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Alberta's premier working to win federal support for LNG

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Alberta might be making some headway in its efforts to get the Canadian government more aligned with west coast LNG developments and Alberta's emissions reduction and energy development goals, Premier Danielle Smith said in a closing day keynote speech LNG2023.

In recent meetings with Prime Minister Justin Trudeau in Calgary, Smith said she shared Alberta's economic priorities, "and we both agreed on the necessity of assuring that phase 2 of LNG Canada proceeds."

Both sides, she said, agreed on the need to optimise the workforce at the LNG Canada worksite near Kitimat, where the first 14mn tonnes/year phase of the Shell-led project is about 85% complete.

"We want to build out the next 2bn ft^3/day-plus of LNG sooner," she said. "We also had a very positive discussion of LNG and ammonia and hydrogen and the need to look at how all three governments can clear the way for investment, job creation and emissions reductions while helping to meet global demand."

Smith also said she had met recently with BC Premier David Eby to discuss shared LNG opportunities and the continued optimisation of the Montney field, which straddles the border between the two provinces and holds an estimated 4,500 trillion ft^3 of recoverable gas reserves.

"Buyers are looking specifically to Alberta, home to about two-thirds of Canada's natural gas production," she said. "But while buyers are looking to Alberta, the challenge has always been delivering LNG to them. With the right infrastructure in place, Canada would become a sought-after supplier for both Asia and Europe."

Smith said she had also discussed those goals with Eby, in particular the ability of BC and Alberta to deliver the world's cleanest LNG to markets in Asia, where it could displace coal for power generation.

"We both think that one of the keys to making sure that we can have successful export projects is by using Article 6 of the Paris Accord, which allows for Canada to get international credit for reducing emissions abroad," she said. "We are going to see if we can pioneer and approach between BC and Alberta to allow for that so that we can be a major player in reducing global emissions."

The two premiers also agreed to establish a formal working group to look at supply chain constraints, permitting and regulatory overlap.

"And we are going to pursue our own expedited process with the federal government to fast-track projects so we can put more shovels in the ground sooner."

LNG2023 showcases Canada's clean LNG

LNG Canada will produce the world's cleanest LNG starting from 2025, when first cargoes are expected from its 14mn tonnes/year phase 1.

Dale Lunan

Tim Egan (left), CEO of the Canadian Gas Association, opened the LNG2023 Conference with a Leadership Dialogue with Jason Klein, CEO of LNG Canada.

Canada will join the global LNG market in 2025 when the world's cleanest LNG will hit Asian markets, the CEO of LNG Canada, the Shell-led consortium developing a 14mn tonnes/year project on BC's northern coast, told an opening session at the LNG2023 Conference in Vancouver on Monday.

In a leadership dialogue with Tim Egan, CEO of the Canadian Gas Association and host of the conference, LNG Canada CEO Jason Klein said cargoes from the project will be 50% less emissions intense than the global average, and 35% less than the best plants operating now.

That's due to a number of factors in Canada's favour, including access to an abundant, low cost and low carbon intensity gas supply in the Montney and access to abundant hydroelectricity, to power not only the upstream production operations but much of the liquefaction opportunities now under discussion on Canada's west coast.

"We are really able to lean on the resources of BC Hydro to provide clean electricity for all of our facilities," Klein said. "We also benefit from the pinnacle of LNG design, and from a much cooler climate."

Shipping distances to Asian markets from Kitimat are half what they are from the US Gulf Coast, without the volatility of moving cargoes through the Panama Canal, and with shorter shipping distances, the environmental impacts of LNG trade from Canada are reduced.

The LNG Canada consortium – Shell, Malaysia's Petronas, PetroChina, Korea Gas and Japan's Mitsubishi – brings a wealth of global LNG expertise to Canada. In return, Klein said, LNG Canada is paving the way for the next wave of Canadian LNG – one that will be led by First Nations as full partners in two projects under development, Haisla Nation's Cedar LNG, and Nisga'a Nation's Ksi Lisims project north of Prince Rupert.

"We are watching very closely our good friends at Haisla who are leading the Cedar project and I'm very excited about the prospect of LNG carriers leaving Cedar, around the corner from LNG Canada, and travelling the Douglas Channel," Klein said. The world needs more reliable and responsible energy and we have the opportunity, here on the doorsteps of Asia, to deliver LNG that can displace coal, that can improve global emissions, and that can help hundreds of millions of people out of energy poverty."

While the first 14mn tonnes/year of phase of LNG Canada will enter service in 2025, its partners are already evaluating phase 2, which would double the output of the facility. All the permits are in place for that second phase, but Klein said LNG Canada must still manage stakeholder expectations around cost competitiveness, affordability, timelines, emissions and other factors.

"In that vein, we are evaluating alternatives to potentially further improve on our world leading design through additional electrification, as and when sufficient reliable power can be provided," he said. "We are having really good discussions with the government and BC Hydro about the infrastructure required to make that happen."

LNG Canada is now about 85% complete, and in the nearly five years since its partners made a final investment decision on the project, in October 2018, much has changed for the host Haisla Nation, its chief councillor told Egan in a second leadership dialogue opening LNG2023.

"That project has immensely changed my community in the last five years," she said. "We are talking about being at the table right from the beginning, actively participating in the project, and benefiting from revenue sharing that we are able to invest in revitalising our culture and our language."

Ten years ago, before LNG Canada set the bar high for indigenous participating in Canadian industrial projects, First Nations throughout the country "sat on the sidelines" and watched as others prospered from projects on First Nations lands and impacted not only the environment but also indigenous cultures.

"Now we are in a true partnership with LNG Canada and majority owners in our own project, Cedar LNG," Smith said. "We truly feel that these projects are a part of the solution."

Crystal Smith (right), chief councillor of Haisla Nation, discussed the impact LNG Canada is having on First Nations with Canadian Gas Association CEO Tim Egan.

Randy Boissonnault, Canada's associate minister of finance.

Canada needs an "at scale" LNG economy: Boissonnault

Dale Lunan

Canada needs an "at-scale" LNG economy to keep up in the global climate change fight, Randy Boissonnault, Canada's associate minister of finance said in a keynote address to the LNG2023 conference on Tuesday.

"The world's major economies are moving at an unprecedented rate and pace to fight climate change, retool their economies and build the net zero industries of tomorrow," he said. "Canada must keep pace because we cannot afford to fall behind – that is why the development of an at scale LNG economy is a strategic priority for Canada."

And he opened his address by echoing a statement by US President last March when he addressed the Canadian Parliament: "The world needs more Canada, whether it's critical minerals, or hydrogen or grains, or artificial intelligence or LNG. Canada has what the world wants."

Boissonnault's message was the strongest expression of support for Canada's LNG aspirations from the federal government in quite some time. Last summer, as Germany sought to source more natural gas from Canada, Prime Minister Justin Trudeau said there was no business case for delivering Canadian LNG to Europe, and instead suggested Germany pursue hydrogen opportunities in Canada.

Since Russia's invasion of Ukraine in February 2022, the world has realised the need to work together to eliminate energy poverty, enhance global security and maintain a strong focus on effectively combating the climate crisis.

"In this context, Canada is well positioned to be a stable and reliable global supplier of choice," he said. "We...have the ability to produce LNG with the world's highest environmental standards and lowest emissions."

Canada, he said, was also the first country to support the Global Methane Pledge, a commitment to reduce oil and gas methane emissions by at least 75% below 2012 by 2030.

"The fact is, we are facing a changing climate, and to use a very Canadian statement, we must skate to where the puck is going."

Mike Rose, CEO, Tourmaline Oil

In Conversation: Mike Rose, CEO, Tourmaline Oil

Tim Egan, CEO, Canadian Gas Association

Tourmaline Oil is Canada's largest natural gas producer, and a leader in employing technology and innovation to produce ever cleaner natural gas. Recently, CEO Mike Rose sat down with Tim Egan, CEO of the Canadian Gas Association, to discuss Tourmaline's past, present and future, Canada's road to net zero, and how to navigate that path.

Tim Egan: Mike, we want to talk about innovation and Tourmaline's innovation story, so I thought why don't we start with you giving us a bit of a snapshot on Tourmaline, how it came about and how you built the company to what it is today?

Mike Rose: Well, I'm a geologist. I started 44 years ago in this business and when I started at Shell in 1979, I was actually told that this might be a sunset industry. The sun is still shining brightly and will for many more decades. I worked at Shell for 14 years in exploration and production; the last job I had was running E&P research for Shell Canada with significant interaction with the entire Shell group. I was always a technical, detail-oriented geologist, a good playmaker, but that research exposure really opened my eyes to the power of technology and research and that's helped me to this day. I left Shell in 1993 as I had an opportunity to go the independent route and start Berkley Petroleum, which we grew to an Intermediate E&P until March 2001, when it was sold to Anadarko. I started Duvernay Oil immediately after that as a private company, went public, and also grew to Intermediate size. We were a pioneer of the Montney play and Shell bought Duvernay in July of 2008 – the last time, ironically, that we had $8 gas, for $5.5bn.

That was when I started Tourmaline, in the summer of 2008, during the major financial crisis. We were in a good position because we were well capitalised coming out of the Duvernay transaction and it was one of the rare times that the very large companies and the majors would part with premium assets in the best part of the Basin – the two premium Canadian gas plays – the Alberta Deep Basin and BC Montney.

Tourmaline went public in 2010 and we've grown from there. We're now the largest natural gas producer in the country as well as the largest natural gas liquid producer – fourth largest producer overall. Importantly, we have by far the largest future drilling inventory of any of the North American large gas producers. The long-term goal is to control the largest lowest-development-cost, lowest-emission natural gas supply in North America; we're well on the way.

Tim Egan: So let's go down that path a little bit, your goal to be the lowest-emitting producer. Often in the present conversation there seems to be a conflict between the shareholders' interest and the environmental agenda. How do you reconcile those two?

Mike Rose: I think our shareholders are very happy with what we're doing on that front. The ones that have invested in us obviously like natural gas. They realise that of the fossil fuel group, natural gas has the highest energy density and the lowest emissions when you burn it. We're certainly not hiding or afraid of the fact that we do create emissions, but we work very hard at reducing those emissions across the whole production chain. I think we're a leader in that regard, and that makes shareholders happy as well.

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That's what this company is, and we plan to be, on a net basis, the lowest-emission producer in Canada, and Canada, we believe, leads the world in that regard.

Tim Egan: How do you measure that as a producer? Is there a straight-up simple measure? Is there a means to do it?

Mike Rose: Yes, everybody's reporting now, any company of size, and so you have to report your total CO_2 emissions and your emission intensity, as well as methane emissions. I think it's gotten pretty sophisticated. Measurement is continually evolving in the field, with standardised measurement protocols being finalised. I'm not the expert in that, I'm just good at finding the stuff, but we have really talented people who manage this aspect of the business.

Tim Egan: You're now recognised in Canada as being the lowest-emissions producer. Do you feel that falls on deaf ears with decision makers in this country?

Mike Rose: To a large extent yes, as we are working very hard on emissions reduction and making material progress, and it is frustrating.

Tim Egan: You make a point in your corporate reporting to talk about GHG emissions, but a lot of people seem just fixated on that when they talk about the environment, and you have a much broader take on environmental performance. You talk about air quality in general, water and surface impact as well. Do you want to talk about that a little bit?

