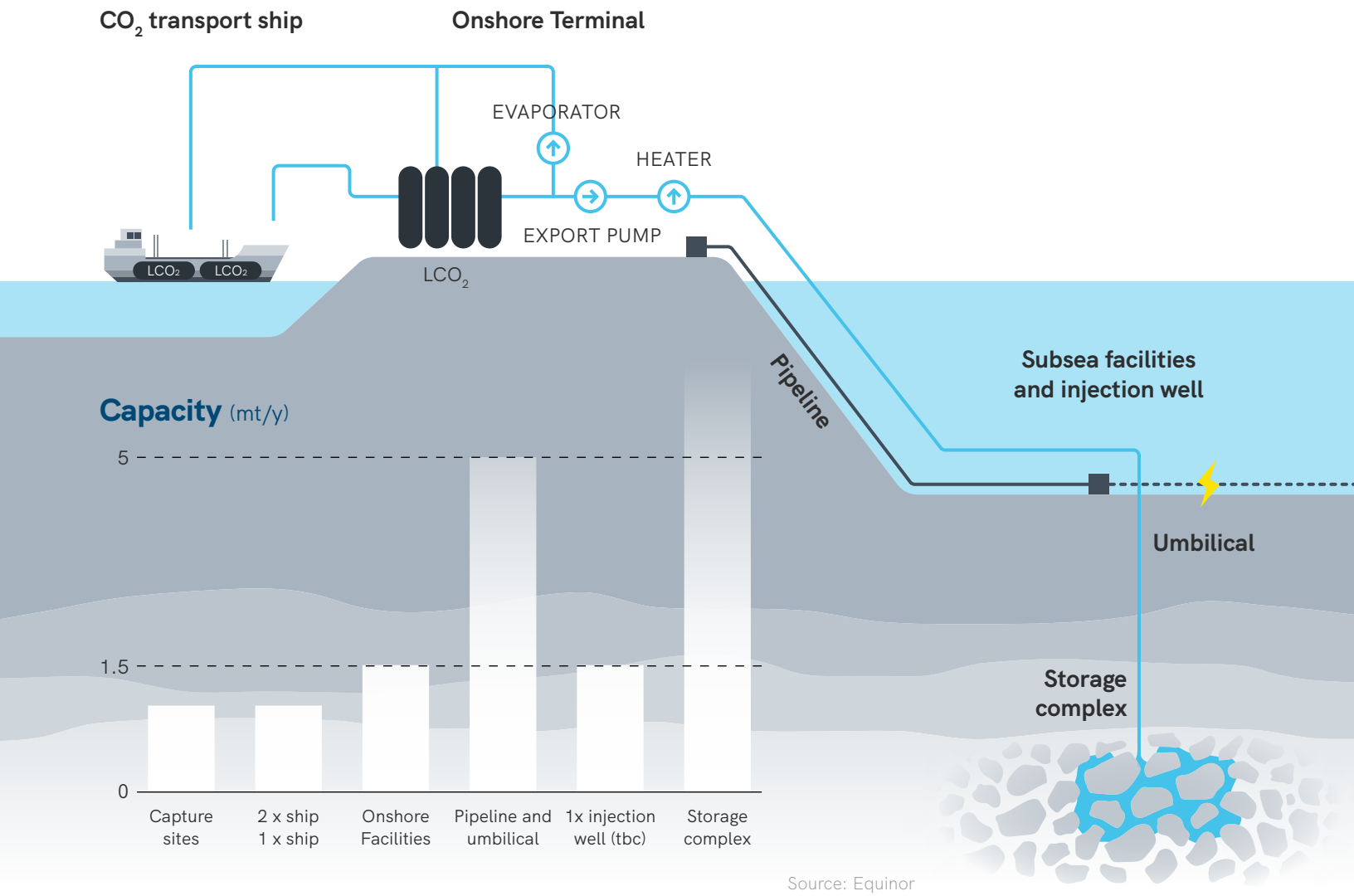
Ambitious climate targets are driving these projects. The UK has made a binding commitment to bring its greenhouse gas emissions to net-zero by 2050, while the Netherlands is likewise targeting a 95% reduction in emissions by the same year. Norway aspires to cut its emissions by at least 50% by 2030.

CCS also goes hand in hand with efforts to decarbonise gas supply. It can be used to capture CO_2 emitted when methane is steam reformed, in order to produce clean, so-called blue hydrogen.

Carbon capture, utilisation and storage (CCUS) is a "well-established technology," the Carbon Capture & Storage Association (CCSA) told *Global Voice of Gas (GVG)*, noting that CO_2 had been captured in various industries, particularly in gas processing, for many years.

