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Insight

September 2019

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Publisher
Murray Fisher, +1 720 264 6644
murray.fisher@spglobal.com

Editor
Emma Slawinski, +44 (0)20 7176 0365
emma.slawinski@spglobal.com

Copy Editors
Alisdair Bowles, James Burgess, Keiron Greenhalgh, James Leech

Production Manager
David Sullivan, +44 (0)20 7176 0268
david.sullivan@spglobal.com

Production Office
Platts Insight Magazine
1800 Larimer, Suite 2000
Denver, CO 80202

Advertising Sales – Americas
Bob Botelho, +1 720 264 6618
robert.botelho@spglobal.com

Advertising Sales – EMEA, Asia-Pacific
Sheryl Tan, +65 6216 1191
sheryl.tan@spglobal.com

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S&P Global Platts
20 Canada Square, 9th Floor
London, E14 5LH, UK

President
Martin Fraenkel

Global Head of Market Insight
Sarah Cottle

Global Head of Pricing
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Chris Midgley

Contributors

Dania EL Saadi
Senior Editor, Middle East

Shi Yun Fan
Associate Editor, LNG

Meghan Gordon
Senior Writer, Oil

Siobhan Hall
Senior Editor, Energy Policy

Paul Hickin
Associate Editorial Director

Sebastian Lewis
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JY Lim
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Jim Magill
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Jeffrey Moore
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Kang Wu
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Eric Yep
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Oceana Zhou
Senior writer, Oil

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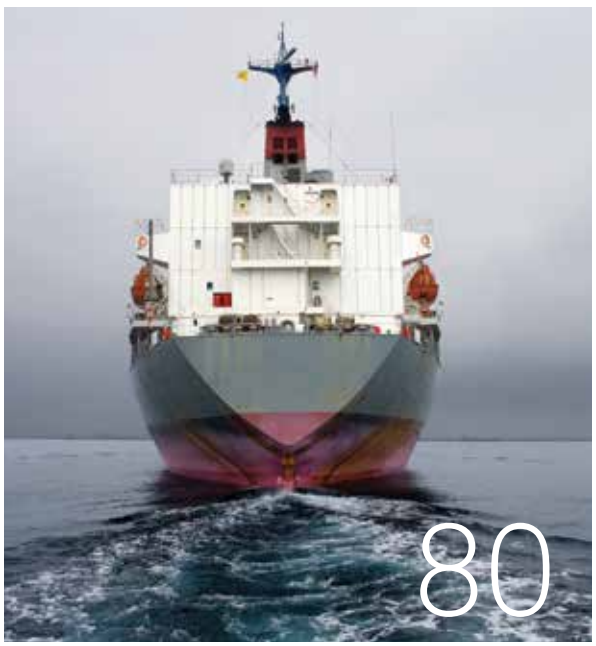

Editor's Note

Emma Slawinski

Editor

Economic warning signals rang out in succession throughout August – from lackluster industrial data in the US, to negative growth in the first quarter in the UK and Germany.

At present, there is little suggestion of an impending economic catastrophe on the scale of the 2008 financial crisis, but analysts are beginning to factor in a higher risk of recession. S&P Global Platts Analytics downgraded its forecast for 2019 oil demand growth to 1.05 million-1.10 million b/d in August, rising to 1.3 million b/d in 2020. However, Platts Analytics has also developed a "Recession Scenario" that sees demand growth slowing to 0.9 million b/d in 2019 and to 0.6 million b/d in 2020. In the absence of a recession, Platts Analytics still points to bullish factors that could help benchmark oil prices recover in late 2020, not least the International Maritime Organization's switch to lower sulfur fuels from January 1.

Beyond short-term matters of supply, demand and price, there is the thornier question of what lower confidence in the global economy could do to investment – not only in oil but also across the energy mix – and how that could shape the future of our energy consumption.

According to the International Energy Agency's World Energy Investment 2019 report, investment in upstream oil and gas supply has been relatively stable for the last three years, following a drop between 2014 and 2016. The agency warned that investment in energy supply will need to rise to meet future demand. Spending on low-carbon power generation, in particular, is falling behind that needed to meet climate goals enshrined in the Paris Agreement, it said.

Efforts to transition to low-carbon energy systems could be more vulnerable if governments rein in spending on support schemes, or research and development. Private investment in renewables could suffer too. "Renewables are becoming more and more exposed to merchant risks," said Bruno Brunetti, global head of power planning at Platts Analytics. "As more developers rely on market revenues, cyclically lower fuel and power prices could undermine projected merchant revenues, discouraging investments."

The coming year will also test the individual strategies of integrated oil and gas companies, such as Shell and ExxonMobil, respectively first and second in S&P Global Platts Top 250 Energy Company Rankings (see page 91). In their latest investor presentations, both said they would increase capital expenditures in the coming years, but they diverge in their approach to the energy transition. While Shell is placing a sizable bet on electricity, ExxonMobil is pinning its hopes on fast growth downstream in chemicals, a sector it expects to deliver above-GDP growth for the foreseeable future. There may be space for both approaches to pay off.

In addition to economic pressures, energy companies are facing a workforce crisis precipitated by demographic shifts and changing aspirations among the brightest and most talented young graduates. This realization should help to create overdue improvements in diversity, an issue explored in our special report, *#ChangePays in energy* (page 32). Harnessing S&P Global's essential data, insights and analytics, the report examines progress towards a more inclusive energy sector, and brings together stories from women leaders who are determined to drive deep change in the industry, helping to ensure its resilience to future challenges.

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Special report

New Horizons: The forces shaping the future of the LNG market

As new flexible supply and demand challenge traditional LNG business models, and the trend towards commoditization gathers pace, what lies ahead? S&P Global Platts' report features analysis, infographics and interviews with the IEA's Fatih Birol and IGU's Joe M. Kang.

Special report

Global petrochemical outlook H2 2019

Amid trade tensions and the emergence of China's new mega refineries, how will global petrochemical markets evolve? S&P Global Platts editors analyze trade flows, supply and demand fundamentals and price trends across key products.

Podcast

Could flaring hinder the US oil revolution?

Gas flaring in the US is climbing, as midstream companies struggle to keep pace with gas production by building new gathering lines and processing plants. What is being done to reduce flaring and will current regulatory efforts be enough?

Video

Insight Conversation: Jerome Leprince-Ringuet, Total Marine Fuels

Total Marine Fuels global solutions managing director Jerome Leprince-Ringuet offers his views on the changes and challenges for shipping and bunkering industries as they head into the final phase of preparations for the January 1 IMO 2020 deadline.

Podcast

Shale and LNG shape outlook for IOCs

Oil majors are wrestling with spending discipline and global economic weakness in the near term, and the energy transition question further out. Editors from S&P Global Platts and S&P Global Market Intelligence analyze recent financial results and contrasting strategies of global energy giants including ExxonMobil, Shell and Total.

IMO 2020: Are Asian refineries ready?

The upcoming change in global standards for marine fuels will transform oil product flows. Asia is well placed to capitalize on the shift, despite the challenges of rising costs and oil prices, write JY Lim and Kang Wu of S&P Global Platts Analytics

The refining industry is on the brink of a major shift in the demand structure of bunker fuels, and refiners are making plans to meet changing product demand brought about by the IMO 2020 deadline.

The initial effect will be to create a huge disposition issue for some 3 million barrels per day (b/d) of high sulfur fuel oil (HSFO), globally. That volume will need be replaced by low sulfur fuel oil (LSFO), marine gasoil (MGO) and various low sulfur blends of gasoil and residuals, with some volumes absorbed by the power sector with the expected drop of HSFO prices.

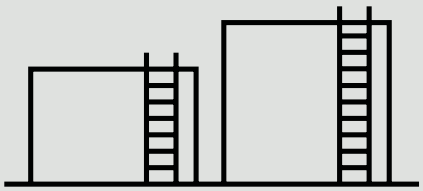
In order to make those changes, relatively expensive steps are required throughout the refining industry to rebalance products. S&P Global Platts Analytics forecasts that the spec change will have a widespread effect on price spreads of refined products in 2020.

For middle distillates, cracks are forecast to surge. HSFO cracks are expected to fall and HSFO absolute prices may drop to low levels towards the end of 2019, incentivizing increased use in power generation.

Despite all these challenges, Asia is set to benefit from IMO 2020 more than most other regions due to its surplus of gasoil and its relatively high complexity of refineries. Asian refiners have continued to upgrade, allowing them to achieve greater yields of valuable lighter products and strip out sulfur. This will set them on a better footing to adjust for IMO 2020.

China and India are well-placed to take advantage of the bunker spec change with their high ratios of coking and hydrocracking versus crude distillation capacities. Japan is a major LSFO producing and consuming country in Asia while South Korea is a major gasoil exporting country. Both stand to benefit from high distillate cracks.

The IMO bunker spec change in 2020 will be the most disruptive event to hit the refining sector in decades, even as Asian refiners have made concerted efforts to supply compliant fuels. But Asia's rising surplus of gasoil will help to ease the region's transition.



Quick take: IMO 2020 impact on Asian refining

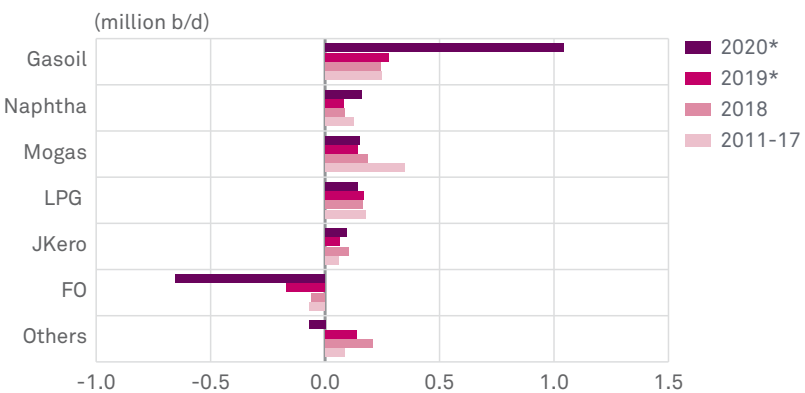
Asia is set to benefit from IMO 2020 more than most other regions due to its surplus of gasoil and the relatively high complexity of its refineries.

China and India are well-placed to benefit from the bunker spec change with their high ratios of coking and hydrocracking versus crude distillation capacities.

Japan as the major LSFO producer and South Korea as a large gasoil exporting country will also stand to benefit from high distillate cracks.

The IMO bunker spec change in 2020 will be the most disruptive event to hit the refining sector in decades, even as Asian refiners have made concerted efforts to supply compliant fuels. But Asia's rising surplus of gasoil will help to ease the region's transition.

Asian product demand growth by year



*Forecast
Source: S&P Global Platts Analytics

The IMO 2020 spec change will have a widespread effect on price spreads of refined products. Specifically for middle distillates, cracks are likely to increase significantly in the fourth quarter of 2019, and peak sometime in early 2020. Both HSFO flat prices and cracks are expected to fall in 2020.

Installation of exhaust gas cleaning systems, also referred to as scrubbers, is one alternative solution that the shipping industry can choose, leading to the continued use of some volumes of HSFO. Other solutions for the shipping industry include LNG bunkers, and the use of other fuels meeting the sulfur requirements, or simply non-compliance. But these are expected to represent a tiny percentage of bunker fuels used: Platts Analytics expects that the compliance rate will be high.

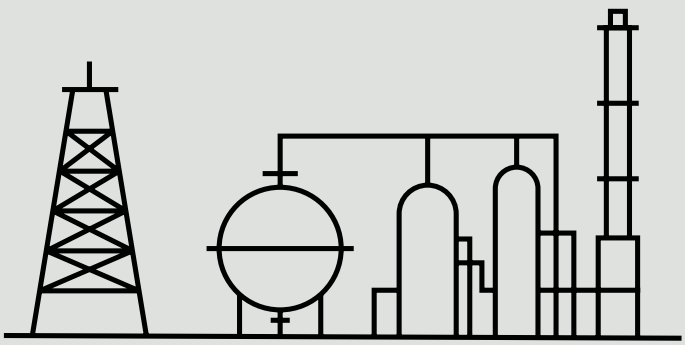
The change will also mean a significant shift in the composition of Asian oil demand, with the gasoil share rising by 2 percentage points from 2019 to 2020 and fuel oil share declining by 2 percentage points.

Singapore, as the world's largest bunkering hub, will have to make major changes. Singapore's product demand composition will undergo a drastic change, with HSFO demand dropping in 2020 while demand for MGO and LSFO rises. Market participants are keeping an eye on how Singapore will gear up to meet its bunker demand. Singapore is the world's largest bunkering market and today imports huge volumes of HSFO.

In 2020, Singapore will still be a net importer of HSFO as vessels installed with scrubbers will continue consume the fuel, but most of its demand will switch to 0.5% LSFO and MGO, creating new challenges to its supply chains.

Overall, the changes are likely to benefit refining in Asia, which is long on gasoil, and the major bunker suppliers and China are developing supply options for LSFO. The Maritime and Port Authority of Singapore (MPA) is working with stakeholders to ensure an adequate availability of compliant fuel oil at its port ahead of 2020, with a list of suppliers made available in mid-2019.

Since 2000, Asian refiners have added substantial volumes of refining capacities as well as upgrading



Conversion capacity

Refineries range in complexity, with the more complex ones able to run heavier and sourer crudes while extracting higher yields of light products. The following are some of the conversion processes that will be pivotal to meeting shifts in product demand triggered by IMO 2020:

Coking is one of the most capital intensive refining processes. Units at a coking refinery are able to utilize lower cost feedstock (heavy sour crude oils) and manufacture primarily light products that meet environmental standards.

Hydrocracking is catalytic cracking in the presence of hydrogen, which is another capital intensive upgrading unit. Refiners use hydrocracking to move from diesel and distillate fuels in the winter to gasoline and jet fuel in the summer. It is a refiner's swing unit.

Catalytic cracking is a refining process of breaking down the larger, heavier, and more complex hydrocarbon molecules into simpler and lighter molecules. Catalytic cracking is accomplished by the use of a catalytic agent and is an effective process for increasing the yield of gasoline from crude oil. Catalytic cracking processes fresh feeds and recycled feeds.

Hydrotreating is a refinery process to remove sulfur, nitrogen and other contaminants from crude oil and other feedstocks.

Hydrodesulfurization is a catalytic chemical process widely used to remove sulfur from refined petroleum products.

Hydroskimming refers to a simple refinery equipped with atmospheric distillation, naphtha reforming and necessary treating processes.

capabilities. In fact, the region has been adding conversion capacities more rapidly than crude distillation units (CDUs) over the past few years.

India's conversion ratio – or the amount of more complex conversion capacity, such as fluid catalytic cracker (FCC), resid catalytic cracker (RCC), hydrocrackers (HCU), or coking capacity relative to CDU capacity – has improved the most among Asian refiners. It is expected to reach a new high this year after a series of upgrading works to prepare refineries for a nationwide rollout of the Bharat VI standard, which applies to gasoline and gasoil and mandates a limit of 10 ppm sulfur, equivalent to Euro 6, in April 2020.

However, China's conversion ratio is still ahead, although the improvement has slowed over the last few years. China implemented the Nation 6 standard with 10 ppm sulfur levels (equivalent to Euro 6) nationwide in January 2019.

Japan's refinery conversion ratio has improved due to CDU closures as part of the METI's Refinery Ordinance. Japan is well ahead in its preparations as it has substantial residue desulfurization facilities, which were originally built mostly to make LSFO for power generation. South Korea's conversion ratio also improved over the years due to upgrading.