Mike Rose: Sure. Our mantra is full environmental performance improvement for air, land and water. Man is certainly polluting all three as our overall population grows, and we want to improve our performance in all three areas. We need as much fresh water as possible around the world, hence we've systematically eliminated fresh water usage from virtually all of our fracking operations.

And we're also a leader in the basin in diesel displacement, getting our drilling rigs and frack spreads off diesel onto our own natural gas. That leads to material emissions reductions, and not just CO_2, but all the other more noxious emissions that are released when you burn diesel. We also have a whole CCUS strategy on the gas side of the business that we will enact.

How we approach our environmental performance improvement is to lay out five-year plans on improving our performance in all three areas, similar to our EP/Financial plans, which we've produced for a long time. We set hard targets in those five-year environmental plans, and we have a perceived technology roadmap to get there. When we get to the end of the five-year plan or achieve the targets early, we set a new five-year plan and put new hard, challenging targets in place. We're now in our second five-year plan on overall environmental performance improvement. Notably, on methane emission reduction, we hit that target three years early, and we have subsequent targets that we're evolving and we'll continue down that path. Importantly, that's not methane intensity reduction, that's a 25% reduction in net methane emissions, three years early, and we're probably the fastest-growing producer in the basin.

Tim Egan: So that kind of environmental performance is about technology. Do you want to talk a little bit about your perspective on technology and where you want your company to be on innovation technology?

Mike Rose: We approach all aspects of the business with a very strong scientific and technology focused lens, as well as a very strong economic lens. And really, all our decisions are made that way. We deliver the lowest capital cost completed horizontals in our two main gas areas, the Montney and the Deep Basin. We have brand new state-of-the-art infrastructure that we've constructed; we're actually the fourth largest gas midstreamer in the basin. Brand new, low emission, and super efficient; we're at the leading edge, technology-wise, in all of these areas.

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A natural gas plant in the Montney basin, Canada

The emissions testing centre at Tourmaline-Perpetual Energy West Wolf gas plant.

When we're talking about environmental performance improvement, we have that same lens. I talked about our diesel displacement and I think we are the first company to get our whole drilling fleet off diesel. That has also saved us $60 million on a net basis over the past three years. You can improve financial performance as well as environmental performance. If there is an opportunity to achieve a positive return from this important environmental performance improvement, then shareholders get a double win – they get a cleaner environment, and they get a more profitable underlying company.

Tim Egan: So when you think about technology innovation in environmental performance, you noted that a key part of your motivation is delivering best value to shareholders to drive your cost down. Do you also think of these technologies as new innovations that you might then patent or develop and carry into the market for use by others out there? Because it seems to me that this kind of innovation is in itself a huge value to others out there in the market.

Mike Rose: We are in the Natural Gas Innovation Fund, which is about sharing technologies, and we're all over that because not only do we want Tourmaline to be the best company out there, but our whole sector needs to be getting cleaner, for all the macro issues that we're continually dealing with. Technology and its innovation application is the answer. We all agree that we need a comprehensive integrated energy and environment strategy that balances improving the environment and reducing emissions while considering the economic well-being of the country, its individual citizens and providing energy security for all. And you can't do that in isolation. Technology and innovation will drive environmental performance improvement. It won't necessarily happen on arbitrary timelines like 2030 or 2050, but it will happen. It's science and technology and innovation that will provide the real answers on our environment.

Tim Egan: The public conversation about what needs to happen on energy is that that there needs to be this kind of dramatic transition, but as you describe the kinds of things you do, it's steady, continuous improvement. It's incremental change, it's setting short-term goals internally as a company and building on them. Is there a disconnect between the sort of high-level government objectives and this idea of a transition and what companies actually do on the ground?

Mike Rose: Yes, I think there is. And it's mostly because the targets that have been set are arbitrary, as are the timelines, and a top down approach in just about anything doesn't work. It needs to be systematically and corroboratively built from the ground up, and we're on the ground now and we're building from the ground up and that's what will actually accomplish something meaningful in the end.

We all need to work together to develop that comprehensive plan. And as I said, you can't do one in isolation, which is pretty much how the approach has been. The world needs more of all forms of energy. We prefer the term transformation to transition, particularly when you talk about oil and gas, because transition suggests it's going away, but we don't think it's going away at all. In fact, oil and gas demand is increasing and has been for some time and will continue to; we will all work in the entire energy industry to reduce emissions and improve our collective environmental performance.

We believe natural gas is the key right →

now to the energy transformation. We think of it as the great enabler. It's affordable, it's reliable, it's abundant, and if you live outside more than 20 degrees either side of the equator, it's essential for life as well. We just need a pragmatic, scientific, economic approach to this file. If you look at some of the cost estimates on the world's energy transition, if we did get completely off fossil fuels, some of the numbers being tossed around are in the range of $150 trillion. In the Shale Revolution in the US between 2010 and 2020 – the total capital expenditure was $1.3 trillion and that was a technical revolution. We really did figure out how to create an enormous amount of abundant low-cost energy; we just ironically killed our own supply-demand equation. That's $1.3 trillion between 2010 and 2020, but to completely get off fossil fuels the think tanks are saying $150 trillion. And we don't have a plan on how to actually accomplish this, and neither does the United States and neither do any of the Western governments.

Tim Egan: But to your point, why would you try to get off? I mean, the reality is that every source of energy we've ever used, we continue to use, and in fact use more of than we ever have before. Use more wood than we ever did, more coal than we ever did, more oil than we ever did. But we're using them better.

Mike Rose: And we're making them better. I think all of our energy choices should be made on an energy equivalent, full-cycle basis, comparing the true cost per unit of energy delivered, and the true, full-cycle environmental impact and emissions footprint of each of those sources. And when you do that natural gas actually screens at or near the top. But in reality, we don't have the luxury to pick one or two sources – we need more of everything.

Now there are some in power in the various Western nations who are trying to arbitrarily accelerate this transition off fossil fuels to 2030 or 2035. It's an incredibly risky path and will materially change the entire world economy and compromise the standard of living of all Canadians starting by impacting the most disadvantaged .

Fortunately, our country has a second chance at this as natural gas evolves into a truly global commodity. The Great Enabler!

Mike Rose, CEO, Tourmaline Oil.

Tim Egan: You note that any kind of change really comes about from the ground up. When it's pursued from the top down, it doesn't go well. What do we do as an industry to make that clearer to decision makers, so that that reality is better realised and we can capitalise on the opportunity we have?

Mike Rose: First, we go out in the field, on the ground, and demonstrate how it can be done! We need to do as good a job as possible of making sure the Canadian population understands the entire energy/environment equation and what we require, and that we can't just stop using fossil fuels tomorrow, but we do need to get ever cleaner with them. Better energy literacy for all Canadians would go a long way in helping to shape a regulatory environment that reflects that whole equation.

Tim Egan: Part of the challenge is to attract younger Canadians to the sector, to see the sector as being innovative and cutting edge. Do you have any suggestions on what we can do to attract more people into the sector and to play up the innovation stories that we have within?

Mike Rose: I think we have to keep communicating. We have to do a better job of elucidating how a career in oil and gas is not only exciting, fulfilling and all those things you want from a great job, but an excellent way to drive the type of innovation that can make a huge difference in the world. We also need the public and the government better educated on what we do, and that's on us as well. And I think we need to somehow encourage a more balanced media to deal with, as well, because they play a big role in in shaping the issue.

Tim Egan: There's a terrible moment in world history right now. Russia has invaded Ukraine. There are monstrous things happening on the ground there. It's forced Europe to reflect on its energy picture, it's forced the world to talk about energy security in a way it hasn't for a very long time. Is this an occasion for Canada to step up? And if so, what more can we do to step up?

Mike Rose: I think yes, is the answer to that question. Can we provide more natural gas to Europe in the immediate short term? No. Can we supply a little bit more gas south to the United States and then in effect, displace some gas that might have been going to Asia and get it to Europe? Yes, we can, and we are. In January 2023, Tourmaline became the first Canadian natural gas producer to supply LNG internationally through our US Gulf Coast LNG venture. What we actually don't really need from our governments, provincial and federal is money, particularly on the gas side; we don't need to be subsidised. We just need consistent regulatory support for the approvals and doing it quickly, so that we can build more pipelines, because that is the key to providing clean, low-cost Canadian energy to the world. Canada will have an LNG industry on the West Coast when LNG Canada starts up in 2025 or 2026. It's currently slated at 2bn ft^3/day; it will hopefully grow to 4bn ft^3/day, but ideally we should build another LNG project or two. North America can be completely energy independent and 'Energy Secure' – it is certainly on the gas side now.

The 12bn ft^3/day LNG export business that has emerged on the US Gulf Coast in the past three years could have been on Canada's West Coast if we'd moved more decisively in the 2010 – 2015 time period. Fortunately, our country has a second chance at this as natural gas evolves into a truly global commodity. The Great Enabler!

This article was originally published on Gas Pathways, an international platform demonstrating the innovation agenda around gas energy and gas energy infrastructure. The BOE Report is a Gas Pathways Partner.

Gas is needed "indefinitely": al-Kaabi


Qatar's energy minister and QatarEnergy CEO Saad Sherida Al-Kaabi

Joseph Murphy

Natural gas will be needed "indefinitely" as a guarantor of baseload energy supply, even as the capacity of renewables continues to grow over the coming years, Qatar's energy minister and QatarEnergy CEO Saad Sherida Al-Kaabi said in a keynote address on Tuesday.

"Gas is absolutely needed, as the cleanest fossil fuel, as a baseload supplier of electricity, and for powering all kinds of factories and manufacturing," he said. "Some people say that by 2050, we will need no more gas. I think we will need gas indefinitely as a baseload."

Qatar, the world's biggest LNG exporter in 2022, took a final investment decision (FID) in February 2021 on the $29bn North Field East (NFE) expansion project, due to raise Qatar's liquefaction capacity from the current 77mn tonnes/year to 110mn tonnes/year by the middle of the decade. It is currently preparing to greenlight North Field South, which will increase capacity even further to 127mn tonnes/year.

"There were doubts at the time about whether that much investment was needed," al-Kaabi said, commenting on the decision to go ahead with NFE. "Especially given the discussion about the energy transition, and the demonising of investments in oil and gas."

Now perspectives have changed, he said, in light of the energy supply crunch, which was exacerbated by fallout from the conflict in Ukraine that began last year.

Concerns about security of supply, affordability and sustainability move in cycles, he said.

"If you look back at history, in the 1970s there was the oil crisis and the concern about security of supply, and then in the 80s and 90s it was about the affordability of oil and gas," he explained. "And then after the 1997 Kyoto Protocol it was all about the sustainability of energy."

Once more the cycle is repeating, he said. Concerns about sustainability are now giving way to concerns about security and affordability.

The unprecedented spike in global gas prices was in no small part due to the Ukraine conflict and Russia's subsequent drastic cut in pipeline gas supply to Europe. But high prices today are also the result of a broader trend of underinvestment in supply that goes back a decade, al-Kaabi said. And the current scarcity of supply would have been much more painful had it not been for unusually warm weather last winter.

"And investment is still not coming in at the level we think it should," he warned.

Talk of rushing to ditch fossil fuels in developed nations is "selfish," he added, given the growing energy needs of the developing world. "There are a billion people in the world that are still deprived of basic electricity that we need today," he said.

