PETROLEUM REVIEW

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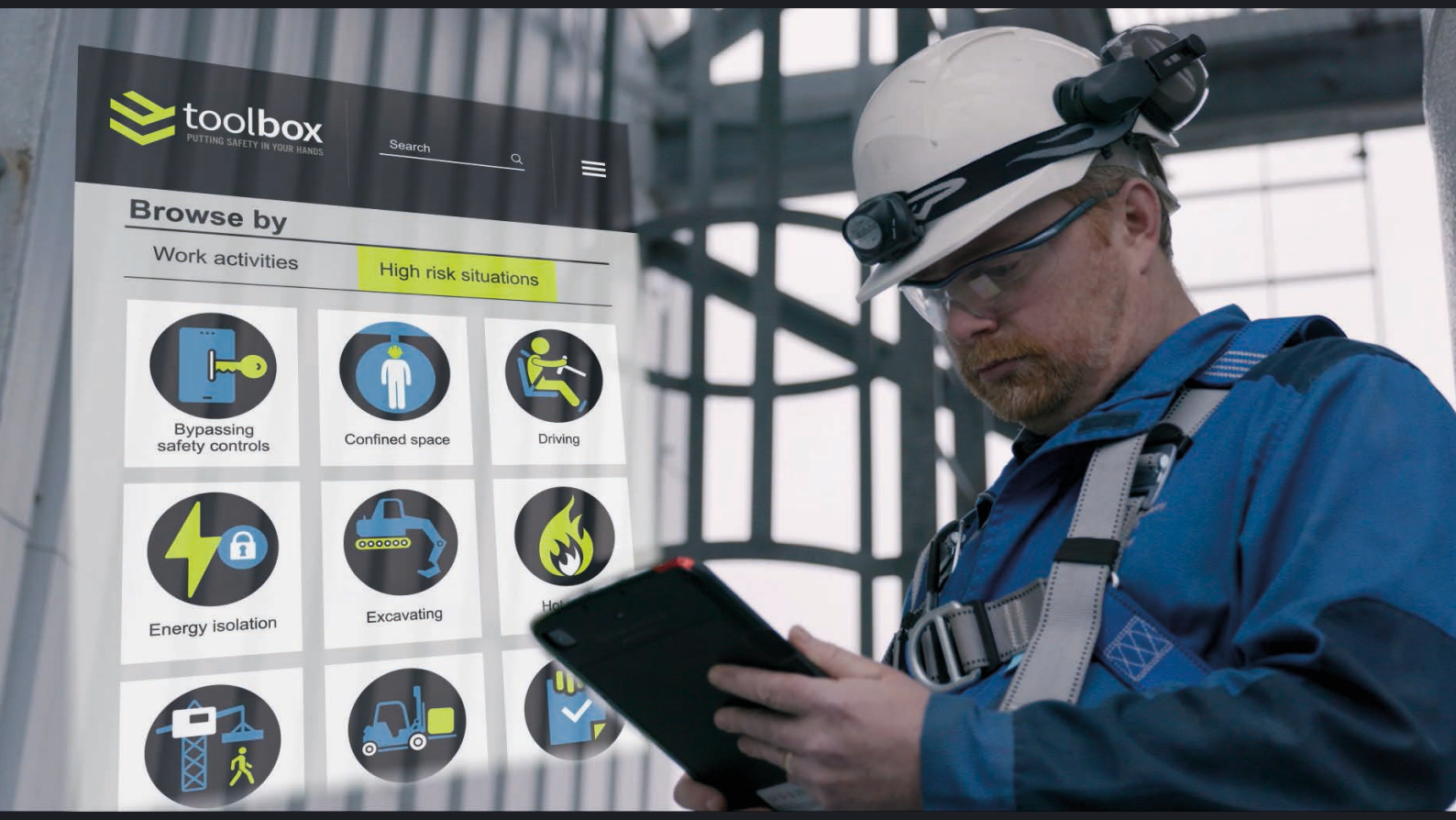

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Editor
Kim Jackson MEI
+44 (0)20 7467 7118
kjackson@energyinst.org

Deputy Editor
Brian Davis
+44 (0)20 7467 7142
bdavis@energyinst.org

Digital Officer
Elliot Tawney
+44 (0)20 7467 7117
etawney**@energyinst.org**

Editorial enquiries
+44 (0)20 7467 7118
editorial@energyinst.org

General enquiries
+44 (0)20 7467 7100
info@energyinst.org

Advertising
For advertising opportunities please contact: Alexander Bassey or Simon Kirby
advertising@energyinst.org

Magazine subscriptions
Chris Baker MEI
+44 (0)20 7467 7114
cbaker@energyinst.org

Membership
For all membership enquiries please contact **membership@energyinst.org** or visit **www.energyinst.org**

Abbreviations
The following are used:

mn = million (10^6)	t/d = tonnes/day
bn = billion (10^9)	kW = kilowatts (10^3)
tn = trillion (10^{12})	MW = megawatts (10^6)
cf = cubic feet	GW = gigawatts (10^9)
cm = cubic metres	kWh = kilowatt hour
b/d = barrels/day	km = kilometre
boe = barrels of oil equivalent	sq km = square kilometres
t/y = tonnes/year	

Abbreviations go together
eg 100mn cf/y = 100 million cubic feet per year.

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61 New Cavendish Street, London W1G 7AR, UK

Chief Executive: Louise Kingham OBE FEI

Contents

Greater diversity and inclusion in decision-making teams leads to higher profitability and improved results

Photo: Shutterstock

Update & regulars

IN THIS ISSUE...

This month's issue of *Petroleum Review* opens with a number of articles explaining how skill set development and embracing workplace diversity are key to future-proofing the energy sector to meet the challenges that lie ahead.

Latin America and the Caribbean are the focus of our regional spotlight and we outline four common investment risks and how best to mitigate them. We also highlight how calls for constitutional reform, political infighting and COVID-19 are threatening Chile's energy transition, and look at the impact the coronavirus pandemic has had on Brazil's energy sector. Our EI Caribbean Branch provides a snapshot of recent developments in the Caribbean, where the primary energy landscape has shifted significantly over the past decade.

We also look at what steps some of the biggest oil and gas operators are making in the move to net zero. Meanwhile, a recent study says it is impossible for every country to satisfy demand for energy with domestically produced renewables and suggests that to achieve decarbonisation, many will have to find new ways to import zero-carbon energy.

The magazine closes with an article from EI Technical, whose latest analysis shows global marine crude oil voyage losses fell in 2019.

Kim Jackson, Editor

Features

See also online...
Renewables sector feeds specialist lubricants business
Visit **bit.ly/EW_Lubricants**

Call for young professionals
There is still time to make your voice heard through the EI's 'Generation 2050' survey. If you are under 35 – and especially if you live and work outside the UK or EU – please take a few minutes to share your thoughts on the challenges of energy access and climate change, at **bit.ly/3iDsyMu**

PERSPECTIVE

How to upgrade a broken US oil benchmark

Richard Swann, Editorial Director, Americas Oil Markets, S&P Global Platts

The seismic shock of the price collapse in NYMEX WTI futures on 20 April 2020 is proving to be a catalyst for a potentially once-in-a-generation reset of oil benchmark pricing systems in the US.

The negative crude prices seen that day for May WTI futures at Cushing, Oklahoma, staggered crude traders, many of whom found themselves exposed to a scarcely believable price that bore no relation to what they saw around them in the physical market.

This has prompted a wholesale re-evaluation of the way that crude is priced, triggering interest in finding a new, robust benchmark more capable of reflecting broader US market fundamentals than Cushing WTI.

For decades, Cushing WTI pricing has permeated almost all corners of the US crude market. Spot crude transactions and long-term contracts – from Midland, Texas, to North Dakota – use the WTI price in Cushing, Oklahoma, as their underlying reference, with adjustments on top for factors such as location and crude quality.

While Cushing has grown in size and importance through the years, the overall US market has evolved too, with profound changes in crude production and export flows over the last decade leaving the epicentre of the market firmly centered on the Gulf Coast. This increases the US' interdependence with the rest of the world and means that US crude prices at the coast closely track trends in the global market. But prices at Cushing can diverge from this pattern. Although it is large in scale, Cushing is a landlocked hub where fundamental forces are often local in nature, such as physical flows on certain pipelines and the level of oil held in inventory at a particular terminal or tank farm.

This means anyone using Cushing as a benchmark to establish the value of crude elsewhere in North America can run into problems. Indeed, the dislocation of WTI crude prices at Cushing from other global crude prices has been a recurring phenomenon over the last 10 years.

This problem became critical for some on 20 April 2020. With so much physical crude exposure to a marker which settled that day at an almost surreal price of –$37.63/b, the disconnect between financial trading at Cushing and the wider physical market for crude in the US was simply too big to ignore any longer. In the words of some in the market, WTI was a 'broken' benchmark.

Seeking a solution

If Cushing is the problem, what's the solution? After taking feedback on what an alternative benchmark could be, S&P Global Platts launched Platts American GulfCoast Select (AGS) on 26 June 2020.

Platts AGS is based at the heart of the oil market on the Gulf Coast, and aims to be more capable of reflecting actual physical US crude market conditions than Cushing, thanks to some important characteristics.

Firstly, Platts AGS represents a market free from the storage constraints which played a part in the Cushing meltdown in April. The new benchmark is based solely on waterborne tanker loadings across several Gulf Coast ports, including Corpus Christi, Houston and Beaumont. Prices based at specific terminals or locations are inherently prone to infrastructure-related problems, which can have a dramatic impact on value. If you are relying on a price benchmark, you want one which reflects the value of your oil, not somebody else's terminal logistics.

Secondly, the new benchmark includes quality parameters to better define WTI Midland. Its specifications include an API range of 40–44, a maximum sulphur content of 0.2%, separate limits on mercaptans, iron, nickel and vanadium, as well as pipeline provenance requiring the oil to be shipped direct from the Permian Basin to the Gulf Coast on one of nine named pipelines.

There are also specific details in the assessment methodology relating to key elements such as cargo size normalisation. In the Gulf Coast market, a trader may be willing pay more for a 700,000-barrel cargo than for a smaller 600,000-barrel cargo simply because of how freight economics work. Furthermore, a robust benchmark needs to be able to account for these differences to arrive at a consistent final price.

These details are crucial if the waterborne cargo market is to become the crude price benchmark the US market needs, avoiding the issues which a landlocked price reference can face – whether in Cushing, Houston or anywhere else.

Using a waterborne benchmark would take the US down a similar path to the rest of the world, where most crude trade is linked either to the price of Dated Brent cargoes in the North Sea or to Dubai and/or Oman cargoes in the Middle East.

Major oil benchmarks, even ones with flaws, are well entrenched and hard to change, so there is a long road ahead for the US to achieve a Brent-style benchmark on its own. But with the wreckage of the events of 20 April 2020 still fresh in the memory, the crude industry is moving down that path. ●

Venezuelan oil production 'close to zero'

Venezuela is now the third smallest producer among OPEC's 13 members, just ahead of Equatorial Guinea and war-torn Libya

Venezuela – one of the world's earliest and, at one time, largest oil producers, as well as a founding member of OPEC – could soon be producing close to zero barrels of oil, according to new analysis by IHS Markit.

The country's crude oil production is currently around 100,000–200,000 b/d and falling. Production was around 650,000 b/d just a year ago and had been as high as 2mn b/d as recently as 2017. It is now conceivable that the country could soon be producing zero barrels, or very close to it, reports the consultancy.

'Never before has a former major oil producing country seen output fall so low for so long. In Venezuela's case, if there is any surprise it is that the disintegration did not happen faster,' comments Jim Burkhard, Vice President and Head of Oil Markets, IHS Markit.

The country is now the third smallest producer among OPEC's 13 members, just ahead of Equatorial Guinea and war-torn Libya.

Venezuela's production fall – the product of decades of decline and decay – has been exacerbated more recently by the COVID-induced oil price collapse of 2020, US sanctions and limited domestic oil storage.

While the slide toward zero production is a historical milestone, Venezuela's demise as an oil producer will have little to no impact on global oil markets given the much larger shifts in world oil demand and supply wrought by COVID-19 and its repercussions.

'In terms of market impact, if you had to choose a time for the fall of a major global oil producer – a founding member of OPEC, no less – this would be it. There is ample production capacity around the world to satisfy the recovery in world oil demand that has been underway since May,' remarks Burkhard.

Given the size of the country's reserves, a restoration of production somewhere in the future is always a possibility. But the state of Venezuela's infrastructure, ongoing US sanctions and lower global demand make it increasingly unlikely, suggests IHS Markit.

'The decay of Venezuela's oil industry has been due to poor management, not lack of below ground oil resources. It is conceivable that a rebuilding of infrastructure under appropriate investment and security conditions could return the country to the ranks of major oil producers,' notes Ha Nguyen, Director, Global Oil Supply, IHS Markit. However, he continues: 'Any recovery would take a considerable amount of time given the degree of dilapidation throughout the country's energy infrastructure. It looks like close-to-zero oil production is Venezuela's new normal for the foreseeable future.'

Venezuela's production fall – the product of decades of decline and decay – has been exacerbated more recently by the COVID-induced oil price collapse of 2020, US sanctions and limited domestic oil storage

Photo: PdVSA

Africa

Cairn to sell Senegal interests to Lukoil

Cairn is planning to sell to Lukoil its entire 40% interest in the Rufisque Offshore, Sangomar Offshore and Sangomar Deep Offshore (RSSD) contract area, including the Sangomar development, offshore Senegal, for a cash consideration of up to $400mn.

Following completion, the company intends to return at least $250mn to shareholders.

Commenting on the announcement, Conor Ward, Upstream Analyst at GlobalData, says: 'News that Lukoil is looking to expand in Western Africa comes as no surprise as the region has seen a flurry of spending from the company over the last decade – with its acquisition of a stake in major projects such as the Pecan field in Ghana, the Bonga Southwest/Aparo field in Nigeria, the Marine XII licence offshore the Republic of Congo, and the Fortuna LNG project in Equatorial Guinea. Lukoil hopes to see major growth from these projects in the next decade as its foothold in Western Africa has potential to grow five-fold from approximately 14,000 b/d in 2020 to approximately 70,000 b/d by the mid-2020s. Sangomar will add an estimated 20,000 boe/d to Lukoil's portfolio at peak.'

He continues: 'It is not just West Africa where Lukoil is making acquisitions, but also in the Middle East where the company purchased a 5% stake in the Ghasha concession, which is expected to add a further 12,000 boe/d to the company's portfolio when it reaches plateau.'

'Many of the projects that Lukoil has acquired shares in have faced multiple delays, such as Bonga Southwest/Aparo where the final investment decision (FID) was expected in 2020 but is now not expected until 2021 at the earliest. The participants of Pecan are still considering a new development concept and the same goes for the Fortuna development, while the Etinde field in Cameroon hangs in doubt. The acquisition of the Sangomar field will really bolster the company's West African growth plans as it achieved FID in 2020 and the operator Woodside has remained adamant that first production will be seen in 2023 as originally planned.'

Decarbonisation

Offshore energy integration could deliver 30% of UK's net zero target

The integration of offshore energy systems, including oil and gas, renewables, hydrogen and carbon capture and storage (CCS), could deliver approximately 30% of the UK's total carbon reduction requirements needed to meet the 2050 net zero target, according to the Oil and Gas Authority's (OGA) *Energy Integration Project* report.

Published in collaboration with Ofgem, The Crown Estate and the Department for Business, Energy and Industrial Strategy (BEIS), the report also highlights the additional potential for offshore renewables (wind, wave and tidal) to contribute approximately a further 30% towards the UK's net zero target. This means the UK Continental Shelf (UKCS) could support, in combination with complementary investments in onshore energy infrastructure, around 60% of the UK's decarbonisation requirements.

There are over 30 energy integration projects already underway across the UKCS, with more than 10 actively being engaged by the OGA alongside this study.

Importantly, the report also concludes that not only is the close co-ordination of these technologies valuable in terms of energy production and cutting greenhouse gases (GHG), but that their integration would help technologies become economically more attractive.

The report findings include:

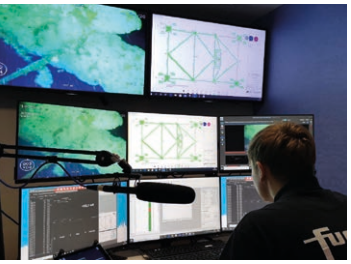
- Oil and gas platform electrification is essential to cutting sector production emissions in the near term, and critical to the industry's social licence to operate. Electrification can abate operational emissions by 2–3mn tCO_2/y by 2030. This is the equivalent of reducing 20% of today's production emissions, rising to 40% by 2030.
- Oil and gas capabilities, infrastructure and the supply chain are crucial to energy integration, and can potentially support further offshore renewables expansion, including floating wind power.
- Re-using oil and gas reservoirs and infrastructure can accelerate CCS, connecting to onshore net zero hubs and saving 20–30% capex on specific projects.
- To reach the CCS scale in support of net zero, the UK needs to develop around 20 individual CO_2 stores for a total capacity of over 3Gt of CO_2 by 2050 (with large CCS projects featuring multiple stores).

Burbo Bank wind farm development in Liverpool Bay
Photo: Ørsted

- Blue hydrogen (produced from natural gas) has the potential to decarbonise around 30% of the UK natural gas supply by 2050, potentially supporting around half of CCS expansions in the same timeframe.
- Green hydrogen (from renewables) can support and enable the significant expansion of offshore renewables in the 2030s and beyond, providing an efficient storage and energy transportation solution. Reducing the costs of the technology involved (electrolysis) would be needed to support the faster uptake of this technology.

Petroleum Review will be taking a closer look at the report findings in its forthcoming October 2020 issue.

IN BRIEF



Remote operations centre
Photo:Fugro

Fugro has delivered what is claimed to be the first fully remote inspection of an oil and gas platform in UK waters, 250 km east of Scotland, using a remotely operated vehicle (ROV) and Fugro's state-of-the art remote operations centre (ROC) in Aberdeen. Karl Daly, Fugro's Director for IRM Services in Europe, says: 'This innovative approach allowed for efficient scope delivery and demonstrates to clients the opportunities for maximising operational windows whilst reducing offshore HSSE exposure, which is always important but even more so during the current pandemic.'

Libya's oil blockade entered its seventh month in August, with the war-torn country's oil output hovering at just 100,000 b/d instead of the pre-crisis 1.2mn b/d. Without a peaceful solution on the horizon, Rystad Energy is further pushing back the country's expected restart to 4Q2020, a change that will help reduce the expected global production surplus to just 58.6mn barrels, or to about one-third of its previous forecast. For more details, visit **bit.ly/PRSept2020Libya**

New research by IHS Markit shows that the combined greenhouse gas intensity of Canadian oil sands projects fell 20% from 2009 levels. It is forecast to decline by at least 16–23% by 2030 (to a level 30% below 2009). Visit **bit.ly/PRSept2020Oilsands**

A total of 10 projects across Scotland have been awarded grants totalling £1.84mn in the fourth round of the Scottish government's Decommissioning Challenge Fund (DCF). The projects include innovation, research and development in well plugging and abandonment, and subsea recovery; decommissioning port infrastructure upgrades; feasibility studies; and the purchase of specialist decommissioning equipment.

Total and its partners have taken the investment decision for the third phase of the Mero project in the Libra block in the pre-salt area of the Santos Basin. The Mero 3 floating production, storage and offloading vessel (FPSO) will have a liquid treatment capacity of 180,000 b/d and is expected to start up by 2024. It follows investment decisions for the Mero 1 (start-up expected in 2021) and Mero 2 (onstream in 2023) FPSOs, both of which also have a liquid processing capacity of 180,000 b/d. The Mero field is estimated to hold 3–1bn barrels of oil.