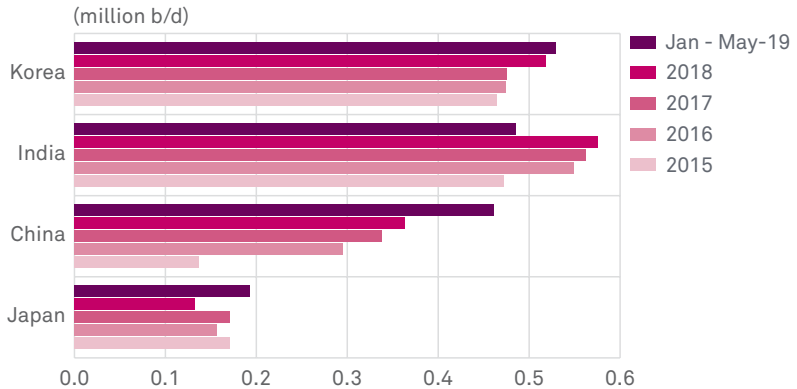
In addition, Asian refiners added significant hydrotreating or hydrodesulfurization (HDS) capacity to meet government mandates for tighter product specifications. Asia's HDS to CDU ratio has improved sharply over the last several years, and will increase further this year.

The higher conversion and HDS ratios in the region will enable refineries to have more flexibility in terms of their choices on crude slates, and more fuel oil will be converted into valuable lighter products. Asian refineries are now on a better footing to make changes to meet IMO 2020 bunker specs.

The "Big Four"

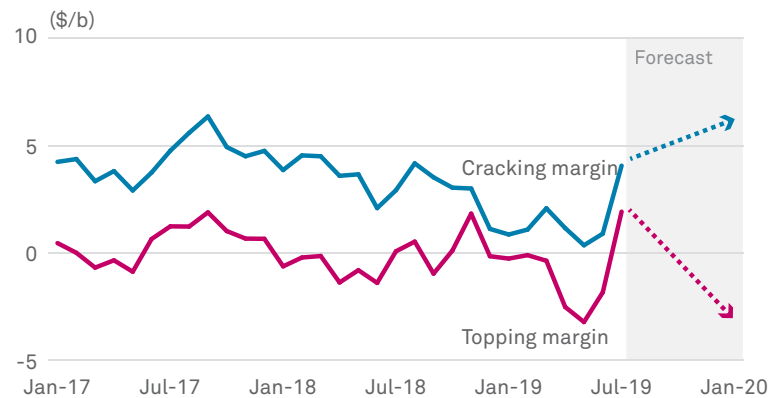
Asia's "Big Four" (China, India, Japan and South Korea) have been exporting increasing volumes of gasoil, due to higher refinery runs as demand growth moderates.

Net gasoil exports by the Asian "Big Four"



Source: S&P Global Platts Analytics

Topping and cracking margins for Singapore



Source: S&P Global Platts Analytics

Chinese net gasoil exports were up last year as a result of weak Chinese domestic industrial demand, as the country's economy slowed and moved to more services-oriented growth. South Korea net exports also accelerated last year, but India remained the top regional gasoil/diesel exporter. In the meantime, Japan's net gasoil exports declined in 2018 on a cut to refinery runs.

For 2019 as a whole, India's net gasoil exports are likely to decline in 2019 due to its robust domestic demand and heavier turnarounds as refineries upgrade to meet the mandate of Bharat VI standard (10 ppm sulfur) nationwide in April 2020.

Japan's exports, however, are expected to be slightly higher this year on the back of further declines in domestic demand despite refiners' possible cuts.

In a nutshell, Asia's net exports of gasoil are expected to rise. Platts Analytics expects Asia's net exports of gasoline to ease slightly in 2019 from last year as regional refiners shift yields toward middle distillates due to stronger distillate cracks. The shift in yields towards distillates will be more apparent come 2020 as distillate cracks strengthen further.

China has become a prominent regional exporter of gasoil. It is a minor net fuel oil importer. China is building desulfurization and conversion facilities and we expect the country to increase its share of the global bunker supply market by increasing production of compliant bunker grades. To further optimize utilization, China could import more medium or heavy sour crudes and increase coker operations, if government policy permits it.

In effect, China is well-placed to benefit from the shift to IMO 2020, particularly with its experience from the early implementation of the new Emission Control Area (ECA) rules from January 1, 2019. The rule means that any vessel entering any port in China along the coast or entering internal waters must use bunker fuels with a sulfur content of no more than 0.5%. This is essentially the same quality specification as the broader IMO specification change set to go into force in 2020.

Singapore will be a major outlet when demand for marine gasoil picks up come 2020. However, given its long distillate position, China may take the opportunity to expand its own bunkering operations.

India is the largest regional net exporter of gasoil and a very minor net importer of fuel oil. Indian refineries are relatively well positioned to deal with challenges associated with bunker spec changes under IMO 2020 owing to their high level of coking and HCU capacity relative to FCC, which would allow refiners to produce more gasoil than gasoline. State-owned IOCL, for

instance, has already carried out detailed tests to advance the production of low sulfur fuel oil compliant with IMO's 2020 rule and aims to start supplying cargoes commercially from September 2019.

Japan is a regional minor net exporter of gasoil and a very minor net exporter of fuel oil. Japan is not currently a major bunker center. But it has substantial residue desulfurization facilities. These were originally built mostly to make low sulfur fuel oil for power generation, but have since been repurposed into refinery conversion unit pre-treatment facilities (to help meet low sulfur diesel and gasoline specs). It is likely that some of these could be shifted back into fuel oil service. That could provide LSFO both for the modest local bunker market, and perhaps more likely, as an export to Singapore.

South Korea is a major regional net exporter of gasoil/diesel and a minor net importer of fuel oil, and will stand to benefit from high distillate cracks in 2020. The country is a mid-size player in the Asian bunker fuel market. Refiners in the country are ramping up investments to destroy high sulfur residue and boost production of lighter and lower-sulfur products.

In summary, the IMO bunker spec change in 2020 will be the most disruptive event to hit the refining sector in decades even as Asian refiners have made concerted efforts to supply compliant fuels. However, Asia's rising surplus of gasoil will help to ease the region's transition. IMO 2020 will drive up demand for gasoil and drive down demand for HSFO, increasing the price differential between the two.

The surplus of gasoil in the region will tighten with a substantial increase in gasoil demand as a result of the spec change. Power generation's use as a sink for HSFO is likely to increase come 2020. In Asia, Bangladesh and Pakistan will have the potential to increase their usage of HSFO, but the Middle East and perhaps Russia will absorb a substantial part of the surplus.

In the longer term, as the demand for HSFO bunkers begins to grow post-2020 as a result of ships adding scrubbers, and as additional conversion and residue desulfurization capacities start up, spreads will narrow and the historical Singapore HSFO arbitrage could return. ■

Additional analysis by Rick Joswick and Chris Midgley, S&P Global Platts Analytics

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Canadian Energy Pipeline Association

Insight Conversation: Jane Ren

Jane Ren, CEO of disruptive technology company Atomiton, talks to Paul Hickin about opportunities in the energy sector and the challenges faced by big oil

The mainstreaming of artificial intelligence and machine learning will have a profound impact on the industrial sphere, not least in energy industries.

Whether companies are active in the upstream, midstream or downstream segment, they face enormous pressures to control cost while living up to societal demands for environmental stewardship and a wholesale shift to cleaner forms of energy.

Energy companies are increasingly turning to digital solutions to achieve these goals. The Industrial Internet of Things (IIoT) brings into play a sensor-enabled network of interconnected devices applied to physical assets. It can help companies find operational efficiencies in the way they deploy assets, infrastructure, energy, products and, of course, their workforce.

This is part of a broader trend of reimagining operational processes and leveraging data that is familiar to S&P Global, Platts' parent company, which has invested in next-generation tech company Kensho and fintech company Panjiva.

A former medical doctor with a career spanning multiple roles at US conglomerate GE and IT company Cisco, Jane Ren founded Atomiton in 2013. She explains how Atomiton is helping to drive the next wave of digitalization, using an IoT platform to connect operational systems and transform real-time data into operational models.

What do you see as the big opportunities for technology in the energy space?

We help oil and gas companies in predictive operations using data and intelligence gathered from the field. Our software stack extracts all the raw data coming from sensors, coming from machines, coming from the

field. It is able to perform real-time analytics, generate actionable insights and then sometimes even help execute those actions into the field.

There are a few areas we see as [sources of] great gains of efficiency for the energy sector. The first is better and greater productivity of the equipment and assets in this domain. When I say assets, it includes wells that could be more productive using better analytics of their performance parameters. It could also indicate generators, machines, even drill pipes that could be better protected and maintained when we know their intelligence.

The second area to gain efficiency, surprisingly, and we see it as very immediate, is energy itself. It takes energy to transport, to generate and to transform energy. So for example in the downstream and midstream sector about 20% to 40% of operating costs is spending on burning fuel to generate heat and steam using water to drive processes. Using data and analytics people can better predict how they use energy and be more efficient.

The third area is the productivity of people. The oil and gas sector is a very people-heavy industry and the last thing you want is downtime. You don't want people going onto the rigs or to the field and to be idle there. A lot of things lead to downtime: if you don't coordinate the supply chain, they don't have tools, they don't have equipment. If you don't have the logistics right it means you run out of fuel, you run out of battery, your machines aren't working.

By having sensor data coming from the field, it is much better for operators to predict how to arrange their logistics, so people are much more productive. When you put all this together, one of the big opportunities in the mid-term is the whole range of supply chain and pricing. But without the visibility on these three factors it is hard to gain visibility in supply chain and pricing.

Some of the work we are already doing, in trying to be predictive about demand on the fuel and product and energy, and therefore respond better in supply chain and pricing structures to have better economic gains. Eventually we see all these changes driving much deeper transformation for the industry.

Is there an area in oil and gas where you see technology being of particular benefit?

Upstream, midstream and downstream all have a lot of [potential gains in] efficiencies but they are organized differently. It's much easier to find very localised problems in midstream and downstream because they are not as fragmented as upstream. When you get to upstream there are operators who will outsource to contractors, so the gains may get segmented between different parties.

Let me give you an example. One of the biggest cost components for operating an upstream drilling project is the cost of maintaining, leasing and transporting equipment, and they often get lost and are not productive. Now who cares about that? It could be the operator or it could be the contractor, and that's one area we see on the upstream side where there are efficiencies to be gained.

Secondly, the productivity of the well. A lot of companies have put their data science teams behind it and they claim to have much better resources, but it is yet to be seen how much productivity is to be gained by doing analytics on a well.

What resistance has there been to embracing technological change in the industry?

That resistance is assumed. When we decided to look at the oil and gas industry as an opportunity area, we knew very well that the industry has often claimed to be in a race to be second. I see a couple of reasons for that. The first level is the mindset. I think the industry's process is designed to be people-heavy and scarce on information, so the processes are the hardest things to change – how people work. So if my work process includes writing on a piece of paper every day information I need to report, I need to verify, I need to make decisions based on my intuition and experience without having to rely on information or intelligence because it wasn't there, this is the way I work. I don't want to be disrupted. So the resistance often comes from the field level.

The second part of that friction is the technology is coming from a different industry, so in the past it was much more Schlumberger, Haliburton etc, who provided the best and newest technology to this industry. Now with the importance of data science and AI there are a different group of companies. There is a cultural mismatch between the companies that do data science and the ones that do hard physical engineering science. There is a resistance between those groups. However, I think the whole sector is trying and they have made a lot of progress in the last few years.

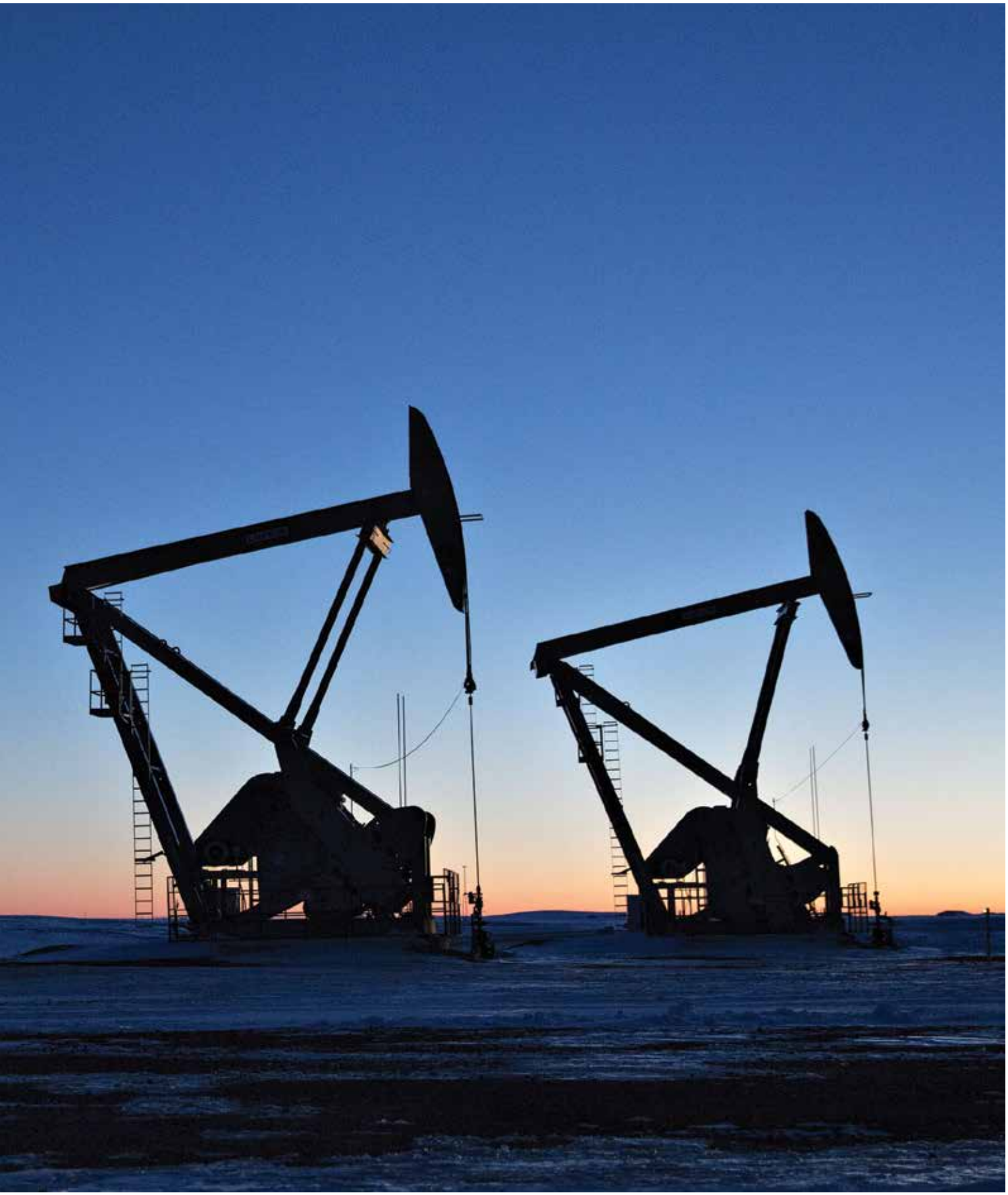
How much has the push towards efficiencies been driven by environmental pressures?

There was quite a bit of introspection around 2015 when oil prices really did nosedive, and at the same time [there was a] wake up call about the future of energy and where are the new sources of business revenue coming from. Fear about the future of energy is far greater than the tangible gain in ROI that's been checked on the books and I believe it's there, it's very complex to get there but the whole ecosystem has to stay in the game because there are no other options.