The minister pinned the blame on legislators that have pushed far too fast a transition away from fossil fuels in the current energy crisis.

"We need to be realistic about what we can achieve," he said. "We need a baseload of sustainable and reliable energy like gas, and like nuclear, to cover the intermittency of renewables. We need to do more with renewables, but we need a balance."

He went on to stress the sustainability of Qatari energy, noting that the country boasted the largest CO_2 sequestration in the MENA region. Today it sequesters more than 2mn tonnes of CO_2 annually, and this will rise to 11mn tonnes within a few years, he said. Qatar is also using solar energy to power its LNG facilities.

"So the carbon intensity of our LNG is probably the lowest in the world," he said.

Forty percent of new LNG due t o arrive on the market by 2029 will be produced by Qatar, he said, adding that Doha avoided short-term thinking about energy supply and pricing.

"If you look at anything on a short-term basis, then all your decisions are completely skewed, whether it's a very low price environment or a very high price environment," he said.

Qatar's preference is long-term contracts structured with stable pricing, he said. The country recently signed the longest ever LNG contracts on record, with China's Sinopec and CNOOC, spanning 27 years.

"If it wasn't for a fair and sustainable price that would be sustainable for 27 years, they wouldn't have signed and we wouldn't have signed," he said. "We're not greedy, we don't try to take advantage. We are very fair in how we structure our contracts.

The minister predicted that Qatar would sign contracts for a record amount of LNG supply this year – a record not only for the country but the entire industry.

"I've never said something that I do not deliver on," he said. "And I don't think such a year will ever be repeated again."

Decarbonisation, energy 'trilemma' at heart of LNG2023

To the surprise of no one, continuing to provide secure, reliable and affordable energy while still pursuing climate goals dominated discussions at LNG2023.

Dale Lunan

Decarbonisation of the global energy system – and the role natural gas and LNG can play in decarbonisation – was a key point of discussion at LNG2023, but working to solve the so-called 'energy trilemma' was right near the top of everyone's agenda, panellists at the conference's final formal session heard July 13.

Much has changed on gas and LNG markets since the International Gas Union (IGU) last hosted its International Conference on LNG in Shanghai in 2019, LNG2023 programme chair Philip Hagyard said, and providing secure, sustainable and affordable energy tops the list.

"Times have changed – we've had the pandemic, we've had the climate crisis, demands on the LNG industry, like all industries, to decarbonise and for LNG to play its part in the energy transition," he said.

Those issues – apart from the pandemic – were on the table at LNG2019, he added, but a host of new challenges have arisen, →

not least of which was Russia's invasion of Ukraine, which led to the IGU postponing LNG2022 and moving it from St Petersburg, Russia to Vancouver.

"The repurposing (of fossil fuel infrastructure), electrification, methane emissions – these are brand new subjects, they were not there at all in Shanghai – not a mention," Hagyard said.

Sustainability heads the agenda

Still, with all the talk surrounding those other issues, decarbonisation of global energy systems, including natural gas and LNG, remained top of mind for most at the conference, said Ed Crooks, vice-chair, Americas for global consultancy Wood Mackenzie.

"Clearly, the number one challenge is decarbonisation," he said. "Energy security, reliability and affordability have rocketed right up the policy agenda and the agenda for the industry as well, but decarbonisation is still seen as very, very important. And a lot of people are working on it in a lot of different ways."

And while many challenges have stood in the path of the gas industry since Shanghai, Michael Stoppard, global gas strategy lead and special advisor at S&P Global, said what struck him most as he moderated sessions, explored the exhibition floor and met with delegates over the four days of LNG2023, was the "sense of confidence" that still permeates the industry, even in the face of those challenges.

"That was not obvious to me before we came, because we have been through a lot," he said. "We have a climate crisis, we've been through a pandemic, we're facing the weaponisation of energy in geopolitics, we've seen extraordinary price volatility to manage. But I think we have a common confidence about where the industry is moving."

The security leg

Unquestionably, energy security became a much more prevalent talking point at LNG2023 with Russia's military intervention in Ukraine and the subsequent loss of Russian piped gas to continental European markets. And while some suggested there was too much talk of Europe, Stoppard emphasised that the loss of Russian gas to Europe was, in fact, a loss to the global supply system.

"This is not gas that has been directed elsewhere, in the way oil has been redirected very strongly into India," he said. "In the case of oil, it has been a reshuffling of trade; in the case of gas, it has been a loss of a volume, and while LNG has been able to replace the lost Russian gas in Europe by showing extreme flexibility, it's not been able to add incremental molecules overnight to the global system.

The Russian situation, Crooks added, also highlighted the growing flexibility of global LNG trade, with cargoes able to be diverted – even in mid-voyage, to new destinations where prices might be higher.

"The point was made in a Monday forum that if Europe isn't secure, nobody is secure," he said. "And that is exactly what happened last year – Europe was not secure."

To address that particular pillar of the energy trilemma, European buyers went to the market and essentially out-bid less well-heeled customers elsewhere in the world, particularly in Asia, Crooks said.

"If we're in that position again, when Europe wants the gas, it has the resources to pay for it, and it will do so – and Europe's problem becomes everybody's problem."

There is no doubt, Stoppard added, that while sustainability remains an important pillar of the energy trilemma, it is no longer the dominant pillar – it has been rebalanced by a new focus on security of supply, perhaps to the detriment of the third pillar, affordability.

Controlling costs

"I'm a little bit concerned that in the commercial, strategic discussions, we've spent a lot of time talking about the importance of affordability," he said. "But in the more technical sessions, there's been some quite concerning discussions about cost inflation and cost management."

Managing those cost pressures and →

ensuring natural gas and LNG remain affordable, Stoppard said, will be a growing challenge in the near term.

"All the forecasts for LNG demand growth that are pretty optimistic are generally based on the assumption that the product can continue to be priced at an affordable level," he said. "So cost, I do see as a dark cloud hanging over this conference and this debate."

WoodMac's Crooks agreed, noting that increased demand for LNG to replace Russian piped gas has created a "bulge" of activity that is being squeezed through the EPC industry, putting strain on global supply chains, particularly in LNG hotspots around the world, "not lease in the US Gulf of Mexico."

"And rising interest rates – that's the other big global issue," Crooks said. "The cost of money is going up, and that's a crucial part of the picture in terms of increasing costs across the industry, squeezing margins, creating potential problems."

Modularisation can help keep a lid on some of those costs, said Hagyard, who as LNG advisor at TechnipEnergies was involved at a technical level with LNG developments in Nigeria, Yemen and Qatar.

"There's been a capacity that's been developed in China and other Asian countries for very large modules, which allow those modularised trains not to be small trains but actually quite large, modularised trains," he said. "That gives you an optimum of the advantages of modularisation and the advantages of economies of scale, which is the traditional source of economy in the industry."

But at the same time, Crooks said, regulatory uncertainty is adding time to projects, and that adds cost. The issue, he said, is most pressing in the so-called Global South – those emerging and less-developed economies that are struggling to deliver energy to millions who have none while at the same time listening to demands from the West to reduce emissions.

"A spokesman from an emerging economy was saying that we are having the values of the west imposed on us, that yes, we care about the climate, but most urgently we need energy security, we need affordability of energy, we need to be able to develop our economy, raise living standards, and that cannot be allowed to fall victim to climate," he said.

Many of the rules governing the global gas market – LNG export developments, how quickly projects can proceed, how much gas production can be developed – are largely controlled by decisions made by governments and regulators in the West, and those policymakers aren't taking into account the interests of the Global South.

"You're not going to be able to address climate properly unless you address energy security and affordability at the same time," Crooks said. "The elements of the trilemma go together, and a political attitude and a policy strategy that focuses only on decarbonisation to the neglect of the other legs of the trilemma is doomed to failure."

This is an industry that can walk and chew gum at the same time. We are able to deal with short-term security of supply, a geopolitical crisis and work on longer term decarbonisation processes.

Michael Stoppard, Global Gas Strategy Lead and Special Advisor with S&P Global Commodity Insights.

Surprise, surprise!

Despite all the challenges facing the global gas and LNG industry, LNG2023 has delivered a few surprises to delegates, Stoppard said, not least of which is a realisation that "this is an industry that can walk and chew gum at the same time. We are able to deal with short-term security of supply, a geopolitical crisis and work on longer term decarbonisation processes."

For Crooks, a major takeaway – not necessarily surprising, but perhaps more illuminating – has been the development of the Canadian LNG industry that has been on display throughout the four days of LNG2023, particularly the involvement of First Nations in those developments.

"This is really pretty radical stuff actually. I can't think of anywhere around the world where industry is working on that basis of giving so much buy-in and commitment to local communities," he said. "I'm not sure how exportable it is, but it is definitely something that the global LNG industry can learn from in terms of project development, community relations, the social licence to operate, how you get buy-in from local communities in the areas where you're operating. I think the Canadian model is really interesting and compelling."

Last word

While the four days of LNG2023 covered a host of topics impacting global gas and LNG developments, the fact remains, WoodMac's Crooks said in his final comments, that the world needs "a lot more" renewable energy.

"But restricting natural gas and stopping the growth of the gas industry does nothing to deliver those increases in renewables," he warned. "It just means there's less energy in total in the world."

For Stoppard, LNG2023 confirmed that security of supply requires investments in supply, which several panels over the course of the four days was being directed more to renewables and less to sustainable natural gas and LNG, which are critical as a lifeline for when the sun doesn't shine and the wind doesn't blow.

"The final point we must say is that this is an industry which does take very seriously the mitigation of emissions and the quest to lower carbon intensity. We have the brains and we have the technology – we have the resources to do it. But we also need the policy framework and the incentives to help us go faster."