Transition driving US electric truck growth

US electric truck sales are set to increase exponentially by 2025

There were just over 2,000 electric trucks on US roads at the end of 2019, a figure expected to grow exponentially to over 54,000 by 2025, according to new analysis from Wood Mackenzie. Although the electric truck industry has only recently begun to receive policy and financial support that the passenger and public transit sectors have benefited from, the emphasis placed on meeting global energy transition goals will drive the growth of this sector over the coming years, says the consultancy.

'Compared to passenger electric vehicle (EV) and electric bus penetration levels, the electric truck market is still in its infancy,' comments Kelly McCoy, Wood Mackenzie Research Analyst. 'Medium- and heavy-duty vehicles (MDV/HDV) are the second largest contributor to US transportation emissions, but much of the emissions reduction efforts thus far have centred on new diesel technologies and hybrids rather than pure electrification.'

Electric truck charging can be achieved using the same approaches as electric buses – with plug-in, wireless and overhead chargers. Plug-in charging at freight facilities is the primary charging method in use today, while wireless and overhead charging specifically for electric trucks are still in the testing phase.

McCoy notes: 'Unlike most other EV segments, electric trucks have a few distinctive considerations when it comes to charging. The range of most commercially available electric trucks is sufficient for their current applications (<300 miles). Since over 68% of city and regional Class 8 trucks are parked for more than six hours each day, many electric trucks may be able to rely on Level 2 chargers. Electric trucks with larger batteries or shorter dwell times will likely require DCFCs [DC fast chargers] to satisfy their charging needs.'

She adds: 'Freight and cargo facilities were not designed to accommodate EV chargers. Chargers can be installed at truck parking spaces much like how public chargers are sited today. However, trucks also spend significant amounts of time at loading docks and these tight spaces do not have room for a charger. Spaces like this will likely have to be redesigned to accommodate chargers.'

Although there are barriers to the mass adoption of electric trucks and the necessary charging infrastructure, the industry is working to combat these, reports Wood Mackenzie. The Volvo Low Impact Green Heavy Transport Solutions (LIGHTS) project aims to design the ideal regional electric truck configuration.

McCoy comments: 'Fleet electrification provides operators with many financial and environmental benefits on its own due to lower fuel and maintenance costs and zero tailpipe emissions. Support from policymakers and utilities is just getting off the ground, and fleet operators willing to test this new technology can take advantage of incentive and pilot programmes to advance their own electrification goals.'

'The LIGHTS project specifically focuses on advancing electric truck technology, but EV charger vendors also have an opportunity to develop advanced charger technologies and solutions. Retractable cables or underfloor mounted chargers are two examples of how trucks parked at a loading dock can be charged, though the installation process and cost need to be studied further.'

Planning for the expected growth in electric truck charging infrastructure in the US will need to take into consideration the size of the electric fleet, hardware and installation costs, charging technologies and battery size

Photo: Volvo LIGHTS

Hydrogen

New European hydrogen network plan

Hydrogen compressor pump

Photo: Cambridge Bay Weather

A plan to build a dedicated hydrogen pipeline network of almost 23,000 km within nine European countries by 2040 has been released by 11 European gas infrastructure companies, reports *Keith Nuthall*. Enagás, Energinet, Fluxys Belgium, Gasunie, GRTgaz, NET4GAS, OGE, ONTRAS, Snam, Swedegas (Nordion Energi), Teréga and the consultancy Guidehouse have called their proposed network a 'European hydrogen backbone'. It would serve Germany, France, Italy, Spain, the Netherlands, Belgium, the Czech Republic, Denmark, Sweden and Switzerland, with links to neighbouring European states (including the UK) and to North Africa.

The conversion of existing natural gas pipelines will be key. The consortium believes such 36- and 48-inch diameter pipelines can transport around 13 GW of hydrogen per pipeline (at lower heating value) across Europe.

The initiative comes as the European Commission launched on 8 July 2020 its EU Hydrogen Strategy (see **bit.ly/PRSept2020Hydrogen**), including supporting the production of 40 GW of renewable hydrogen electrolysers across Europe by 2030.

Some €27–64bn is expected to be required to build a 'backbone' network, comprising 75% converted natural gas pipelines and 25% new pipelines. The wide range of the estimate is due to uncertainties in compressor costs, explains the consortium. This is because the energy density of hydrogen is three times lower than natural gas. So, to produce the same energy output, three times more hydrogen must be transported. Given its low mass and large volume flow, 'greater efforts for compression are to be expected with hydrogen', which means some compressors will need to be replaced and others refitted, says the consortium. However, it estimates overall operational costs at €0.09–0.17/kg of hydrogen per 1,000 km², 'allowing hydrogen to be transported cost-effectively over long distances across Europe'.

Emissions reduction

Cutting Asia-Pacific LNG plant emissions

Using renewable energy to power LNG plants in the Asia-Pacific region could reduce emissions by about 8%, according to Wood Mackenzie analysis. The Asia-Pacific produces over a third of the world's LNG, but also generates over 50mn tCO_2e of emissions during liquefaction, reports the market analyst, while Australian LNG projects account for over half, or 29mn tCO_2e, of liquefaction emissions from LNG projects in the region.

Many of the Asia-Pacific's LNG facilities are located in remote areas, far from the power grid. As a result, feedgas is used to generate electricity to run the plant and fuel the liquefaction process. Typically, 8–12% of feedgas is consumed at the plant to run these processes. Older, more inefficient plants, as well as nascent floating LNG (FLNG) vessels operate with far higher losses.

Wood Mackenzie Senior Specialist Jamie Taylor says: 'Three main decarbonisation levers could help reduce emissions at LNG plants – namely operational efficiency, design changes, and the use of renewable energy, which could be sourced from the grid or generated onsite.'

Feedgas is used to fuel gas turbines to generate electricity to power the plant. Replacing these gas turbines with electricity could greatly reduce emissions, assuming the grid power is less carbon intensive. The other option is to install on-site renewable power, in particular solar.

Taylor says: 'If a solar plant or a hybrid solar plus battery storage plant is installed at the LNG facility, back-up generators could be switched off and renewable electricity could be used to meet the power load. As costs continue to decline and technology improves, renewable plus battery storage could become an alternative in the future, especially for new LNG plants.'

'We are already seeing Australian LNG plant operators examining ways to reduce carbon emissions throughout the value chain. Initiatives are underway at the upstream assets supplying the North West Shelf and QCLNG, and Darwin LNG has installed a battery that reduces the need to run one of the gas turbines. Our analysis shows that installing renewable energy generation could reduce emissions at Asia-Pacific's LNG plants by 8% in 2020 alone.'

While LNG has clear benefits over other fossil fuels in power generation, the industry is increasingly scrutinising the emissions intensity of its upstream supply and the production process. Several industry players have set carbon neutrality 2050 targets, and there are indications LNG buyers are looking more closely at the emissions associated with cargoes they are procuring. Stricter project financing criteria, especially from European banks, is another cause for concern for companies developing capital intensive greenfield projects.

But perhaps the biggest driver for decarbonisation is the potential for carbon tax or tighter regulations in both exporting and importing countries. This would significantly impact the already strained project economics post oil price crash. Taylor comments: 'A carbon tax is likely to be the biggest driver for LNG projects to switch to renewable energy at the plant or deploy carbon capture and storage to reduce emissions from upstream gas, or both.'

'Using less feedgas as a fuel would result in more gas being available to supply either the domestic market or be converted into LNG for exports. Rather than increasing annual LNG output, which would only be possible by debottlenecking the plant, this "saved" gas would be used to extend the plateau LNG production level by a few years. Revenues associated with the resulting extended plateau could reach into several billion dollars longer-term.'

'In APLNG, for example, installing 60 MW of solar in 2020 at a cost of $60mn increases the remaining value of the project by $62mn. 'This is due to the additional revenues generated from selling the "saved" feedgas. The relative benefits of installing solar are increased further when a carbon tax is considered.'

> ***'A carbon tax is likely to be the biggest driver for LNG projects to switch to renewable energy at the plant or deploy carbon capture and storage to reduce emissions from upstream gas, or both.'***
>
> **Jamie Taylor, Senior Specialist, Wood Mackenzie**

IN BRIEF

Photo:Volta Trucks

Volta Trucks, the Scandinavian start-up full-electric vehicle (EV) manufacturer, is to pilot test its forthcoming Volta Zero, claimed to be the world's first purpose-built full-electric 16-tonne delivery vehicle, with UK parcel delivery service DPD. The vehicle will be tested by DPD within London's Ultra Low Emission Zone (ULEZ) in 1Q2021.

The European Bank for Reconstruction and Development (EBRD) and KfW IPEX-Bank are loaning €90mn and €45mn respectively to global chemical and sustainable technologies group Johnson Matthey to build a factory in Konin, Poland, that will produce cathode materials for electric vehicle (EV) batteries.

Total has signed an agreement to sell the UK Lindsey refinery and its associated logistic assets to the independent Prax Group for an undisclosed sum. Located in Immingham, Lincolnshire, the Lindsey refinery has an annual production capacity of 5.4mn tonnes.

San Leon is investing $15mn in Energy Link Infrastructure (ELI), the company which owns the Alternative Crude Oil Evacuation System (ACOES) project in Nigeria. ACOES will provide a dedicated oil export route from the OML 18 asset, comprising a new pipeline from OML 18 and a floating storage and offloading vessel (FSO). Once commissioned, the system is expected to reduce the downtime and allocated pipeline losses currently associated with the Nembe Creek trunk line (NCTL) to below 10%. The pipeline component of the ACOES project is expected to have a throughput capability of around 100,000 b/d of oil, while the FSO will have a storage capacity of 2mn barrels.

The UK and Ireland Fuel Distributors Association (UKIFDA) and the Petrol Retailers Association (PRA) have voiced their views on the UK government's latest consultation looking at ending sales of new petrol, diesel and hybrid cars in the UK by 2035. UKIFDA believes that governments need to be 'technology neutral' in their legislation, rather than setting one technology above others, while the PRA has highlighted a number of barriers to achieving the ban and the impacts it would have on different sectors of industry and society. For details, visit **bit.ly/PRSept2020Tradeassoc**

Stepping on the gas post-pandemic

The global gas industry is expected to resume market growth post-COVID-19

After growing by more than 2% in 2019, global gas use is set to fall by around 4% in 2020, as the COVID-19 pandemic reduces energy consumption across the global economies. However, the resulting low gas prices, as well as clean air and climate policies, will promote further switching to gas from other more polluting energy sources, such as oil and coal. This trend was already underway before the pandemic, thanks to cost-competitive gas in key sectors including power, industry and transport, and major regions including Europe, North America and Asia. These are the key findings of the *Global Gas Report 2020,* published by the International Gas Union (IGU), BloombergNEF (BNEF) and Snam.

The report shows that medium-term growth will come from increasing cost-competitiveness and increased global access to gas. A particular growth opportunity exists in LNG. LNG imports reached 482bn cm in 2019, up 13% from 2018, and while this figure is expected to fall by around 4.2% in 2020, it could rebound quickly to previous levels as soon as 2021, depending on the persistence and longevity of the pandemic, says the study.

Ample natural gas resources exist to support demand growth, but greater gas infrastructure development is needed to support growth in the medium term, suggests the report. India is planning to almost double the length of its gas transmission grid, while China will grow its gas network about 60% by 2025.

In the longer term, there are major opportunities to scale up the use of low-carbon gas technologies, but these depend on substantial policy action and infrastructure investment in the coming years. Clean hydrogen could abate up to 37% of energy-related greenhouse gas (GHG) emissions, according to BNEF estimates. However, this would require a range of meaningful steps, including emissions pricing linked to clear, Paris-aligned long-term climate targets; harmonised standards governing hydrogen use; coordinated strategies regarding regional and global infrastructure roll-out, and the deployment of hydrogen-ready equipment, such as pipelines, gas turbines and end-use appliances.

The development of an international hydrogen market could also accelerate adoption. The report finds that Germany, which is pursuing rapid development in hydrogen, could procure cost-competitive hydrogen (at about $1/kg) in 2050 from a variety of sources, including via electrolysis from its own domestic renewable power, or via pipeline imports from North Africa or Southern Europe.

The report also reviews the long-term outlook for natural gas under different existing scenarios, including those from the International Energy Agency (IEA), BNEF and IGU analysis. The IEA's Stated Policies Scenario, from its *2019 World Energy Outlook*, envisions gas use growing 1.4%/y to 2040, while BNEF's economics-led *New Energy Outlook 2019* foresaw 22% growth in power sector gas demand to 2050.

In contrast, the IEA's Sustainable Development Scenario sees natural gas use declining from the end of the 2020s onward as the global energy demand flattens and the world embraces stronger climate action. And both IGU and BNEF analysis indicate that around one-third of energy-related emissions could be abated by adoption of clean gas technologies.

This divergence in outlooks highlights both the risks and the opportunities for the global gas sector in the energy transition – and the importance of actions taken by both industry and government to capture the new opportunities and mitigate the risks for the sector in the coming decades.

Low gas prices, as well as clean air and climate policies, will promote further switching to gas from other more polluting energy sources, such as oil and coal

Photo:BP

Emissions reduction

'Decade of delivery' drives BP net zero strategy

BP is aiming for emissions from its operations and those associated with the carbon in its upstream oil and gas production to be lower by 30–35% and 35–40% respectively by 2030

Photo:BP

BP has set out its strategy for a 'decade of delivery' towards its net zero ambitions, which it says will 'reshape' its business as it 'pivots from being an international oil company (IOC) focused on producing resources to an integrated energy company (IEC) focused on delivering solutions for customers'.

Within 10 years, BP aims to have increased its annual low carbon investment 10-fold to around $5bn/y, building out an integrated portfolio of low carbon technologies including renewables, bioenergy and early positions in hydrogen and carbon capture, use and storage (CCUS). It aims to have developed around 50 GW of net renewable generating capacity by 2030 – a 20-fold increase from 2019 – and to have doubled its consumer interactions to 20 million a day.

Over the same period, the company's oil and gas production is expected to reduce by at least 1mn boe/d, or 40%, from 2019 levels. Its remaining hydrocarbon portfolio is expected to be more cost and carbon resilient.

BP is also aiming for emissions from its operations and those associated with the carbon in its upstream oil and gas production to be lower by 30–35% and 35–40% respectively by 2030.

The company has also set out a new financial framework to support a fundamental shift in how it allocates capital, towards low carbon and other energy transition activities. 'The combination of the strategy and financial framework is designed to provide a coherent and compelling investor proposition – introducing a balance between committed distributions, profitable growth and sustainable value – and create long-term value for stakeholders,' notes BP.

'Energy markets are fundamentally changing, shifting towards low carbon, driven by societal expectations, technology and changes in consumer preferences. And in these transforming markets, BP can compete and create value, based on our skills, experience and relationships. We are confident that the decisions we have taken and the strategy we are setting out today are right for BP, for our shareholders, and for wider society,' said Helge Lund, Chairman, BP.

Bioenergy

Principles for post-COVID bioeconomy recovery

The Biofuture Platform, a 20-country, multi-stakeholder initiative, has launched a set of voluntary principles that offer guidance to governments and policymakers around the world on the need to promote the sustainable bioeconomy in both short-term relief packages and broader post-COVID economic recovery programmes.

The five principles are:

- *Do not backtrack:* Ensure continuity and long-term predictability of bioenergy, biofuels, and bio-based material targets and existing policy mechanisms that have proved successful.
- *Consider short-term COVID support for producers:* Where appropriate, address short-term challenges for bioenergy and bio-based materials industries in the context of relief packages related to COVID-driven economic losses.
- *Reassess fossil fuel subsidies:* Take advantage of a low oil price environment to reassess fossil fuel subsidies for a fairer playing field.
- *Build back better with bio:* Where appropriate, integrate the bioeconomy sector as part of broader recovery programmes, eg by requiring bioeconomy investments/targets as part of aid and recovery packages for specific sectors such as transport and chemicals.
- *Reward sustainability:* Integrate sustainability rewarding mechanisms into policy frameworks, promoting positive externalities in the production and use of bio-based fuels, chemicals and materials.

The principles were developed following consultations with policymakers, industry experts and international organisations such as the International Energy Agency (IEA), the International Renewable Energy Agency (IRENA) and the Global Bioenergy Partnership (GBEP).

Bioenergy is expected to play a key role in the decarbonisation of the energy sector. However, it is also one of the sectors most affected by the COVID crisis. For example, earlier IEA analysis has estimated that transport biofuels production, expected to continue to grow before the crisis, could in fact decline as much as by 13% in 2020, the first decrease in output in two decades. At the same time, the IEA Sustainable Recovery Plan shows that biofuels could be a very cost-effective way to create employment in the energy sector, as they have the second-largest number of jobs (15–30) created per $1mn of spending.

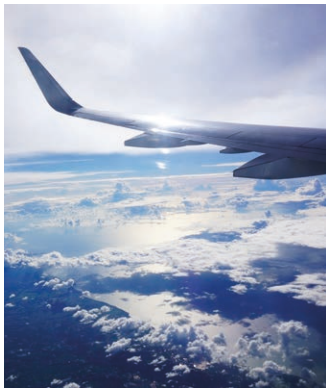
The principles are non-binding and non-prescriptive, with member countries encouraged to implement them in accordance with broader sustainability initiatives and economic recovery programmes. A number of countries have already implemented or are considering new policies in line with the principles. These include Brazil's RenovaBio and Canada's Clean Fuels Standard programmes. The US also recently revealed plans for a Higher Blends Infrastructure Incentive Programme, to reinforce biofuel distribution infrastructure.

Other regions have also set ambitious targets. For example, India plans to scale up bioenergy use including 20% sustainable ethanol in gasoline by 2030 and the EU also has established policy ambitions to scale up advanced biofuels by 2030 in the Renewable Energy Directive (REDII).

Some countries have included sustainable fuels in their economic recovery measures. France, for example, announced an important support package to the airline industry, which incorporates sustainable aviation fuel targets.

Dr Fatih Birol, Executive Director of the IEA, which facilitates the Biofuture Platform, says: 'Bioenergy is the overlooked giant of the renewable energy sector and will be paramount to a successful global energy transition. But its growth is currently not on track to meet sustainable development goals. It is critical that governments incorporate bioenergy in their COVID economic recovery plans, promoting jobs in the sector and ensuring its considerable potential does not remain untapped.'

For more information visit **www.biofutureplatform.org**



Some countries have included sustainable aviation fuels in their economic recovery measures

Photo:Pixabay

IN BRIEF

The European Bank for Reconstruction and Development (EBRD) is stepping up efforts to transform Ukraine's energy sector. The Bank reports that a €51.9mn sovereign loan to Ukrgasvydobuvannya (UGV), Ukraine's largest natural gas producer, will increase domestic natural gas production, reduce the country's dependency on imports and improve the efficiency and transparency of the sector.

Chevron is to acquire Noble Energy in an all-stock transaction valued at $5bn, or $10.38 per share, in what is the oil industry's first big mergers and acquisitions deal since the coronavirus pandemic sent the price of crude plummeting earlier this year. The total enterprise value, including debt, of the transaction is $13bn. For more information, visit **bit.ly/PRSept2020Chevron** and **bit.ly/PRSept2020Africangas**

The EBRD is providing a €80mn loan to the Natural Gas Infrastructure Company of Cyprus (ETYFA) for the acquisition of a floating storage and regasification unit (FSRU) and the development of related infrastructure. The FSRU will be permanently anchored about 1.3 km off the coast of Limassol in Vasilikos Bay and will connect directly to the adjacent Vasilikos power station, the largest power plant in Cyprus. The EU is extending a €101mn grant for the project under the Connecting Europe Facility. The remaining project costs will be funded by a €150mn loan from the EIB and a €43mn equity contribution from the Electricity Authority of Cyprus (EAC). The project is expected to reduce the country's CO_2 emissions by 10% and lead to a substantial reduction in local air emissions (sulphur dioxide, particulate matter and nitrogen oxides). In the longer term, the flexible gas-fired Vasilikos power plant will play a key back-up role as Cyprus moves increasingly to wind and solar power as part of an accelerating green transition in the EU.