The fears come as the industry realises it has very little control of the oil price. The fear is, if we don't change things now while we still can, what if it happens again and the price continues to drop down? That's the short-term fear. Then there's the long-term fear, the prediction that in 20-30 years the use of fossil fuels will dramatically decrease, with EVs and an entire change in the energy value chain, drives major companies, the

"There is a cultural mismatch between the companies that do data science and the ones that do hard physical engineering science"

Jane Ren



likes of Shell and Chevron, to think of the future of their companies if they don't change. Of course they have examples of companies that didn't transform and that drives them from the board level to make their business more intelligent.

Since the oil price drop, the industry has, one, been talking about how to get more efficient for every barrel of oil and two, we need to look at alternatives, diversify, go to wind, go to other renewables so the risk is not so exposed.

In what geographies do you see the greatest opportunities for technology to be used in the energy sector?

I will compare three geographies that we have interactions with – they have different characteristics. A lot of the interactions we have are in the US with oilfield service companies, also with midstream and downstream companies. The benefit is that Houston, an oil hub, is fairly close to California which has mushroomed with a lot of AI.

In terms of looking at the future for renewables and how we adapt our energy strategy, Europe seems to be more progressive than the US. So we helped one of the midstream operators there save 15-20% energy, a corporate mandate. So yes, we reduce operating costs but we must reduce our carbon footprint and this is a most important priority.

I talk to quite a few national oil companies in Asia, including Thailand and Malaysia – they want to catch up in technology. So tech is a big driver for them because they feel they have been a little behind the Western world and it's an opportunity to leap forward, so they want to adopt and learn fast. But in general they are still early.

Both the energy and tech space have been traditionally dominated by men. How have you seen the challenges and changes?

I agree with you, both industries have been behind in female representation at a senior level. But this area is new and when an area is new nobody is putting a claim on this kind of profile. The winners are the ones that outperform others and make an impact. The perception of knowledge with engineering is associated with a male type of engineer and that perception needs to be changed, and that's what I'm trying to do through though leadership. ■

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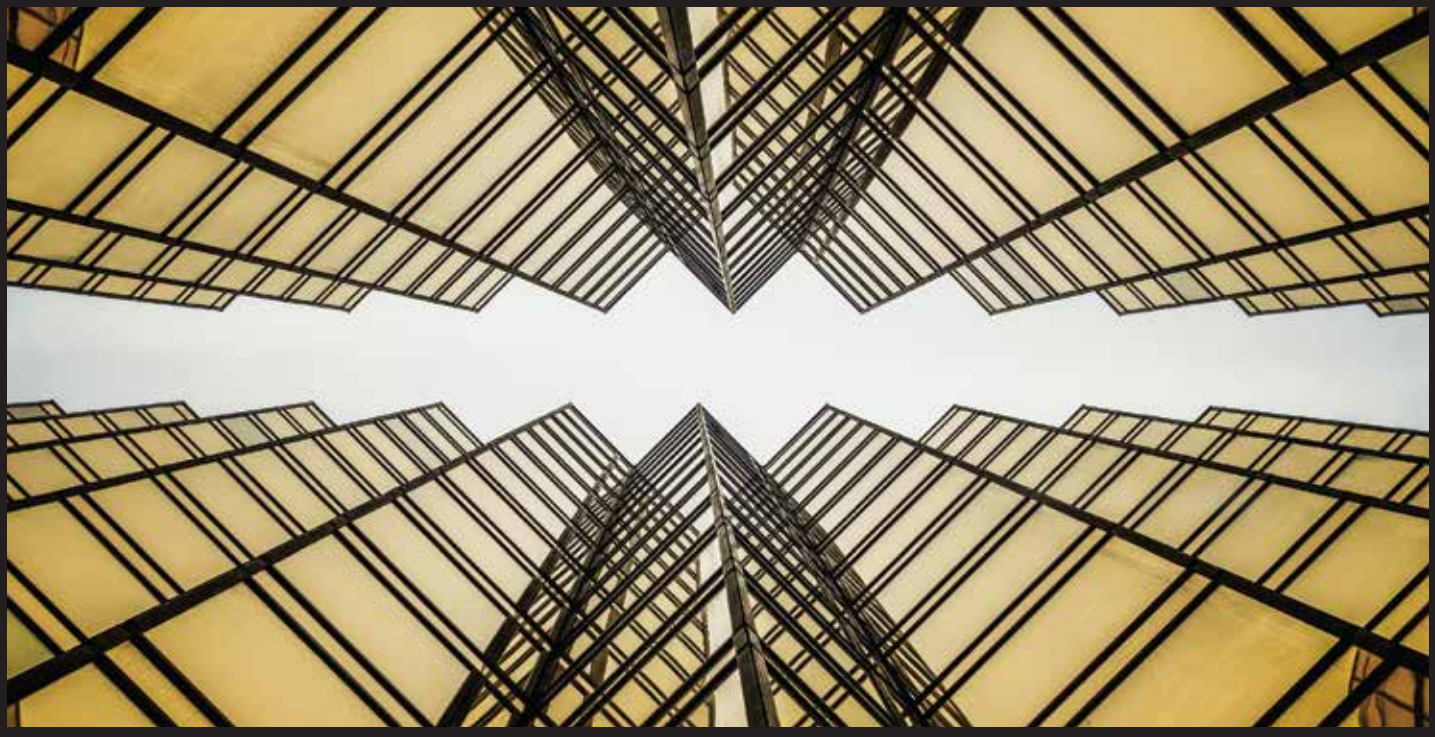

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Trading up: Fujairah's plan for growth

Despite the heightened security risks around the Persian Gulf, stakeholders in Fujairah port and free zone appear undaunted. The emirate wants to develop port facilities and new industrial projects, to attract trade across oil and energy products. By Dania EL Saadi

The Middle East bunkering hub of Fujairah may have been rattled by the recent tanker attacks in the Gulf of Oman, but officials are adamant that it will be business as usual, as the port and accompanying free zone forge ahead with diversification plans.

Fujairah is trying to compete with other bunkering and oil storage hubs like Singapore, the world's biggest, and Amsterdam-Rotterdam-Antwerp, the huge oil refining and distillate storage complex spanning the Netherlands and Belgium.

Officials and operators hope to capitalize on Fujairah's strategic position outside the Strait of Hormuz, a chokepoint where daily oil flow accounts for 21% of global petroleum liquids consumption, according to the US Energy Information Administration.

But the port and adjacent free zone in Fujairah, where two refineries and 17 oil terminals are located, are exposed to the rising tensions between Iran and the US, and have suffered a dip in bunkering activity as higher insurance premiums dissuade vessels from refueling in Fujairah, according to traders.

Iran has threatened to close the strait after the US re-imposed sanctions on Iranian crude oil exports last year, and this year did not renew waivers to eight countries to continue to import oil from Tehran.

Choppy waters

The positioning of Fujairah, one of the seven emirates that make up the UAE federation, is vital to the UAE, OPEC's third largest oil producer, which pumps about 3 million b/d, mostly from state-owned Abu Dhabi National Oil Company. The Habshan oil pipeline carrying Murban crude for export from Fujairah is the country's only oil pipeline that lies outside the Strait of Hormuz. Murban is a key oil grade for the UAE.

Officials argue that the port and zone will not be hindered by the regional tensions, while analysts believe that, although Fujairah will see continued growth in oil storage, it is likely to lose some bunkering business.

The port does not reveal bunkering data, but officials say overall throughput at the Fujairah Oil Tanker Terminals grew in May and June on the year. The throughput at FOTT excludes volumes from the Vopak jetty and ADNOC's single-point mooring facilities, which export Murban crude.

"We have seen a big upturn this year, May 2019 was our second-highest throughput [for oil products] since September 2016, when it was a boom time for the oil industry," said William List, manager of Fujairah Oil Tanker Terminals.

"It is business as usual within the Port of Fujairah, the additional safety and security measures taken mean we haven't been significantly hindered by what's been happening to the vessels [in the Gulf of Oman]," List added.

Six vessels have been attacked in the Gulf of Oman since May. US officials blamed Iran for the last two vessel attacks in June, which was also marked by Tehran shooting down a US drone.

"While the knock-on effect on the bunkering demand in Fujairah is fairly visible, the port seems to continue seeing similar flows of products [including fuel oil] in and out, i.e. trade is not impacted as much as bunker demand is," said Iman Nasseri, managing director for the Middle East at consultancy Facts Global Energy.

Neighboring Oman, whose ports lie outside the Strait of Hormuz, could potentially attract some bunkering activity in the future, especially the up-and-coming development of Duqm on the Arabian Sea, according to analysts.

Oman, the biggest Middle East oil producer outside OPEC, has its own ambitions to develop bunkering and oil storage hubs. Oman Tank Terminal Co and Occidental Petroleum signed a memorandum of understanding in 2017 to potentially store up to 2 million barrels of Oxy's crude, which could include US crude grades, at Ras Markaz.

"If you think of [a] potential alternative you can think of Duqm, which could emerge as a competitor. If they are not bunkering in Fujairah they are likely to bunker in the Mediterranean or Singapore," said Alan Gelder, a vice-president for refining at consultancy Wood Mackenzie. "Bunkering is a global, competitive business."

Expand and diversify

"We are working on attracting more investment in petrochemicals, in refining, in bitumen, in LNG, in LPG and to diversify the offered activities," said Salem Al Hamoudi, director of the Fujairah Oil Industry Zone. "We are increasingly focusing on soft growth of the area and how to emerge as a fully integrated energy hub."

As an integrated hub, Fujairah is seeking to be more than just a bunkering and oil storage center but also a place where companies trade products. In 2017, Fujairah started publishing weekly product inventories to help boost its status.

Despite analysts' reservations, there are some positive signals, including concrete steps towards the expansion of Fujairah's physical infrastructure.

ADNOC is building an underground oil storage facility in Fujairah that can store 42 million barrels of crude.

Aramco Trading Company, a unit of the state-owned Saudi energy giant, opened an office in Fujairah this year and is mulling acquiring oil storage facilities there, the trading unit told S&P Global Platts in June.

Brooge Petroleum & Gas Investment Co., a UAE company, has 400,000 cu m of oil products storage and is building an additional 600,000 cu m of capacity for crude oil, along with a 250,000 b/d refinery that it says will begin its first phase of operations by the first quarter of next year.

"There is increasing interest to invest in additional storage, especially crude and currently we are operating at a very high capacity utilization," said Al Hamoudi, though he declined to specify the utilization level.

Currently, oil and products storage capacity stands at 10 million cu m (62.9 million barrels), divided into 3 million cu m of crude and the remainder oil products. The UAE's oil and products exports stood at 2.3 million b/d and 916,000 b/d, respectively, in 2018, according to OPEC. Singapore's current estimated storage is 22 million cu m, while Rotterdam has 6.75 million cu m.

Storage capacity is forecast to reach 16 million cu m by 2023, Al Hamoudi said. Companies that own storage terminals in Fujairah include Vopak, Vitol and Mercuria.

Chris Wood, managing director of Uniper Energy DMCC, which owns a refinery at Fujairah, was bullish about the zone's prospects.

"If you look at their ambitions, the investment plans they have around the Free Zone and announcements around crude storage and crude trading, I think they will continue to grow as a significant trading hub for the Middle East," said Wood.

"We've been through this [tanker attacks] once before in the 1980s and it didn't change the Middle East as far as crude exports and crude storage."

During the 1980-88 Iran-Iraq war, hundreds of tankers were attacked in the Persian Gulf and the US got involved when Kuwait asked Washington to help protect its tankers. Throughout that war, the Strait of Hormuz remained open.

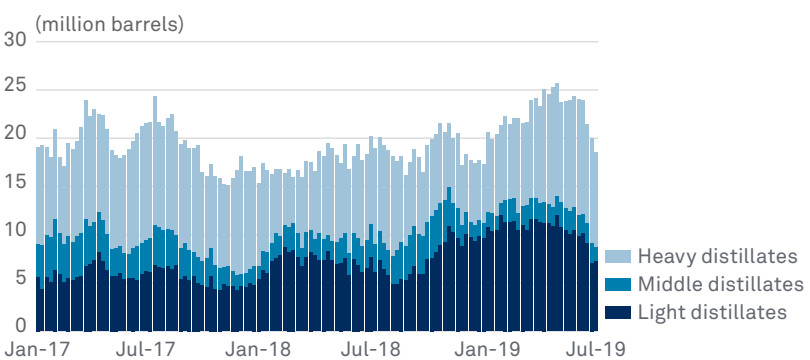
LNG and beyond

Meanwhile, Fujairah is also eyeing developing an LNG terminal as part of its diversification plans.

"We are promoting the idea of an industrial use of an LNG terminal, with a branch activity serving the offshore demand for ships that require LNG," said Al Hamoudi. "We have interested parties to start LNG bunkering in Fujairah. It is a question of time and demand, when the LNG bunkering will be available in Fujairah."

This is not the first time that an LNG terminal project has been discussed in Fujairah, however. The Abu Dhabi government-owned Mubadala Investment Company had previously mulled setting up an LNG import terminal, but the project was shelved.

Fujairah oil product stockpiles



Source: S&P Global Platts

Fujairah City, the capital of Fujairah, which is eager to grow into an oil and products trading hub

Fujairah is not the only place eyeing the role of LNG bunkering hub. Last year, Oman signed an agreement with France's Total that includes the possibility of establishing an LNG bunkering unit in the port of Sohar.

"An increasing number of new ships are choosing LNG as a fuel and LNG bunkering could be quite a differentiator for Fujairah and make sure they are on the global network of LNG bunkering hubs, that could be one way of attracting volumes," said Wood Mac's Gelder.

"LNG as an industrial fuel, that could be a good thing for companies in that region because they should have access to relatively low cost and relatively clean fuels which enhances their competitive position."

The other two smaller projects Fujairah is focusing on are LPG terminals and a bitumen refinery.

"We are exploring the potential of establishing a bitumen refinery," said FOIZ's Al Hamoudi. "Bitumen is a commodity that is required for each country and I believe we are importing some of our local consumption of bitumen. Such a specific project is going to add value to the local and international market."

Links in the supply chain

Then there is the opportunity of IMO 2020, which could provide Fujairah with increased volumes, according to officials. From next January, the International Maritime Organization will reduce the permitted content of sulfur in marine fuel to 0.5% from the current 3.5%.

The two existing Vitol and Uniper refineries in Fujairah can produce low-sulfur fuel oil, and Brooge's refinery currently under construction should add to this capacity from early 2020.

"Having two refineries in Fujairah both capable of producing compliant fuel oil [0.5% LSFO] and the blending capabilities of the terminals within Fujairah places the port in an ideal situation to capitalize on opportunities to grow the bunker business further," said FOTT's List. "Fujairah historically has been known as a blending hub, and going ahead products will need to be blended and we have the flexibility to do all that."

Putting aside the hostilities in the region, analysts say that Fujairah needs a differentiating factor and a role beyond bunkering to continue to grow. Just as Singapore grew out of establishing a refining and petrochemical hub, Fujairah may need to follow a similar path.

"Singapore has refining and petrochemical projects and that gives them the opportunity for trading not only in crude but also in products and intermediates, which is how you can get a much more diverse portfolio of products moving in and out and that's what you need to really become a major trading hub," said Wood Mac's Gelder.

Aramco's opening an office in Fujairah and potentially trading from there could be a lodestar for the emirate, its port and its oil zone.