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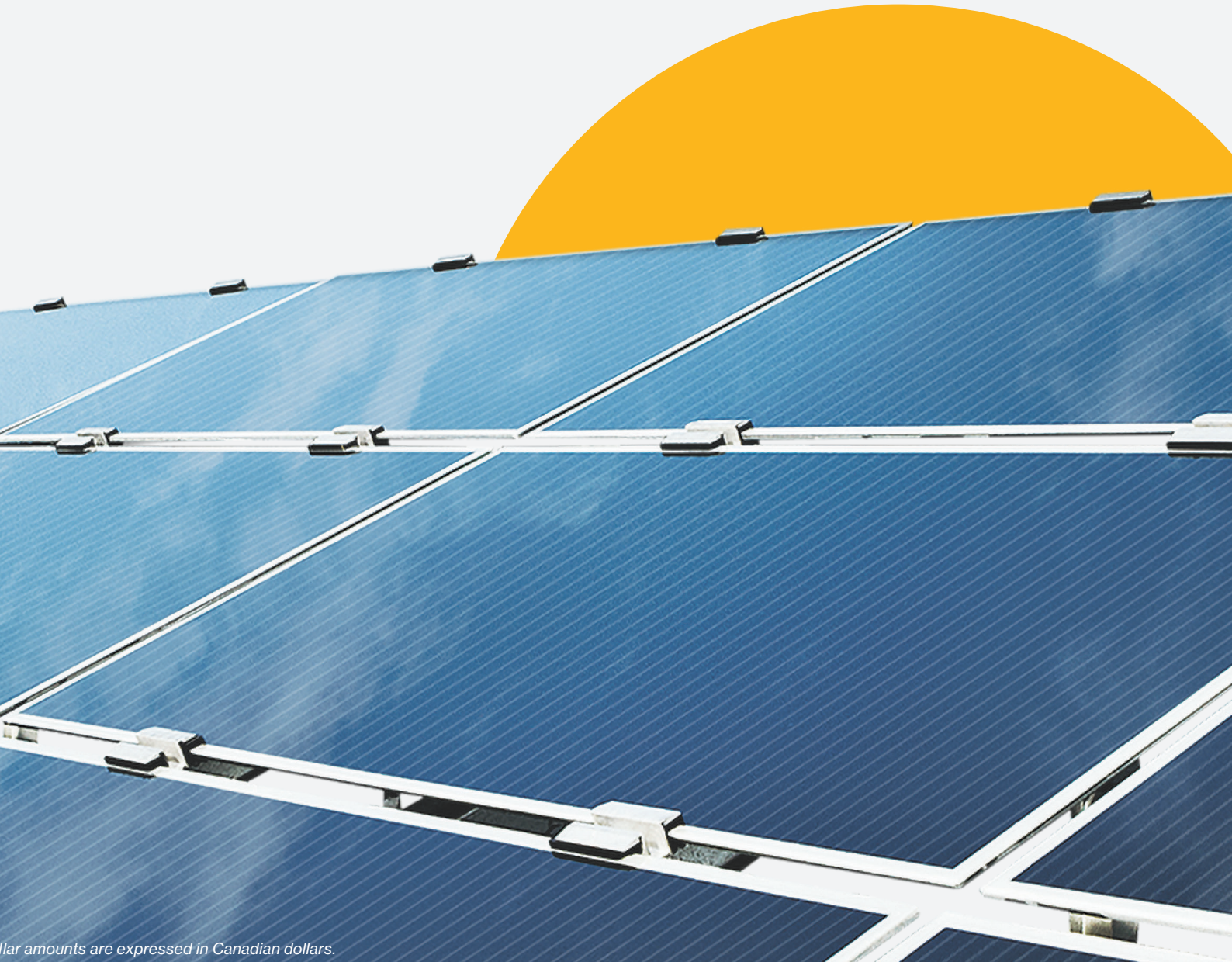

llar amounts are expressed in Canadian dollars.

2022 the "most turbulent year ever" for natural gas: IGU

Dale Lunan

The International Gas Union (IGU) on Wednesday released its 14th annual World LNG Report at the LNG2023 Conference, and called 2022 the "most turbulent year ever" in the history of global gas markets.

But LNG demonstrated "essential value as a flexible, reliable, available energy resource for a secure energy transition."

Global gas markets, which were already tight in the 2021 post-Covid period, were pushed into a major supply crisis in February 22 when Russia invaded Ukraine, the IGU said in its report. In the wake of that military incursion, pipeline imports of Russian gas were cut, leaving a structural supply deficit in continental Europe that led to a scramble to restore energy security, and prices rose sharply.

But in a later session at LNG2023 discussing the IGU report, Sharmaine Ang, global LNG engagement lead for S&P Global Commodity Insights, said price volatility in the world's gas markets preceded the invasion, and were clearly evident as the winter of 2021-2022 progressed.

"In terms of the significance of this new paradigm, I can think of three different aspects," she said. "Firstly, the globalisation of LNG trade, secondly, the increased need for financial hedging of physical LNG cargoes, and thirdly, it shone a light on potential areas of improvement for how LNG term contracts can be priced and structured."

On the globalisation front, 2022 demonstrated how LNG flows were able to better react to changes in prices in given markets, Ang said. European markets were paying a bigger premium than what was available in north Asia, and the market responded to that by increasing cargo deliveries to Europe.

US producers alone managed to ratchet up exports to Europe to 55.2mn tonnes, a 148% increase from 2021, despite the loss of output from the Freeport LNG facility in Texas in June, the IGU report said. For all of 2022, US LNG volumes accounted for 44% of European LNG imports, which Europe took 65% of all US LNG exports.

Later in the session, Tatiana Khanberg, the IGU's director of strategic communications and membership, noted that this "financial muscle" exhibited by European LNG buyers left less well-heeled buyers priced out of the market and had impacts beyond fuel markets, reaching into manufacturing and fertilizer production, which were also affected by the high prices.

"To make the point, the impact of the crisis we have experienced was certainly felt most heavily by the most vulnerable populations, and in Asia, that was very much evident last year," she said.

In the longer term, beyond 2026 and even through 2030, the world will continue to grow – with steady 1% to 2% population growth continuing – and those people deserve energy, said Freeman Shaheen, president of Chevron Global Gas in Houston, told the IGU session.

"What is clear to us is that we need to be cleaner, so when I say that oil and gas will continue in the short-, medium- and long-term, it has to continue cleaner," he said. "We're doing a lot at our company: in the Permian, we no longer flare routinely; we're monitoring methane, we're keeping it in the pipe and using a third party to monitor that; we're using renewables in our operations."

The world will need affordable, reliable and ever cleaner energy, he said, and "gas will get us there."

But Xi Nan, senior vice president of gas and LNG markets at Rystad Energy, stressed caution before jumping wholeheartedly into a new energy reality.

"I want to stress that when prices were very low, we said now we are transitioning to much cleaner energy, but now, when prices are very high, we say we need to have gas," she said. "I think we need a bit longer term to see what we really need in the energy system."

Joseph Murphy

Didier Holleaux, vice president of Engie and the president of the Eurogas association

Europe's energy crisis is far from over

Didier Holleaux, vice president of Engie and the president of the Eurogas association, warns that Europe faces several more potentially tough winters in terms of gas supply security, and urges policymakers to avoid complacency.

Europe got through last winter avoiding energy shortages and the sharp decline in natural gas prices over the past six months has provided a welcome reprieve for consumers. But the continent's energy crisis is far from over, Didier Holleaux, president of the Eurogas association and vice-president of France's Engie, tells *NGW*, warning that risks will remain over the next four winters and authorities must avoid complacency.

The front-month gas contract at the Dutch TTF hub is currently trading at €30-40/MWh. This is a far cry from the peak of €340/MWh that was seen in August 2022, following a drastic cut in Russian pipeline gas supply over the summer.

EU authorities have taken steps to bring down gas prices over the past year, although Holleaux believes the 2022 prices and an unusually mild winter, rather than policy, are largely to thank for relatively low prices now. And he also stresses that current prices are still significantly higher than what was considered normal in the years prior to the COVID-19 pandemic.

"The main factor in rebalancing the market in Europe has been very high prices," he tells *NGW*. "That attracted all available LNG globally, but also significantly reduced industrial demand. And then there was the mild winter."

The European Commission's enforcing of gas storage requirements ahead of last winter also played a role, he says. The EU executive introduced a bloc-wide obligation of 90% gas storage utilisation by November 1, 2022, and this target was far-surpassed, with the level reaching nearly 95%.

Though "helpful," the EU storage rules were so rigid that at times this triggered price spikes, he adds.

The European Commission recently hailed the first tender of its newly-launched joint purchase platform for acquiring gas ahead of the next winter as a "remarkable success." According to media reports, buyers placed orders for 11.6bn m³ of gas, while suppliers offered 13.4bn m³.

However, Holleaux cautions that it is still too soon to say whether the platform can be considered successful.

"So far buyers and sellers have only been matched up. They still have to negotiate and come to an agreement. It's like speed dating - it's good that people turned up, but unless they leave the room with a decision to meet again, we don't know what the success is."

He also notes that given that a lot of the gas was requested on the network rather than at the LNG terminals, much of the volume bid for was remarketed rather than marketed.

"That means that it was gas that had already been dedicated to Europe and remarketed, rather than new gas supply," he says.

"It means that only 20-25% maximum of the gas bought is really new gas coming to Europe," he says. "That's why we consider the success modest. But in a crisis, every bn m³ of gas counts."

He also praised the joint purchase platform for enabling smaller market players to participate on a level playing field with larger players.

The view of Eurogas, Holleaux says, is also that the TTF price cap that the EU introduced after the August 2022 spike in prices was set so high and so late in the season that it had no impact on the market. But a lot of market players consider it was designed poorly, and therefore it would have been inefficient or even had an adverse impact on the market if triggered.

He also regrets that natural gas was only included in the EU taxonomy of what should be considered as "transition investments" with such restrictive conditions that very few projects such as gas-fired power plants can be included.

Unrealistic forecasts

Holleaux also points to mixed messages in the bloc's energy forecasting, which has hindered the signing of longer-term contracts for new gas supply. In its RepowerEU working document released last year, the European Commission projected that bloc gas demand would fall to only 135bn m³ of gas by the end of the decade, and Holleaux stressed that this forecast should be revised.

"If you believe this figure, then you don't need any new contracts and you don't even need to find replacements for the missing Russian gas," he says.

The key focus should be facilitating buyers signing new long-term contracts. In the wake of Russia's invasion of Ukraine last year, the European Commission reached a deal with Washington on securing an additional 50bn m³ of US LNG. But Holleaux believes little in practice has been done to achieve such goals, describing the deal as "not yet materialized."

The majority of long-term LNG contracts helping to underpin investment in new supply have been mostly with Asian buyers or large LNG portfolio companies. Holleaux notes that for example there are only two projects in the US set to reach a final investment decision mostly as a result of European contracts – Port Arthur Phase 1 and Rio Grande LNG.

"The commission has not taken any concrete steps to help European companies reach those long-term contracts, and it's also a problem with national governments," he says.

He adds that the joint gas purchase platform could have also been focused in part on attracting longer-term gas supply.

The lofty vision for a downsized role for natural gas in the European energy mix in RepowerEU partly relied on targets for a significant expansion in the use of renewables and the production of biogas and later hydrogen. Holleaux views the forecast for biogas production – 35bn m³ by 2030 – as "absolutely achievable." But he is less confident about the projections for hydrogen output – 10mn metric tons produced domestically and an equal amount imported by the end of the decade.

"Some of these targets are overambitious – they cannot be achieved within this timeframe," he says.

All told, Holleaux warns that the energy, and particularly gas crisis, for Europe, is far from over, and the risk of high prices and potentially shortages will persist for at least the next four winters. That is until the next wave of global LNG supply arrives, from projects such as Qatar's North Field East project. Cold weather this coming winter, coupled with high Asian demand, could spell serious problems, he warns.

"We are out of winter and the price of gas on the spot market started to go down, so politicians seem to believe that the crisis is over," he says. "No, the crisis is not over, and the next four winters are still high-risk winters. And the current price is still very high compared with the average price of previous decades, and this is a big challenge for European industry, which is competing with other industry in other parts of the world."

Joseph Murphy

Freeman Shaheen, President of Chevron Global Gas

Strength through regulatory certainty and firm partnerships

Freeman Shaheen, President of Chevron Global Gas, stresses the need for regulatory certainty, the ability to attract capital and long-term offtake agreements to avert future energy crises.

It really takes capital coming into the market. These assets don't get built overnight.

Freeman Shaheen, President of Chevron Global Gas.

The energy industry needs regulatory certainty, the ability to attract capital and long-term offtake agreements to avert future energy crises, Freeman Shaheen, president of Chevron Global Gas, tells *NGW*.

Even before COVID-19 rocked global energy markets, the natural gas industry saw capital drying up as uncertainty weighed over the future demand for gas during the energy transition. And the situation was further exacerbated while the pandemic hit, Shaheen says.