Energy Institute's UK members back green recovery

In July, the Energy Institute (EI) released its annual UK survey report, *Energy Barometer 2020*, based on responses from more than 350 UK professionals selected to represent views from oil and gas through to renewables and energy efficiency. It is the first *Barometer* study to be published since the UK upped its ambition to net zero and the first to factor in the challenges and opportunities left in the wake of COVID-19 and the global lockdown. Respondents reflected on the successes and opportunities of the energy industry over the past decade, and voiced their predictions for upcoming emissions reduction targets through to 2050.

The results are already striking a chord with UK policy makers; energy professionals have singled out energy efficiency as the biggest missed opportunity of the past decade, and are pledging their support for a 'green recovery' from the COVID-19 pandemic. These findings landed the day before Chancellor Rishi Sunak's mini-budget, which features a £3bn package to support domestic energy efficiency, including the Green Homes Grant scheme.

Chris Stark, Chief Executive for the Committee on Climate Change, said of the *Barometer*: 'The overwhelming support from energy professionals for a resilient recovery from COVID-19 should give Ministers the confidence to act. Decisions in the coming months will shape our economic recovery – and bend the path of future UK emissions'

EI members also use the *Barometer* survey to weigh in on the inclusion of net zero in business strategies, the impact of UK energy policy over the past 12 months, and recommended first steps the government should take to tackle hard-to-decarbonise sectors such as aviation, road freight and home heating.

For highlights of *Energy Barometer* in the media – including articles by EI President Steve Holliday FREng FEI and EI Trustee and UKERC Director Dr Robert Gross FEI – as well as a recording of the launch webinar, visit **bit.ly/3kjP26H**

Generation 2050

The deadline for the EI's Generation 2050 survey, aimed at capturing the views and perspectives of young professionals working in energy around the world, has been extended to 2 October. It's open to anyone up to the age of 35 who wants to influence the Generation 2050 manifesto that will be published later in the year. Full detail is at **www.energy-inst.org/Generation2050**

New professional members

The EI provides a range of professional membership grades and chartered titles. Achieving these higher levels of recognition supports your career development and demonstrates your commitment to the industry. Congratulations to the individuals who have achieved professional recognition and/or have acquired registration in the last few months.

Member (MEI)

Fiona Boyd – The Highland Council
Stuart Ashley Scott – University of Cambridge – Engineering Department
Ho Leung Lee – Hanison Construction
Jebraeel Gholinezhad – Portsmouth University
Charles Pool – Genesis Oil and Gas
Nicos Ladommatos – University College London
Alexander Watney – Marsh
Tariq Hussain – Shell
Simon Lark – EPUKi
Jack Cameron – BP
Colm Louis Tynan – Waterford Institute of Technology
Mark James Phelpstead – Turner & Townsend
David John Greenwood – Siemens
Muyiwa Oyinlola – De Montfort University
Martin Hockaday – The Carbon Trust
Paul McGonagle – Rimkus Consulting Group
Jak Lau – Arup
Lincoln Smith – Siemens Gamesa Renewable Energy
Manisha Patel – Kuzuko Group
Eugene Bryce – The Energy Checking Company
Kwong Fat Chan – South Technical/University of Hong Kong
Richard Green – Haider Green
Paul Deane – Bechtel Oil, Gas and Chemicals
Daniel Forsythe – Worley
Enyioma Opurum – Oceaneering International
John Carlton – City, University of London
Mel Swift – GTC
Muhd Aiman Afiq Abu Bakar – ExxonMobil
James Bird – BP
Saad Mannan – Qatar Petroleum
Mahmoud Gawish – McDermott International
Man Sang Ting – UL VL HK
Keng Boon Goh – Edinburgh Napier University
Nathaniel Kar Kei Ng – Kellogg Brown and Root
Lekan Omoniwa – Ove Arup & Partners
Bruce Cowe – Total
Tom Green – Tronox
Simon Donald – Sparrows Offshore Services
Colin Easton – ProSalus
Jean–Paul van der Ende – JPVDE HSSE
Chung Man Siu – The HK & China Gas Company
Andrew Webster – KBC
Luke Olly – Central England Co–operative
William Ireland – Logan Energy
Ian Livingston – Firethorn Consultancy Services
Iain Murdoch – Shell Projects & Technology
Samuel Richardson – io Consulting
Jack Wishart – Marsh & McLennan Companies
Peter Gurr – University of Bath
Stephen Adams – Half Key Associates
Kim Wan Ricky Poon – Chinachem Group
Tanya Sargent – BP
King To Yeung – Leigh and Orange

Innovative solutions found for offshore wind workforce during pandemic

As the energy industry adjusts to working with increased physical separation during the ongoing COVID-19 pandemic, G+ Global Offshore Wind Health and Safety Organisation, based at the EI, has recognised five organisations for initiatives to improve operational safety.

With social distancing severely reducing the number of offshore wind turbine technicians permitted to undertake wind farm inspections, maintenance and repairs, a cross-sector crew transfer vessel innovation challenge was launched, in partnership with ORE Catapult, KTN and the Workboat Association.

Five companies were selected as finalists. Demonstrations are now underway with Flameskill, offering a particle filtration head top to protect users from solid and liquid particles and micro-organisms, and Entex, with its Disinfex Booth, generating a dry fog of non-toxic disinfectant that kills viruses, pathogens and bacteria. Canary Sentinel, Sea Sure and Life's Shield were also selected.

Commenting on the submissions, G+ General Manager Kate Harvey said: 'For offshore wind, the pandemic presents additional challenges in what is already a complex working environment. We've been impressed at the breadth and ingenuity shown in response to our call for proposals.

As offshore wind capacity grows, the sector continues to work tirelessly to uphold the highest safety standards. These varying solutions will allow vital operations to be carried out in a more efficient and safe manner.'

Further information about the innovation call is at **energy-inst.org/wind-workforce**

IN BRIEF

EI decommissioning project funded by Engineering X
A project led by the EI to investigate the risks of structural failure of decommissioned oil and gas installations worldwide is one of six recipients of funding totalling £1mn announced by Engineering X, a collaboration between the Royal Academy of Engineering and Lloyd's Register Foundation. More info at **bit.ly/2DTjUuo**

EI joins group to support net zero in the built environment
The EI has joined a task group led by the UK Green Building Council (UKGBC) aiming to demystify how practitioners in the built environment sector can go about procuring quality renewable energy and carbon offsets as the industry pursues a consistent and ambitious trajectory to net zero.
More info at **bit.ly/30GnZL8**

Toolbox ya está disponible en español

The EI's Toolbox web app has been made available in Spanish, on top of the existing English and French, demonstrating the increasingly global relevance and use of the learning from incidents platform. The work to translate content continues apace. By the end of the year, Toolbox will also be helping to keep teams safe in Russian, Portuguese, Mandarin, Malay and German..

The platform has expanded in other ways too, building on existing content from the EI's oil and gas partners, with new content drawn from collaboration with the wind energy industry. Members of the G+ Global Offshore Wind Health and Safety Organisation are now using the platform as a mechanism to disseminate lessons from incidents in their sector.

Toolbox is the EI's flagship, free-to-use energy health and safety app. It holds incident lessons and safety information shared by global energy companies for use in the workplace. It can be used on or offline on smart phone, tablet or laptop. Thousands of people have used Toolbox since its launch a year ago. Even during the current lockdown, supervisors are using Toolbox to engage their teams remotely. Understanding what went wrong during similar jobs is arguably more important now than ever.

Toolbox is available at **toolbox.energyinst.org**

Tsz Lap Chan – The HK and China Gas Company
Kirsti Norris – UWE Bristol

Fellow (FEI)
Robin Rafferty – Brunei Shell Petroleum
James Hoare – LHW Partnership LLP
Shivkumar Jadeja – Fluor
Sivaneswaren Kannan – INPEX
John Ramsay McAllister – Mott MacDonald
Graham Bennett – DNV GL
Gerard Burke – Risk Impact
Anthony Stephen Puckett – Tri–Zen International
Julian Brown – Tekmar Group
Graham Talbot – Abu Dhabi Power
Kate Dourian – World Energy Council
Simardeep Soor – UK Government Investments
Ruth Cairnie – Babcock
Daniel Westerman – National Grid
Adrienne Kelbie – Office for Nuclear Regulation
Denice Fennell – EDF Energy Trust
Kevin Dibble – ENGIE
Beverley Gower–Jones – Carbon Limiting Technologies
Michelle Davies – Eversheds Sutherland
Bob Ward – LSE
Poppy Kalesi – Environmental Defence Fund
Andy Kerr – Climate–KIC
Azad Camyab – Pearlstone Energy
Cary Chan – Hong Kong Green Building Council
Nick Turton – Energy Institute
Andrew Crossland – Infratec NZ/Advance Further Energy UK
Jianzhong Wu – Cardiff University
Marcus Peters – EON Climate and Renewables
Jo Butlin – EnergyBridge (UK)
Peter O'Sullivan – Penspen Group
Keith Scoles – Powerlt Fwd
Neil Hughes – Electric Power Research Institute (EPRI)
Prakash Patel – Marsh
Elaine McFarlane – Shell Global Solutions

CEng Chartered Energy Engineer:
Mohd Farid Ismail – Universiti Teknikal Malaysia Melaka
Christina Marie Woodman – Sustainable Energy
Adam Sheikh – Repsol Sinopec Resources UK
Abdel Khoodaruth – University of Mauritius
Omer Shuja Ahmad – Low Carbon Contracts Company
Stanley Okosodo – Stork
Kyle Nicol – Worley

Chartered Energy Manager:
Craig Brown – Science and Technology Facilities Council
Angela Ellison – MOD DIO
Anthony Douglas – CBRE Glocal UK
Nikolaos Koumpetsos – WSP Parsons Brinckerhoff

Chartered Environmentalist:
Thamizh Thendral Venkatesan – EDF Energy

CEng Chartered Petroleum Engineer
Tyler Stewart – Plant Integrity Management

Contact the EI Membership team on t: +44 (0)20 7467 7100 or **membership@energyinst.org** for details of upgrading your membership, applying for registration or for any other queries about your EI membership.

SKILLS

Maintaining a resilient workforce

In recent years, shortage of talent was one of the greatest threats facing the oil and petrochemicals sector. The job market looks bleak in the face of the current global pandemic, and this lingering talent crunch is likely to get worse, not better. However, there are strategies to mitigate this risk, writes IBM's *Sonia Van Ballaert*.

Long before COVID-19, hiring cycles in the oil and petrochemicals sector have typically followed industry cycles of oil prices. In 1986, 1998, 2008 and 2014, graduate recruitment and apprenticeships nearly disappeared, while in 2014 the industry cut over 440,000 jobs due to low oil prices. As a result, the labour pool has steadily declined over the last few decades.

Meanwhile, as the industry was experiencing a crew change due to a wave of retirements, a massive skills shift was also occurring. Thanks to the rapid evolution of technology, the convergence of physical and digital operations became a reality. In the connected 'Industry 4.0' world, data and digital competences have become as important as core engineering skills – and both are in high demand. Compounding the skills gaps already caused by the great crew change and increased digitalisation, another important shift is occurring – the transition to a more sustainable, lower carbon world. This systemic industry shift will require companies to revisit not only their portfolio and practices, but also the very domain skills needed to operate.

Yet the fossil fuels industry has fallen out of favour precisely with the young talent needed to progress the transition to an increasingly inter-generational, inherently digital and ultimately low carbon world. With different career expectations than those traditionally offered by large enterprises, attracted by digital giants, start-ups and non-linear work-life journeys, and very concerned with the climate emergency, the workforce that the oil and petrochemicals industry wants may not be the one it gets.

Time pressures

If it is difficult to hire new talent, what about teaching the talent already there? The half-life of professional skills was once estimated to be 10 to 15 years. Today, the half-life of a learned skill is estimated to be five years, and even shorter for technical skills. This suggests that a skill learned today will be about half as valuable in just five years or less.

IBM's historical data reveals another alarming trend – it is taking longer to close skills gaps using traditional training approaches such as classroom and virtual learning. In 2014, the median time it took to close a capability gap through training in the oil and petrochemicals industry was four days. In 2018, the median was an astonishing 35 days. In just four years, the time to close a skills gap has increased by more than a factor of eight.

One of the reasons that skills have become harder to acquire is that some that are required are behavioural – such as teamwork, communication, creativity and empathy. According to the World Economic Form in its *Future of Jobs* report (**bit.ly/WEFFutureofjobs**), the top three skills identified as critical in the fourth industrial revolution are actually soft skills such as complex problem solving, critical thinking and creativity. These skills are best developed through real-world experience rather than structured learning programmes, and that takes time.

Other new skills take more time to acquire because they are highly technical, such as data science capabilities. Many of

Workplace resilience means being ready to take a big leap into the unknown for new skills and training

Photo: Getty Images

these skills are rapidly changing due to the swift evolution of digital technologies, making it hard to keep pace with the latest paradigms and tools. Yet digital technologies will have a tremendous impact on oil and petrochemicals workers. According to IBM's *2018 Global Country Survey*, executives estimated that over the next three years, 4.5% of the workforce would need to be retrained or reskilled as a result of intelligent automation alone.

Many organisations have not kept up with the demand for skilled workers – not only in existing operations, but also in three critical new areas:

- Connected operations, requiring high levels of data and digital literacy.
- Hybrid, low carbon solutions requiring an influx of new domain expertise.
- Agile, adapative organisational cultures that are resilient in a period of systemic change.

As a result, enterprise vitality shrinks. Without skilled workers, organisations struggle to innovate, deliver value to customers, grow their businesses and create new jobs.

Skills tool kit

Workers in the oil, gas and petrochemicals industry are now expected to have a combination of digital, technical and soft skills in their tool kit (see **Figure 1**). Digital skills consist of software engineering, data management and analytical capabilities to measure operations in real time. Technical skills include instrumentation technologist expertise as sensors are applied to more field equipment and machinery. Soft skills comprise creative problem solving and the ability to manage change to analyse data in real time in the field, make course corrections and innovate.

Facing such deep, varied and changing skills requirements at industry-scale means that traditional hiring and training are not sustainable solutions to the talent crisis. Successfully navigating this new environment where change and innovation are constant requires reshaping how organisations manage skills, talent and culture. Based on insights from multiple IBM Institute for Business Value (IBV) research initiatives as well as performance benchmarking, three strategies stand out to build a resilient workforce – personalisation at scale, skills transparency and learning in ecosystems.

Personalisation at scale

Employees want career, skills and learning uniquely tailored to their experiences, goals, interests and, where possible, connected to individual purpose and meaning. For younger generations, helping tackle the climate challenge offers a compelling reason to keep their skills current. Hence the importance to them of participation in initiatives and personal development that support the energy transition.

Companies must therefore learn to personalise their employees' growth 'at scale'. This means going further than segmenting employees in the same job roles, or the same business units. It means understanding the current skills of every employee, knowing where the company and the individual want or need to progress, and personalising an interesting and dynamic path. Artificial intelligence (AI) can help enable this level of personalisation and bring meaningful employee experiences to life by tailoring employee notifications, learning paths and content to fit both business and individual needs.

Increased skills transparency

Companies should transparently inform employees about the roles and skills that are growing in market demand. From there, they can provide employees with engaging, meaningful ways to develop their skills in critical areas, demonstrate their skills proficiency and be recognised for doing so. This new level of transparency provides employees with information to self-direct their learning and career choices, which is crucial to staying ahead of the shrinking half-life of skills.

Conversely, at the enterprise

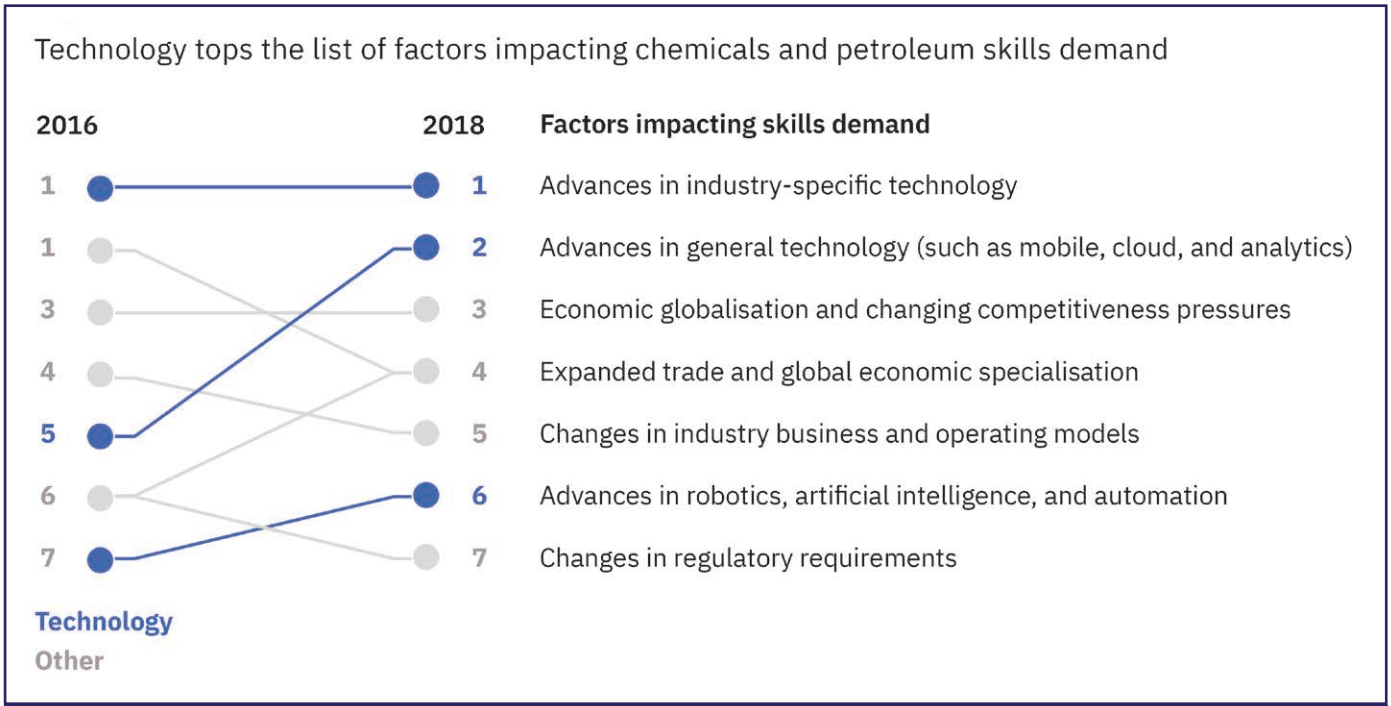


Figure 1: Skills shift occurring between 2016 and 2018

Source: IBM Institute for Business Value (IBV) 2018 Global Country Survey and IBV Global Skills Survey 2016. Q: What impact, if any, do you believe the following factors will have on demand for skills in the next five years? n=292 for 2018 survey; n=230 for 2016 survey.

level, organisations will need to apply agile analytics to predict and infer skills supply and demand, even as circumstances and strategies continue to change. This means applying scenarios and alternate skills building strategies and to work at speed to keep up with changing economic realities and technology futures.

Learning in ecosystems

Organisations must now find solutions to the skills challenge through broader internal and external ecosystems. Cultural shifts are required to welcome third parties as part of the team, embrace partners to manage specific internal functions, and prepare for integration of data across the enterprise and ecosystem. Inside the organisation, companies need to build agile teams with heterogenous skill sets to enable experiential, peer-to-peer innovation and create a culture where learning becomes viral.