"A high and predictable carbon price is an important component for a market-driven CCUS industry," the CCSA continued. "Other important potential mechanisms are: low-carbon product standards which can create a market for decarbonised products, government procurement policy which can provide reliable demand for decarbonised products, and potential carbon border adjustment mechanisms which ensure domestic/regional markets are not exposed to carbon leakage."

The business models that governments devise for CCUS in power, industry, hydrogen and CO_2 transport and storage will "dictate the investment framework for CCUS and define the route to market for the CCUS industry," the association said. →



Source: Equinor

Norway's "greatest climate project"

Norway is already a pioneer in European CCS, hosting the continent's only two operational, large-scale projects, located at the offshore Sleipner and Snohvit gas fields. The projects have a combined capacity of around 1.5mn metric tons/year. But they only capture CO_2 in the gas extracted at the fields, and are not used for third-party emissions storage.

The Norwegian government is now contemplating a much bigger operation known as Longship. Initially, Longship will involve the capture of CO_2 from a cement factory in Brevik and a waste incineration plant in Oslo. The transport and storage part of the project, Northern Lights, is backed by Norway's national energy firm Equinor, alongside partners Shell and Total.

Northern Lights will entail the transport of captured CO_2 from Norwegian and other European industry to a reception plant north-west of Bergen. From there, the CO_2 will be piped offshore to an aquifer some 3 km under the seabed.

The involvement of oil and gas companies in CCS is key, Per Sandberg, senior advisor for business development at Equinor, told *GVG*.

"A lot of this work involves standard oil and gas operations," he said, pointing to reservoir exploration and appraisal, well drilling and installing subsea equipment, the laying of pipelines and the monitoring the CO_2 storage.

Equinor also brings its direct experience from the Sleipner and Snohvit fields to the table.

The cost of Longship is projected at 25.1bn kroner ($2.6bn), including 17.1bn kroner in →

investments and 8bn kroner in operating costs over a 10-year period. The government presented a white paper for what prime minister Erna Solberg described as Norway's "greatest climate project" in September. It proposed 16.8bn kroner in state support for the scheme, with private investors expected to foot the rest of the bill.

Equinor is hopeful that the government will take a final investment decision (FID) on Longship's first phase in December, Sandberg said. This stage will involve the capture and storage of 1.5mn mt/yr of CO_2. The Brevik cement factory and the Oslo waste incineration plant will provide some 0.8mn mt/yr, he said, meaning Equinor has to find other customers for the remaining 0.7mn mt/yr, both in Norway and other European countries.

Equinor and its Northern Lights partners are installing a larger pipeline to carry the CO_2 offshore, Sandberg said, so that the project can be easily scaled up to its second-phase capacity of 5mn mt/yr.

"We're seeing tremendous interest," he said. "We're already talking to 50 companies in Europe."

Equinor's "ambition" is to provide the transport and storage of CO_2 at a cost of between €30-55/mt by 2030, according to Sandberg. This does not involve capture costs, which vary significantly depending on different industries.

The cheapest capture costs are typically at gas processing facilities. For instance, existing industries that produce ammonia and hydrogen already separate out CO_2 as part of their production processes. The capturing of this already-separated CO_2 would be relatively low cost, Sandberg explained.

European CCS projects could potentially work without any direct state subsidies if carbon prices were much higher under the EU's emissions trading system, in which Norway participates. Prices are currently at just above €30/mt, having risen significantly over recent years.

Equinor sees carbon pricing as just one piece of puzzle, however.

"What we see is as the real driver for most of potential customers, is actually not the uniform CO_2 price, but their own voluntary ambitions about climate," Sandberg said. "Almost every city, every region and every modern company in Europe has set themselves extremely demanding CO_2 targets."

"This creates a dynamic and a willingness to pay that goes way beyond the uniform CO_2 price," he said.

Equinor believes the measure of Longship's success will be how much it spurs the development of CCS beyond Norway.

"Norway needs carbon capture just like any industrialised nation needs it to decarbonise," Sandberg said. "But the project is a kickstarter for CCS value chains, helping to improve them for other countries to benefit from."

CCS is also necessary to produce clean hydrogen from gas. Commenting on the EU's hydrogen strategy, published in July, Sandberg said there needed to be "a level playing field" between blue and green hydrogen to avoid "defining green hydrogen as the winner before the race starts."

"We need to decarbonise the molecule pool as well as the electricity pool and this is where the European hydrogen strategy runs into a problem," he said.