As economies exited lockdowns post-pandemic, though, demand for oil and gas soared but there was insufficient past investment in supply to cover it, resulting in price spikes, he says. Then came the war in Ukraine, creating further volatility, particularly as Europe lost most of its pipeline gas supply from Russia and had to scramble for LNG to replace it.

To prevent further volatility, what the energy sector needs "regulatory certainty and partnerships – those partnerships look like capital investments with long-term offtake investments," Shaheen says.

Prior and even during the pandemic, an increasing number of major financiers were announcing plans to scale back support for hydrocarbon projects. While responses vary across the world, Shaheen believes that "an important lesson has been learned that oil and gas has a key role to play for decades to come."

"It will take decades to make the world greener, and investing in gas today will help in that pursuit by displacing higher carbon intensity coal," he continues. "We're also working to make gas cleaner," he notes, pointing to Chevron's efforts in the Permian basin, where it is increasingly monitoring methane emissions leakages by deploying and scaling advanced detection technologies, as well as using renewables where possible to power its operations.

"I'm really proud to see how things have evolved in my 30-year career. I see this energy around the way we're making the production much cleaner," he says. "We're proud of what we do, and I think it has a key role to play in the world, a very responsible role. There are many developing countries, markets and people that haven't experienced the safety, security and reliability of energy and the prosperity that's associated with it. And they deserve that."

Building up an LNG base

Asia has a very disciplined approach to long-term LNG contracting so they weren't so susceptible to spot price spikes seen over the past year, he notes. "Europe is now moving towards those longer-term commitments, and we're also seeing more discussions about regulatory certainty and streamlining processes."

Is Chevron setting up as a global LNG supplier? "We're contracted for more liquefaction volume out of the US. We've got a joint venture operation with Angola LNG that can deliver to Europe. We're also working on assets in Equatorial Guinea which we picked up in the Noble deal," Shaheen says.

Chevron made a "bold move" to expand its geographical focus with the acquisition of Noble Energy in 2020, in the midst of the pandemic. The deal worth $5bn gave Chevron a position in the gas-rich East Mediterranean, including operatorship of the Leviathan and Tamar gas fields off Israel, as well as the as-yet-undeveloped Aphrodite gas field off Cyprus. Planning is underway for potential LNG exports from these assets.

The company is also continuing to optimise its Western Australian LNG operations, he says.

"We really do believe that gas leads to a lower carbon future, especially by displacing coal," Shaheen says. 'It really takes capital coming into the market. These assets don't get built overnight. It takes three to four years to get trains up and running. Further capital when there are low-carbon technologies employed such as at Gorgon LNG, so a long-term offtaking commitment is needed from customers to support this."

Chevron has now emerged as the biggest producer in the Permian basin, and is eager to link that supply with global markets. Last year it contracted 4mn mt/yr of liquefaction coming out of the US while it also provides supply to the LNG producers. Those LNG exporters can enjoy cleaner gas that has been produced without routine flaring and regular methane monitoring, Shaheen says.

"And that means a lot, especially to the Europeans. Often their first question is how is your gas cleaner?" he says.

On the benefits of US gas, both in terms of cost and environmental impact, Shaheen notes that the country, which only 15 years ago was expected to become the biggest importer of gas, is now on track to becoming the biggest exporter.

"It has a vast, low-cost resource base and the skills, and it takes the right types of partners and long-term contracts to realise the US investment portfolio, he says.

Hitting back against concerns about hydraulic fracking, Shaheen says he's very proud of the way the US is producing and supplying the market while doing it more cleanly and with more responsibility. He points to new initiatives gaining momentum such as MiQ, Equitable Origin and Project Canary that certify the gas as responsibly-sourced.

Most Americans favour natural gas


American Gas Association President Karen Harbert

Joseph Murphy & Monte Stewart

Natural gas has a bright future in the US and globally despite some efforts to hinder its production and phase out its use, says the president of the American Gas Association.

In an interview with *Natural Gas World* at the LNG 2023 conference, Karen Harbert said politicians are getting onside with voters who prefer the fuel as a means of cooling their homes on hot summer days and heating them during frigid winter conditions.

"Twenty-five states have passed legislation prohibiting the banning of natural gas use," she said. "So, that's half of the country and more than half the throughput of natural gas. Policymakers, based on input from their constituents and voters, have spoken. There's other states that are considering the same thing."

In a recent AGA poll, natural gas received 76% approval rating, while only 5% were against it and 12% had no opinion, said Harbert.

She noted that a court struck down a proposed ban in California, and the decision is reverberating across the country. And, in Eugene, Oregon, the city council has scrapped a planned November plebiscite on an ordinance to ban gas as a power source in new low-rise buildings. The move resulted due to concerns about the ban's legal validity.

Harbert said politicians are starting to listen to people who want a choice when it comes to power sources. President Joe Biden could be more supportive of the natural gas sector but the industry is moving at the pace at which it believes it can deliver energy safely.

"I think back to different global pinch points in global tension and global crises," she said. "American industry has always stepped up to the plate in one way or another. We had the Marshall Plan. We marshalled all the things we needed to do to actually expedite the production of weapons, when we needed to do that. This is another inflection point. This time, it's the energy industry that has stepped up to prove that it can be a big part of calming global tensions, and doing good service to our allies. And, I think that is changing the conversation."

The Biden administration realises that natural gas and LNG, in particular, are important components in responding to the crisis in Ukraine. As a result, the American government is prepared to do what is necessary to support natural gas and LNG production, she said.

"I don't think you're going to see the Biden administration come out with a full-throated embrace of natural gas," said Harbert. "That is not what the president ran on. He ran on a very climate-focused agenda. Sure, but things change, right? He didn't anticipate a war in Ukraine. He didn't anticipate a pandemic, where we came through for everybody in America to be able to stay at home and change the energy dynamic completely. We were no longer supplying energy to buildings downtown because [office workers] weren't there. It was then 24/7 At home, and we figured that out."

"So, I would like to see the industry get more credit, but that's not what they're looking for. They're looking to stay in business and supply their customers."

She said it is essential to have natural gas and LNG available to supplant coal plants, put countries outside of North America on a lower emissions trajectory and address energy poverty in those nations.

"Because if you don't address energy, poverty, they're going to continue to use the most affordable, dirtiest fuel possible, and we have to figure out how to address that," she said. "Natural gas is the solution."

When it comes to the pace of permitting, pipeline builders are more frustrated than LNG facility developers. In the next five to seven years, she said, the US, Canada and Mexico were set to add 80mn tonnes/year of LNG to the global market.

"I mean, [LNG] could be the best green solution to climate change, ever," she said. "And No. 2, it's going to do a lot for the competitiveness of the US – and it's the right thing to do."

International Energy Agency forecasts of a drastic decline in natural gas are not impeding investment, she said. Producers are showing capital discipline and investors are playing catch-up in wake of a COVID-19 pandemic-induced decline.

"We're less in balance than we would like in terms of demand and supply, but we're not out of balance – that's important," said Harbert. "The other side of the equation is, the LNG facilities are becoming more modern, and modularised, which means they're going to be more efficient and cost-effective to produce and they'll be able to [be built] faster. And that will draw demand, which will obviously draw production. So, it's a cycle there."

Harbert does not expect financing efforts to be impeded by energy company shareholders' concerns about environmental and social governance. She said natural gas and LNG producers will seek to reduce emissions throughout the supply chain.

"There's an economic incentive, there's an environmental imperative and a customer expectation," she said.

As a result, producers will be able to offer profitable investments to corporate finance committees under a favourable investment timeline between now and 2050.

"We're going to be there and we're going to be turning a profit – and we're going to be growing," said Harbert.

Joseph Murphy

Shamsairi Ibrahim, Vice President of PETRONAS LNG Marketing & Trading

Balancing energy transition with security

Shamsairi Ibrahim, Vice President of PETRONAS LNG Marketing & Trading, discusses the company's position on balancing energy security, affordability and sustainability, its views on the future role of LNG and its development of low-carbon technologies.

PETRONAS is the first energy company to own and operate two FLNG facilities and is developing the first nearshore LNG facility in Malaysia, located at Sabah.

Summarise PETRONAS position regarding the energy trilemma of security, affordability and sustainability?

A year has passed, and we have gone through multiple events that has shaken the energy market, making it more volatile with energy security a pressing concern for many nations.

It is important to note that the energy trilemma is unique to different nations and economies. Some nations are able to focus on sustainability, while others are challenged with energy security and affordability.

This is why, at PETRONAS, we take the view that the energy transition must be undertaken in a just and equitable manner. To this extent, the focus of the transition must be balanced with greater emphasis being put behind stabilising supply to meet the rising demand for energy.

In terms of providing energy accessibility and security, natural gas is an abundant source. It will still be relevant in the coming decades, as more and more modern, scalable and economical technologies are being adopted to monetise gas in a safer, cleaner and more responsible way.

PETRONAS being an established LNG player with more than 40 years of experience, takes a realistic path to a low-carbon future and will continue to advocate gas and LNG usage to complement renewables.

Global natural gas prices have subsidised significantly in the last six months. Can we consider the immediate threat of gas shortages in Asia and Europe over?

Although global natural gas prices have indeed subsided significantly, it does not necessarily mean that the immediate threat of gas shortages is completely over.

What we are facing today is not merely caused by the Russian-Ukraine conflict, but a compounding effect of the less-than-modest investments in upstream over the last few years when LNG demand is growing, amid a shift in focus to renewables.

To ensure the sustainability of the gas industry, producers, consumers and governments have an equal responsibility to create a harmonious LNG ecosystem. As long as conditions remain the same, the threat of energy shortage will not be over.

We need stronger collaboration between all parties across the value chain and stable investments in new gas fields and infrastructures in making LNG/gas more accessible, to ensure supply demand is balanced.

At PETRONAS, we believe in a balanced approach which combines responsible development of conventional and unconventional resources with renewable energy to ensure global energy security and to support the movement towards a net zero carbon emissions future.

What is PETRONAS main message to investors, policymakers, and the energy industry in terms of avoiding future energy crises?

We need to remember that there is no perfect set of rules in the energy transition. Any transition requires continuous learning and refinements, whereby the key action here is to start doing something.

Thus, it is essential for all parties across the value chain to collaborate and take collective action to create a sustainable and harmonious ecosystem and prevent future energy crises from occurring by learning from valuable lessons of the past.

There are 2 key areas that all parties should focus on:

- Stronger collaboration and table investment in new gas fields in making LNG and gas more accessible. These include infrastructure readiness, technical and financial support. As new facilities development requires huge investments, it's imperative for producer and consumer to collaborate to create mutual benefit.
- Pivotal role of financing bodies. The rise of ESG (environmental, social, governance) financing as announced by major banks in the region is a great milestone as it shows their appreciation and support for cleaner energy projects including LNG.

We, at PETRONAS, are firm believers in taking accountability and playing our part to ensure a just transition that allows progress and sustainable development for all. We must move forward, taking practical steps towards a low-carbon future together.

To what extent has a tightened LNG market impacted global emissions?

The cost of a tightened LNG market has forced the hand of governments and nations to turn to higher emissions energy sources such as coal.

As an LNG producer, PETRONAS is fully supportive of all endeavours to improve liquidity and stability in the market.