Creating opportunities for job sharing and internal mobility and moving skilled talent across organisational boundaries can enhance skills development. Across the external ecosystem, organisations can engage with a coalition of partners to continually explore and pilot innovative skills-gap closure strategies. Investing in new and emerging skill-building technologies can also be a highly effective strategy. Organisations can harness the power of initiatives such as massive open online courses, code schools and industry expertise networks. Applying AI can source and harmonise the most relevant educational assets for employees.

Are you ready?

To assess whether your organisation is ready to implement these innovative strategies to build a resilient workforce, you may ask:

- How engaged and coordinated are your ecosystem partners in joint learning?
- Are you able to constantly evaluate skills currency and find tactics to address new gaps?
- Do you use opportunities to leverage experienced-based learning or real-world learning?
- How are you using new technologies to craft highly personalised learning journeys?
- Do you look outside the industry for key skills of the future?
- What strategies do you have to scale learning to different populations quickly?

By answering these questions, your business can develop an adaptive organisational culture that will be resilient in a period of systemic change and able to face new challenges head on.

Download IBM's report *The chemicals and petroleum industry guide to closing the skills gap* at **https://www.ibm.com/thought-leadership/institute-business-value/report/chemicals-petroleum-skills-gap**

SKILLS

Overhauling talent norms

Companies need to master the new rules of the talent game for the energy transition to succeed, writes *Michelle Meineke*.

Greater levels of retraining and reskilling will be essential to deliver vital work in infrastructure, decarbonisation, digitalisation and ensure future workforce resilience

Photo: Shutterstock

Some 85% of jobs that will exist in 2030 have not yet been invented.[1] Energy markets are far from immune to this stark shift. Where, how and why we work is undergoing a huge upheaval. No job is unaffected as the world strives for a lower carbon and increasingly digitalised world. The COVID-19 pandemic is also dramatically reshaping working norms, notably with lockdowns.

These drivers must result in a cultural change that sees energy markets championing innovation and diversity more than ever. As succinctly put by business leader Doug Conant: 'To win the marketplace, you must first win the workforce.'

A new world needs new ideas

BP, Shell and Total, among others, have set the goal of being carbon neutral by 2050, while Italy's Eni has pledged to cut its greenhouse gas (GHG) emissions by 80% by that date. The world's largest container shipper Maersk has also committed to becoming carbon neutral by 2050. This is just a taste of the companies who have announced ambitious plans. But while laudable, the targets will not succeed without a new pipeline of skills. It requires a holistic approach, with skills being instilled by academia and then utilised effectively and nourished by industry.

That is not easy when the list of coveted skills seems to get ever more demanding. Digital awareness is one, with employers particularly keen on knowledge of, and skills in, big data, artificial intelligence (AI), the Industrial Internet of Things (IIoT) and more. The same applies to science, technology, engineering and mathematic (STEM) skills, of which the global shortage continues. Energy companies' eagerness for 'softer' skills is also on the rise, primarily as they seek a creative and intellectual ecosystem. Along with emotional intelligence, appetite for those with adaptable intelligence (AQ) is intensifying – ie an ability to do complex problem solving, critical thinking and cognitive flexibility.

'As much as the human capital challenge has increased for our sector, our very purpose – for society and the environment – has also become pin sharp since events such as the environmental emergency and the COVID-19 pandemic. Together, we have a once in a generation opportunity to work together and show that choosing to take on a career in our industries is about choosing to support our communities and our planet in finding sustainable energy, waste and water solutions,' says Michael Lewis, E.ON UK Chief Executive and Chair of Energy & Utilities Skills Partnership. 'It is about being in the vanguard of tackling the environmental crisis; it is about meeting those vital zero carbon targets and it is about underpinning the UK economy and people with infrastructure and essential services as critical workers.'

Forget the box

Instilling a culture that inspires most workers to think outside the box – rather than the historical norm of a few – means creating a 'safe to fail' environment. Within reason, this must have a no-blame policy when experimenting with novel ideas, be it in the office, the laboratory or out on site. Crafting this new culture also means energy companies must work much more closely with academia to ensure that knowledge in the classroom is relevant in the working world.

A tightknit engagement is essential as the energy landscape is changing so rapidly. And of course, it means up-skilling, re-training and hiring cross-industry talent (there is a two-way flow of talent between energy and technology markets, for example). PwC's 23rd Annual Global CEO Survey revealed that top management who have embraced upskilling are already realising the rewards with a stronger corporate culture, greater innovation and higher workforce productivity. It is also pivotal to improving talent retainment, as well as attracting new employees.

'Greater levels of retraining and reskilling will be essential to deliver vital work in infrastructure, decarbonisation, digitalisation and ensure future workforce resilience. By embedding inclusion into our working practices and inspiring the next generation to pursue careers in our sector, we can attract a more diverse talent pool to meet the challenges ahead,' notes Energy UK's Interim Chief Executive, Audrey Gallacher.

'Our research shows that to deliver net zero, the energy industry needs to recruit hundreds of thousands of people over the next 30 years. And that really is the tip of the iceberg in terms of the wider impact of net zero across other industries.'

Nicola Shaw CBE, Executive Director, National Grid

Time is short

There are certainly intellectual and commercial challenges ahead. Some 75% of the emissions reductions necessary to meet net zero emissions are dependent on technologies that have not yet reached commercial maturity, according to the International Energy Agency (IEA). It also reports that net zero targets, which now cover half of GDP globally, will not be met without 'major

Spotlight on diversity and inclusion

Diversity and inclusion (DNI) are vital to enabling companies to keep the energy transition on track. For moral motivations alone, energy companies must actively make this is a seamless part of their culture, not a box-ticking exercise. There are also many economic and organisational benefits.

According to McKinsey, one way of 'winning the war' for talent is for an organisation to monitor the demographic profile of its changing workforce and ensuring that diverse talent is not lost. Driving employee motivation and satisfaction is also key, with McKinsey's research on Latin America showing that companies committed to diversity are 75% more likely to report a pro-teamwork leadership culture.

'To make the most of the opportunities presented we must develop a diverse workforce with different perspectives and ideas. Importantly, we need to make sure that we access 100% of the talent within our businesses and unlock the potential that everyone has to offer. It is that diversity of thought, brought together in an inclusive and empowering context, that will allow us to thrive in a changing environment,' comments Craig Shanaghey, President, Operations Services (Europe & Africa) at Wood and D&I Task Group Chair.

Engineering UK, for example, is being proactive and has said it will review its electronic data interchange (EDI) approach considering the Black Lives Matter movement, increase discussions about trans rights and review its demographic data collection. ●

acceleration' of innovation in four key areas – electrifying heat and transport; carbon capture, use and storage (CCUS); green hydrogen and bioenergy.

'There is no doubt that the energy sector will only reach net zero emissions if there is a significant and concerted global push to accelerate innovation. While we have witnessed tremendous progress in technologies like solar PV, wind turbines and lithium-ion batteries, the technological advances that will be needed demand a step change in both the speed at which innovation occurs and the scale at which new technologies are deployed,' warns Fatih Birol, Executive Director, IEA.

Clearly, supporting creative research and development (R&D) pays off. The renewables market is finally enjoying the fruits of its decades-long and hard-won R&D progress, for example. New wind and solar plants are now cheaper than new coal and gas plants in countries that cover two-thirds of the global population, according to Bloomberg New Energy Finance (BNEF). Energy companies and governments will also call upon those with water knowledge in the coming decade. Water will be the biggest source of tension in 2040, followed by data ownership, according to 500 respondents of a World Energy Council (WEC) survey. Are academia and industry aligned to ensure that there is enough trained talent who will be experienced and ready to act? In most cases, the answer is currently no.

Know your staff

How much do employers really know about their workforce, or prospective workforce? And how much do employees, and prospective staff, understand about their changing work environment? Not enough – a knowledge gap that needs plugging. One route is data collection and dissemination about individual behaviour and characteristics. For instance, 42% of respondents to Deloitte's 2020 Global Human Capital Report said that work behaviours – such as whether a person is a maker, a doer, or a manager – will be most important for segmenting the workforce in three years. Yet just 27% said their organisations are segmenting the workforce this way.

Why we work is also evolving. Research conducted by YouGov for a National Grid report found that 57% of adults specifically want to work for an organisation that is helping the UK to deliver its net zero goals.

And therein lies a key point of reshaping the talent ecosystem – adaptability is in our DNA and people are willing to change. They just need guidance in this new world of energy. ●

32%

of respondents to a PwC survey cited a lack of key skills as the top threat to business in 2020

27%

of the workforce will retire over next decade, according to the UK's Energy & Utilities Skills Partnership – this equates to 277,000 vacancies up to 2030

[1] Dell Technologies, Institute for the Future (IFTF) – **bit.ly/2DvddhD**

Age really is just a number

Energy companies have long used a worker's age to presume their skills and organise them within the company accordingly. Now, however, 65-year-old interns can be found working alongside 25-year-old managers, calling into question the assumption that age is a reasonable proxy for understanding people's workplace challenges and needs, said Deloitte in its 2020 Global Human Capital Trends report.

Therein lies the rise of perennials (the human variety). First articulated by Gina Pell, the idea is to have a more meaningful, holistic view of a worker's capabilities, one that extends beyond age.

But even forward-looking organisations are still getting to grips with today's dynamic and complex talent pool. Up to 70% of organisations in Deloitte's survey said leading multigenerational workforces is important or especially important for their success over the next 12–18 months. Yet just 10% are fully ready to address this trend. For one, Deloitte suggests improving workforce flexibility and career customisation, which is especially attractive to younger workers. COVID-19 and the subsequent homeworking has proven that remote working – a popular customisation – need not interrupt workflow. ●

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- **Richard Whitmore**, Senior Lead Specialist, Energy Storage, Offshore, Ørsted UK
- **Keith Bushell**, UK Environmental Affairs stakeholder manager, Airbus OL
- **Dr Tom Knowland**, Head of Sustainable Energy and Climate Change, Leeds City Council

More information at energy-inst.org/energy-efficiency

DIVERSITY

Evidence continues to show that greater diversity and inclusion in decision-making teams leads to higher profitability and improved results

Championing diversity in energy

Skill set development and embracing workplace diversity are key to future-proofing the energy sector to meet the challenges ahead, reports *Ruth Cairnie* FEI, Chair of POWERful Women and former Executive Vice President at Shell.

At a time when awareness of the value of workplace diversity is growing, the latest statistics on the representation of women in the top ranks of the UK's energy industry make interesting – and at times astonishing – reading.

In May 2020, the POWERful Women initiative joined with PwC to conduct its annual survey of the number of women at board level in the top UK energy companies (approximately 80 organisations).[1] This revealed some welcome progress – women now occupy 21% of all board seats (up from 16% in 2019) and 13% of executive board seats (double last year's figure). However, 38% of the major energy companies still have no women on their board at all and more than two-thirds (79%) have no female executive directors (see **Figure 1**).

While this is the most progress we have seen since POWERful Women started compiling board statistics in 2015, there is a long, long way to go before the representation of women at senior levels is sufficient or sustainable. And as we strive to meet the challenges and maximise the opportunities that lie ahead for our industry, the need to speed up progress becomes ever more pressing.

Looking specifically at oil and gas companies in the UK, the figures aren't any better, with the majority continuing to appoint very few women at senior level. In fact, it is oil and gas companies that dominate the bottom half of POWERful Women's rankings.

It is a similarly disappointing picture at lower levels of organisations, across the sector. According to the Oil and Gas Technology Centre (OGTC), while women make up 47% of the UK workforce as a whole, they only represent 22% of the oil and gas workforce and only 12% of engineers in the sector are female.[2] Women in oil and gas say they face major hurdles to advance their career and the OGTC is doing valuable proactive work to improve these statistics, drive diversity and inclusion, and transform the workplace culture. A step change is needed in terms of focus and determination – the progress on health and safety in the past decade has shown what the industry can deliver with real commitment, and we need to see the same scale of effort here.

As well as finally making more progress on the headline statistics, there is some further positive news within the POWERful Women board stats. We were delighted to see that 12 energy companies now meet our 2030 target of having at least 30% of their executive board seats occupied by women – Shell, Good Energy, Total, Ørsted, RWE, Engie, Ovo, TRIG, Pharos, Tullow, Mainstream and Pressure Technologies. And a good proportion of these are in the oil and gas sector.

Other companies are showing leadership by making strong public commitments to improve.[3] BP, for example, has recently updated its POWERful Women Pledge on gender diversity and has achieved its 2020 target.

Peter Duff FEI, Head of Diversity and Inclusion for BP (EMEA) set out the pledge: 'In 2011, we set a goal to have 25% female group leaders (our most senior women) by 2020.

'There is a long, long way to go before the representation of women at senior levels is sufficient or sustainable. And as we strive to meet the challenges and maximise the opportunities that lie ahead for our industry, the need to speed up progress becomes ever more pressing.'

Ruth Cairnie FEI, Chair of POWERful Women

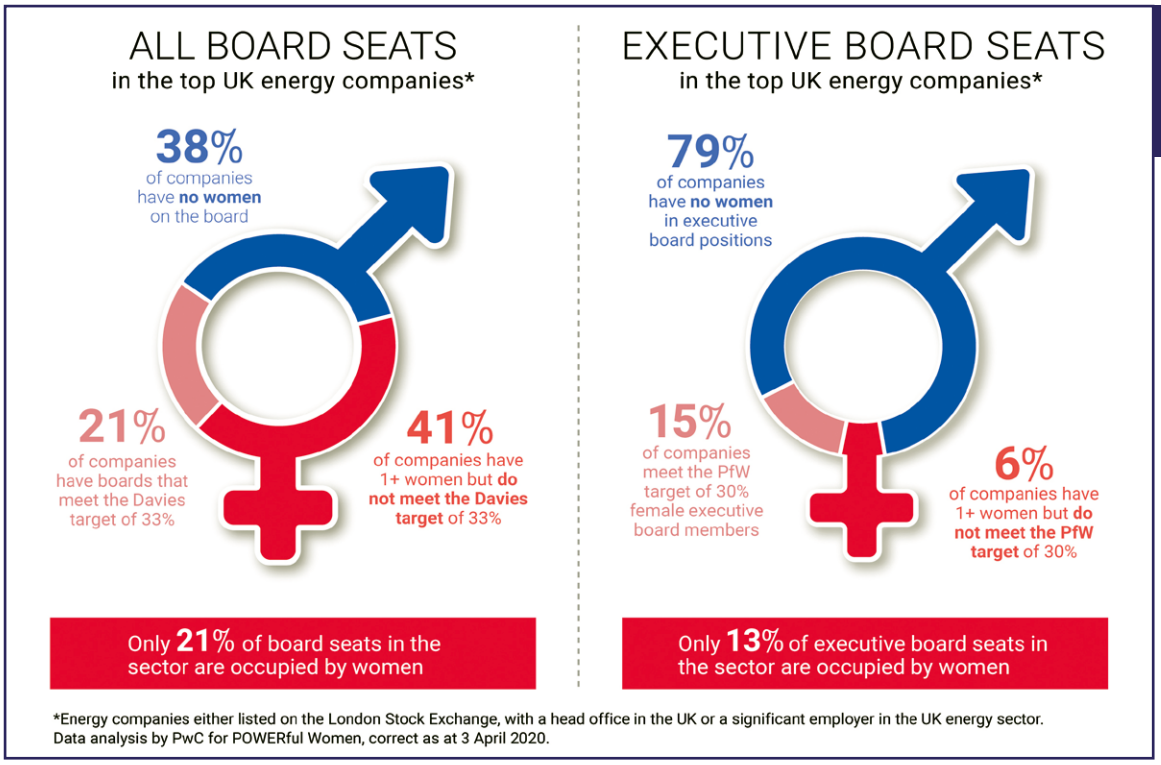

Figure 1: UK energy board seats held by men versus women in 2018–2020

Source: POWERful Women

We have met this goal, with over 25% female leaders. Our overall BP population is now 38% female, but we know there is more to do. As we reimagine energy for people and for our planet, we are reinventing BP to become more focused, more integrated, more inclusive, and better equipped to meet the world's fast-changing energy demands – women in BP are playing a critical role in this.'

Diversity pays

So, why does diversity matter to companies like these? Why should diversity and inclusion be front and centre of every manager's mind and company strategy in our industry, particularly in today's difficult economic climate? The short answer is because it is better for business outcomes.

Evidence continues to show that greater diversity and inclusion in decision-making teams leads to higher profitability and improved results. A report in May this year from McKinsey found that 'companies in the top quartile for gender diversity on executive teams were 25% more likely to have above-average profitability than companies in the fourth quartile.'[4]

In fact, at times of uncertainty and disruption, as we are facing now in a post COVID-19 economy, the benefits of diversity and inclusion are more critical than ever. The energy sector is already facing huge challenges as it transforms itself into a decarbonised, digitalised and smarter industry that meets its customers' needs – and for that we need innovation, which means making use of all available talent. Diversity of thought and experience is essential for meeting the business challenges and opportunities ahead.

As we continue to emerge from the coronavirus pandemic, we must work to keep gender on the agenda and ensure that diversity isn't a casualty of the recovery. There is a risk that without due focus and attention, women and minority groups may be among the first to be targeted for redundancies, particularly those who are less visible while furloughed or working from home. To avoid this, it is essential to adhere to principles of data-driven decision-making and careful tracking of diversity through any re-organisations or re-structuring.

On the positive side, companies may benefit from the lessons learned from lockdown. We have seen how technology is enabling us to work flexibly and effectively from home, which can only be a benefit to a business that wants to attract and retain a wide range of talent.

Working to shift the dial

This is where POWERful Women will continue to play a central role, promoting the benefits of greater diversity and inclusion to drive further progress in the UK energy sector. Established in 2014 by Baroness Verma and Laura Sandys FEI, POWERful Women works in partnership with companies, government and aspiring women to increase female representation at senior levels across the industry.

We encourage and support companies towards our targets of 30% of executive board positions and 40% of middle management roles to be held by women by 2030.

POWERful Women works to deliver these targets in three ways:

- *Campaigning and reporting* – encouraging energy companies to improve by highlighting those actively trying to make a difference and encouraging others to follow suit.
- *Supporting women in their careers* – helping talented, aspiring women move into senior leadership roles through our popular mentoring scheme, networking and events.
- *Practical support for companies* – providing tips and resources to those trying to improve the gender diversity of their organisations.

As our 5th anniversary survey revealed earlier this year, women in the industry are ambitious to reach senior levels and, as they map their career paths, they are aware of the skill sets required for the energy transition – technical skills and digital fluency, resilience, team leadership. But they suffer from a lack of visible senior female role models and practical support in the workplace. POWERful Women is helping to address this.

'Our industry is adapting to a changing energy system...We need to attract the best talent and enable those individuals to thrive and fulfil their potential. Diversity, in all its forms, will be how we find the best solution to the challenges and opportunities ahead.'

Sinead Lynch FEI, UK Country Chair, Shell

POWERful Connections

POWERful Women is always on the look-out for great mentees. The *seniority* of the role of the applicant is important as our service is designed to support women looking to move to executive and board positions within the next five years.

Also, if you are a senior energy professional (ideally C-suite) you could be a POWERful Connections mentor.

Contact **info@powerfulwomen.org.uk** for details.

Leading and learning

One key initiative from POWERful Women has been the establishment in 2018 of the Energy Leaders' Coalition (ELC), a group of CEOs committed to increasing diversity and inclusion within their own organisations and across the wider industry.[5] It is a forum where energy leaders can learn from each other and drive real visible progress on diversity.

Membership of the group has been growing and there are now 16 members willing to demonstrate industry leadership on this issue.