"All of those plans will certainly help Fujairah's role to expand beyond a major bunkering and storage hub, to something close to Singapore and ARA, towards becoming a major trading hub," said FGE's Nasseri. ■

Additional reporting by Claudia Carpenter

South African gold loses its shine

South Africa's gold production is in decline, with platinum group metals looking increasingly lustrous by comparison, and other countries such as Ghana becoming more attractive destinations for gold producers. Filip Warwick reports

South Africa has some of world's biggest reserves in gold, platinum and coal, and mining continues to be a core industry, contributing more than 29% of the country's exports in May 2019. But South Africa's traditional gold industry has lost some of its shine over the last few decades, with gold production in steady decline.

During the past two decades, gold mining companies have experienced only two years of positive annual growth in gold production, with South Africa producing 83% less gold in 2018 than it did in 1980, according to Statistics South Africa. The sharp decline in gold output is remarkable, given that South Africa has the world's second-largest reserves of the metal, according to estimates from the US Geological Survey.

The state of the industry has raised political hackles. In July, Kevin Mileham, opposition spokesman for energy and natural resources, told parliament that mining was dying "not because the mineral resources are running out, but because of government ineptitude, poor policy choices and militant trade unions."

"[Mining] is dying because investors no longer wish to put capital into a country where the word of the government is no good," Mileham argued.

He was responding to a statement by Gwede Mantashe, the minister for natural resources and energy, who said South Africa remained a highly attractive destination for mining. Mantashe noted there were 61 prospective mining projects in the pipeline with an investment value of more than $7.7 billion. Those projects could create as many as 32,000 jobs, he said.

The share of South African GDP from mining was 7.2% in 2017, a fall from 21% in 1970. However, it continues to make up around 29% of exports and employ over 464,000 people who support some 4.5 million dependents, according to the Minerals Council South Africa, an industry group.

But in order to keep extracting gold from maturing mines, operators are having to dig deeper amid high labor costs, regular strikes and escalating prices for electricity from South Africa's state-owned monopoly Eskom. The difficult operating environment appears to be benefiting Ghana, which is attracting significant new investments from major miners.

Another consequence of the difficult gold mining conditions, in combination with soaring palladium prices, is a shift in focus for miners active in South Africa towards platinum group metals.

Costs struggle

South Africa's gold mining sector has for some time struggled with ever-growing production costs at its deep mine operations and union strikes.

In the second quarter, AngloGold Ashanti, the world's third-largest gold mining company, started a process to review divestment options for its South African assets, including the sale of its Mponeng gold mine, one of the world's deepest.

The gold miner has encountered challenging operating conditions as a result of the depth of the mine, high labor costs, which have contributed to reducing margins, and insecure power supplies that resulted in blackouts. Eskom, which provides more than 90% of South Africa's electricity, cut power across the country in the first quarter of the year due to low coal supplies and an ageing power network.

"Mantashe's 61 prospective mining projects should be interpreted as a reinforcement of President Cyril Ramaphosa's message during his state of the nation address – that Eskom is a fundamental expenditure," said Indigo Ellis, an analyst at research and consultancy firm Verisk Maplecroft.

According to its financials, the company's debt stands at $29.5 billion.

Then there's the issue of industrial strife. In April, striking workers at Sibanye-Stillwater's Driefontein, Kloof and Beatrix gold mines agreed to end their industrial action after five months. Sibanye-Stillwater estimates monetary losses from the gold strike at about $114 million, said Henrika Ninham, investor relations manager.

South Africa's largest gold producer, the company's output in the first quarter of 2019 was about 104,000 oz of gold, or 36% of its production in the same period of 2018, due to the impact of the five-month strike.

Going to Ghana

South Africa's gold miners are looking for potential projects that will generate a higher return and quicker payback periods. This has prompted operators and investors to look to other countries, with Ghana being the top destination.

Back in 2017, gold production numbers still presented South Africa as the continent's top gold producer with output of 4.4 million oz, according to the Minerals Council South Africa. Nevertheless, the West African gold mining hub was clearly making concerted efforts, with Ghana producing 4.22 million oz, according to Ghana's Chamber of Mines. Burkina Faso's Ministry of Mines said the country produced 1.4 million oz of gold in 2017 while Mali's Ministry of Mines indicated output of 1.5 million oz gold.

Ghana's Chamber of Mines said the country's gold output increased by 14% in 2018 to 4.8 million oz, overtaking South Africa's output of 4.2 million oz for the first time and making it Africa's largest gold producer.

The sharp decline in gold output is remarkable, given that South Africa has the world's second-largest reserves of the metal, according to estimates from the US Geological Survey

AngloGold Ashanti now sees Ghana as the number-one gold producer in Africa, with mining operators in Ghana benefiting from low cost mines, friendlier policies and new development projects.

The latter include AngloGold's plans to reopen its Obuasi mine project this year, following its closure in 2014, with the redevelopment project expected to take about 30 months. Ghanaian President Nana Akufo-Addo said in January that the total investment is projected to be $1.6 billion, covering the expected 22-year lifespan of the mine.

AngloGold is not alone. Newmont Goldcorp, one of the world's largest gold producers, is also operating in the West African country. And South African gold miner Gold Fields operates Tarkwa, described as one of world's largest gold mines. Between its Tarkwa and Damang mines in the country, Gold Fields produced 710,000 oz of gold in 2017.

Other major miners active in Ghana include Perseus Mining, Kinross Gold and Golden Star Resources.

PGM attraction

Platinum group metals look like an increasingly attractive play for South Africa's miners. Mining production statistics from May 2019 show the country's production down 1.5% year-on-year, the seventh consecutive month of decline, according to Trading Economics. One of the largest negative contributors was gold, down 24.4%. Over the same period, PGMs saw an increase of 6.8%.

Last year, margins for South Africa's platinum miners were negative on average, as the industry made an aggregate loss, with capital expenditure less than a billion dollars, said the Minerals Council South Africa. But a surge in palladium prices has thrown struggling South African mining companies a lifeline. In July, the LME palladium cash price hovered around the $1,550/oz mark, a year-on-year increase of 60%. The overall increase in the basket price of PGMs in South Africa was largely due to palladium.

Besides cutting thousands of jobs in its gold mines, Sibanye-Stillwater is diversifying into PGMs in a bid to reduce costs. Higher profits from its PGM operations offset a loss from its gold mines.

South Africa's Anglo American Platinum forecast an 80% increase in earnings for the six months that ended June 30, as a result of a higher PGM prices. For a producer like Anglo American Platinum to maintain an increase in earnings, the miner will need to maintain a high PGM basket price.

"Like many PGM miners in South Africa, they are critically reliant on the rand price. Should the PGM and rand price remain at its current level, next year's earnings will remain flat," FNB Wealth and Investments analyst Wayne McCurrie told S&P Global Platts.

Despite the crisis in South African mining, producers of PGMs appear to be best placed to weather wage negotiations with various South African unions as they have bolstered war chests after increased production and rallying prices.

But even they are still vulnerable, said McCurrie. "Should the rand strengthen tomorrow, their earnings will go down and perhaps even will go backwards because they have big cost increases – increases of 10-15% in electricity and 7-8% in wage union negotiations."

Strike risk looms large

That's not the only labor issue miners are having to worry about. In 2014, the Association of Mineworkers and Construction Union led the longest-ever platinum mining strike in South Africa, costing the platinum mining sector around about $2 billion in revenue.

"Unions have a mandate from their members and are likely to play brinkmanship," Wits Business School associate professor Mzukisi Qobo told Platts. "This is also likely to be so since platinum mining companies

have registered windfalls and returned value to shareholders in the recent past."

Last June, AMCU, the majority union in the platinum sector with over 250,000 members, had argued for a monthly basic wage of R17,000 ($1,200) for its members. Any prolonged strike in the sector will further damage confidence at a time when peace is required to focus minds on stabilizing the economy, said Qobo.

"All players – unions, mining industry, and government – are aware of the grim realities in the economy. Any strike in the [mining] sector would be akin to self-mutilation as there will not be any winner," said Qobo.

South Africa's GDP fell by 3.2% in the first quarter of 2019, according to Statistics South Africa, the most recent figures available as Insight went to press.

"South Africa is already entering recession territory. It simply cannot withstand another strike in the sector," Qobo said. "There is usually a snowballing effect of strikes in key sectors such as mining... A strike in the platinum sector could see a fireball spreading to other sectors."

During a five-month strike by AMCU in 2019, the union threatened to shut the country's gold, platinum and coal mines.

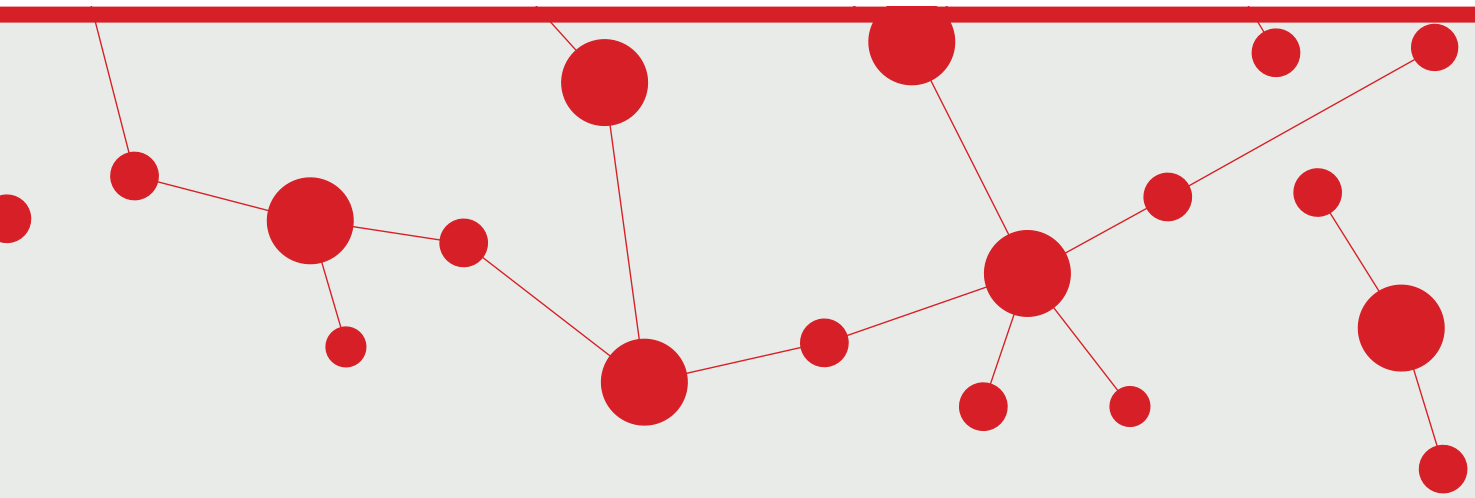
Still, it is possible that President Ramaphosa will persuade the industry and the unions to reach some settlement to preserve stability in the economy, Qobo said.

"He has some cards to play with the unions since he conceded ground to include known union leaders in his cabinet, however, nothing is guaranteed, it all depends on how government gets involved in mediating a potential industrial conflict early on; and whether the industry and the unions can reach some satisfactory middle-ground," Qobo said.

Several years of regulatory stability and concerted action to tame the power of militant labor unions would be required to repair South Africa's reputation among investors, said Verisk Maplecroft's Indigo Ellis. Even if platinum miners see off the challenge from unions, their operations in South Africa would still face pressure on multiple fronts, he said.

While PGMs look more interesting than gold, they may be the best of a bad bunch.

"The hurdles to operating successfully in South Africa could be attracting miners with stronger risk appetites, who will come up against strong freedom of bargaining and social license-to-operate concerns," said Ellis. ■



#ChangePays in energy

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Lead Author
Maya Weber

Research
Kent Berthoud
Andrew Cooper
Ashleigh Cotting
Simon Heald

Editors
Katie Darden
Valarie Jackson
Chris Newkumet
Mark Pengelly

Data Visualization
Martina Klancisar

Chair, S&P Global Women's Research Council
Alexandra Dimitrijevic

Women's Research Council Task Force
Fiona Boal
Rose Marie Burke
Beth Burks
Allison Good
Nathan Hunt
Andrey Nikolaev
Annette O'Hanlon
Gareth Williams

Content Project Manager
Carrie Bharucha

Global Head of Market Insight
Sarah Cottle

Global Head of Pricing
Dave Ernsberger

Global Head of Analytics
Chris Midgley

Foreword

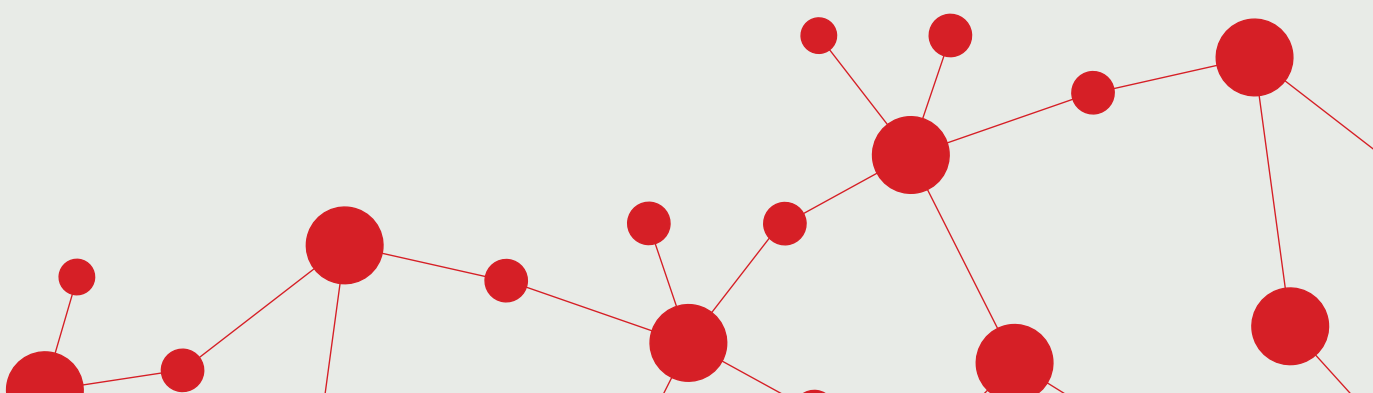
As a woman and executive, I am proud to share with you our *#ChangePays in energy* report, whose original research finds the energy sector worldwide has indeed made progress in the area of gender diversity.

Why is this important? At S&P Global, through our #ChangePays campaign, we are discovering the many ways diversity "pays." So far, our research has explored the benefits of increased female participation for the capital markets specifically, and the world economy in general. We hope to learn more through our newly created Women's Research Council, which aims to harness data and expertise across the divisions of our company.

Importantly, the findings add to the conversation about gender diversity in business. If there is a bottom line, it's positive: women's participation in boards and senior executive roles in the energy industry is accelerating.

The number of women in senior management and boards in companies of the S&P Global BMI Energy and Utilities indices more than doubled over the past two decades, approaching 15%, the average figure for most other industries.

That figure hides wide disparities, with New Zealand at close to 30% and South Korea and Japan near to 2%-3%. Progress is also slower in the C-suite, with utilities in particular continuing to do a better job than other energy firms.