We hope that after a few years of operating in a volatile environment, industry players will begin to realise the importance of security and stability of LNG supply.

We believe that long-term contracts and a stable long-term pricing mechanism will not only be able to address the pricing volatility faced by the industry but also establish long-term and sustainable gas demand from buyers. This is also critical for producers who are developing LNG exporting projects which require huge investments and a long gestation period.

We believe that under any market conditions, the approach to LNG supply remains to be anchored on close collaboration with both sellers and buyers to ensure business sustainability and reliability which is mutually beneficial for all parties involved.

At PETRONAS, we recognise that the LNG market is dynamic and is influenced by various geopolitical, economic and environmental factors. However, we remain firm believers of LNG, as the →

cleanest burning fossil fuel to be the ideal transitional energy source that will ensure global sustainable development.

Walk through how PETRONAS is contributing to increased global LNG supply with its new project pipeline? What is the current status of LNG Canada Phase 2 and Petronas' third FLNG project in Malaysia?

One of our upcoming projects that is expected to come onstream by the middle of this decade is LNG Canada. At full capacity, LNG Canada will expand our portfolio by 14mn metric tons/year.

PETRONAS and our joint venture partners are currently evaluating options for phase 2 of LNG Canada.

As for PETRONAS' third FLNG project, a final investment decision (FID) was taken in November 2022, for a nearshore LNG facility in Sabah.

The engineering procurement, construction and commissioning (EPCC) contract for the project was awarded to the winner of front-end engineering design (FEED) competition (JGC Corporation and Samsung Heavy Industries).

The nearshore LNG facility, located at Sipitang Oil and Gas Industrial Park (SOGIP), Sabah, is planned for completion by 2027. This project will grow our production portfolio by another 2mn mt/yr of LNG. Beyond these two projects, PETRONAS is also partnering with YPF to explore an integrated LNG value chain in Argentina.

Should LNG be considered a transitory or end fuel on the road to net zero?

At PETRONAS, we take a realistic and middle-ground view of the energy transition, as renewables alone cannot be the answer toward meeting global energy demand.

The challenge of intermittency in renewable energy supply continues to persist which in turn impacts the energy reliability and security that industries and businesses require.

This is where natural gas plays a crucial role and forms the core ingredient of the energy transition.

As the cleanest burning fossil fuel, natural gas is the perfect complementary partner to address intermittency issues faced with renewables. For example, how natural gas can partner solar to provide an uninterrupted supply of energy 24 hours a day, even when the sun is not shining. Natural gas as fuel is already a mature technology and advanced with multiple adoption technologies capable of meeting stricter carbon reduction regulations.

On the flip side, the use of renewables to power LNG production plants is a viable way of reducing the plants carbon footprint. In fact, we've signed a deal for 90 MW of hydroelectricity that will be used to gradually power the PLC from 2024 onwards and will enable us to decommission old and inefficient gas turbines.

How should LNG retain its social licence?

At PETRONAS, we believe that there are two key areas for the LNG industry to look into to retain its social licence. First, by decarbonising the LNG production process. Second, by leveraging LNG's proven technologies to accelerate the development of clean and renewable energy sources.

Allow me to share ongoing examples of how we are doing so. Firstly, we continuously strive for Operational Excellence to keep our assets and operations not just in order, but more importantly, optimised, efficient and clean. For example:

- We aim to reduce our Scope 1 and 2 GHG emissions from our assets, at 49.5mn mt of CO_2 equivalent by 2024 to achieve our net zero carbon emissions goal by 2050. We continue to mitigate and reduce emissions at our operations based on the guiding principles of measure, reduce and offset.
- From 2024 onwards, PETRONAS LNG Complex (PLC) in Bintulu will gradually be powered by hydroelectricity and will allow us to decommission old and inefficient gas turbines.
- By 2025, carbon capture and storage at offshore Sarawak gas field (Kasawari) will come on stream with the potential to reduce CO_2 emission of around 76mn mt.
- We are decarbonising our marine transportation by applying gas burning of LNG ships at both our buyers and our own terminals (18 terminals) during loading / discharge.
- We've upgraded our LNG vessels with Hull Performance Solution technology to cut bunker consumption, reducing around 18,000 mt of CO_2 emission annually.
- We implemented a digital solution at the PLC, designed to increase energy efficiency in the liquefaction process and to optimise boil-off gas (BOG) use and raw feed gas for fuel gas consumption known as ARIES.
- In addition, our two floating LNG (FLNG) facilities have adopted N+0 gas turbine generator (GTG) operating philosophy to reduce the total fuel gas requirement for the GTGs and zero-flaring practice during offloading to ensure optimal operating conditions.

Secondly, we are working with multiple partners to grow our portfolio of low carbon solutions such as:

- Collaborating with key industry players, such as JERA, to develop ammonia and hydrogen.
- Conducting a joint technical and commercial feasibility study with ENEOS Corporation (ENEOS) to produce low carbon hydrogen from PETRONAS' existing facilities, production of green hydrogen from a new hydro-powered electrolyser facility, and hydrogen conversion into methylcyclohexane (MCH).
- Developing a carbon sequestration hub with Shell to collect, aggregate and sequester carbon from various domestic and international sources.
- Combined efforts with Japan Petroleum Exploration Co. Ltd. (JAPEX) to evaluate optimal capture, storage and transportation methods, as well as estimation of emissions, capture volumes and monitoring methods of CO_2 stored underground.
- Formed a global alliance and collaboration for LNG bunkering at four locations in Japan. Offshore wind and LNG bunkering alliances to develop solutions in hydrogen, ammonia and carbon capture and storage (CCS).
- Utilising CCS technology (JOGMEC, JX Nippon Oil) for studies to develop high CO_2 gas fields in Malaysia.

Joseph Murphy

Paul Marsden, president of Bechtel's global energy business

LNG2023 brings the entire industry together to discuss the critical changes

Striking a balance between energy security, affordability and availability is no easy feat given the market's turbulence over the past few years, Paul Marsden, president of Bechtel's global energy business, tells NGW.

The upcoming LNG2023 conference in Vancouver next month offers the chance for the entire natural gas industry to come together to discuss the critical challenges that the world energy market faces, Paul Marsden, president of US EPC firm Bechtel's Energy global business unit, tells *NGW*. First and foremost among those challenges is striking a balance between energy security, affordability and availability – no easy feat given the market's turbulence over the past few years.

A global pandemic that shut the global economy down, followed by a fast-paced recovery and then the war in Europe, has disrupted markets and supply chains, as well as assumptions about energy planning, Marsden says. The LNG industry, where Bechtel is a leading developer of liquefaction, storage and regasification facilities, has seen its fair share of that volatility.

"Very mature, established supply chains became very rapidly disrupted," Marsden says. "Big producing industries in Southeast Asia effectively shut down during the pandemic, raising the question of where all this contracted LNG can go to," he says. "Then we reemerge from the pandemic, with global economies roaring back to life, and the next question is where is the LNG we really need."

Then came Russia's invasion of Ukraine. Europe, once reliant on Russia for 40% of its gas, has had the majority of that supply cut over the past year, prompting a scramble for more LNG and the construction of infrastructure to import it at breakneck speed. There was heightened demand globally for LNG as major US producers that previously sent most of their LNG to Asia began diverting it to Europe.

"Overlaid on top all of that, you had all the very, very bold climate commitments. But energy demand is increasing, and ultimately, we're coming to terms with the fact that the reliability of renewables doesn't match up to baseload hydrocarbon-generated power," Marsden says. "Essentially, the pendulum swung too far towards lofty ambitions and net zero, but without the technology or supply chains to deliver that. But then, with demand for energy coming back, we've gone back to what we know, which in some cases meant turning coal plants back on, which was a huge step backwards."

Now with the market showing early signs of rebalancing, there is a greater sense of clarity, Marsden says. This is evident in how the oil and gas majors have restated their ambitions, clearly stressing that hydrocarbons are here to stay.

"We need to focus on being more energy efficient. We need to focus on using cleaner hydrocarbons. We need to modernise our facilities and reduce their emissions," he says. "And focusing on that, it's quite incredible what you can achieve in terms of reducing carbon intensity without making our energy system vulnerable as it has been in the last couple of years."

LNG2023, he says, "gives the whole industry the opportunity to all come together to talk about those challenges, including the supply chain, the operators and the customers buying the products."

Maintaining a social licence

LNG has a critical place in the energy mix for decades to come, Marsden says, stressing its value as a cleaner source of baseload power versus coal, with modern combined-cycle gas turbines producing three times less stack emissions than coal plants.

How should LNG retain its social licence going forward? Marsden believes there's too much focus on addressing the 5% of natural gas used in combustion at liquefaction plants, using costly technologies such as e-drives and carbon capture, and not the 95% of emissions associated with the end use of the fuel. Ongoing innovations in gas-fired power generation will be crucial for dealing with the latter.

"Modern combined-cycle power is incredibly efficient," he says, citing the recent launch of SSE Thermal's Keadby 2 power plant in the UK that has a thermal efficiency of 63%. "You can add carbon capture to those facilities, but it's a lot of cost that ultimately has to be borne by the consumer, who has already been hit by high inflation and high energy prices. Suggesting to the consumer you have to pay more to make this power a little bit cleaner is probably not going to land very well."

Marsden sees further scope for additional innovation in combined-cycle technology to make it cleaner and more efficient, pointing to the electric vehicle industry as an example where rapid technological advancement has taken place in the space of a mere decade.

As an EPC contractor, Bechtel works with operators to improve project efficiency and limit the environmental impact, while also engaging with suppliers to ensure they are using the best technology available, Marsden says. The company also focuses on its own emissions from construction activities, seeking ways to use less fuel and more electrification. And these efforts can also save Bechtel money, he says.

Bechtel also takes heed of the social impact of its operations, the executive notes.

"We build big stuff, but we also build big legacies. So, when we leave the community, we leave that community with healthier supply chains and an upskilled workforce. We put services and jobs in that area in a sustainable way, so that when we leave, there isn't a vacuum."

COVID-19 was a major disruptor of the global labour market, which posed another challenge to the industry.

"When the world woke up from its COVID slumber, and you had all this government stimulus put back into economies to revive them," he says. "All that has created a huge appetite for building new infrastructure. We don't have the workforce to go build everything we want to build."

"We've got to focus on how we do more work with less people – that's not about being more productive but being smarter."

Greater automation and mechanism has a role to play, he says. So does increased modularisation, where work can be spread across different parts of the world. But this is not as robust a solution as it used to be, as the labour shortage is a global problem. With a reduced pool of available workers, the focus should be on attracting more young people into the market.

One step Bechtel is taking to do this is by establishing programmes with local schools and colleges to develop comprehensive programs that will grow a skilled workforce, benefiting local regions for many years to come, he says.

Joseph Murphy &
Dale Lunan

Tellurian Energy CEO Octavio Simoes

Global gas challenges a function of under-investment

Chronic underinvestment in new supply has led to the energy crisis we are contending with now, says Tellurian Energy CEO Octavio Simoes.

Challenges facing the global natural gas industry today are not merely a product of recent price volatility – especially in Europe and particularly since Russia's invasion of Ukraine – but of chronic underinvestment in new supply, says the CEO of US natural gas company and LNG hopeful Tellurian Energy, Octavio Simoes.