Sinead Lynch FEI, UK Country Chair at Shell, was a key player in the establishment of the ELC in 2018. Explaining the importance of the initiative and why Shell joined, she says: 'Our industry is adapting to a changing energy system. For Shell to lead in the energy transition, we need to be a true meritocracy. We need to attract the best talent and enable those individuals to thrive and fulfil their potential. Diversity, in all its forms, will be how we find the best solution to the challenges and opportunities ahead. For us, it makes good business sense to support and empower women at every stage of their career.'

At our Annual Conference on 1 October 2020 we will focus on the work of the ELC members to date. A new report marking the ELC's second anniversary will present inspiring examples of policies and practical initiatives that have been successful in increasing the representation of women and the positive business results that have flowed. And it will explore next steps, recognising that many challenges remain and that improvement must be continuous.

Showcasing what good looks like

So, what kind of policies are already making a difference?

ELC companies have shared some great examples of internal initiatives[6] – from ways to tackle unconscious bias in recruitment and promotion to effective flexible working policies; and from making senior female role models more visible to leading from the front by publishing challenging targets. Central to all of these is the gathering and tracking of diversity data so that progress can be measured.

For example, early last year Shell UK reviewed its flexible working policies, practices and perceptions using an independent expert, and this led to a renewed company commitment. Materials such as an interactive toolkit to explore flexible work options were developed, and moving forward the company will continue to monitor the impacts. The commitment has been well-received by employees like Lindsey Darling, Global Product and Additives Contracts Manager, Shell UK, who says: 'Having flexible hours is really useful in a global facing role as it allows me to connect with different businesses later in the day or in the evening. It also works better for me personally.'

Look out for more case studies when the 2nd anniversary report is published on 1 October.

Next steps

Other initiatives across the oil, gas and wider energy sector are making important inroads to achieving a diverse and inclusive industry. For example, the government's Innovate UK has launched the Women in Innovation Awards to find and support the UK's most promising female innovators to develop their ideas and scale up their businesses.[7] And the work of Women in Science and Engineering (WISE) is helping increase the representation of women in STEM, from the classroom to the boardroom.[8] In oil and gas specifically, the OGTC's award-winning TechX accelerator and incubator programme has set a goal of increasing the number of female-led technology businesses it supports by 30% by 2021.[9]

Of course, the government and energy regulators have a pivotal role to play in driving progress on diversity in the UK's energy industry and POWERful Women works closely with the Department of Business, Energy and Industrial Strategy (BEIS) on this.

In February 2020 the UK Energy Minister announced that an oil and sector deal would be in place within five years. It will be a major step forward if this includes a set of diversity targets, like the Offshore Wind Sector Deal of 2019 with its commitment to 'increasing the representation of women in the offshore wind workforce to at least a third by 2030'.[10] This would help put the industry on the right path for a positive step change in diversity and the opportunity to reap the business benefits of future growth and sustainability.

As our sector takes on the twin challenges of the energy transformation and economic recovery, it is not just what we do but how we do it that has to change. At POWERful Women we are here to support companies on that journey.

To find out more about POWERful Women's work and how you can get involved, visit **www.powerfulwomen.org.uk**

Footnotes

1. **bit.ly/PfWstats**
2. **bit.ly/OGTCdiversity**
3. **bit.ly/PfWpledge**
4. **mck.co/2DAw4YF**
5. **bit.ly/PfWELC**
6. **bit.ly/PfWELCreport**
7. **bit.ly/WomenInnovationAwards**
8. **bit.ly/WISECampaign**
9. **bit.ly/OGTCblog**
10. **bit.ly/UKGovOffshoreWind**

Leading on whole systems thinking

Dr Charmalee Jayamaha is Technical Collaboration Manager at the UK's Energy Systems Catapult. Her team, Systems Integration, specialises in whole systems thinking, which is key to designing the future energy system. Her role is to identify and pursue new opportunities for innovative low carbon projects and technologies.

She says: 'Innovation in the UK energy sector is happening fast to achieve net zero by 2050... At the Energy Systems Catapult we do not differentiate between men and women. We consider fresh talent to be at the heart of innovation.'

To read the full story of Dr Jayamaha's career and other case studies visit **www.powerfulwomen.org.uk**

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energy institute

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Abstract deadline: 30 October 2020

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- **David Griffiths**, Head of Safety, Health and Environment, **SSE Renewables**
- **Robert Evans**, Director of EHS UK&IE, **Siemens Gamesa**

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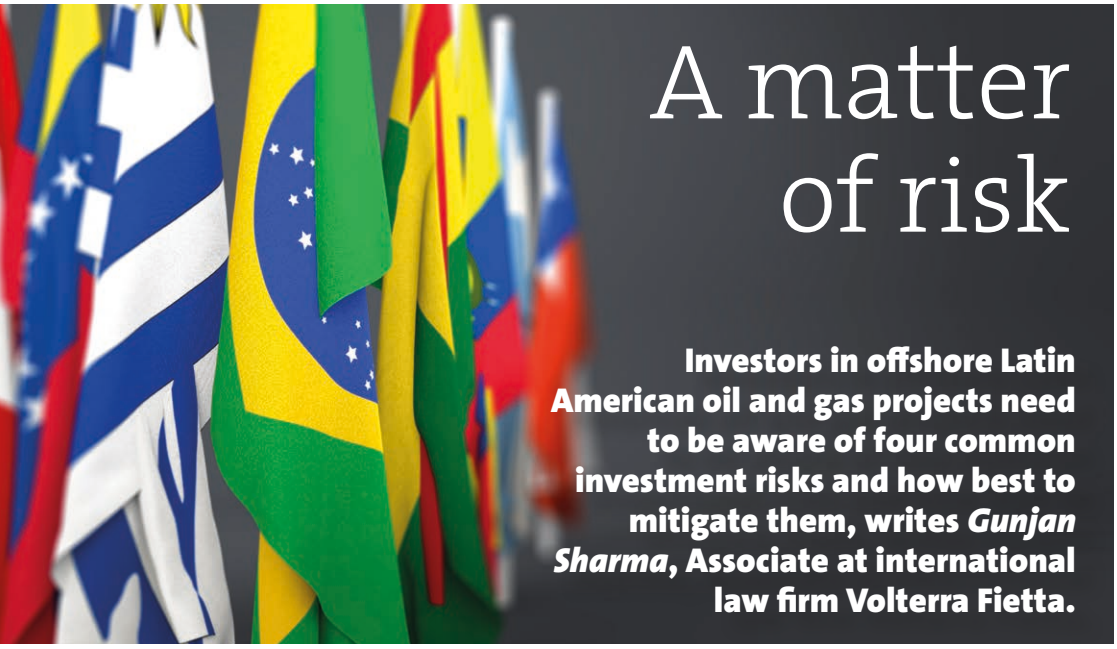
LEGAL



A matter of risk

Investors in offshore Latin American oil and gas projects need to be aware of four common investment risks and how best to mitigate them, writes *Gunjan Sharma*, Associate at international law firm Volterra Fietta.

Investment in offshore Latin American blocks has grown rapidly in the last few years. However, investors in the region often face similar investment risks. Four of the most common are competing maritime claims by states to the same block; the administrative ability to terminate a licence or production sharing contract (PSC), often without material cause (called *caducidad* and 'administrative rescission*'); limited recourse to international arbitration to resolve disputes; and the implications of low carbon sources.

Investors should be aware of these four risks, and how to mitigate them, when they seek to invest in offshore Latin American blocks.

Lack of delimited maritime areas

A common risk in Latin America is competing sovereign claims to the same offshore block. Under international law, states can exercise sovereign rights over their continental shelves, which extend at least 200 nautical miles from their coasts. However, the boundaries of a state's maritime areas are not always established and two or more states often lay claim to the same maritime areas. This is especially true in Latin America, including in the Caribbean.

Despite this, a single state can, and often does, license operations in a maritime area subject to a competing claim from another state. Unsurprisingly, the other state objects to this conduct – as seen, for example, in Venezuela's deployment of naval vessels in the Guyana-claimed Stabroek block. Even states in less contentious relationships object to each other's claims.

Although there are doctrines of public international law that can protect investors who make investments in good faith despite competing claims, the risk of a loss could still be high if sovereign control of the block does not end up with the initial licensing state.

This risk may not be sufficiently mitigated because the definition of the licensed area expressly extends 'up to the maritime boundary' between the licensing state and its neighbour. Instead, the competing claim can encompass a material portion of the licensed block.

Investors, particularly operators, should consider other types of risk mitigation. This includes drilling exploratory and productive wells in areas of the licensed block that are less likely to be subject to a dispute, subject to any minimum exploration commitments or other PSC terms; assessing the possible final delimitation of a disputed maritime area with oceanographers and experienced counsel; and reviewing and anticipating possible transboundary unitisation schemes or joint development zones, such as the recent Unitisation Agreement signed by Barbados and Trinidad and Tobago in February 2020.

Caducidad and administrative rescission

A significant risk in offshore Latin American projects is the risk of *caducidad* and/or administrative rescission. Under these legal concepts, the licensing state may administratively terminate a PSC in the event of certain pre-defined events. These events are often defined by political, not experiential, considerations. In many cases they would not be considered a material breach of a PSC as a matter of best international practice.

Nevertheless, the laws of certain Latin American countries (such as Chile, Colombia, Mexico, Panama, Paraguay and Venezuela) provide for limited or sometimes no compensation in the event of *caducidad* or administrative rescission. Moreover, in the event of such an administrative termination, the operator may even be required to transfer its immovable and sometimes other operating assets to the state, free of charge. These practices can stand in stark contrast to how administrative rescission or *caducidad* is practised in continental European law.

In addition, disputes concerning an administrative rescission or *caducidad* might also be considered nonarbitrable and subject to the exclusive jurisdiction of domestic courts (such as in Mexico). Investors may therefore lack access to a neutral forum to adjudicate these important disputes.

The risks of these types of administrative termination are well-established. *Caducidad* was invoked by Ecuador to terminate offshore interests held by Occidental on the basis of a potentially unauthorised partial farm-out, after Occidental had prevailed in an arbitration concerning a tax dispute with the government. KBR's interests in the construction of natural gas platforms were administratively rescinded by Pemex in 2004 – at the same time that Pemex and KBR had a separate contractual dispute. That administrative rescission resulted in 13 years of multijurisdictional arbitrations and litigations.

Contractual terms can be used to limit the risk of these often mandatory concepts of laws. For example, the licence contracts for Mexico's Ronda 1 auction contained terms requiring non-binding expert consultation prior to an administrative rescission, compensation for administrative rescission and a protection of the investor's treaty rights. Investors can also structure their investments to benefit from the protections found in bilateral investment treaties, which can provide more robust protections than domestic law.

Relatedly, special attention should be paid to PSC terms that require the reversion of immovable

Flags of Latin America
Photo: Shutterstock

and other operating assets to the state upon the termination of the underlying PSC. Although these clauses may make commercial sense if a PSC expires in the ordinary course, the clauses ideally should not apply to the early termination of the PSC, with or without fault. If they do, there is a risk the investor may therefore bear the loss of the assets without any chance of return, even if there is a commercial discovery.

No international arbitration

International arbitration remains a key protection in oil and gas investments by providing investors with a neutral forum to resolve their disputes with the state and national oil companies (NOCs). However, in many civil law systems in Latin American, only 'free transferable patrimonial rights' (or similar concepts) can be subject to arbitration. This phrase is variedly and ambiguously defined throughout the region. In particular, certain administrative acts concerning PSCs – such as the failure to provide necessary licences – might be considered non-arbitrable issues of administrative law. Sometimes, claims for damages arising out of such acts may still be arbitrable, even if the validity of those acts cannot be challenged in arbitration. However, it is unclear how that would work in practice.

Investors should determine if and how this risk applies to them. If so, this risk might be mitigated by providing the legal seat of arbitration in a neutral, well-respected venue, such as London, New York or Miami; and broadly defining what is subject to arbitration in the PSC.

Energy diversification and low carbon sources

Investors should also be aware of a region-wide movement to transition to low carbon sources and energy diversification. To date, the member states of CARICOM (Caribbean Community), as well as Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico and Uruguay (undoubtedly among others), have undertaken to expand the role of renewable energy in their markets.

Although energy diversification can be a laudable goal, offshore oil and gas investors should remain alert to potential state measures that purport to advance environmental interests but are unfair, unreasonable, arbitrary or conducted without due process of law or compensation.

Of course, states are entitled to regulate, but they must do so within legal parameters. Governments and NOCs should therefore plan and execute regulatory changes carefully and with expert advice to comply with legal obligations, including under public international law.

For example, recent state drafts of PSCs in the region have expanded the discretion of environmental agencies to impose limits where exploration or production can occur in a block, even after a licence has been granted for the block. These clauses should be carefully considered in light of their potential abuse.

Although not solely relevant to offshore operations, investors might also want to take the possibility of energy diversification into account in long-term price and cost projections, especially after the COVID-19 pandemic.

An attractive proposition

To conclude, offshore Latin America remains a considerably attractive commercial proposition. However, investors should maximise their potential returns by carefully considering and, where possible, mitigating the four risks identified above. ●

* Rescission – the revocation, cancellation or repeal of a law, order or agreement.

CHILE

Time of crisis for energy transition

Calls for constitutional reform, political infighting and the COVID-19 pandemic threaten Chile's energy transition programme, reports *Maria Kielmas*.

Prior to the pandemic, Chile's gas sector was expecting a growth year, with the Quintero (pictured) and Mejillones LNG import terminals constructed in the aftermath of the 2008 energy crisis operating at full capacity

Photos: GNL Quintero

Chile is facing its greatest political crisis of recent times, coupled with political uncertainties emerging from discussions on eventual constitutional change. These were the comments of Energy Minister Juán Carlos Jobet speaking at a June 2020 virtual meeting of the renewable energies grouping, Asociación Chilena de Energías Renovables y Almacenamiento (ACERA), on what should have been its annual dinner.

An energy strategy first established under the second presidency of Michelle Bachelet (2014–2018) and upheld by President Sebastián Piñera, also in his second term, committed Chile to a minimum 70% renewables share in energy production and a national carbon tax by 2050.

With limited conventional energy resources of its own, Chile imports all its oil, refined products, gas and most of its coal needs. The country is vulnerable to external energy price and political shocks – notably in 2008 when Argentina unilaterally cut off gas supplies. So, development and expansion of the country's ample resources for solar, wind and geothermal power supplies, as well as conventional hydropower, made sense from an energy security as well as environmental perspective. The plan to substitute coal, which makes up 40% of Chile's power generation capacity, with renewables resulted in the country being lauded internationally as a leader in sustainable development and decarbonisation.

Hidden costs

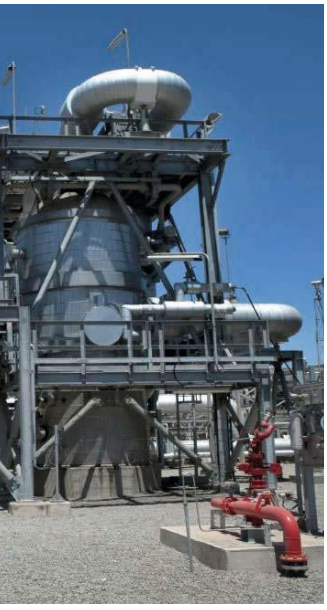
However, the costs of this energy transition in terms of investment, end-user tariffs and potential unemployment did not come into public focus until October 2019. A 4% fare rise on the Santiago metro and a 9% rise in electricity prices due to a new carbon tax triggered an explosion of social unrest and calls for changes to the 1980 Constitution dating from the Augusto Pinochet dictatorship. These continue as Chile struggles through the economic consequences of the COVID-19 epidemic. Bankers envisage an 8–14% GDP fall this year, the worst economic contraction in the country for 35 years.

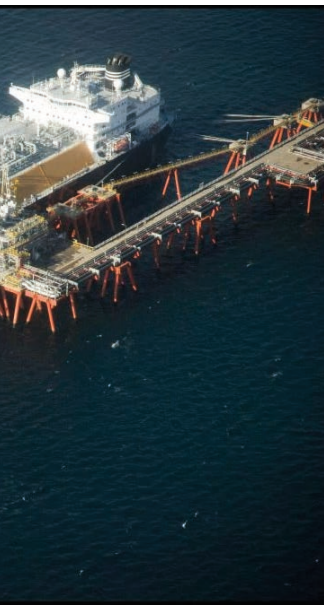
'People thought that Chile was an upper income country, but we have a large population living in poverty,' says Patricio Navia, Professor of Liberal Studies at New York University and Professor of Political Science at Diego Portales University, Santiago, Chile. 'After COVID we do not have the resources to finance the energy transition, there are more urgent needs now.'

In response to the rioting, the government withdrew the metro fare and electricity rises and announced a $5.5bn reactivation plan. This was followed in March 2020 by an $11.75bn (4.7% GDP) stimulus package and in May by a $23.93bn line of credit from the International Monetary Fund (IMF).

Oil and gas problems

In July this year, state oil company ENAP shut in its 116,000 b/d Bio Bio refinery for two months' maintenance and laid off 14% of the workforce. The 94,000 b/d Aconcagua refinery meets 60% of national refined products demand, with the remainder coming from stocks and imports. In a July presentation to the senate, ENAP General Manager Andrés Roccatagliata announced that the company would cut capital investment by 40% this year (about $400mn), halt all exploration drilling, renegotiate contract costs, eliminate all travel and external consultants, and seek to refinance





$620mn of debt. A future company restructuring, and possible privatisation, are rumoured.

Meanwhile, ENAP officials are facing a series of charges from local prosecutors about toxic emissions from its refineries and port facilities. In July, ENAP President Maria Loreto Silva, who was Minister of Public Works during the first Piñera administration (2010–2014), resigned because of alleged conflicts of interest in a land deal. She was replaced by Fernando Massú, already an ENAP Director and Chairman of the Santiago office of Brazilian finance company BTG Pactual.

Prior to the pandemic, the gas sector was expecting a growth year. The Mejillones and Quintero LNG import terminals – constructed in the aftermath of the 2008 energy crisis – were operating at full capacity. Gas accounts for 20% of Chile's power generation capacity. In 2018, Chile and Argentina signed a deal to revive mutual gas trade after a 10-year hiatus and to promote gas integration between the countries. But environmental protests have halted a number of local gas pipeline projects to power plants aimed at substituting coal-fired power. Low oil prices and COVID-19 caused operators of the Argentine Vaca Muerta shale play to cut operations and in May to suspend gas exports to Chile. Now there is substantial closed-in gas capacity in the power generation system.

Incentives

Enel Generation Chile, the local subsidiary of the Italian power utility, is committed to advancing renewable energy and plans to add 2 GW of renewable capacity to the system by 2022. Enel's 128 MW Bocamina coal-fired plant will be disconnected in December this year and the Bocamina 11 plant (350 MW) will shut down in May 2022.

At a June 2020 conference organised by the Santiago office of BTG Pactual, Enel Chile CEO Paolo Pallotti said that the evolution of natural gas prices over time will be crucial to renewables expansion, as will be the need for greater transmission grid flexibility. Gas industry grouping Asociación de Empresas de Gas Natural (AGN) issued a late June statement noting that incentives and 'adequate remuneration' for the utilities are key to ensuring the nation's decarbonisation plans.

An Enel Chile spokesman declined to comment on how the company expects the renewables projects will affect end-user tariffs and how necessary improvements to the power transmission grid will be financed. However, in June the Energy Ministry announced plans for a 'fair and sustainable transition strategy' to address the socio-economic consequences of decarbonisation. At least 14,000 direct and indirect jobs in the coal-fired power sector will be lost as a result.

Public transport cross-subsidies

The 4% metro fare rise aimed to cover converting the system's power supply to 100% renewable energy, as well as subsidising fares on the city's expensive electric buses, newly purchased from China but without any bidding process that could have lowered their price. However, Santiago metro fares account for 15–20% of the net earnings of Chileans on the minimum wage and who make up a large proportion of its passengers.