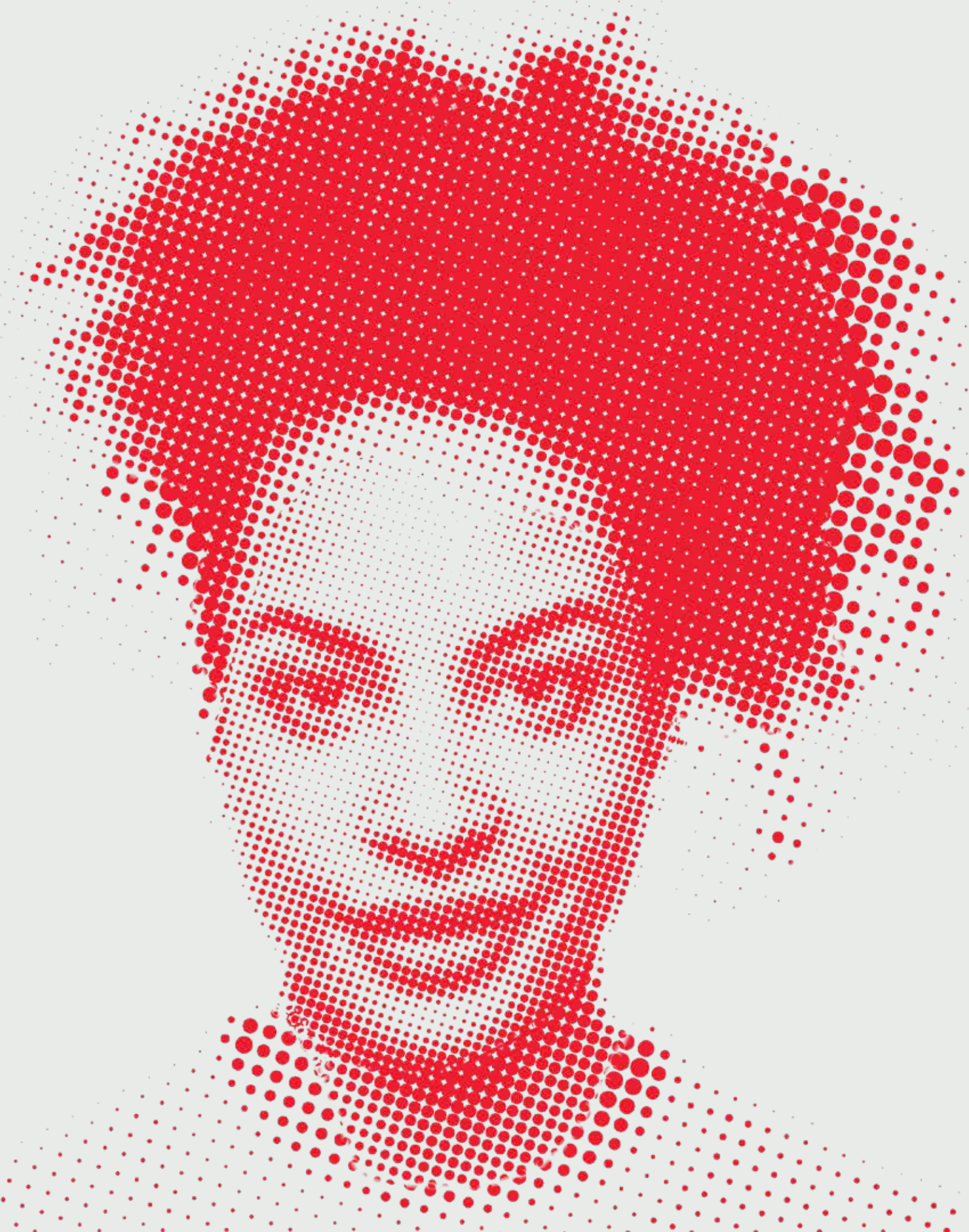


In commodities, a survey by S&P Global Platts shows that 60% of industry executives are optimistic that they can change. And what about the renewables sector, which some say represents the future of energy? Surveys generally find that, while renewables companies have a larger proportion of women, there is still work to be done, again at the C-suite level.

You'll also hear directly from senior woman industry executives and regulators, through 12 exclusive interviews. I was inspired by Patti Poppe, CEO of CMS Energy. She sees progress at CMS, where 45% of board members are women, as are about 30% of its officers. To get there, "there was definitely intentionality," she says, such as having diverse selecting panels so as to minimize bias, but also "to some degree we happened to find extraordinary women."

I hope this report will provide you with the data, analytics and insight needed to set intentions, take action and to make change pay.

Alexandra Dimitrijevic
Global Head of Research, S&P Global Ratings
Chair, S&P Global Women's Research Council



The changing face of energy

Growth in women's representation in energy leadership positions has increased in the past 10 years, but there's still a long way to go. Maya Weber reports, with research by Kent Berthoud, Andrew Cooper, Ashleigh Cotting and Simon Heald

Women now occupy less than one-fifth of senior leadership spots at energy companies around the world, but trends this decade show growth for women on boards of directors, in career paths leading to the executive suite, and at the C-suite level.

That's according to an analysis of companies around the world that are constituents of the S&P Global BMI Energy (Sector) Index and S&P Global BMI Utilities (Sector) Index. The analysis, by S&P Global Platts Analytics and S&P Global Market Intelligence, was based upon a dataset of personnel compiled by S&P Global Market Intelligence.

Gains were most visible on boards, where efforts to diversify are more established, with an added push from investors and, in some places, regulation (see figure 1).

The share of female board members in the S&P Global indices nearly doubled since 2000 to reach 15% for the energy sector on average. Growth in this decade was more than twice that of the last decade.

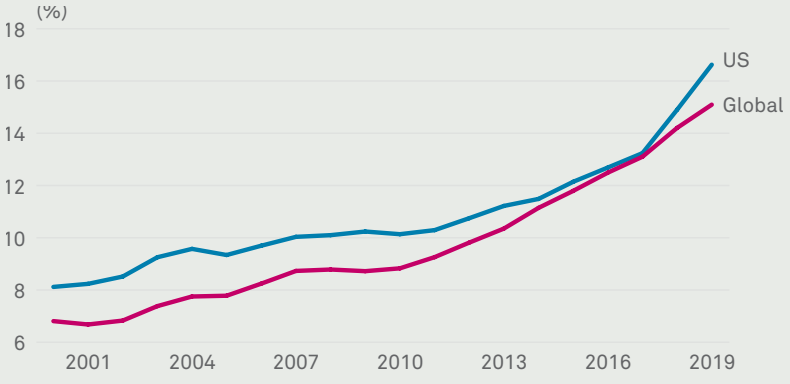
While it is unlikely that growth in women's representation on boards would continue at the current rate, this would see energy boards attain 50-50 gender parity by 2058. Based on the same assumption, US boards would reach parity sooner, by 2044.

Comparing the energy and utilities indices with the S&P Global Broad Market Index as a whole, the energy sector since 2013 has closely tracked the broader swath of industries when it comes to female board representation (see figure 2).

However, there were differences within the global energy sector – with subsectors such as utilities; renewable electricity; oil, gas and coal; and independent power producers seeing significant variations (see figure 3).

Reaching further down, the analysis considered a category that included senior managers and executives in an effort to get a look at the pipeline feeding into the highest levels. One of the common explanations for why there aren't more women in the C-suite is that there aren't enough women a step below to promote.

Figure 1. Female board members in energy



Source: S&P Global Market Intelligence, S&P Global Platts Analytics

Women filled 15% of those senior manager pipeline spots in 2019 on average for the energy sector, up from less than one in 10 in the early 2000s (see figure 4).

Representation in the powerful C-suites, encompassing top leaders such as the CEO, chief operating officer and chief financial officer, has been at slightly lower levels. If the current rate of growth does not increase, it could take until the 2090s for energy C-suites to reach gender parity.

Women now occupy 13% of C-level executive slots in the global energy industry, still less than one in eight, the data showed, but that's almost doubled since 2000 (see figures 5 and 6).

Fiona Boal, head of commodities and real assets at S&P Dow Jones Indices, drew attention to the growing share of women in the senior manager ranks, but said it was still to be determined whether those women would take the final step into the C-suite.

"The fact they're there has to be encouraging," she said, however, "you can have a lot of women in senior management roles, but they ... often wrongly are perceived not to be in the path that takes you into the senior levels of running a company." That could include fewer women in operational, mainline or revenue-generating parts of the business that often feed into the C-suite.

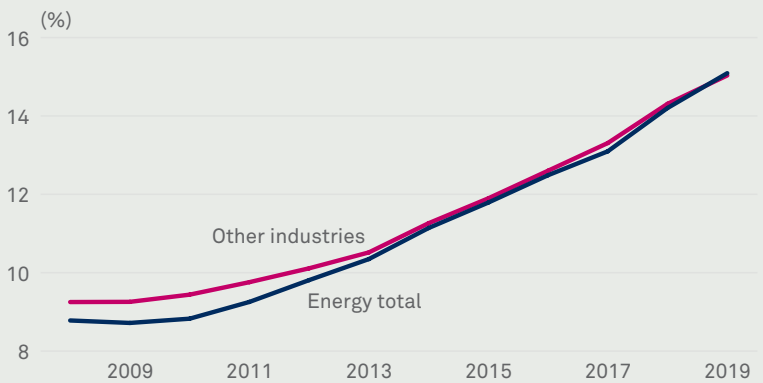
Caren Byrd, managing director for investment banking at Morgan Stanley, said, "I'm happy to see [the

The share of women on utility boards globally rose to 17% in 2019, from 12% in 2009

numbers] going in this direction." The gains in the board numbers are important for diversity because, "it starts at the board ... it's the board that picks the C-suite," she noted. Boards also plan for succession of CEOs.

There were variations by region. The US maintained a small lead over the global average in energy sector C-suite representation at about 2% higher since 2000;

Figure 2. Female board members in global energy vs other industries



Note: Other industries based on S&P Global BMI (all sectors)

it also currently exceeds the global average for boards. Southeast Asian countries like Thailand, the Philippines and Malaysia were among the highest performers in the indices, while elsewhere in Asia, Japan, South Korea and Pakistan trailed (see figure 7).

Utilities consistently beat the energy sector average, as well as oil, gas and coal companies in the share of women in all three categories: board, C-suite and senior manager levels.

The oil and gas sector, though, has been making similar gains to utilities, just starting from a lower level.

The share of women on utility boards globally rose to 17% in 2019, from 12% in 2009.

In power and utilities, expectations have changed about the pool of candidates to be considered for boards.

"At this point it's a given, it's understood, that the slate [for boards] has to really be well-represented ... for gender and ethnic diversity," said Jennifer Rockwood, who leads the power and utilities practice at recruitment firm Russell Reynolds.

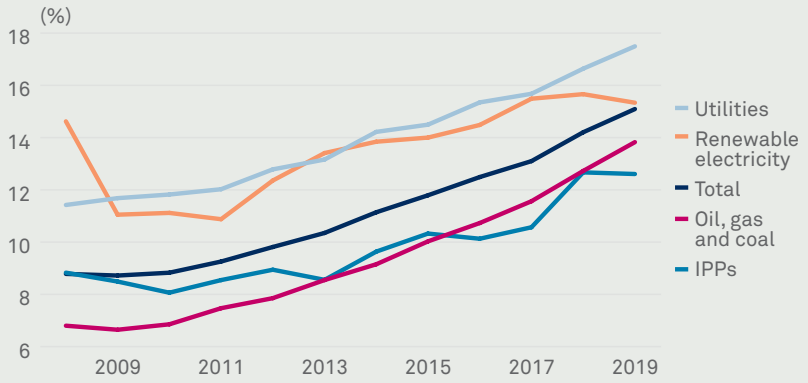
Complementing the data analysis, S&P Global Platts interviewed more than a dozen female leaders about their perceptions of gains, hurdles and efforts underway related to gender parity.

A frequent refrain was that their companies or organizations had embraced research findings that teams with diverse representation have better performance outcomes, make better decisions, or see more innovation. Several cited the importance not only of gender, but also other underrepresented groups when seeking to increase diversity, noting numbers are substantially lower for women of color.

With the share of women on boards still below one in five, some suggested energy companies should look beyond the traditional roles feeding the director positions.

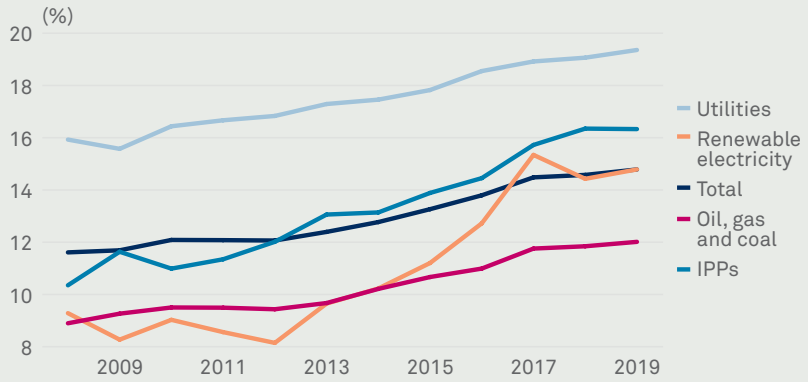
"If they broadened the searches a little bit, they'd probably just naturally get more diversity," said outgoing FERC commissioner Cheryl LaFleur, who was due to leave the agency at the end of August. "I think most boards are woke enough to want it, but it's been

Figure 3. Global energy, female board members by subsector



Source: S&P Global Market Intelligence, S&P Global Platts Analytics

Figure 4. Global energy, female senior managers by subsector



Source: S&P Global Market Intelligence, S&P Global Platts Analytics

in tension with the narrow pools that are sometimes considered for some of those jobs."

In the oil and gas sector, the share of women on boards reached 14% in 2019, double the level in 2009.

While that is still below one in five, some multinational oil majors blew past those averages. The board of BP is 36% female, though its executive team is still just 15% female, according to data provided by the company. Shell has approached parity, with women making up 45% of the board at the end of 2018, up from 8% in 2011, the company said. That may reflect a trend by those large companies, particularly in Europe, to advance diversity and offer generous maternity leave

and flexible work schedules, the lack of which can still frustrate women in smaller companies.

Compared with smaller peers, Maria Victoria Zingoni, Repsol's executive managing director of commercial businesses and chemicals, believes large, multinational companies such as hers are well-positioned to deal with issues such as diversity and inclusion, and have a responsibility to drive them forward. She said large companies in particular "understood that this is important because you don't want to lose 50% of the talent."

Zingoni also said gender diversity can put energy companies in a better position to tackle the challenges they are facing. "If you understand better your customers, you understand better your suppliers, you have a different understanding of what the energy transition means and how to approach that, you have different standpoints in your decision making and that helps you make better decisions," she said.

Despite embracing the goal of increasing diversity in senior leadership ranks, female leaders frequently cited a struggle to attract and build a pipeline of talent, from the entry level on, particularly in the energy sector where there is a high demand for people in technical positions and engineers.

"You have to have a diverse pipeline throughout your organization so that when you are making selections you do have gender in the pool," said Patti Poppe, CEO of US utility company CMS Energy. "You have to work really hard to get the limited pool of diverse candidates in the engineering positions [and] they're highly sought after."

Several also described a need to encourage women to enter mainline or operational parts of the business, or profit-and-loss centers, if they are to advance to higher levels.

"In the push to bring women forward, we pulled them into coordinating roles, and in pulling them into coordinating roles, we pulled them away from operational roles," said Christina Verchere, CEO of OMV Petrom. "They would get to a certain level and couldn't progress further up because they had a gap in their experience."

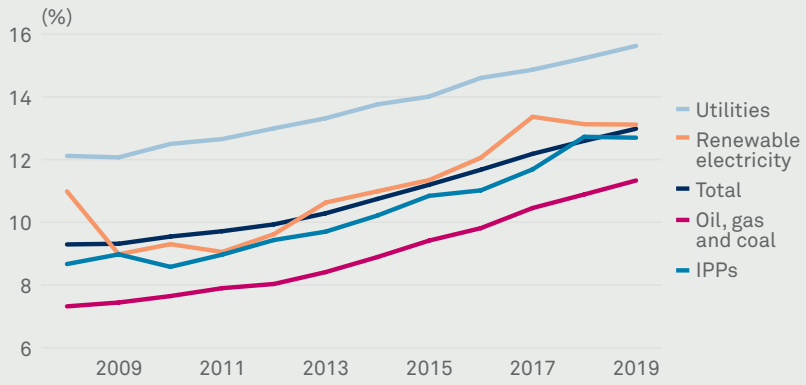
As with boards, utilities also showed higher numbers at the C-suite level than the energy sector average, though women were still below one in five. In 2019, women made up about 16% of utility C-suite spots, up from 12% in 2009, the analysis found.