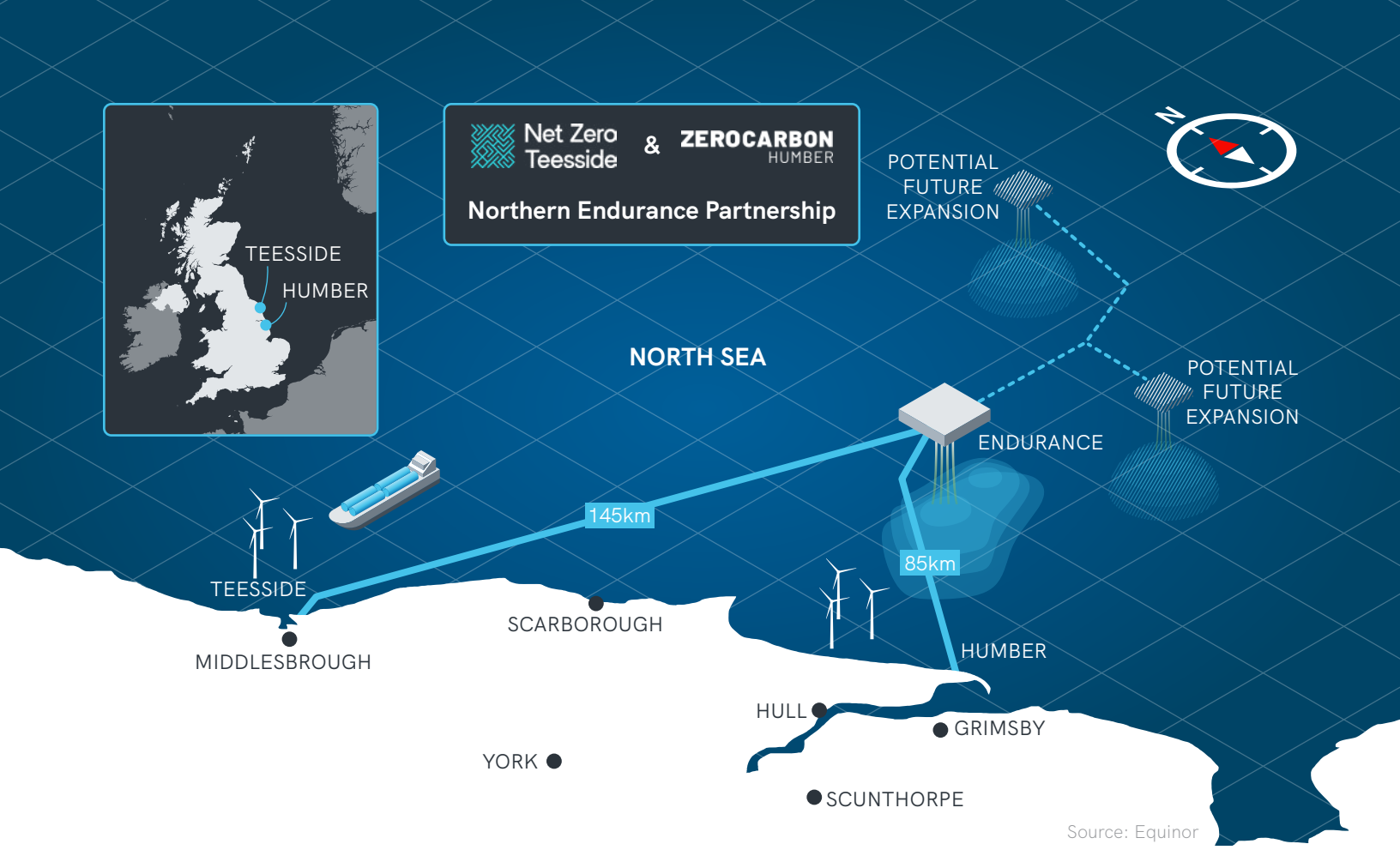
Hydrogen has a major part to play in Europe's decarbonisation, but the only way to provide the large amounts required is by making use of existing gas supply and infrastructure, he said.

"There's nothing wrong with electrolysers or green hydrogen. The problem is the lack of electricity," Sandberg continued. "Every electron that you use to produce green hydrogen will not be used to decarbonise the electricity pool."

Blue hydrogen can be developed sooner and become an enabler of green hydrogen at a later stage, he said.

Decarbonising the UK's north

While Equinor does not currently have any blue hydrogen projects underway in Norway, it is exploring options, Sandberg said. It is also involved in two major CCS and blue hydrogen ventures in the UK. →



Source: Equinor

The Zero Carbon Humber (ZCH) and Net Zero Teesside (NZT) schemes aim to help the large Humber and Teesside industrial clusters in northern England achieve net-zero emissions as early as 2030, through CCS, hydrogen and fuel switching. The schemes are expected to capture some 17mn mt/yr and 10mn mt/yr of CO_2 respectively from various industrial sites. This CO_2 will be piped to an aquifer in the North Sea for storage.

BP, Equinor, Italy's Eni, Shell, Total and UK transmission system operator National Grid have set up the Northern Endurance Partnership (NEP) to develop the infrastructure needed for the CO_2 transport offshore and storage. NEP has filed a bid for financing from Phase 2 of the UK's Industrial Decarbonisation Challenge fund.