Chile has no direct energy subsidies. The initial protests exploded into the largest such protests in Chile's history. Demonstrators were angered by the poor quality of public services, specifically energy and water utilities, and social inequality. The government acceded to demands for a plebiscite (direct vote of all members of the electorate) on reforming the constitution – scheduled for October this year – but which has left the entire political class entangled in a factional war. The outcome of this struggle may bring significant change to Chile's energy sector.

Constitutional questions

Chile's 1980 Constitution was designed to obstruct democracy. But since democracy was restored in 1990 there has been democratic consolidation, economic growth and poverty reduction. However, the core of the Constitution – namely individual property rights and the role of the state as a promoter of business and investment – remains the same.

Although Chile's scant oil and gas reserves remain the property of the state, electrical transmission and distribution services were handed over as a natural monopoly to private operators. Power generation functions as an open market. Electricity market privatisation in 1982 became a model for similar privatisation in Latin America and worldwide, notably Britain. But there have always been doubts how its minimal regulation could deal with the challenge of integrating renewable energies.

Countrywide lockdowns at the onset of the COVID-19 crisis left many consumers unable to pay their bills. In June, the Senate approved a controversial bill that forbids public utilities from cutting off access to basic services during the pandemic and created a constitutional hot potato. 'Companies purposely chose not to read meters in order to prevent the bill on non-payment going through,' observes Navia. President Piñera eventually vetoed the bill, but the veto was overturned by a congressional economic committee in mid-July.

Social versus business balance

The government views the senate's bill to prohibit the cutting off of basic services for non-payment as unconstitutional. According to Chilean lawyer Cristian Flores-Fernández, currently a researcher at the Humboldt University in Berlin, this unconstitutionality is based on the fact that it would affect the right to property, the principle of equality in relation to public burdens, and the right to develop economic activities by the utilities. The central axis of the constitutional discussion, Flores-Fernández says, will be a rebalance between social rights and social justice and existing property rights. The state has to protect access to basic services, he says.

The basic services issue coincides with discussions on a constitutional amendment to allow Chileans a one-off 10% withdrawal from their privately-managed Administradores de Fondos de Pensiones (AFP) pension funds. The government opposes this, although its governing Chile Vamos coalition is split on the issue. Economists claim that such a withdrawal would create an $18bn fiscal hole in the budget, slump the capital markets and damage investor confidence – a crucial factor for the energy transition.

Navia believes that there could be a two-year process to write a new constitution that will put normal life, including the economy and investment, on hold and yield a document that is not substantially different from the present one. The political left wants to kill off the Pinochet legacy even though there is a need in Chile for a better balance between the state and the market. If the energy companies call for a tariff rise, the political left will call for their nationalisation, he says.

Changing Chile's energy mix while maintaining the same market dynamics will be a difficult, maybe impossible, task. ●

BRAZIL

Coping with coronavirus

Petrobras' investment in 2020 is set to fall from a planned $12bn to $8.5bn, of which 85% will go on R&D operations, with the majority on developing pre-salt fields

Photo: Petrobras

Brazil's energy industry has been hard hit by the fall-out from COVID-19, writes *Patrick Knight*.

Brazil has been one of the countries worst affected by the impact of the coronavirus worldwide, with almost 70,000 deaths reported in early July 2020. The country's energy sector in general – and the part state-owned Petrobras oil company in particular – have had to take drastic measures to survive.

The collapse of the world price of crude in April occurred at a time when Petrobras was exporting almost half its 1.9mn b/d production, nearly 50% of which was going to China. Coupled with the fall in earnings from crude exports, the sharp fall in domestic demand for gasoline and natural gas obliged Petrobras to make a series of deep cuts in investment and bring forward other plans to reduce costs.

Production cuts

With the world crude price at little more than $25/b in mid-April, and threatening to stay at that level for some time, Petrobras directors decided to cut crude output by about 200,000 b/d. Measures taken to achieve this included decommissioning 62 platforms located in shallow offshore waters, as well as 14 platforms at onshore fields. The company also unveiled plans to sell shares in some of the blocks it has gained in recent bidding rounds. However, as these measures on their own were not sufficient to meet the desired production cut, the maintenance of some platforms located on deepwater, pre-salt fields, planned to take place in 2021, was also brought forward to this year.

Petrobras had already started to reduce manpower from its peak of almost 50,000 in 2019, a year of record production and strong demand. The company now plans to cut staff numbers to 30,000 by the end of 2021. Meanwhile, the number of buildings used for Petrobras' operations will fall from 17 to eight.

Although Chinese demand for crude oil, by far Brazil's largest market, fell sharply in April 2020, demand has started to bounce back. However, the sharp growth in unemployment in China, caused partly by a rapid drop in demand for a wide range of exported goods, is a cause for concern for the medium and longer term. As a result, Petrobras knows it must be cautious. Brazilian crude is also sold to Indonesia, Spain, Singapore and South Korea. Petrobras had anticipated volumes produced increasing to 3.5mn b/d by 2024, but this now looks unlikely to be achieved.

Meanwhile, demand for natural gas has dropped sharply, as Brazil's manufacturing output has fallen. With less electricity needed from gas-powered power stations, Petrobras is to sell 51% of its share in the Gasbol gas pipeline that brings gas from Bolivia, probably to Mitsui of Japan. Having already earned about $19bn from the sale of assets last year, Petrobras is also to sell stakes in a number of gas-fired power stations and other gas pipelines.

The Brazilian economy is expected to shrink by between 6–9% in 2020, while industry – the main market for gas – is anticipated to fall by even more. Only 1.3mn motor vehicles are now expected to be built in Brazil this year, half the number previously forecast. Although demand for motor fuel, which fell by 60% in April 2020 compared with the same month in 2019, has now partly recovered, unemployment is rising fast, so less fuel will be needed.

Petrobras still plans to sell about 37% of shares in Brazil's largest fuel distribution company, BR Distribuidora, as well as a 36% stake in the country's leading petrochemical company, Braskem, which it owns jointly with Odebrecht. However, these sales will not take place until next year, when Petrobras expects to get a better price.

Meanwhile, only one of the eight refineries (responsible for about 50% of Brazil's total refining capacity) Petrobras had already announced it would sell (see *Petroleum Review*, September 2019) is expected to be sold in 2020. Bids from the Abu Dhabi company Mabalada and from Essar of India have been received for the plant in Bahia state, while Sinopec is also reported to be interested. The other facilities are expected to be sold in 2021.

At the close of 2019, Petrobras had announced plans to invest $76bn in its operations between 2020 and 2024. However, this figure has been cut by 20%, with this year's investment set to fall from a planned $12bn to $8.5bn. Some 85% of this will go on R&D operations, the majority on developing pre-salt fields.

Sugar and ethanol sector impact

Meanwhile, as the sharp fall in Brazil's industrial activity has

Petrobras is planning to sell about 37% of shares in Brazil's largest fuel distribution company, BR Distribuidora

Photo: Petrobras

caused a sharp fall in domestic demand for gas, the low crude price, together with the fall in demand for motor fuels, has also greatly impacted the country's important sugar and ethanol industry.

The world sugar price has been depressed in recent years due to high stocks of sweetener. This led the sugar mills to increase the proportion of cane being distilled into fuel ethanol to the maximum possible, which is about 55%. However, ethanol is only competitive with gasoline (which itself contains about 20% of ethanol in Brazil) when it retails for a maximum of 70% of the price of gasoline. But with the gasoline price so low early this year, domestic demand for ethanol collapsed. The export market for Brazil's ethanol fuel, concentrated in the US, also collapsed earlier this year; although the world sugar price has recovered slightly in recent months.

As a result, the sugar industry has had to ask for help. In response, the Brazilian government has undertaken to finance the stocking of 6bn litres of ethanol, about 20% of normal production.

Motor fuel market

Brazil is a world leader in the production and use of ethanol fuel for passenger cars. All vehicles made in the country are now fitted with a device that detects how much gasoline, ethanol or any intermediate blend is in a tank. The fuel injection system adjusts accordingly. Ethanol is available across Brazil's 41,000-strong network of service stations; with the installation of pumps having required massive investment in the sector.

Although there is a level of interest by a number of motor manufacturers in producing electric vehicles (EVs) or hybrid models in Brazil, the limited number of charging points compared with the ease of obtaining both gasoline and ethanol is likely to mean growth in demand for such vehicles remains low for some time.

At present, almost all the ethanol sold in Brazil is made from sugar cane, while biodiesel, of which a proportion must be blended with mineral diesel, is made mainly from soya oil. In the past few years, the production and export of maize, which is increasingly planted in the north of the country after the soya crop has been harvested, has grown fast. As a result, several maize producers have now begun to make ethanol fuel, with more than 1bn litres manufactured at 12 production facilities over the past year. Many more ethanol production facilities are being built and even more are planned.

The ethanol industry had also reported good progress in making chemical feedstocks from ethanol, at a competitive price. However, this price is dependent on oil prices, so the recent price collapse of crude has been bad news for the ethanol producers. Brazil's cotton industry, too, has been impacted by COVID-19, the fall in the price of petrochemicals resulting in the cost of synthetic fibres falling to the point that cotton cloth could no longer be competitive on pricing. However, this situation will not last if the crude price remains above $40/b. ●

CARIBBEAN

A changing landscape

The primary energy landscape has shifted significantly in the Caribbean over the past decade, faced with falling energy demand, COVID-19 and the oil price crash.

***Kevin E Durham*, CEO, Technical Authority – Upstream Petroleum Operations, ATOM Consultancy and Chair, EI Caribbean Branch, provides a snapshot of recent energy developments in the Caribbean region.**

Guyana and Suriname

The Guyana–Suriname sedimentary basin boasts a gross recoverable resource for the deepwater Stabroek block of over 8bn boe. ExxonMobil (45%, operator), Hess (30%) and CNOCC Nexen (25%) started exploration activities in the block in 2008, and the past five years have seen an unprecedented 16 commercial discoveries.

Commercial quantities – more than 295 ft of high-quality oil-bearing sandstone reservoirs – were first discovered in May 2015 at the Liza-1 well. A fast-tracked field development plan saw first oil just five years later, in December 2019. ExxonMobil's Upstream President, Liam Mallon, anticipates first oil in 2024.

Guyana currently produces some 75,000 boe/d from the Liza subsea well production system to the *Liza Destiny* FPSO. Two more commercial discoveries – Jethro-1 and Joe-1 – were recently made by Tullow Guyana (60%, operator), Total E&P Guyana (25%) and Eco (Atlantic) Guyana (15%) in the Orinduik block in August 2019.

New finds continue to be made, with Apache and Total making three significant oil discoveries offshore Suriname, for example. In July 2020, Apache Corporation and Total announced a major oil discovery at the Kwaskwasi-1 well, following the January and April 2020 announcements of discoveries at the Maka Central-1 and Sapakara West-1 wells respectively. The next exploration well on Block 58 will be at the Keskesi location. In May 2020, Petronas Suriname E&P completed a 50% farm down of its block 52 offshore interest, splitting the equity 50:50 with ExxonMobil E&P Suriname.

Trinidad and Tobago

Trinidad and Tobago is the leading natural gas producer in the Caribbean region, averaging 3.44bn cf/d in 2020, of which 7% is used for domestic power generation and 58% exported as LNG. Gas production peaked at 4.33bn cf/d in 2010. Crude oil and condensate production has seen a significant decline, averaging 106,756 b/d in 2009, now down to 56,723 b/d.

Stena Carron drillship, offshore Guyana

All Photos: ExxonMobil

A few years ago the government of Trinidad and Tobago decided to realign the oil and gas business of state-owned Petrotrin to focus on developing upstream potential, renaming the company Trinidad Petroleum Holdings in November 2018, with Heritage Petroleum acting as the upstream arm, and divesting the 160,000 b/d capacity Pointe a Pierre refinery to Patriotic Energies and Technologies. As a result, Trinidad and Tobago's energy security portfolio became reliant on imported refined fuels but this did not affect power generation as the national grid is powered by natural gas turbines.

The major natural gas producers are BP (56%), Shell (20%), BHP (11%), EOG (10%) and Denovo (2.4%). Domestic production is not considered to be sufficient to meet current demand of 4.2bn cf/d. However, BHP discovered 3.5tn cf gross contingent resources, with additional unpenetrated potential during its North deepwater gas exploration programme in 2019. The Ruby project is expected to offset declines from the Angostura field in the mid-2020s.

Meanwhile, US sanctions imposed on Venezuela this year, prohibiting US companies from doing business with state-owned PdVSA, have put a dampener on two potentially game-changing gas deals between Trinidad and Venezuela – the billion-dollar development of the 2.4tn cf Dragon gas field and the 10tn cf Loran/Manatee cross-border gas field.

US oil major Chevron holds a 60% interest in the Loran field, the remaining 40% stake is held by PdVSA; while Shell T&T has a 100% interest in the Manatee field. Under an agreement signed in 2013, 73.75% of the natural gas field straddling the maritime borders belongs to Venezuela, the balance belongs to Trinidad. Also affected are future developments with other cross-border fields, such as Manjin-Cocuina and Kapok-Doradoh.

Jamaica

In 2019, the government of Jamaica repurchased a 49% stake in the 32,000 b/d capacity Petrojam refinery that had been acquired by Venezuela's national oil company PDV Caribe in 2006. Currently averaging 30,000 b/d, Petrojam subsequently locked in crude oil supply agreements with Petroecuador and the Barbados National Oil Company, and started refining low sulphur fuel oil to meet IMO sulphur specifications and increased storage capacity in Montego Bay. According to the Energy Economics and Planning Unit, Energy Division, Ministry of Science, Energy and Technology, Jamaica remains a net importer of energy. However, in 2019 Jamaica's renewable energy consumption was derived from various sources, namely hydropower (155,000 MWh), solar (46,000 MWh), wind (272,000 MWh) and biomass/WTE (325,000 MWh).

Upstream exploration activity by Tullow Oil in the offshore Walton Morant blocks proved challenging. Following 2D seismics and a 3D survey, Tullow elected not to proceed into the next stage of the licence. Tullow Oil, which has an 80% interest in the oil exploration project, wrote-off its oil exploration licence taking a $36mn hit, while United Oil & Gas still holds a 20% interest and is proceeding with the project. A joint venture farm-down effort

is underway, with the aim of bringing in an additional partner for potential exploration drilling in 2021.

Grenada

Grenada joined its Caribbean energy producing counterparts when Russian independent Global Petroleum Group found commercial gas while drilling the Nutmeg 2 wildcat well in October 2017. The government passed a Hydrocarbon Incentive Bill in 2017 to garner interest from international oil and gas companies. Following this the National Gas Company (NGC) of Trinidad & Tobago signed a commercial agreement with the Global Petroleum Group (GPG) in April 2018. The agreement between the two companies was a result of the Energy Sector Development Framework Agreement signed between the Government of the Republic of Trinidad & Tobago and the Government of Grenada.

The energy sector in Grenada is characterised by high dependence on fossil fuels.

Grenada's installed renewable capacity is 2.16 MW (wind 0.1 MW and solar PV (photovoltaic) 2.06 MW). In September 2014, the government signed a Geothermal Support Partnership Agreement with the government of New Zealand. In May 2015, geological and geochemical surveys were completed and assessed at 12 locations. A 2 MW wind farm on Carriacou originally expected for 2012, a 2 MW solar PV plant on Grenada, and a 10–20 MW geothermal plant initially envisioned for 2016, are at various phases of development. The Carriacou wind/diesel project received partial funding of €2.5mn from the European Union, with co-funding of $2mn by Grenada Electricity Services.

Barbados

Barbados currently produces 500 b/d of oil and 1,100mn cf/d of gas. LNG and transport fuels are imported. The government of Barbados and BHP signed exploration licences in 2015 for two offshore blocks. In July 2020, after several stakeholder consultations the Environment Minister approved BHP's PID (project initiation document). BHP will commence a three-year licence phase, which includes conducting 2D seismic surveys on the two blocks.

Cuba

Cuba's national oil company Cuba Petroleos (CUPET) produces 68,000 boe/d, of which 52,000 b/d is oil and 100 mms cf/d is gas. CUPET operates four refineries with combined capacity of 134,200 b/d. In mid-2019, CUPET launched the country's first licensing round at a roadshow in London, offering 24 blocks in mid- to deepwater off the north coast in the Cuban Economic Exclusive Zone (EEZ) of the Gulf of Mexico.

Cuba's total renewable installed capacity in 2019 was 797 MW, with ongoing projects due to increase this capacity. Cuba aims to increase the national share of renewable energy to 24% by 2030 through the development of solar PV plants totalling 700 MW-peak capacity, along with 13 wind farms (663 MW), 19 bioelectric plants (755 MW) and three hydroelectric projects (56 MW).

The state-owned Union Eléctrica, funded by IRENA/ADFD, has installed and commissioned four solar PV power plants with a total installed capacity of 10 MW, providing annual generation of 15,000 MWh.

Cuba's first biomass power plant, recently synchronised two boilers to the grid. The 60 MW plant is expected to provide about 50% of the province's power demand, and will supply steam (122 t/h) and all the electricity needed by the sugar mill (about 8 MW), while the remaining power will be delivered to the national grid. The facility is capable of consuming about 2,100 tonne of bagasse and 1,200–1,500 t/d of marabou, and is expected to save about 100,000 b/y oil and reduce carbon dioxide emissions by about 300 t/y.

Renewable energy projects

Renewable energy projects are taking shape across the Caribbean region and are rising on the agenda for those islands that have high electricity tariffs and are net importers of fossil-based energy. Energy security remains a major concern.

Installed photovoltaic solar energy capacity across the region has increased exponentially in the past decade, rising from 55 MW in 2010 to 800 MW in 2019, while solar power rose from 45 GWh in 2010 to 843 GWh in 2018. Renewable hydropower capacity increased from 905 MW in 2010 to 1,057 MW in 2019, while hydropower climbed from 3,235 GWh in 2010 to 3,490 GWh in 2018. Wind energy capacity was boosted from 122 MW in 2010 to 610 MW in 2019, while wind energy production grew from 288 GWh in 2010 to 1,288 GWh in 2018. Geothermal energy developments are also taking place on some islands.

Generally, Caribbean countries are extremely vulnerable to climate change and natural disasters. For example, Hurricane Maria devastated the island of Dominica in 2017. As it was rebuilt, the government took major steps to make the island more climate resilient, achieving energy independence as drilling of three exploration wells confirmed a reliable reservoir potential of 120 MW of geothermal energy. Reinjection and production wells proved up the resource capability to 11.4 MW. The next phase for the Dominica Geothermal Development Company is to construct a 7 MW geothermal power plant.

Together with the above mentioned renewables initiatives, it is evident that the Caribbean region has a noteworthy role to play in the global energy transition picture. ●

Below left: Control room monitoring all aspects of the Liza 1 field development

Below right: Aerial view of ExxonMobil's logistics shorebase at Demerara River, Georgetown, Guyana

EMISSIONS MITIGATION

The reality of net zero?

Net zero operations by 2050 is a new goal for some of the world's biggest oil and gas operators. Laudable, but how? *Michelle Meineke* reports.

Quickly accelerating from a walk into a gallop is never easy, but it is possible. That is what major energy companies are trying to do – and not a moment too soon. A brief look at the news headlines reminds us that environmental pressures worldwide are rapidly intensifying. BP's Chief Executive Bernard Looney captured the gravity of change required in one sentence: 'Providing the world with clean, reliable, affordable energy will require nothing less than reimagining energy.'