Rockwood sees an upward trend of women in leadership in power and utility companies as companies are starting to see the fruits of investments in grooming the next generation of talent.

There are still challenges, but there is an "absolute concentrated focus" on cultivating the next generation, she said.

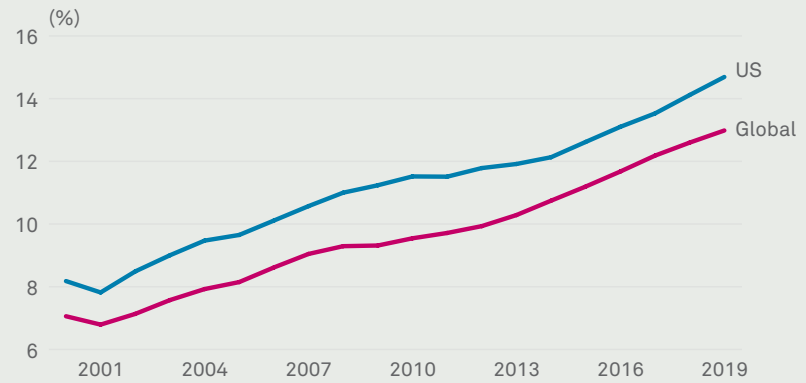
As a sign of progress in the utility space, Anne Pramaggiore, senior executive vice president and CEO

Figure 5. Global energy, female C-suite executives by subsector



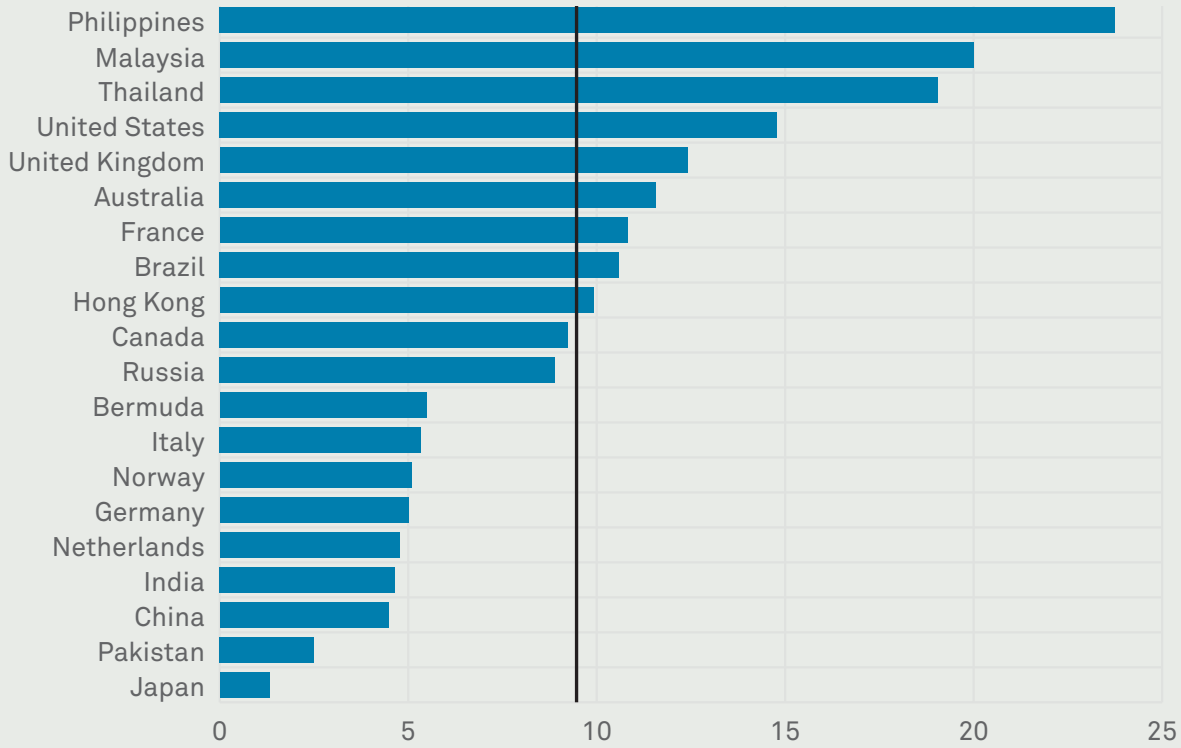
Source: S&P Global Market Intelligence, S&P Global Platts Analytics

Figure 6. Female C-suite executives in energy



Source: S&P Global Market Intelligence, S&P Global Platts Analytics

Figure 7. Female C-suite executives in energy, selected countries (2019)



Note: Includes countries with sufficient sample sizes in S&P Global BMI Utilities and Energy indices
Source: S&P Global Market Intelligence, S&P Global Platts Analytics

of Exelon Utilities, pointed to research from the Edison Electric Institute. It found that 20.9% of CEOs of US regulated investor-owned utilities were female at the holding company level.

"Some of it is a function of the skill sets that are now viewed as necessary to run their utilities. With change in the business model and technological change, people are coming to run utilities with different skill sets such as finance, or the regulatory and legal side of the business," she said.

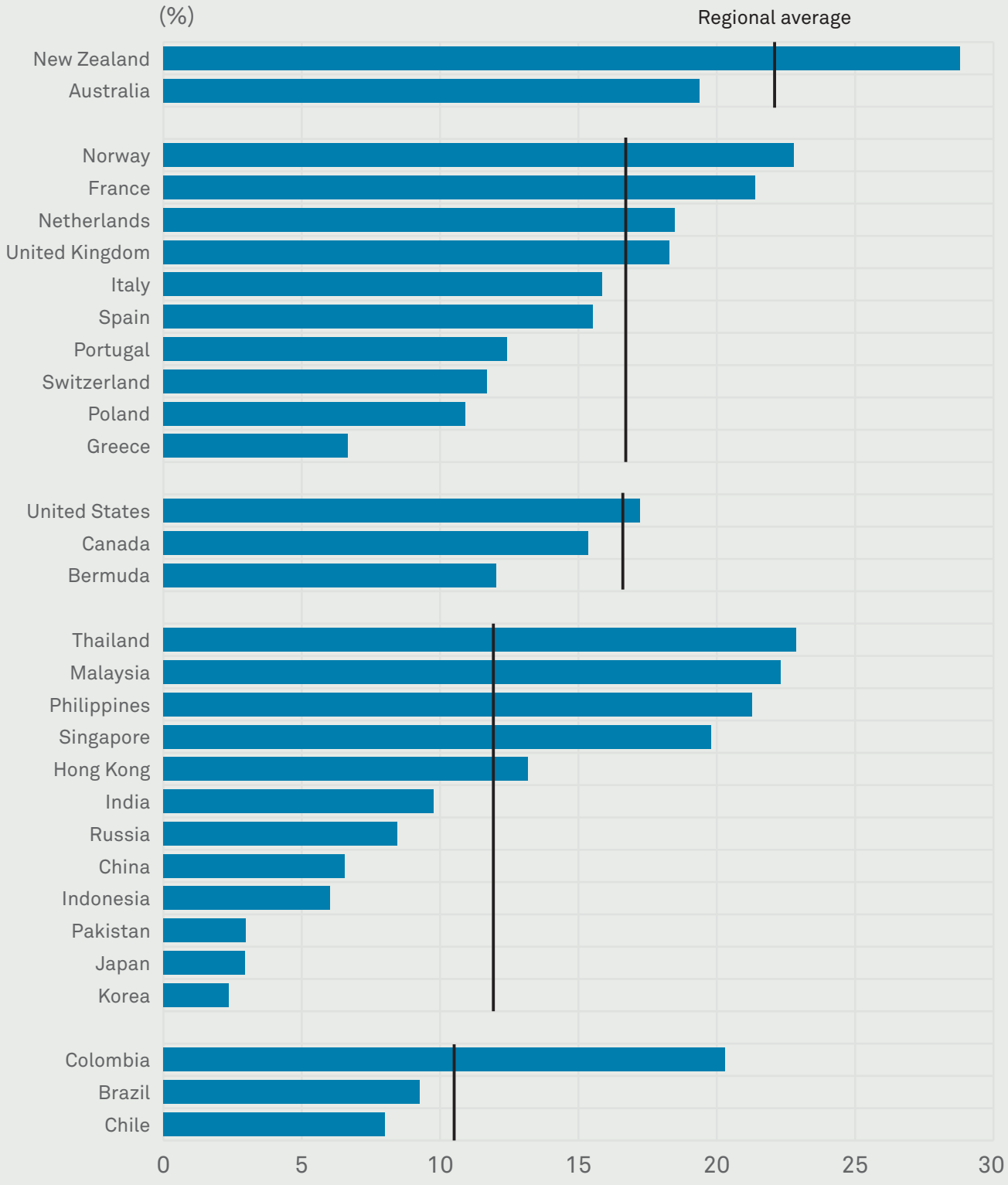
Those are areas where women probably have been present at higher levels for longer periods than in engineering and STEM, she said.

Sue Kelly, president and CEO of the American Public Power Association, said that as utilities move away from their traditional business model – of having poles, wires and generation or "keeping the lights on and the beer cold" – customers expect more, and want to exercise options using technology, she noted. That allows different disciplines to have a say, she said.

> "As much as anything, it's about getting in at the grassroots in the schools, in opening people's minds up to the sorts of jobs they can do" **Hilary Mercer**

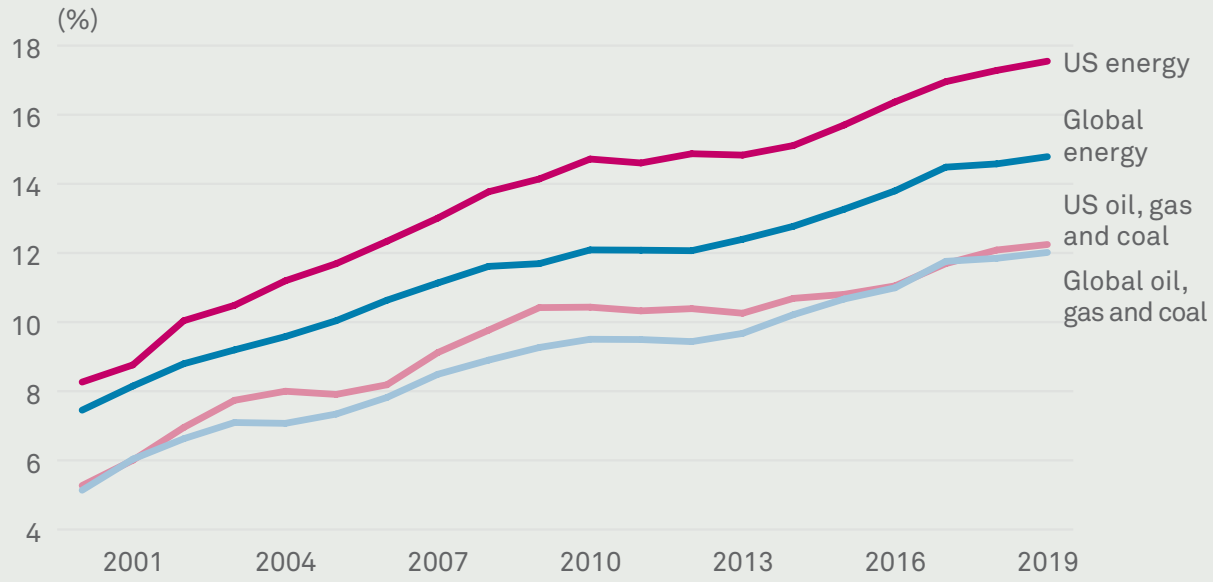
"Consumers are going to be the new asset class," offered Lisa Frantzis, senior managing director at Advanced Energy Economy and managing director at Navigant Consulting. "Everything is moving more toward a much more interactive customer, [and] the customers are not just men." Globally, she said the

Figure 8. Female board members and senior managers in energy by country (2019)



Source: S&P Global Market Intelligence, S&P Global Platts Analytics

Figure 9. Female senior managers in energy, US vs global



Source: S&P Global Market Intelligence, S&P Global Platts Analytics

value in the power sector is shifting to distribution and behind the meter, with the annual global investment by 2030 estimated at $1.3 trillion, she said.

As public-facing, regulated entities, utilities also face greater expectations to mirror the communities they serve.

Companies interviewed described efforts to bolster diverse representation at multiple levels in the employment track. Those included creating networking groups, having senior managers mentor or sponsor budding leaders, and attempting to diversify the pool of applicants considered during the hiring process. With the urgent need for employees in technical areas, these also included outreach to schools and sponsorship of educational programs.

"As much as anything, it's about getting in at the grassroots in the schools, in opening people's minds up to the sorts of jobs they can do," said Hilary Mercer, VP of Shell's Pennsylvania Chemicals. She described challenges getting over "the paradigm" that there are jobs women can and can't do.

For the oil and gas sector, drawing in diverse young recruits may be more difficult, given public perceptions of the fossil fuel industry, as well as preconceptions about the fieldwork, the need to move to remote locations, and a relatively low number of role models for women or minorities in the sector. The challenge is heightened by expected retirements and stiff competition for young talent from the high-tech sector.

Amanda Eversole, COO at the American Petroleum Institute, said there is room to help the industry clearly communicate the breadth of opportunity in the field. Jobs ranging from data scientist to supply chain specialist pay well and offer long careers, she said.

Amid challenges around public perception that could impact the ability to draw women and men, Crystal Heter, segment president, natural gas transportation, for Tallgrass Energy, said, "the industry needs to do a

better job of advocating for the measures it has taken, and the progress it has made, to be socially responsible."

Katie Mehnert, founder of Pink Petro, a social media organization for women professionals in the energy sector, and Experience Energy, a jobs platform, sees a need for oil and gas companies to embrace a "cultural shift," in which diversity and inclusion become core values, rather than a "priority" that can be set aside.

She sees a need to reach "way down" into elementary school, to talk about where energy comes from, and better tell the industry's story about its impact on humanity.