"I think that if you look fundamentally at what the challenges are, they stem from the fact that since 2014, we have cut down almost in half the annual investment in the oil and gas sector," he told *NGW* in an interview ahead of LNG2023.

In an effort to achieve Paris Agreement goals, economies around the world have turned away from fossil fuels to focus on electricity – and new, greener ways of generating electricity – without really remembering how embedded oil and gas is in global economies.

"People tend to focus only on electricity production, which is only 25%, without realising how important oil and gas is in areas like fertilisers and production of steel and concrete and other processes and materials," he said.

In the months leading up to Russia's invasion of Ukraine in February 2022, and certainly in the months since, global attention has shifted from environmental concerns to worries about supply security. Germany has become the poster child for this energy trilemma: in a rush to burnish its environmental image, Germany closed coal-fired generating plants and nuclear facilities, and pivoted directly to renewables to meet its needs.

But that over-ambitious reliance on wind and solar failed miserably, and in an environment of supply shortages when gas from Russia disappeared, Germany found itself ramping up LNG import capabilities and re-starting some coal-fired power plants.

But Germany was not alone in the scramble to secure energy, at whatever cost financially or environmentally, Simoes said. LNG was diverted to Europe at the expense of Bangladesh going dark, Pakistan abandoned gas to go back to coal and other Southeast Asia economies were left to seriously consider whether they could really invest in natural gas and decarbonisation.

"So when we look at the statistics, the goals of decarbonisation are not only not being met, they are actually being made worse, because 2021 emissions were the highest, emissions in 2022 were higher than 2021 and 2023 is going to be more than 2022," Simoes said.

In a climate for increasing demand, he said, the LNG sector is also left with challenges to attract financing to build new capacity – a result of the price volatility. The ages-old financing model, based on 100% capacity factors and fixed fee for liquefaction, no longer works, because rising costs have pushed the fixed fee much higher than what the market is willing to pay, and projects can't get financed.

"And I don't just say bank financing, I also mean equity financing. Equity requires a return and the banks maybe get comfortable with certain coverages, but then there's no equity," Simoes said. "We have several different cases in the market that show that some projects have gone ahead where there is zero return on equity and that's just not a viable model going forward."

Graphic drawing depicting the Driftwood LNG project. Soource: Tellurian Energy.

LNG2023 director announces launch of Global Gas Innovation Roundtable


LNG2023 Executive Director Mel Ydreos

Joseph Murphy

LNG2023's executive director Mel Ydreos announced on Wednesday the creation of a Global Gas Innovation Roundtable, the goal of which would be to increase understanding of the technology and innovation underway in the natural gas industry.

In a press conference, Ydreos said establishing the roundtable would be the "legacy" of LNG2023.

"The mission of the roundtable is to ensure that governments, policymakers, multilateral institutions and energy thought leaders have a greater understanding of the technology and innovation underway that will improve performance, environmental and otherwise in the gas sector," Ydreos said.

Innovation is not just about technology, he said.

"It's about commercial innovation, it's about digital innovation and technological innovation," he said. "Our aim will be to ensure that governments around the world are aware of the significant efforts happening in the industry in this area."

Spreading that awareness is challenging, because there are so many developments happening, he said. "And currently there isn't a forum by which we're able to amplify the message around how much innovation is going on."

He drew attention to the launch last year of the Gas Pathways website, an initiative of CGA Enterprises that is operated and maintained by *NGW*, and also focused on innovation in the industry.

"It's a platform that actively engages with and amplifies all these things that we're talking about," Ydreos said. "We've been able to organically grow that platform, and we're well on our way to establishing it as the most authoritative platform that deals with innovation in the gas sector," he said.

The roundtable will be different, though.

"We will be guided by an advisory board of the most senior CEO and energy professionals from around the world," Ydreos said. "They will guide the focus of the roundtable and what the roundtable will be doing."

The roundtable will issue regular reports that "clarify what's going on, and hopefully distil and in an easily consumable way, present some of these innovations," he said.

The first of those reports was released on Wednesday, entitled CCUS as a tool for LNG innovation. It explains what carbon capture utilisation (CCUS) and storage involves, and provides four case studies where the technology has been applied. One is in North America, one in Europe, one in the Middle East and one in Australia.

Ydroes noted that as of September 2022, there were only 30 CCUS facilities operating commercially in the world, but there were a further 164 under development.

"So we're starting to see the commercialisation of CCUS and it's going to be very important for the industry, particularly in the future as it manages its emissions profile," he said.

The report notes that there are a further 90 pilot and demonstration CCUS facilities worldwide aimed at improving the technology's efficiency. And it also lists the 11 key CCUS hubs being developed around the world.

"We present the application of CCUS. Where does it make sense? Where does it not make sense," Ydreos said. "It's about being very objective about the application of this technology."

For instance, while CCUS is not a good fit for natural gas transport, it makes sense to apply when it comes to natural gas processing.

"We begin to lay out where the greatest opportunities are for the deployment of CCUS, and then we conclude with advice to government policymakers on how they can support the adoption of CCU S and its commercialisation," Ydreos said.

Discussions are underway with a lot of CEOs regarding the roundtable, and they see its value and are interested in providing their advice, he said.

"We plan to be not only producing reports, but also engaging in major forums around the world in order to push the agenda of innovation, including some digital outreach, to establish the roundtable as a credible and needed roundtable for the energy world," he concluded.

Joseph Murphy

Martin Mayer, Vice President, LNG at McDermott

The case for e-drives

Martin Mayer, Vice President, LNG at McDermott, discusses the energy trilemma, the role of LNG and how the increased adoption of e-drives with continuing innovation is making a mark on emissions.

What is your view on the energy trilemma? In a time of volatile and high energy prices, how can we balance energy security and affordability with sustainability?

We understand the Energy Trilemma is the need to find balance between energy reliability, affordability, and sustainability and its impact on everyday lives. If we address the prime sources of energy, i.e., oil, coal, piped gas, LNG, renewables and nuclear, none can satisfy all three criteria. Renewable energy is clearly best-in-class with respect to sustainability. Although, one must not omit the lifecycle footprint through the renewable value chain, i.e., from raw material extraction through to production and operation. Renewable energy is affordable and increasingly so. But currently, it cannot meet the world energy demands and still needs major investment and scale up of infrastructure to improve the reliability and consistency in supply.

In the short- to medium-term, it is necessary to provide both energy security and affordability through non-renewable sources, notwithstanding public objection to using hydrocarbons (and/or nuclear).

Energy supply from hydrocarbons is affordable and reliable, but has higher emissions throughout its value chain, particularly in the transportation sector. There are many opportunities to abate these emissions, but these techniques

come at a cost, particularly for energy provided through coal or oil.

Piped gas and by inference LNG, is affordable, and have relatively lower emissions than coal and oil, with opportunities for further abatement. As such, natural gas and LNG are well positioned to be the energy source of choice in the short- to medium-term, to satisfy the shortfall from renewable sources.

Natural gas and LNG provide proven and cost-effective solutions to energy security, can displace some of the energy supply of higher-emission sources – replacement of coal in power stations for example – and can provide the security of energy supply that is necessary as emerging technologies, together with the renewables industry, strive to meet the world's energy demand.

What role does LNG have on the road to net zero, and how can LNG best maintain its social licence to operate?

Natural gas and LNG can contribute in a significant way to the reduction of emissions in the energy industry in the near term. Use of natural gas is constrained by its availability in areas of high energy demand and by constraints in infrastructure to move the gas in sufficient quantities to the end user. In these instances, LNG provides a valuable opportunity to support an increase in use of natural gas, which can then be utilised to displace higher emitting fuel sources, such as use of coal for power generation.

Additionally, LNG has a high energy content per unit volume and can be stored in large quantities. Therefore, it provides an ideal way to provide energy security and reliability, and enable supply of energy at peak demands, whether diurnal or annual. Importantly, LNG can also provide much needed energy security for events, whether geopolitical or climatic, that are outside the control of a natural gas consuming nation.

Use of natural gas, and by inference LNG, generates higher emissions than renewable sources of energy. Therefore, to maintain support for LNG, there is a necessity to show pathways to reduce emissions and implement emission reduction technologies on new and existing natural gas and LNG facilities. Many emission reduction concepts can be implemented at a relatively low cost, particularly if combined with use of renewable energy, but others do incur an increase in cost, such as sequestration of the CO_2 that is already captured as part of the processing of the natural gas or LNG and then generally emitted.

We've seen increased adoption of e-drives as a low-carbon power solution for LNG facilities. How significant an impact do they have on emissions versus gas turbines and what do they add in terms of extra cost?

The use of e-drive as a low-carbon power solution for LNG facilities must be considered with both Scope 1 and Scope 2 emissions in mind: emissions associated with the operation of the LNG facility (Scope 1); and the emissions associated with the generation of the power that supplies the LNG facility (Scope 2).

A good example of a low-carbon solution is the Woodfibre LNG project where the imported power to the LNG facility is primarily from a renewable source, in this case hydroelectric. It would be unrealistic to categorise an e-drive LNG plant as low carbon if the power to drive the facility is sourced from an open cycle or coal fired power plant. Power sourced from a natural gas fired combined cycle power plant has some potential to enable a lower carbon LNG facility but this improvement in emissions can be negated, if not completely lost, due to the process heating requirements of an LNG facility.

By using e-drive in conjunction with renewable power, the GHG emissions could be reduced by 80%-90% when compared to a traditional industrial gas turbine driver configuration utilised by most of the world's LNG facilities. When considering auxiliary systems required to operate gas turbines and e-drive compressors, the cost difference between the two solutions is not significant although the cost of power supplied through renewable sources is transferred from a capital cost to an operating cost.

What kind of innovations are we seeing regarding e-drives and what is the potential for those innovations to drive down costs?

One of the innovations we are seeing with e-drives is the development of an increasingly standard and modular design approach to the liquefaction and refrigeration units of an LNG facility. This should provide an opportunity to drive down cost and result in a reduced testing program and shorter delivery times.

Time to act now on carbon capture: Saipem

Richard Surprenant, business development manager for carbon capture solutions at Saipem

Joseph Murphy

In the roadmap to reach net zero emissions, carbon capture is a mature technology that can definitely support hard-to-abate industries, given the lack of alternatives for addressing their emissions, Richard Surprenant, business development manager for carbon capture solutions at Saipem, tells *NGW*.

The carbon capture technology has been around for decades but has undergone an evolution with the introduction of advanced solvents, says Surprenant.

Saipem has developed its own unique enzymatic technology, which uses a potassium carbonate, that rapidly accelerates capture compared with conventional amine-based methods.

"Our technology is unique in that it uses enzymes to catalyse a specific reaction within carbon capture, which is the hydration and dehydration of CO_2," he says.

Saipem's CO_2 Solutions technology uses the same carbonic anhydrase enzyme that humans and all living organisms use during respiration. Flue gas passes through the solution, and is then hydrated and transported to the second column and then the CO_2 is stripped out in a very pure form.

"This chemistry doesn't have any of the drawbacks of amine-based technology. It's non-toxic, it's non-volatile, it's inert to contaminants and it's also regenerated at low temperature – a unique feature," he says. "This reduces the environmental footprint and the energy footprint of carbon capture."

For some industries such as cement manufacturing, paper production and steelmaking, CO_2 is the only feasible choice for decarbonisation, Surprenent stresses. In the case of cement making, for example, most of the CO_2 that is emitted does not come from the fuel that is used, but the fact that rock is being decarbonised.