A sub-project of ZCH is the Equinor-led Hydrogen to Humber (H2H) Saltend, which will convert North Sea gas arriving onshore at the Easington terminal into hydrogen. It will be the largest plant of its kind in the world, combining a 600-MW autothermal reforming unit with CCS capabilities.

HSH Saltend alone is expected to lead to a 900,000 mt/yr reduction in CO_2 emissions. NZT also aims to produce hydrogen for industrial use, relying on North Sea gas as its feedstock.

Other key CCS and hydrogen projects in the UK include HyNet in Merseyside and Acorn at St Fergus in Scotland. There are also earlier-stage plans at the Isle of Grain LNG terminal in southern England and in south Wales.

CCS has been brought to the forefront since the UK committed to its 2050 net-zero target, replacing a previous goal of reducing emissions by 80%.

"The adoption of the net zero target is a boost to CCS as it now means all industries will have to make a major contribution in order to meet net zero, rather than being part of the remaining 20%," Will Webster, energy policy manager at industry association Oil & Gas UK (OGUK), told *GVG*.

In the longer term, a more sustainable business model is needed for more widespread CCS in the UK, Webster said, where project investors get remuneration from the market. Carbon pricing →

will play a role, as could contracts for difference, currently used for offshore wind in the UK, he said.

Blue hydrogen is a logical approach for the UK, he said, given the major role gas already plays in its energy mix. Some 80% of UK homes are hooked to the gas grid and gas accounts for 40% of the country's power.

"Both blue and green hydrogen are really interesting prospects," Webster said. "We need to get them both up to scale. [But] blue is the best way to do that in the short to medium term – that's a sector you can get up to volume pretty rapidly."

> **"You need these objectives to get around the sort of chicken and egg problems with any new sector in that you've got to develop the production, the infrastructure, storage and the market design all at the same time."**

Unlike Norway, the UK is yet to publish a national hydrogen strategy, although the government has said it hopes to do so before the 2021 United Nations Climate Change Conference next November. This strategy will be important for establishing top-level objectives, Webster said.

"You need these objectives to get around the sort of chicken and egg problems with any new sector in that you've got to develop the production, the infrastructure, storage and the market design all at the same time."

A strategy will be also be needed for creating a business model for how investors are remunerated, and for establishing how the hydrogen market and the existing gas market will interact with each together.

"You need a clear strategy at the top so that when the more detailed regulatory decisions are being taken they are all going in the same direction," Webster said.

Cleaning up Rotterdam

Over in the Netherlands Porthos, a consortium comprising gas operator Gasunie, state producer EBN and port authorities, is looking to storage some 2.5mn mt/yr of CO_2 in the North Sea from industries in Rotterdam. Gasunie expects the scheme to recover 10% of total emissions produced by the industrial cluster. Local industry operators Shell, ExxonMobil, Air Liquide and Air Products signed joint development agreements on the project in December 2019.

The CO_2 will be delivered via planned pipelines to depleted gas fields on the country's shelf. Porthos estimates the cost of the transport and storage at €60/mt, spokesman Sjaak Poppe told *GVG*, although it will depend on the volumes at play.

"The main driver is the ETS price, as well as our success in lowering costs," Poppe said.

The Dutch government has a subsidy scheme aimed at closing the gap between ETS prices and the cost price of the CCS. Porthos is also hoping to get €102mn ($118mn) in funding from the EU's Connecting Europe Facility.

Companies looking to provide the CO_2 should know by the second quarter of 2021 whether or not they have received subsidies for capturing it, Poppe said. Porthos is targeting a final investment decision (FID) in early 2022, and the project should start up in 2024. ■

IGU Chooses Italy for 2025-2028 presidency

Andrea Stegher has been announced as IGU President from 2025-28, with Milan set to host the 30th World Gas Conference

During the two-day virtual sessions of the International Gas Union' electronic Council meeting, Italy was chosen to hold the organisation's presidency from 2025 to 2028

As part of the winning bid, the city of Milan will also host the 30th World Gas Conference in 2028. The WGC is the landmark event for the global gas industry held in the country holding the Presidency of the IGU.

As part of its bid for the Presidency, Italy defined two key focus areas: integrating natural and renewable gases to advance the energy transition and working towards a more inclusive international industry.

New IGU Secretary General appointed

The International Gas Union will enter a new era next year with the establishment of a permanent headquarters as the organisation's Secretariat moves from Barcelona to London.

In accordance with this move, and after an international search process, the IGU has appointed experienced energy executive Mr **Andy Calitz** as its next Secretary-General with effect from 1st of August 2021.

With a comprehensive background in the global gas industry, Mr Calitz was a member of Shell's senior executive group for almost 15 years and has worked in Canada, Russia, China, Australia, South America, Europe and Africa.

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