"The industry is not sought after by women and young people and minorities. Let's face it," said Mehnert. ■

Methodology

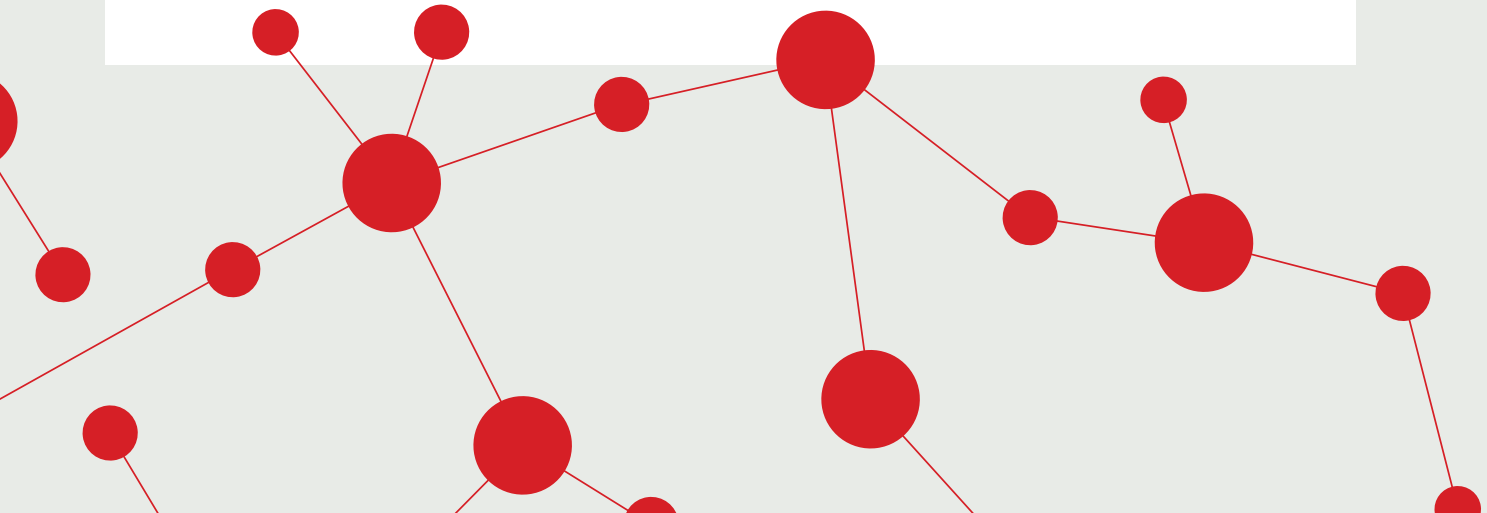
S&P Global Platts Analytics and S&P Global Market Intelligence conducted this analysis based on S&P Global Market Intelligence people data for the constituents of the S&P Global BMI Energy (Sector) Index and S&P Global BMI Utilities (Sector) Index.

The two indices include a total of 799 companies: 461 companies in the oil, gas and coal industry; 241 companies classified as utilities; 50 companies classified as independent power producers; and 47 companies classified as renewable electricity. The higher number of oil, gas and coal companies reflects the total number of publicly traded companies in existence in each category. There are more than 2,000 publicly traded oil, gas and coal companies across the globe. In contrast, there are almost 600 publicly traded utilities, roughly 180 publicly traded IPPs and about 230 publicly traded renewable electricity companies. The analysis classified companies by their primary industry, according to the Global Industry Classification Standard used by S&P Global Market Intelligence.

The renewables category includes companies engaged in generation and distribution, rather than those that manufacture capital equipment or provide technology, components and services.

For the selected companies, the analysis identified board members, senior managers and other key executives. The latter two categories included more than five dozen roles tracked in the S&P Global Market Intelligence database. Researchers identified the gender of the individuals covered in the analysis based on several factors. Honorifics in the database helped identify the gender of 85% of the individuals included in the analysis. Pronouns used in biographical data fields enabled identification of another 13.5%, and the remaining 1.5% were classified by matching first names to external sources, such as the US Census Bureau. This classification method was 95% accurate when back-tested against the known dataset.

Growth rates based on current trends used a simple linear regression, calibrated using the previous decade of data.



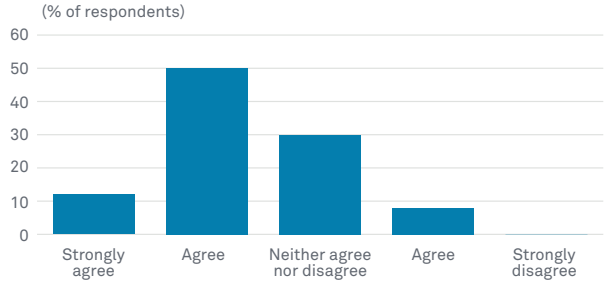
Industry execs confident about diversity, inclusion

More than three-fifths of C-suite executives in the commodities industry are confident their firms have the capacity to address diversity and inclusion issues, according to the findings of a recent survey commissioned by S&P Global Platts.

The global survey of 400 top-level executives at companies in the commodities sector asked "to what extent do you agree or disagree that your company has the capacity to address issues related to diversity and inclusion?"

In total, 62% of respondents agreed that their firms did have the capacity – with 50% saying they agreed, and a further 12% saying they strongly agreed. Just 8% of executives said their firms did not have the capacity to address diversity and inclusion.

To what extent do you agree or disagree that your company has the capacity to address issues related to diversity and inclusion?



Source: S&P Global Platts C-Insight survey

Female executives said the results were an encouraging reflection of the increasing importance of gender diversity and inclusion, but noted there was a difference between having the capacity for change and actually reaching gender parity.

"So many think that they do have the capacity to change, but there's a capacity versus a desire," said Trudy Curran, board member at Baytex Energy and the Alberta Securities Commission and former CEO of mining firm Riversdale Resources. "We all have the ability to make changes and move forward in the future; I personally don't think it will happen that fast. I see that it takes time to build the pipeline."

Most confident

While the survey also covered companies operating in the petrochemicals, metals, and agriculture industries, firms in the "oil and gas" and "energy/power" sectors were among the most confident. In the oil and gas sector, 61% of respondents agreed their companies were able to deal with diversity and inclusion, while just 5% disagreed. In energy/power, 62% agreed and 8% disagreed.

"If the industry has the capacity, then why is women's participation so meager, especially at senior levels?" asked Carole Nakhle, CEO of advisory firm Crystol Energy and founder of Access for Women in Energy, a group aimed at supporting women in the sector.

"More than 60% is an encouraging number, but then the outcomes should be much better than what we currently have. Maybe executives believe their organizations have the right intentions, but somehow there seems to be a problem with implementation."

In contrast, Maria Victoria Zingoni, executive managing director of commercial businesses and chemicals at Spain's Repsol, said she thought the sector did have the capacity to change. "I would answer positively to that," she said. "The industry is understanding more and more that diversity is an important driver of value in the company. I'd say our commitment is there."

The survey, completed in May, involved 100 C-suite executives from the energy/power sector and 50 each drawn from oil and gas, coal, petrochemicals, agriculture and metals. The minimum revenue of most companies was $320 million, with a lower threshold of $130 million applying to agriculture.

By Mark Pengelly

Patti Poppe

President and CEO, CMS Energy

CEO of CMS Energy, a US electric and gas utility, since July 2016, Poppe is an industrial engineer who took an unconventional route to the sector from a career in auto manufacturing at GM.

At the time she made the shift to utilities, she said, “my family and I were relocating a lot.”

“We were about to move to [South] Korea, and I got a job offer at DTE Energy, the local utility.” It gave her the chance to stop moving while still fully pursuing her career, and to join a sector undergoing major transformation.

She credits multiple male mentors who gave her challenges and encouraged her to stay in core operational roles, rather than support missions, positioning her well to advance.

Despite the positive attention focused on the number of female CEOs in the US electric utility sector, Poppe sees room to grow. “I do think a lot of ground has been covered. I think that’s great, but it’s still a small number – it’s like the largest numbers of the smallest numbers.”

Still, she sees progress at CMS, where 45% or board members are women, as are about 30% of its officers. To get there, “there was definitely intentionality,” such as having diverse selecting panels to minimize bias, but also, “to some degree we happened to find extraordinary women.”

“We picked them because they were extraordinary, not because they were women,” she said.

“We picked them because they were extraordinary, not because they were women”

Among the remaining challenges are cultivating a diverse pipeline throughout the organization, so there is gender diversity when the company is making selections. “There’s more work to do at the entry level,” she said, as women are still underrepresented in engineering, and diverse candidates are highly sought after. Women also don’t tend to flock to the feeder positions of line workers and in gas distribution, she said. “There’s work to be done to dispel gender bias myths about roles that have traditionally been done by men.”

To compete for top jobs, she said women need to step out of their comfort zones and into mainline jobs that give them the experiences often considered important for those roles.

While her company has “done pretty well” on gender diversity, she says “what I’ve been frustrated with in my company is representation of women of color.” Efforts to address that have included employee resource groups for under-represented populations, creating development plans for employees, and cultivating what she sees as an empowering message that differences are a strength.

Christina Verchere

CEO, OMV Petrom

Having studied economics, Verchere rose through the ranks of US oil firm Amoco and subsequently BP, after the two firms merged in 1998. She served as president of the integrated oil giant's businesses in Canada and Asia-Pacific, successively, before being appointed CEO of OMV Petrom, the largest oil and gas producer in Romania, which is majority-owned by Austria's OMV.

For Verchere, the importance of advancing women in energy is all about diversity of thought – something that enriches corporate life and helps companies to make better decisions.

Diversity of thought doesn't stop at gender, said Verchere, but also helps to foster a broader conversation about diversity and inclusion, such as sexual orientation and work/life balance, from which both men and women can benefit.

"For me, diversity of thought is the foundational principle that enhances business performance and I believe hugely in that. And that principle of diversity of thought – one aspect of which is gender – is often the lead-in conversation to other aspects of diversity," she said.

The corporate world has awakened to the benefits of promoting gender diversity, Verchere believes but, in doing so, has created a problem for itself. "In the push to bring women forward, we pulled them into coordinating roles, and in pulling them into coordinating roles, we pulled them away from operational roles. They would get to a certain level and couldn't progress further up because they had a gap in their experience," she said.

Solving this means focusing less narrowly on outcomes and more on ensuring women have opportunities across the entire business. Like others, Verchere believes that encouraging greater participation from women in science, technology, engineering, and mathematics is critical for boosting representation in the energy sector.

"That's the big focus for the industry: how do you get girls studying STEM? And then once they've studied it, how do you attract them to your industry? That's is another area where I think we're seeing more collective drive to attract girls to our industry."

Ultimately, the best path to greater diversity and inclusion may come through a variety of different routes. The corporate world is increasingly developing "a sense of purpose," said Verchere. She thinks a combination of companies wanting to do the right thing, along with pressure from regulators, shareholders, and other stakeholders, will eventually lead to greater gender balance.

"This combination of nature and nurture – wanting to do the right thing, with a little regulatory push – it helps corporations to focus and prioritize. Once you get critical mass, you can get momentum and the change stands on its own," said Verchere.

"For me, diversity of thought is the foundational principle that enhances business performance and I believe hugely in that"

Vicky Bailey

Board member, Equitrans, Cheniere Energy and PNM Resources

Bailey, a board member for midstream gas company Equitrans, LNG developer Cheniere Energy and utility holding company PNM Resources, has held myriad energy-sector leadership roles over more than 30 years, including heading Indiana's largest electric utility, serving as a state and federal regulator, and working on international bodies.

"I've been fortunate to be around people who were visionaries who wanted me to succeed. I had the opportunity to be in the room and then it's up to me to prepare myself to handle the responsibilities," she said.

She notes her breadth of experience helped when being considered for boards: her background in industry, financial experience evaluating rates as a regulator, leadership roles such as at Cinergy/PSI Energy (now Duke Energy), advanced management courses, as well as entrepreneurial experience.

She sees signs that oil and gas companies are feeling the need to address diversity. From what CEOs are reading or hearing at conferences, from shareholder advisers, "people are talking more about that," she said. There is more talk about the capabilities of the workforce and the business benefits of "having diversity in the brainpower around the table," she said.

More emphasis is being put on leadership development and making sure that women and minorities are part of the peer group of high-development candidates, she said. Boards are also looking at succession planning for CEOs.

Despite some challenging numbers in oil and gas, she sees progress with women gaining line responsibilities, such as Equitrans chief operating officer Diana Charletta, who recently was also named president of Equitrans Midstream. "I think the story should be upbeat, not Pollyannaish, but that we're doing better. We're not where want to be, but that will always be case," she said.

As for racial minorities in top leadership posts in oil and gas, "the numbers are woefully low," Bailey said. There are obstacles to getting minorities into the industry; to come to where the jobs are located, she said. In addition, "where you don't see individuals like yourself in those positions, you may not think of that as a career area for yourself," she said.

"Where you don't see individuals like yourself in those positions, you may not think of that as a career area for yourself"

Among the challenges that remain, "the hurdle will always be 'can she really do the job?' The hurdle will be how you are perceived, she said. "That's something we fight every day. Having our voices heard, being viewed by colleagues as having expertise and credibility and gravitas that individuals come to you as an expert; as someone who knows their field."

Laura Beane

CEO, Avangrid Renewables

Now holding the top spot at Avangrid Renewables, Beane started at the company in 1995 as a contract receptionist, and fought boredom by recommending changes to the corporate presentations she was printing for her bosses. Soon she was getting invited into meetings and pursuing an MBA at night.

She raised her hand for different roles over the years."I really have never felt that my gender held me back, and back then, utilities were known as male-dominated, but I never personally felt any of that," she said.

A key difficulty is attracting a diverse pool early in the pipeline of workers entering the company, she notes. "In the energy industry, such a large percentage of our employees are often in the field, either line workers or technicians at the wind facilities or solar facilities, and those tend to be very male dominated to this day. We're working really hard to change that." That includes scholarship programs and outreach to technical colleges, she notes.

"We've really worked to see if we can help that pipeline issue as we bring women into these fields, but it's tough, there's not a whole lot of women that appear to be interested in those career fields." And there is stiff competition to draw and retain those people, amid rapid growth in the industry.

On a personal note, Beane said it is because of a female manager's suggestion that her career stayed on track around the time her son was born. "In my mind, I was going to have to leave entirely for a period of time." Instead, they worked out a plan for her to target about five hours of work a day that were not tied down to a set schedule, allowing her to be available for meetings any time of day. "My part-time status I think was largely invisible to everybody that I worked with."

She believes that power companies definitely still have ground to gain in moving women into leadership roles, but she sees positive efforts. "I am very encouraged because I feel that the company is making more deliberate effort in this area than I've ever seen," partly with a new human resources chief focused on diversity and inclusion. "It's really opened up a conversation that I don't remember having at the executive and senior management levels."

One of the efforts to tackle that at Avangrid is an internal networking group, meant to attract and retain female talent, that is open to women and men, she notes.

"We've really worked to see if we can help that pipeline issue as we bring women into these fields, but it's tough, there's not a whole lot of women that appear to be interested in those career fields"

Colette Honorable

Partner, Reed Smith

From her post as chairman of the Arkansas Public Service Commission in 2013, Honorable was tapped to be president of the National Association of Regulatory Utility Commissioners, and later a member of the US Federal Energy Regulatory Commission. She is currently a member of the energy and natural resources group at law firm Reed Smith.

Nominated to join FERC by President Barack Obama, Honorable was the third African American to become a commissioner. “I remember some of the African American staff members coming to me and saying ‘we’ve waited a long time for this day.’ It just blew me away.”

She recalls experiences early in her legal career at the Arkansas PSC of being the only person of color in the room. “If I had been focused on myself, it would have isolating, intimidating to go to a place where there were mostly older, Caucasian men who had worked in the sector for decades.”

To cope with that challenge, “I was driven to master it. I was driven to learn it,” she said.

From her vantage point, it is refreshing that there are several more women CEOs at US utilities, such as Mary Kipp of El Paso Electric, Lynn Good at Duke Energy and Patti Poppe of CMS Energy. “I’ve visually seen the difference, but the fact that I have is a sad commentary on how far we have yet to go,” she said.

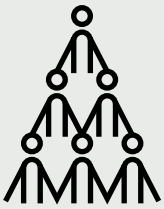
Gaining experience on the operational and financial sides of the business will be important for more women to rise further, she suggests. “Women who get great experience in operations, that is something that sets them apart,” she said.

In addition, she sees “a confidence issue” for women, who may be smart and qualified but don’t feel that they meet all the prerequisites of a role.

She sees a need for the utility sector to become more “intentional” in finding qualified women and people from diverse backgrounds, as well as for more women to put themselves forward for opportunities.

“The case for diverse women is even more challenging and dire, and unacceptable, I’ll be frank. There are many diverse women in the general counsel world and in certain levels in upper management, but we have much more work to do to bring that same intentionality that we need to bring in focusing on women in general to the diverse women’s effort,” she said.