"These hard-to-abate industries need to get aggressive in adopting carbon capture because they have no other option," he says.

Saipem has undertaken more than 70 pre-combustion carbon capture projects – whether for syngas or hydrogen production, and is bringing that expertise for the post-combustion projects. The company recently announced a partnership for large-scale carbon capture projects with MHI that employs amine technology but at a mature scale. Meanwhile it is advancing its enzymatic carbon capture technology for small and medium emitters with modular plants.

Carbon capture technology can be used to capture up to 90-95% of CO_2 that is emitted, depending on the concentration of CO_2 in the emissions, Surprenant says. In the same or a boiler or a process furnace, for example, the 90-95% capture rate is achievable. The concentration of CO_2 in emissions and the scale of projects also determines the cost.

Surprenant says recent policy developments in the US such as incentives included in the 2022 Inflation Reduction Act (IRA) and the 4 5Q carbon capture tax credit favoured the development of carbon capture. He notes that Canada is now trying to match this level of support with various national policies and provincial policies, including in Alberta, British Columbia and Quebec.

Over in Europe, Saipem has been able to tap European research funds to improve its carbon capture technology through the ACCSESS initiative. Surprenant also hails the EU's incoming carbon border adjustment mechanism (CBAM), which encourages industrial suppliers outside of the bloc to adopt carbon capture as well.

In terms of what more policy makers could do, he stresses that there should no longer be an "optionality" for industries to adopt carbon capture, and regulation needs to enforce this. " We don't have the luxury of time, and if we want to reach net zero we need to act now," he said. "We need to quickly reach a situation whereby all economic development from now on must deploy carbon capture when needed."

Joseph Murphy

Clint Strittmatter, Principal Process Engineer at McDermott

McDermott: net-zero LNG is a realistic goal

Clint Strittmatter, Principal Process Engineer at McDermott, argues that net-zero LNG is a realistic goal but needs credibility. He also discusses with NGW the latest developments in addressing methane emissions at LNG facilities and the benefits and evolutions in modularisation.

Is net-zero LNG a realistically attainable goal and how should the industry best work towards it?

Net-zero LNG is a realistic goal but to ensure credibility, the LNG industry should address the complete value chain from upstream through to end user. Achieving net-zero across parts of the LNG value chain is attainable but is challenging across the entire value chain. The following points can be made for each element of the LNG value chain, noting that approximately 75% of the GHG emissions would result at the end user.

Upstream: Achieving net-zero emissions on the upstream side is challenging and dependent on the source of the natural gas, whether onshore, offshore, through conventional drilling or fracking. There are multiple initiatives in place to reduce emissions, from electrification of production facilities using renewable energy through to detection of, and elimination of, fugitive emissions.

LNG Liquefaction: There are multiple ways to reduce emissions from LNG liquefaction facilities. The use of electrically driven compressors, taking power from renewable sources, has the largest impact, enabling an 80%-90% reduction in GHG emissions when compared to a traditional industrial gas turbine driver configuration utilised by most of the world's LNG facilities. The majority of the remaining emissions can be mitigated through design features that limit flaring during trips/start-ups and sequestration of the CO_2 that is removed from the feed gas. A small amount of difficult-to-eliminate emissions would need to be offset by carbon credits.

LNG Transport: There have been many advances in emission reduction from LNG carriers including efficiency improvements in ship design and engine technology as well as reductions in venting and fugitive emissions of methane. To achieve net-zero, offsets through carbon credits would be required.

LNG Regasification: LNG regasification facilities have a limited energy requirement. Use of heat from ambient sources, air, water, or utilisation of waste heat from nearby industries, can bring the emissions to near zero with the final small, and often intermittent, emissions offset by carbon credits.

End User: This becomes industry and end user specific, but in general, to achieve a net-zero scenario will require carbon capture with sequestration plus an element of offset using carbon credits.

What developments are we seeing in the area of addressing methane emissions at LNG facilities?

In general, methane emissions are very low on existing LNG facilities due to an increased use of welding of piping rather than the use of flanges. There is increasingly more focus on the source of methane emissions and implementation of schemes to reduce, and if possible eliminate, such emissions through implementing seal gas recovery systems and reduced emission valve glands into designs. There is also increased focus on reducing operational flaring, whether due to normal operation, shut down, start up, and non-routine emissions. For owners and operators there are opportunities on the operation and maintenance side of the LNG facility to implement increased frequency of leak detection and repair (LDAR) programs. More advanced detection systems such as infrared cameras and laser-based detectors are being deployed to make LDAR programs more efficient and effective.

What are the main benefits of the modularization approach and are we seeing the industry adopt it more, and if so why?

The prime drivers to adopt a modularization approach are:

Labor Cost: This is a benefit if module fabrication facility labor costs are lower than field labor costs, especially when the infrastructure required to support crews in the field is considered.

Productivity: Module fabrication facilities have a stable workforce, well proven standards, procedures and assembly-line techniques that add to the overall efficiency of the fabrication process. The work in the fabrication facility is performed in a covered and/or environmentally controlled environment. This eliminates the loss of productivity due to wind, rain, flooding, lightning, etc.

Equipment: With proper work scheduling and sequencing, a modularization approach can allow for reduced on-site costs due to a reduced requirement of equipment in the field.

Safety: Shifting work into a controlled fabrication facility environment generally benefits the overall safety risks of a project.

R**eduction of Peak Workloads:** Modularisation reduces the amount of direct and indirect field labour. This can be an important factor in projects that are competing for resources with other projects or simply are limited in local resources. Cost can be saved due to reduction in size of temporary facilities, camps, transport of workers, food, water, housing, medical needs, and recreation facilities at the jobsite.

Schedule: On projects that are hampered by a lengthy permitting process, modularization can effectively allow construction to begin months earlier in the fabrication facility. Once the permit is acquired, modules can be set much quicker than the time required for onsite fabrication and assembly. The LNG industry is seeing an increasing focus on implementing a modular execution strategy, primarily as this provides greater certainty on project delivery, both on cost and schedule. This reduces the uncertainties that are not often under the total control of the EPC contractor, whether these are political, social, or climate influenced events.

In what ways is this modularization approach evolving?

The early module concepts in the LNG industry were often based on stick built layouts which resulted in a missed opportunity of greater reduction for site based activities relating to hook up, installation and commissioning. Subsequent modular LNG designs were developed for the early Floating LNG projects. Again, these had specific constraints, whether due to marinization requirements or limits on available footprint with resulting safety/hazard implications.

In recent years the LNG industry is moving to modules in the 1000-10,000-te size range, based on an increased degree of standardisation and repeatability of the module design. It is also developing modules on a system basis thereby minimising site hook up and commissioning activities.

LNG emissions measurement and verification a focus for industry

Elsie Ross

With growing demand for lower carbon LNG, measurement and verification of methane emissions will be essential and work is well underway to tackle the challenge, a last day session at LNG2023 heard.

GTI Energy, a US-based research and training organisation, is collaborating with industry on protocols to measure and report on emissions along the LNG supply chain. It plans to release the second version (2.0) of its Veritas methane emission measurement and verification initiative by the end of this year, Chris Moore, program manager, told a paper session on measuring and reducing LNG emissions. The protocols would provide companies and countries with a consistent approach to measuring and verifying methane emissions and enable comparisons between companies in the LNG supply chain.

The US and EU also are promoting Oil & Gas Methane Partnership 2.0 (OGMP 2.0), an international framework for measurement-based reporting of methane emissions along oil and natural gas value chains. "The objectives are to provide governments and the public with assurance that industry members' methane emissions are being managed responsibly," said Rob Smith, vice-president of regulatory affairs at Cheniere Energy, the largest LNG exporter in the US.

OGMP also is designed to provide member companies with a credible means to demonstrate that they are contributing to climate mitigation, encourage improved methane reduction performance and reporting and methane emission reduction through

The objectives are to provide governments and the public with assurance that industry members' methane emissions are being managed responsibly

Rob Smith, vice-president of regulatory affairs at Cheniere Energy

transparency, flexibility, collaboration and best practice sharing, he said. Today there are more than 100 OGMP partners.

For the Veritas initiative, one of the challenges in the measurement of LNG emissions is that there are very few studies that report specific methane emissions from import/export LNG terminals, said GTI's Moore. "The goal is really to get to an estimate that is based on at least 50% measurements but that's easier said than done."

To get a rough idea of methane emissions, those involved in developing the Veritas open source measurement protocols have to rely on available information such as US Environmental Protection Agency (EPA) emission factors in the greenhouse gas inventory.

"We know that they are probably inaccurate and they have a fairly large uncertainty associated with them that doesn't really ever get reported," said Moore. "However, it's important to start with these numbers, and then build off of those our existing understanding of how much methane there is, because that's what we're tied to, in a regulatory sense and in a historical sense."

In developing the protocols, GTI, along with Highwood Emissions Management and SLR Consulting, worked with 36 industry, research, environmental NGO and financial stakeholders across US natural gas segments. "And we have taken feedback, they've had reviews, but at the end of the day, GTI Energy has the final say," he said.

The technical protocols calculate methane emissions for six segments of the natural gas supply chain: production; gathering and boosting; processing; transmission and storage; distribution, and LNG. Although the initial focus has been on the US, GTI would like to make the protocols applicable across the globe, he said.

For the LNG segment, GTI selected import/export terminals for the protocols, focusing on what companies and facilities can measure and quantify. When implementing Veritas measurement protocols at a terminal it focuses on two key areas, including understanding what portions of the facility are the emissions best calculated on based on engineering understanding and secondly, items such as venting – short duration and very large – that are very difficult to quantify.

All of the rest are best measured. "The key is to ultimately get 50% of your inventory from that best measure, so to constantly improve and get better," said Moore.

"You also want to go through and construct an expected emissions distribution, so that you know what you're ultimately going to compare your emissions to, and reconcile with, the measurement."

Protocols for each of the six supply chain segments include:

- Methane Intensity: defines what methane intensities should look like for each segment of the natural gas supply chain;
- Measurement: describes how to take measurements to inform emission inventories by segment;
- Reconciliation: reconciles emission-factor inventories with actual measurements by segment;
- Single value chain summation: adds multiple segments to reach a total emissions intensity; and
- Assurance: provides guidance for verifying an emissions inventory, company documentation requirements and third party auditing.

In the reconciliation protocol, GTI emphasises the need for performing cause analysis across all segments of the supply chain. "If you have large emissions going in, and really being able to bound the duration of those omissions by performing some type of cause analysis based on your existing understanding of your facility, that's really important," he said. That's because if a company applies a single large event and spreads it out for a year-to-year estimate, it will significantly over-estimate its emissions. "We want to make sure that we are able to recommend how we define specific point events in time."

GTI also is constantly working to evolve the assurance protocol. "As GTI energy, we put these protocols out there [and] we want to make sure that folks who say they're using these protocols have some way of transparently delivering reports," said Moore. The company, he said, also wants to make sure that it is delivering a good product that is comparable across the various estimates.

In the various protocols, GTI also emphasises the need for transparency with technology providers and vendors to go "above and beyond" to show the accuracy and uncertainties around the measurements, the session was told. That's because in Veritas protocols, "we put a lot of that on the vendor, rather than the company," said Moore.

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