And BP certainly appears to be standing by that. Along with committing to being net zero by 2050, the announcement in early August that it has upped its targets again came a month earlier than anticipated. Among many targets, BP has committed to a 10-fold increase in low-carbon investment by 2030, with up to an eight-fold increase by 2025. And emissions from BP's operations will be 30–35% lower by 2030, while emissions associated with carbon in upstream oil and gas production will be 35–40% lower by 2030. This has set a high bar for other major energy firms. Greenpeace even gave the plans a rare, if tentative, thumbs up, calling it a 'necessary and encouraging start'.

Many others are also making the right noises. BP, Shell and Total are among those who have announced net zero by 2050, along with Spain's Repsol and London-listed Energean. Norway's Equinor is aiming for 'near zero' by mid-century, while Sweden's Lundin Petroleum has set an incredibly high bar, saying it will reach carbon neutrality by 2030. Comparatively, Italy's Eni is aiming for carbon neutrality by 2070. Other oil majors, including ExxonMobil and Chevron, are taking different routes (*see box: Mixed bag*).

Technology matters – a lot

Some black holes need plugging for these targets to be both realistic and respected – the risk of falling short of these goals is very real. Aside from hindering what is still delicate momentum for this global overhaul, poor management could also lead to stranded assets and potentially destroy shareholder value, warns financial think tank Carbon Tracker. Neither would do global energy security, nor investors' confidence, any good. Plus, time is too short for backtracking; an intimidating fact that has paralysed some companies' efforts.

Major oil and gas companies have a mountain to climb
Photo: Shutterstock

Above all, there must be encouragement and support within the energy ecosystem, regardless of targets, for we all stand to win (or lose). There are bright spots. For one, renewable energy capacity investment has shown great resilience in the first half of 2020, according to research company BloombergNEF (BNEF). One sub-sector of renewables especially – offshore wind – has had by far its busiest half year ever for final investment decisions.

But with an eye on the climate clock, energy companies must break a sweat to clarify how they will make tangible and speedy progress. One of the major hurdles is a lack of commercially viable technologies (*see box: Key tech priorities*). There is no time to wait for the latest round of innovations, ie repeating the decades-long wait for lithium-ion batteries to evolve from the first prototype to the mass market.

'There is a stark disconnect between these high-profile pledges and the current state of clean energy technology,' highlighted the International Energy Agency (IEA) in July. 'While the technologies in use today can deliver a large amount of the emissions reductions called for by these goals, they are insufficient on their own to bring the world to net zero while ensuring energy systems remain secure – even with much stronger policies supporting them.'

Five years on from the signing of the Paris Agreement, it is concerning that early-stage technologies still play such an outsized role in energy companies' plans. Around 35% of the cumulative carbon dioxide emissions reductions needed to shift to a sustainable path come from technologies currently at the prototype or demonstration phase, the IEA points out. A further 40% of the reductions rely on technologies not yet commercially deployed on a mass-market scale.

In the agency's Sustainable Development Scenario, annual average investments in technologies that are currently only at prototype or demonstration stages total around $350bn through to 2040. They reach nearly $3tn in the 2060s. These are especially daunting numbers as energy stakeholders find their feet in a burgeoning recession triggered by the first truly global pandemic in a century, not to mention volatile oil prices.

Key tech priorities

The key technologies the energy sector needs to reach net zero emissions are known today, but not all of them are ready. The IEA says that around half of the cumulative emissions reductions that would move the world onto a sustainable trajectory come from four main technology approaches:

- electrification of end-use sectors, such as heating and transport;
- application of carbon capture, utilisation and storage;
- use of low-carbon hydrogen and hydrogen-derived fuels; and
- use of bioenergy.

Mixed bag

Inevitably with a global overhaul, the net zero narrative has its critics. Chevron's CEO, Mike Wirth, told Bloomberg: 'We have not set long-term targets that we are not exactly sure how we will get to. Our approach has been, get on the path, start taking actions, set short-term accountability metrics, make progress and start marching in that direction.'

Others say that the three-decade timeline suggests some energy companies are hedging their bets. 'If they really wanted to do it, they could bring the targets closer, to 2035 or so,' said Siamak Adibi, a Senior Consultant at FGE London. 'Net zero is a sort of paradox. It is not possible to be achieved by oil companies when they have oil and gas assets to monetise and still want to guarantee a reasonable return for their investment.'

While valid points, it is worth remembering that, 10 years ago, the idea that some of the world's fossil fuel behemoths would commit to a net zero target would have been scoffed out of most boardrooms. The Paris Agreement, the world's most comprehensive climate-related deal signed in 2015, was already a momentous step. Global commitments on this scale had not been made for nearly two decades since the Kyoto Protocol in 1997.

And now, despite extreme social and economic global turbulence, energy companies are not backtracking on their environmental promises. Instead, they are pushing ahead with ambitious targets, net zero or not. So, fostering a collaborative and knowledge-sharing clean energy ecosystem for fossil fuel operators is pivotal to even have a slight chance of adhering to the Paris Agreement. ●

Equally, the net zero goal spans three decades for most companies. There will be plenty more dents to the global psyche – civil, environmental, economic, etc – so companies' roadmaps must be designed so that the energy transition rolls on, regardless. Efforts cannot falter every time news headlines erupt.

Non-negotiable

Most of the largest companies in the world now account and report on the emissions from their direct operations (Scopes 1 and 2), but Scope 3 emissions are proving more complex. The GHG Protocol Corporate Standard classifies a company's greenhouse gas (GHG) emissions into three scopes. Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy, while Scope 3 emissions are all indirect emissions that occur in the value chain of the reporting company, including both upstream and downstream emissions.

Some are managing, such as Total, which has pledged net zero for all three scopes across all its production and energy products used by its customers in Europe by 2050 at the latest. The oil major has also reduced its Scope 3 average carbon intensity by 6% since 2015.

Others are finding it harder. ExxonMobil, for one, argues that Scope 3 emissions do not provide any meaningful insights into the company's emission reduction performance and could mislead the numbers. This could be especially true for non-integrated energy companies, which have far greater control over their supply chain.

But full transparency is non-negotiable, especially as Scope 3 emissions can often represent a company's biggest GHG impacts.

Next steps?

One route towards greater transparency is developing a full GHG emissions inventory – incorporating all scopes – so companies can understand their total impact and address weak spots and promote stronger areas. For example, Eni will pursue a strategy that aims to obtain an 80% reduction in net Scope 1, 2 and 3 emissions by 2050.

International reference protocols do not indicate an unequivocal estimation methodology that allows a concise and comparable representation of GHG emissions. So, Eni created a new methodology, which was reviewed by independent experts at the Imperial College London. The result of its application has also been verified by RINA, an independent certification company. This methodology includes all GHG Scope 1, 2 and 3 emissions, in absolute and relative terms, linked to the energy products sold, whether they derive from equity or non-equity productions.

This proactivity highlights the need – and viability – for industry-wide standardised reporting and comparative methods. This is especially essential as nearly every time a company announces a new target, there are different parameters (eg carbon dioxide target cut, scope of emissions covered, scope of operations covered).

How offset mechanisms, such as the European Union's Emissions Trading Scheme EU ETS, can evolve to support net zero goals is critical, as is the development of the carbon capture and storage (CCS) market. From the perspective of the Paris Agreement, the deployment of CCS globally remains well off track, according to the Global CCS Institute.

To meet climate mitigation targets, an estimated 2,000-plus large-scale CCS facilities must be deployed by 2050, requiring hundreds of billions in investment. Today, there are just 51 CCS facilities globally. Nineteen are in operation, four are under construction and 28 are in various stages of development, with an estimated combined capture capacity of 96mn tonnes of carbon dioxide per annum.

Looking ahead, the stakes are high – disconcertingly so. Failure to tick the right boxes in a net zero journey will undeniably jeopardise energy security and the planet. Now it is time to avoid finger pointing, continually up ambition and get to work. ●

What does 'net zero' mean?

Net zero refers to achieving a balance between the amount of greenhouse gas (GHG) emissions produced and the amount removed from the atmosphere. There are two different routes to achieving net zero, which work in tandem – reducing existing emissions and actively removing GHGs.

A gross zero target would mean reducing all emissions to zero. This is not realistic, so instead the net zero target recognises that there will be some emissions, but that these need to be fully offset, predominantly through natural carbon sinks, like oceans and forests. ●

STRATEGY

Decarbonising global energy trade

It is impossible for every country to satisfy demand for energy with domestically produced renewable energy, notes a new report* by Lux Research. To achieve decarbonisation, they will have to find new ways to import zero-carbon energy, with new electricity infrastructure using high voltage AC or DC transmission lines and power-to-gas. But no energy carrier is likely to offer low enough costs to replace LNG or oil entirely and offer a global energy trade. *Brian Davis* reports.

Today's global economies are supported by a global energy trade that is built on fossil fuels. What's more, growth of the global economy has resulted in greater demand for energy. However, not every country can meet its own energy demands through domestic production, and the global energy trade – notably oil, natural gas and coal – is crucial for many countries to maintain a growing economy due to their limited domestic energy resources. Globally, 2,800 TWh/y is transported from resource-rich regions, such as the Middle East, to energy-intensive regions, such as south-east Asia.

Not only is the demand for energy imports growing; it is also diversifying. New energy carriers like LNG tankers are supplementing, or in some cases substituting, the traditional oil and coal vessels that have largely made up the mix of energy imports to date.

In the global push towards decarbonisation, many countries are finding it difficult to replace their hydrocarbon-based energy imports with domestic renewable sources of energy like wind or solar. These new energies also face their own resource limitations. In places like Singapore, Japan and the Netherlands, energy demand is simply too high to be met with low-energy density wind and solar alone.

As Tim Grejtak, Lead Energy Storage Analyst of Lux Research, explains: 'The two key resource constraints are the availability of land for wind and solar installations and availability of resources like wind speed or solar insolation. Singapore is one of the most population dense countries in the world, and there is little room for large solar arrays despite decent solar power resource potential. The Netherlands does have some space for solar installations, but solar output is half that of more favourable regions, which increases costs.'

Ultra-high voltage AC and DC power lines offer higher efficiency and longer distance lines to better connect to remote renewable sources

Photo: Pixabay/S Hermann & F Richter

Climate change expert David MacKay of the University of Oxford has illustrated the challenges of meeting energy demand solely through domestic renewable energy. He analysed population density per capita energy demand and found that the power used per unit area in some regions exceeded wind and solar production. Lux expanded on MacKay's analysis and concluded that countries representing $9tn of global GDP (gross domestic product) would face difficulties in meeting energy demand with domestic renewable production alone, requiring the import of future energy carriers.

Electricity is the sole means of transmitting renewable energy today. There are approximately 5mn km of high voltage power lines around the world, with roughly 200,000 km added each year. The majority of this transmission line growth is to support renewable energy capacity additions, with China as the leader in new transmission line building to support its wind and solar aspirations.

AC and DC transmission

Grejtak highlights challenges in the efficiency and cost of long-distance, high capacity lines which have driven regional transmission operators to look to new technologies like ultra-high voltage AC (UHVAC) and ultra-high voltage DC (UHVDC) power lines. 'These higher efficiency, longer distance lines better connect remote renewable sources to population centres,' he notes.

At intermediate distances and capacities (~300 MW, 500 km), an AC powerline is 95% efficient and typically costs $400mn, compared with a DC powerline which is 98% efficient and costs about $1.2bn to cover the same distance.

AC transmission requires no conversion between the source of electricity and the end customer – only stepping up and down voltage through transformers. High voltages can carry more power over longer distances with lower inductive and resistive losses, but suffer from higher corona losses as air ionises near high voltage lines.

New AC transmission line projects in China are now above 1,000 kV. These power lines have required advances in shielding and insulation to reduce corona losses and improve safety. Other developers like Siemens and ABB

are promoting high voltage DC transmission, which eliminates inductive losses but requires AC-DC and DC-AC conversion through large thyristor or transistor halls.

Lux Research suggests that for shorter distances and lower power, AC transmission wins out.

Lux used a database of AC and DC power line projects to derive the costs of the electricity supply chain. The average power line length and capacity from that database was about 500 km and 300 MW – roughly consistent with the scale and distance from load of utility renewable projects. These values are used for the remainder of the analysis here.

At 300 MW capacity and 500 km distance, AC lines are found to be the lowest-cost option, adding just $10/MWh to base electricity compared to DC lines, which add $26/MWh. Both AC and DC power lines have less than 5% loss, so conversion costs are effectively base electricity costs. 'As renewable energy projects get larger and more distant from load centres, AC transmission lines become less compelling and DC transmission begins to be favoured,' says Grejtak.

He emphasises that: 'The biggest challenge for UHVAC is shielding and electrical insulation. For UHVDC, the main challenge is shielding/electrical insulation and installing efficient and inexpensive power electronics for AC-DC conversion in valve halls. China is undertaking the world's biggest DC transmission project, the Changji-Guquan UHVDC transmission line, which will move 12 GW over 3,300 km at 1,100 kV. This ambitious project is being built by State Grid Corporation of China and ABB.

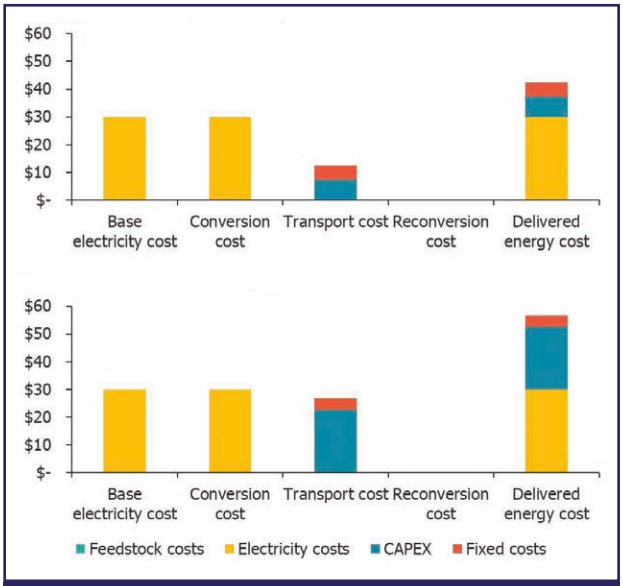


Figure 1: Electricity transmission costs in $/MWh, at 300 MW and 500 km, for AC (top) and DC (bottom) power lines

Source: Lux Research

Present and future energy carriers

Pipelines have been used to deliver energy for a couple of centuries, starting with coal gas for street lighting in London. Today, 2mn km of pipelines globally transport crude oil, natural gas and petrochemicals in regional markets. Natural gas pipelines constitute 65% of total pipeline length, with crude oil pipelines making up an additional 20%. Significant pipeline capacity is in the US, to support the country's growing oil and gas sector, due to the expansion of unconventionals.

However, Lux Research maintains that 'with the rise of renewable energy, crude oil and natural gas pipelines may quickly become stranded assets'. Innovations in pipeline utilisation have largely come from Germany and Denmark, which have piloted power-to-gas technology to decarbonise their natural gas infrastructure and promoted renewables integration.

According to Grejtak: 'Right now, most power-to-gas projects are blending hydrogen into existing natural gas networks at low concentrations (less than 5%). The low hydrogen concentration is due to the limits of compressor stations and turbines in existing natural gas networks, and research is ongoing for 100% hydrogen-compatible turbines and compressors. The low concentration is largely about material choice and fluid dynamics design.'

One of the first power-to-gas plants was WindGas Falkenhagen in Brandenburg, Germany. This pioneering plant was built by Uniper in 2013 and featured a 1.75 MW electrolyser from Hydrogenics. It has since been upgraded to include a 600 kW methanation plant. One of the largest power-to-gas plants today is Energiepark Mainz in Mainz, Germany. It began operations in 2015 and features three 2 MW electrolysers from Siemens. Partners include the Linde Group and Stadwerke Mainz, the local utility.

Shipping

Ships have been central to the import of energy for almost 300 years, starting with whaling in the 1700s. Today more than 3.5 TW of energy is supplied by crude oil, LNG and petroleum products shipped around the world. Not limited to specific right of way (ROW) like pipelines or power lines, these oil and gas ships have enabled a truly global energy market for energy products. Shipping today is being challenged by both the delivered product and the energy used in shipping to deliver that product.

Grejtak maintains: 'As countries look to decarbonise their energy mix, they are turning to lower carbon fuels like LNG that require specialised cryogenic tankers. Some early adopters are even leveraging those designs to build liquefied hydrogen (LH2) tankers. As the industry aims to reduce carbon emissions by 50% by 2050, the shipping industry must turn to entirely new energy carriers to decarbonise.'

He explains that LNG tankers are specialty-built with vacuum-insulated cyrogenic tanks and boil-off gas management systems. LH2 tankers have even more sophisticated vacuum-insulated cyrogenic tanks to handle hydrogen's lower liquefaction temperature (–253°C for liquid hydrogen versus –162 °C for LNG). But to date these ships are demonstration vessels. Moss Maritime and Kawasaki Heavy Industries have plans for dedicated LH2 tankers.

Lowest cost energy carriers

When comparing all energy carriers across all sources of power and distances, AC and DC power lines will undoubtedly provide the lowest-cost solution to connecting remote solar power systems to customers. While this is good news for energy costs – not converting electricity to renewable fuels keeps electricity prices low – it limits the prospects of a worldwide renewable energy trade that can balance supply and demand and set prices globally.

Only at distances greater than 20,000 km, when HVDC lines drop in efficiency, or greater than 1,000 km but less than 100 MW, when HVAC lines drop in efficiency, does shipping appear competitive. The lower delivered power case for sea-based energy carriers will be to support small island communities, but the long-distance energy trade will be more limited, as shipping journeys greater than 20,000 km account for less than 0.2% of total journeys today.

Local or global energy?

While solar resources in places like Northern Europe might be poor, they do have access to local high wind resources like the North Sea. Floating wind turbines may have higher electricity costs – estimated at $60/MWh versus the modelled

$30/MWh for solar. But depending on power delivery, may offer lower costs than importing renewable energy from farther away.

The Lux report discusses available solar resources at length due to the substantial growth of record low solar prices, but offshore wind resources represent a different supply. In Northern Europe, 22 GW of offshore wind has been deployed to date and is seen as a viable way for Europe to meet its energy demands, so the report investigates whether Europe should build offshore wind (which is local, but more expensive) or import solar energy (which is cheaper, but needs to be imported).

The report finds that for projects less than 100 MW, it is cheaper to stick with local offshore wind. This is a negligible project size for offshore wind; Shell and Ørsted have proposed GW-scale wind-to-hydrogen projects in the North Sea. For projects larger than 100 MW, it is worth the additional investment to import cheaper solar energy, but only if it is imported via HVDC powerlines from nearby Northern Africa.

A failed project, Desertec, investigated this in 2009, but Nur Energie is looking to resurrect the concept with a €2.7bn power line. Importing solar energy in the form of hydrogen from Australia is a more expensive option. Ultimately, each renewable energy trade project will need to consider how much energy needs to be imported, and where that energy is coming from.

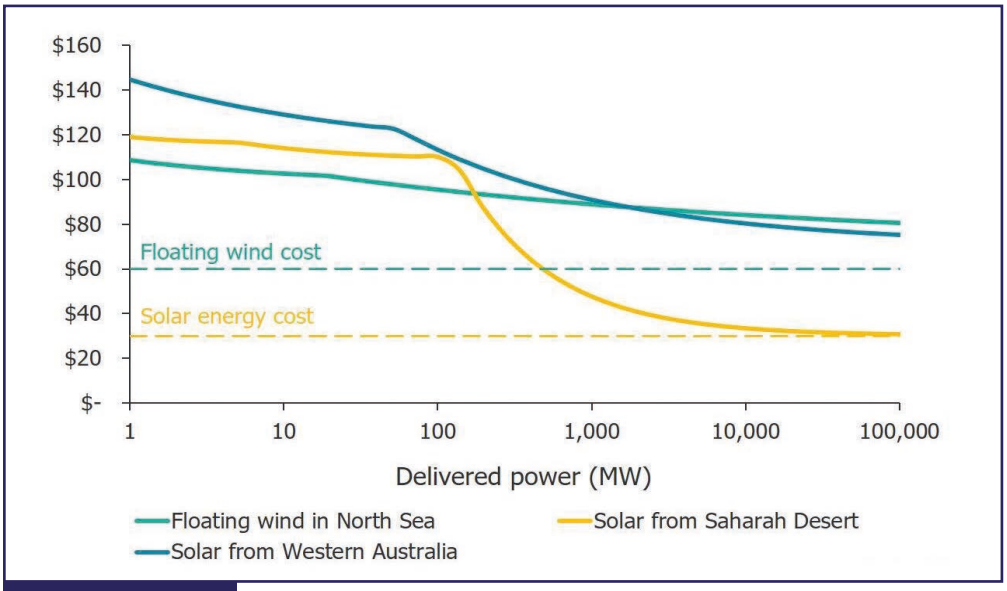


Figure 2: Renewable energy costs in Northern Europe, in $/MWh

Source: Lux Research

The outlook

Lux considers that liquid organic hydrogen carriers, high voltage DC transmission and liquefied hydrogen will enable energy intensive economies to reach their CO_2 targets starting in 2030.

Successful projects will target multiple, high value applications. Industry consortia will be key, focusing on difficult-to-decarbonise sectors like chemicals, heavy transportation and heat will make better use of energy carriers. These sectors intersect, and partnerships among industry, logistics and renewable power will be essential.

However, new infrastructure projects are not cheap. So development of consortia will be critical for reason of cost. These renewable energy carrier projects are likely to cost billions of dollars each, and costs won't be borne by industry alone but in partnership with governments.

'High value applications include fuels for medium- and heavy-duty trucks and buses, fuels for long-distance planes and ships, and feedstock for industrial processes like refining and cement and steel production,' explains Grejtak. 'These applications would otherwise be very hard or impossible to decarbonise with electricity or batteries alone. Several consortia are investigating options.'

H-Vision aims to decarbonise chemicals production in the Netherlands. The Hydrogen Road project is looking to transport hydrogen from Australia to Japan. The Intermountain project envisages decarbonisation of power generation in the US. And the Mitsubishi/Sembcorp/Jurong Port/LNG Corporation consortium is evaluating LOHC (liquid organic hydrogen carriers) for hydrogen import in Singapore, just to name a few.

'The cons of establishing a global renewable energy trade is that it will take investment, time, and considerable effort and coordination from industries and governments,' suggests Grejtak. 'These new renewable energy supply lines are by no means trivial ventures. They aim to accomplish in 10 years what it took the entire oil and gas industry 100 years to establish. The pros are substantial, however. Renewable energy markets will expand beyond country borders making it easier and less expensive to integrate higher levels of wind and solar, reducing CO_2 emissions in challenging sectors like heavy transportation and industry will be far easier. More energy-intensive countries will have a much easier time decarbonising their economies by importing renewable energy, and overall decarbonisation efforts will accelerate.'

On the horizon

Even with highly favourable conditions, high volume energy carriers can only just match LNG prices today. If renewable energy displaces hydrocarbons, though, future LNG prices will be lower as demand drops.

'Cost-effective synthesis and transport of hydrogen and synthetic fuels could accelerate decarbonisation timelines, notably for later-to-decarbonise sectors like heavy industry, shipping and aviation. This could in turn accelerate solar and wind deployment to support additional electrochemical production of fuels, as over-generation becomes less of a concern,' says Grejtak.

'The challenge is coordinating and establishing the end-to-end partnerships and supply agreements that makes a supply chain a commercial success. While electricity transmission infrastructure is cheaper and more efficient, it is by no means a sure thing. Transmission projects often have financial returns set by regulators, or have trouble securing permitting and right-of-way. They will more often be used for intra-continental or intra-regional electricity transfer. Countries representing $9tn worth of GDP will struggle to meet their own energy demands with in-country or in-region wind and solar, so will need to import renewable energy if they are to hit their decarbonisation goals. Ultimately, a shipborne renewable energy trade will provide a significant level of flexibility.' ●

* T Grejtak, Lead Analyst; A van Berkel, Director, Research; Y-S Yu, Senior Analyst, Lux Research, *Evolution of energy networks: Decarbonising the global energy trade*, Lux Research, 2020.

HYDROCARBON MANAGEMENT

Fall in global crude oil voyage losses

The latest analysis of the 2019 data on global marine crude oil voyage losses, presented by *Paul Harrison*, Consultant to the EI's HMC-4A Marine Oil Transportation Database Committee, shows a fall in losses over the past year.

The Energy Institute's (EI) HMC-4A Marine Oil Transportation Database Committee has been collecting and analysing worldwide oil shipping data for over 25 years and meets twice a year. The 2019 autumn meeting was held in Houston in November 2019, hosted by ExxonMobil, while the spring 2020 meeting was held online due to the COVID-19 pandemic.

Committee members submit their voyage measurement data annually and receive a global analysis and confidential individual company reports.

The following member companies submitted data for 2019: Bazan, BP Oil International, CEPSA, Chevron, Chinese Petroleum Corporation, Equinor, Essar Oil UK, ExxonMobil, Marathon Petroleum, Mercuria, Monroe Energy, Petrobras, Petrogal (GALP Energia), PetroIneos, Phillips 66, PREEM, Repsol, Saras, Shell and Total. Additional members are always welcome.

The main findings from the global analysis are presented below. US inland barge movements are analysed separately but are not included.

Database development

The total number of ship voyages reported for 2019 increased, as did loaded volume, with reported bill of lading (BOL) volume totalling 5.71bn barrels. However, the volume of crude with complete voyage data fell slightly to 4.15bn barrels, as shown in **Figure 1**.

Comparison with the *BP Statistical Review of World Energy* indicates that the 2019 database includes approximately 38% of the global shipped volume at BOL and contains complete load and discharge data for around 28% of estimated global seaborne movements.

Global losses

Losses fell steadily after 2001 to a net standard volume (NSV) loss of –0.161% in 2010 (by convention losses are given as negative). The 2011 figures showed an increased loss of –0.172%, with losses then remaining fairly steady until 2015, which saw a significant fall to –0.160%. The fall in 2019 from –0.168% to –0.147% is the first significant change since 2015.

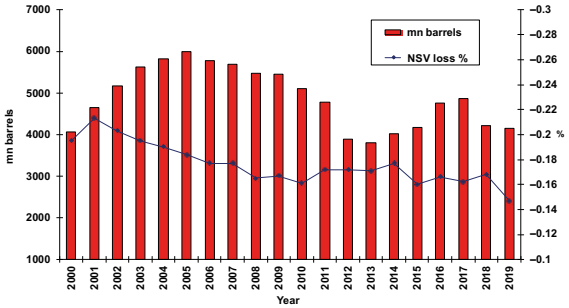


Figure 1: Database volume and average recorded net loss of crude oil, 2000–2019 *Source: HMC-4A*

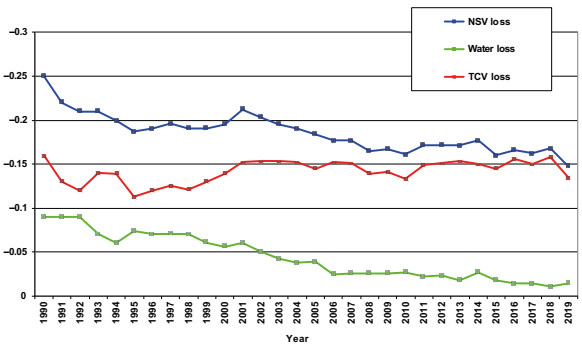
It must be noted that losses include apparent as well as physical losses. Apparent losses result from the combination of fixed and random errors in the measurement systems used at load and discharge.

In recent years, changes in NSV loss have been largely driven by gross or total calculated volume (TCV) loss. This was the case for the change seen in 2019, with TCV loss falling from –0.16% to –0.13%. Water loss increased slightly, as shown in **Figure 2**.

TCV loss comprises any real losses due to evaporation plus any apparent losses due to systematic measurement differences. Water loss represents any additional water reported at discharge compared with that reported at load, ie an accounting loss in terms of oil quantity but not a real loss of either oil or water.

Analysis indicates that the reduced TCV loss in 2019 was due to reduced losses seen for a number of high volume grades/ports, rather than any major shift in trading patterns. This may have been coincidental and it will be interesting to note if the reduced losses are maintained in 2020.

Figure 2: NSV, water and TCV losses, 1990–2019 *Source: HMC-4A*



Loss comparison for individual crude oils

Table 1 (pp36–37) gives mean NSV loss and standard deviation for shipments of the most popular crudes in the database (20 or more voyages with full data). The mean of the reported API gravity is also given, together with the overall percentage loss based on reported total barrels shipped. For comparison, figures for NSV loss calculated by voyage are given for 2019 and 2018.

Conclusion

It has been clear for some time that any significant improvement in mean NSV loss would depend on reducing TCV loss and it seems that this has been the case in 2019. Significant loss differences for individual ports remain and the detailed work of the Committee helps to highlight where improvements might be made. Offshore loadings are particularly susceptible to large swings in gross measurement and water determination and the Committee has recently developed new guidance aimed at improving measurement for cargoes loaded offshore – HM 86: *Guidelines for measurement of crude oil loaded at offshore installations*, which should be published shortly.

The HMC-4 Committee also analyses US crude oil barge movements and has also developed product loss benchmarks which were reviewed in 2019. New members are always welcome to join and expand the database and any companies with data to submit should contact Kishan Kansara at the Energy Institute, **kkansara@energyinst.org**

Crude Type	API gravity	Overall volumes (NSV)			Calculation by voyage					
		Total barrels	Barrels loss	Barrels loss %	2019 NSV loss %			2018 NSV loss %		
					Mean	St. Dev.	No.	Mean	St. Dev.	No.
Al Shaheen	29.8	31,542,331	–103,836	–0.33	–0.33	0.20	47	–0.32	0.13	57
Alaskan North Slope	32.6	78,833,915	–61,761	–0.08	–0.06	0.17	107	–0.10	0.16	94
Alvheim	33.6	24,051,612	–20,385	–0.08	–0.09	0.15	30	–0.13	0.19	34
Amenam Blend	39.2	23,719,671	–51,693	–0.22	–0.22	0.17	25	–0.26	0.23	25
Amna	37.7	12,378,249	–23,924	–0.19	–0.20	0.28	22	–	–	–
Arabian Extra Light	39.6	55,092,319	–139,824	–0.25	–0.26	0.39	112	–0.22	0.27	168
Arabian Heavy	27.4	45,966,920	–54,986	–0.12	–0.14	0.32	86	–0.19	0.39	55
Arabian Light	33.1	208,583,239	–376,245	–0.18	–0.17	0.31	310	–0.22	0.32	407
Arabian Medium	30.7	11,764,860	–35,467	–0.30	–0.21	0.71	24	–0.14	0.40	56
Arctic Oil	23.7	19,048,987	–34,190	–0.18	–0.18	0.10	27	–0.16	0.10	30
Asgard	52.0	26,521,622	–29,147	–0.11	–0.11	0.23	32	–0.16	0.14	31
Azeri	37.8	81,142,815	–100,087	–0.12	–0.11	0.14	104	–0.14	0.12	183
Bakken	43.6	24,463,941	–34,612	–0.14	–0.14	0.21	47	–0.10	0.21	42
Basrah Heavy	23.7	52,707,776	–100,567	–0.19	–0.22	0.34	53	–0.12	0.27	80
Basrah Light	28.9	137,417,070	–317,591	–0.23	–0.20	0.38	154	–0.18	0.37	142
Bonga	27.9	33,357,092	–51,682	–0.15	–0.17	0.39	38	–0.06	0.21	48
Bonny Light	34.3	17,907,491	–24,654	–0.14	–0.14	0.27	21	–0.49	0.29	48
Bu Attifel	41.0	13,795,357	–3,309	–0.02	0.06	0.88	25	–0.32	0.51	27
Buzios	28.8	33,838,048	–56,012	–0.17	–0.16	0.22	37	–	–	–
Castilla Blend	17.9	39,279,422	–57,854	–0.15	–0.16	0.33	59	–0.10	0.21	61
Catcher	27.3	18,970,944	37,723	0.20	0.21	0.29	37	–	–	–
Clair	23.5	22,139,953	10,233	0.05	0.04	0.26	37	–	–	–
Clov	31.9	18,126,129	–39,144	–0.22	–0.21	0.19	22	–0.31	0.13	23
CPC Blend	46.6	179,175,684	–447,562	–0.25	–0.26	0.16	229	–0.26	0.15	267
Eagle Ford	44.4	44,294,544	–73,296	–0.17	–0.17	0.28	98	–0.19	0.26	30
Egina	27.5	34,905,891	–15,974	–0.05	–0.04	0.16	38	–	–	–
Ekofisk	38.8	38,643,511	–5,339	–0.01	–0.01	0.11	63	–0.02	0.13	71
El Sharara	42.5	22,983,668	3,011	0.01	0.01	0.14	35	0.01	0.16	45
Es Sider	36.1	37,320,831	–92,069	–0.25	–0.26	0.23	54	–0.28	0.18	66
Escravos	31.7	32,533,268	–28,397	–0.09	–0.08	0.13	37	–	–	–
Espo	35.6	18,711,564	212	0.00	–0.00	0.24	29	–0.17	0.25	21
Export Blend	30.0	41,977,538	–69,733	–0.17	–0.18	0.23	59	–0.14	0.32	32
Flotta Gold	36.2	13,270,902	–41,228	–0.31	–0.31	0.11	21	–0.28	0.13	21
Forcados Blend	32.4	34,880,932	–113,077	–0.32	–0.29	0.38	43	–0.22	0.25	60
Gina Krog	39.5	16,583,133	–20,276	–0.12	–0.12	0.23	28	–	–	–
Grane	29.0	75,774,006	–9,485	–0.01	–0.01	0.11	119	0.02	0.17	96
Gudrun Blend	52.7	15,111,596	–6,892	–0.05	–0.05	0.10	24	–0.06	0.18	23
Gullfaks	39.4	62,355,823	–91,374	–0.15	–0.15	0.20	80	–0.16	0.19	64
Hebron	21.1	26,967,404	–833	–0.00	–0.01	0.20	53	–	–	–
Hebron (Offshore)	20.7	18,411,830	36,226	0.20	0.19	0.16	28	–	–	–
Heidrun	24.4	24,481,321	36,563	0.15	0.15	0.16	39	0.14	0.22	28
Hibernia	33.3	26,417,695	–6,573	–0.02	–0.03	0.15	41	–0.07	0.13	31
Iracema	32.1	36,971,432	–43,148	–0.12	–0.09	0.26	41	–0.13	0.18	43
Kimanis	36.6	14,034,376	8,645	0.06	0.08	0.36	35	–0.06	0.16	49
Kuwait Export	30.3	71,806,821	–224,786	–0.31	–0.33	0.32	74	–0.31	0.27	99
Lula	30.0	119,201,192	–91,142	–0.08	–0.07	0.21	118	–0.08	0.24	138
Maya	21.9	182,342,990	–101,481	–0.06	–0.07	0.39	303	–0.11	0.40	356
Mellitah	42.7	17,957,221	–19,155	–0.11	–0.10	0.13	26	–	–	–
Midland Sweet	42.8	197,764,164	–457,771	–0.23	–0.21	0.29	239	–0.12	0.36	50

Crude Type	API gravity	Overall volumes (NSV)			Calculation by voyage					
		Total barrels	Barrels loss	Barrels loss %	2019 NSV loss %			2018 NSV loss %		
					Mean	St. Dev.	No.	Mean	St. Dev.	No.
Murban	40.4	48,905,674	–119,823	–0.25	–0.24	0.20	91	–0.28	0.21	110
Novy Port	35.4	34,373,679	–60,986	–0.18	–0.18	0.13	45	–0.17	0.11	42
NWS Condensate	60.7	13,452,269	–18,589	–0.14	–0.15	0.16	23	–	–	–
Oseberg	38.9	17,078,816	–19,226	–0.11	–0.12	0.22	25	–0.22	0.22	27
Patos Marinza	9.4	3,716,654	10,328	0.28	0.26	0.64	30	–0.02	0.15	26
Peregrino	13.7	19,833,125	–10,966	–0.06	–0.07	0.37	36	–0.19	0.50	23
Qatar Marine	32.0	14,053,950	–40,306	–0.29	–0.32	0.33	22	–	–	–
Qua Iboe	37.4	35,552,807	–63,325	–0.18	–0.18	0.36	40	–0.19	0.13	26
Russian Export Blend	30.4	182,430,384	–331,377	–0.18	–0.18	0.22	272	–0.19	0.17	313
Saharan Blend	44.9	94,934,696	–63,887	–0.07	–0.05	0.18	131	–0.07	0.16	111
Sapinhoa	30.0	24,297,341	–26,641	–0.11	–0.12	0.31	26	–0.10	0.29	30
Schiehallion	25.6	24,032,789	–45,848	–0.19	–0.19	0.40	41	–0.00	0.66	48
Sokol	34.7	19,434,119	–24,616	–0.13	–0.12	0.22	31	–0.13	0.55	41
Statfjord	38.9	31,368,452	–61,325	–0.20	–0.20	0.20	40	–0.17	0.34	48
Stones	28.9	11,115,466	–26,780	–0.24	–0.24	0.20	38	–0.11	0.17	26
Troll	34.6	15,944,440	–6,041	–0.04	–0.03	0.16	26	–	–	–
Upper Zakum	33.8	73,731,859	–232,266	–0.32	–0.31	0.30	84	–0.30	0.43	71
Varandey	36.7	44,443,048	–61,057	–0.14	–0.14	0.19	55	–0.27	0.22	47
Vasconia	23.5	57,338,297	8,612	0.02	0.01	0.14	93	–0.08	0.31	104
West Texas Intermediate	42.7	46,217,356	–52,801	–0.11	–0.10	0.19	75	–0.17	0.19	119
West Texas Intermediate Light	46.6	10,458,214	–32,379	–0.31	–0.25	0.45	27	–	–	–
Western Desert	41.4	21,235,652	–44,170	–0.21	–0.21	0.23	42	–0.29	0.29	51

Table 1: Analysis by crude oil type, 2018 and 2019 *Source: HMC-4A*

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This 3-day training course, delivered across one week will teach delegates how to implement the internationally recognised Energy Institute Model Safe Code of Practice 15 - Area Classification for Installations Handling Flammable Fluids.

EI LIVE 12, 14 and 16 Oct 2020
EI member: £1560 + VAT - Standard: £1770 + VAT

Oil & Gas

Introduction to LNG

This 4-day training course provides an introduction to the LNG chain. Suitable for students who are new to the LNG sector and/or those with a non-technical background.

EI LIVE 14–17 Sep 2020
EI Member: £1290 + VAT - Standard: £1390 + VAT

Economics of the Oil and Gas Industry

This 4-day training course provides an introduction to the economics of the oil and gas industry and is suitable for those who are new to the field.

EI LIVE 23–26 Nov 2020
EI Member: £1290 + VAT - Standard: £1390 + VAT

Oil and Gas Mergers & Acquisition

This 5-day training course provides an overview of Mergers & Acquisition activity trends, the process involved in conducting these activities and the skills that are required.

EI LIVE 5–9 Oct 2020
EI Member: £2450 + VAT - Standard: £2690 + VAT

Oil and Gas Industry Fundamentals – Awareness

This 4-day training course provides delegates with an overview of principal activities in the international upstream, midstream and downstream petroleum industry.

EI LIVE 8–11 Sep 2020
EI Member: £1290 + VAT - Standard: £1390 + VAT

Bespoke Online training available upon request. For more information visit energy-inst.org/training or contact webtraining@energyinst.org / +44 (0)20 7467 7178