One culprit, she said, is a tendency to lump gender in with diversity, so that “if we have women on the board; women in the C-suite, we have diversity.”



“There are many diverse women in the general counsel world and in certain levels in upper management, but we have much more work to do to bring that same intentionality that we need to bring in focusing on women in general to the diverse women’s effort”

Janet Weiss

President, BP Alaska

Now overseeing BP's essential interests in Alaska, Weiss has spent most of her 34-year oil industry career in the state. She's held a range of engineering and leadership assignments, including as vice president for the Gulf of Mexico shelf and western Wyoming.

Attitudes have changed since her second day at US oil company ARCO, as a young graduate in chemical engineering, when her boss dropped her off on Alaska's North Slope, returning a week later to ask what she had learned, she said.

"I think about the first couple of years in the mid-1980s ... low oil prices in a state that's economy runs on oil, and thinking about the culture, fiercely independent, 'what is this woman doing coming up here taking a man's job?' That's dramatically different now," she said. "Now there's a lot more women, but not enough, in the industry, whether it's the boardroom, or the control room," she said.

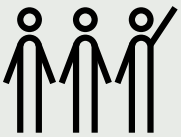
As to hurdles for women advancing to leadership, Weiss said "the biggest thing that I see is this interpretation of confidence at the table – how women might come across and communicate, and how they're heard, how unbiased are we in our listening." At times, she said, "that portrayal of confidence matters."

BP's leadership, she insists, embraces the view that better answers emerge when different perspectives are at the table. According to data shared by the company, women make up 35% of all staff, 36% of the board of directors, 48% of graduate hires, 40% of experienced hires, and 24% of group leaders.

The numbers drop off at the highest levels to 15% for the executive team, despite some recent additions. Asked why that may be the case, Weiss said: "That is a very good question that of course I and various colleagues do talk about from time to time." Getting to the executive team, she suggests, may require diplomacy in the external world, on top of an ability to transform a business. "Most of my colleagues, women that had a great shot at getting there, ended up retiring before they got there."

Among the efforts underway, she highlights a business resource group that brings together women in the industry across the globe to develop and learn. Beyond mentoring efforts, she also points to sponsoring, or "mentoring on steroids." This involves managers pulling someone up sooner who they have they have seen in action enough, in an effort to "overcome some of the unconscious bias."

Her evolving management philosophies have at times taken on physical signs. To support bringing everybody to the table, she brought in a 16-foot Matanuska Birch boardroom table, crafted with her daughter. More recently, she drew headlines by shaving her head to keep to her word, after the team met a goal of keeping Prudhoe Bay production levels steady for several years.



"The biggest thing that I see is this interpretation of confidence at the table – how women might come across and communicate, and how they're heard, how unbiased are we in our listening"

Lisa Lambert

Chief technology and innovation officer, National Grid

A software engineer by training, Lambert had a Silicon Valley career before joining the new venture capital unit that utility giant National Grid created to invest $250 million in technologies over several years to disrupt itself.

Lambert sees opportunities for women amid the transformation underway in the electric utility space toward decentralization of generation, storage, metering, communications and the formation of multiple niches.

"There is a new group of upstarts that have entered that market and are competing, [and] some are trying to partner with utilities," she said, adding "the opportunity for women then is to enter into this industry via the startups." The numbers aren't large for women in startups but they are better than the incumbent energy or high-tech companies, she said.

Investment targets for National Grid Partners have included artificial intelligence, security systems, distributed energy systems, hyperlocal weather forecasting, predictive analytics – a variety of companies offering technologies its help improve transmission and distribution business going forward.

Lambert says she is "absolutely" seeing women in senior leadership in those companies pitching for investment capital. She says the data shows diversity is important for performance.

Based on her own experience of often being the "only" woman in the room in her prior career in high-tech manufacturing and venture capital, she has worked to increase opportunity for women. She created a nonprofit bringing women together to help advance their careers. While at Intel Capital, she also founded a venture capital unit investing in women and minority-led technology startups.

In general terms, women make up about half of those entering the workplace at entry level, "but there's this massively leaky pipeline because we fall off precipitously when you get to those senior positions," Lambert said. "It's a real problem getting to the next level."

A major hurdle she sees for women is gaining access to informal networks where rapport is built and where people have a chance to tell of their contribution, and to mentors or sponsors that will advocate to them in the senior ranks. "I think women tend to be more heads down. 'If I do a great job; if I produce at work I'll get recognized.' It doesn't work that way anymore. You have to visible, you have to be known," she said.

"I think women tend to be more heads down. 'If I do a great job; if I produce at work I'll get recognized.' It doesn't work that way anymore. You have to visible, you have to be known"

Cheryl LaFleur
Commissioner, FERC

LaFleur twice occupied the top spot at the US Federal Energy Regulatory Commission as chairman. Her path began at a law firm and included a career in northeastern utilities, where she rose to be National Grid USA's acting CEO.

"Overall I've seen the energy sector make progress, albeit slow progress," said LaFleur. Back in 2007, she recalls counting only four women out of 64 CEOs at an electric utilities trade group of top executives. "It's still not proportional, but we're definitely seeing that start to change."

Her path included some bumps along the way. She left a law firm after being passed over as a partner and having a child, then networked her way in a part-time legal position at the then New England Electric System, she said.

The regional utility offered a workable schedule, but it also brought valuable mentorship from CEO John Rowe, the chance to solve key regulatory challenges that gave her visibility, and get operational experience, she said.

"I feel like I had, overall, a good experience. It did not end positively when I was passed over for CEO after I was acting CEO for almost a year," she said. "Overall, I had a situation where I had both mentoring and support through my 30s through some of the work-family issues that seemed to derail some female professionals' careers," she said.

As to whether being female affected her career, "I think it's hurt me and helped me," she said. "There are times when people have given me honest appraisals of why I didn't get certain jobs that I think I have detected comments about myself that I believe are more likely to be made about a woman, like I wasn't tough enough, something that is not an opinion I have of myself. I feel like I've done a lot in my life."

On the other hand, she adds, "when I had this wonderful opportunity to come to FERC, I know the White House was looking for a woman because they lost the only woman on the commission and all the people on the shortlist were female."

She suggests one reason electric utilities may have more women leaders than the oil sector may be that the importance of regulatory success to utility revenue has meant opportunities for those with a legal, rather than technical, background.

Having reached the end of her term of office, LaFleur was poised to leave FERC at the end of August.

"There are times when people have given me honest appraisals of why I didn't get certain jobs that I think I have detected comments about myself that I believe are more likely to be made about a woman"

Hilary Mercer

VP, Shell's Pennsylvania Chemicals

An engineer by training, Mercer is vice president of Pennsylvania Chemicals, a Shell unit developing a major polyethylene project north of Pittsburgh. Her career has entailed positions around the globe employing her technical skills, with stops ranging from the Netherlands to Oman to Malaysia. She previously managed a worldwide portfolio of integrated gas projects at Shell.

"At my first big construction site in Oman in the late 1990s, it was [me] and 6,000 men – I was the only woman there," she said. Twenty years later, she sees a shift in the number of women taking on technical roles. "If I looked then at Pennsylvania Chemicals, everywhere you look there are women," she said.

Yet she mentions challenges the oil and gas industry has faced in developing a diverse talent pool of technical professionals in areas that had historically lower female participation. She recounts her company's efforts to support STEM education, including scholarships and sponsoring programs at community colleges.

A major challenge, still, is getting over the idea that there are jobs women can and can't do, she said. "That is one of the most important things we can do at school level – to open people's eyes up to the possibility," she said. "I came from a family with a father who was an engineer. I was very lucky in the sense it never occurred to me I couldn't become an engineer, or that I couldn't work in the oil and gas industry."

The focus at Shell on gender parity is "huge... enormous," she said. Gains in Shell's leadership are indicative: the board comprised 45% women at the end of 2018, up from 8% in 2011, she notes. The share of women in senior executive positions was 24% at the end of 2018, compared with 17% at the end of 2013.

"We need the best talent for going through the energy transition. If you restrict yourself to only 50% of the population, you are never going to get the best talent you can to thrive."

"I came from a family with a father who was an engineer. I was very lucky in the sense it never occurred to me I couldn't become an engineer"

She also described the company's belief that if you have diverse teams, you get a better, more innovative, more collaborative environment, and improved results. Finally, diverse teams allow companies to appeal to the diverse users of products and services, she said.

To help female employees build their careers, Mercer said senior leadership sponsor women and help put them into jobs to develop them. She also pointed to a 16-week maternity leave policy and support for dual-career families.

Anne Pramaggiore

Senior executive vice president and CEO, Exelon Utilities

Starting in the utility sector with a retail and law background, Pramaggiore held posts in the law department and business regulatory side at US utility Commonwealth Edison before gaining operational experience to round out her portfolio.

"It's very exciting," Pramaggiore said, of recent gains for women in the utility sector, including a rise in female CEOs among investor-owned utilities over the last five years.

"With change in the business model and technological change, people are coming to run utilities with different skill sets such as finance, or the regulatory and legal side of the business," she said. "Those are areas where women have probably been seen at higher levels for longer periods of time than in engineering and STEM. That has led to the door opening up," she said.

Still, she said, there's no question women are under-represented in the industry, as in STEM jobs in general. There's been a focus on this at Exelon, which has looked at barriers to women or girls coming into these areas of study, she said.

Those barriers include "a lack of awareness of the type of jobs that were out there," a lack of experiences that might allow girls or young women to be excited about those jobs, and a lack of confidence that these jobs would be open to them, she said.

Trying to nurture that pipeline, she said the company has for six years held an icebox derby, where middle to high school girls build electric race cars and solve STEM problems. It joined the UN HeForShe initiative, sponsoring a high school students' STEM program on university campuses, entailing field trips and interactions with potential role models at the company.

But she also welcomes a newer focus. "The question around 10 years ago was how do we get more women into STEM fields or more women into the utility industry, how we shape them for business," she said. That has shifted to "how does the industry ensure that it's adapting to different types of talent that are going to come in," she said. Because the business is changing fast, "we need to be innovative, and you need diversity of all types in order to innovate and move forward." Part of that is taking a broader view of leadership styles, she said.

"We need to be innovative, and you need diversity of all types in order to innovate and move forward"

As to her own path, Pramaggiore, gives credit to male CEOs at ComEd and Exelon who gave her opportunities in operations, allowing her to learn the basics of how the system works, and how the workforce approaches it. "I think it's important for anyone who wants to sit in the CEO chair to understand how the business operates at that level."

Maria Victoria Zingoni

Executive MD, commercial business and petrochemicals, Repsol

Originally from Argentina, now working at Madrid-based integrated energy company Repsol, Zingoni grew up in an oil and gas producing region. After university, it was a natural move for her to begin her career working at YPF, Argentina's national oil company, she said.

"I love to be involved in the energy sector, because I understand that energy is a good way to develop society."

Although reluctant to go into the upstream sector, Zingoni's managers pushed her toward the idea. She now believes this was one of the most important decisions in her career, "because it allowed me to understand the business from scratch."

"Understanding the business is key – and having good leaders that help you go through the different areas of the business is also key. I am where I am today because I have been in different businesses in different countries. That's the only way you can have a senior position in a large company," she added.

Even today, the proportion of women involved in Repsol's exploration and production business is smaller than elsewhere, with women accounting for 29% of employees and 21% of leaders. By contrast, women make up 37% of employees and 27% of leaders in the downstream segment. In corporate functions, both figures are significantly higher, with women making up 54% of employees and 42% of leaders.

"We are more actively working on promoting diversity on the E&P side," said Zingoni.

Repsol's group-wide target is to have 31% of leadership positions held by women by 2020. Encouraging more women to study STEM is important to making this a reality, she said. "The technical and engineering part of the energy sector is still very much considered a male one, so education is very important."

Compared with smaller peers, Zingoni believes large, multinational companies, such as Repsol, are well-positioned to deal with issues such as diversity and inclusion, and have a responsibility for driving them forward. "If you think about global diversity – and when I talk about diversity, I mean not only gender, but race, nationality, and sexual orientation – we require a global mindset in global companies."

"If you think about global diversity – and when I talk about diversity, I mean not only gender, but race, nationality, and sexual orientation – we require a global mindset in global companies"

Jennifer Stewart

SVP, government and regulatory affairs, Southwestern Energy

With a consulting and legal background, Stewart joined natural gas producer Southwestern Energy as vice president for tax. She tried to develop the role as a partner to the business, rather than simply compliance, and then sought out added responsibilities, she said. Promoted to senior VP for finance, she then served as interim CFO and took on the new role created for her as senior VP of government and regulatory affairs.

"To get to that place where you're in the roster, women have to prove themselves substantively and technically first... I think the bar may be a little higher for women than for men to prove themselves at that level," she said.

At Southwestern, a woman is chairman of the board and there are two women board members. Both the CEO and board are strong proponents of female leadership development, she said.

"It's not a targeted women's initiative; if we identify a female leader, we're going to develop her right along with a male leader," she said.

She offers a suggestion for companies going forward. "Give women the opportunity to fail just like you give men the opportunities to fail. Give them stretch assignments and put them under the same pressure."

Young women are saying "give me a challenge, give me something that is scary," she notes, impressed by their ambition.

As for how companies can increase the role of woman in leadership, she says, "if you want to have more women on boards, you're going to have to open up your aperture" for the requirements of board membership beyond traditional positions, such as CEO or CFO.

"Give women the opportunity to fail just like you give men the opportunities to fail. Give them stretch assignments and put them under the same pressure"

Shareholders, regulators increase impetus to change

By Maya Weber

Energy companies are facing external pressures to lift their female leadership numbers from institutional investors, activist shareholders, and even potential employees and customers. But a number of female executives interviewed said the internal drivers at their companies were stronger.

"I think there is a desire to do that at the top of the house at BP because there is a deep belief that you get to better answers if you bring in different perspectives and voices, and that women have a very important perspective," said Janet Weiss, president of BP Alaska.

"It's the internal belief in better business outcomes that's the stronger force. Are there external pressures? You betcha," she adds.

Governments and regulators are increasingly watchful of companies that are lagging in female representation on corporate boards. Norway imposed a 40% quota on boards of listed companies more than a decade ago. A number of other European countries, including France, Italy, and Germany, have followed suit with varying quotas, some with more teeth than others. California imposed something similar in 2018. And gender pay gap disclosure in the UK, which started in 2018, has shed light on the issue of gender disparity in leadership positions, prompting some companies to address it.

Investors are also playing a role. State Street Global Advisors, one of the world's largest asset managers, in 2017 threatened to vote against the full slate of board members for companies with all-male boards. Another large money manager, BlackRock, has said in proxy voting guidelines that it would expect to see at least two women directors on boards. The New York State Common Retirement Fund is among large pension funds warning of votes against directors on boards that lack diversity.

"The way that investors are standing up in terms of sustainability to the big corporations is quite vocal now, especially in the context of climate change," noted Christina Verchere, CEO of Romanian integrated oil company OMV Petrom. "When you're in that conversation about sustainability with this investor group, you are in a bigger conversation about societal issues, one of which is about gender."

However, many female executives said the shift toward more gender-diverse leadership teams was primarily motivated from within.

Anne Pramaggiore, senior executive vice president and CEO of Exelon Utilities, sees both external and internal factors as important. "Diversity and the tie to innovation is a very strong

driver for business, and so I think that's the internal impetus," she said, noting the major transformation underway of the utility business model.

Investors are also paying attention, she said. "There's no question about that. They make that quite clear." And there's society at large. "The discussion across our culture on diversity is a strong dialogue right now and businesses are part of that as well."

Moreover, as a utility, her company faces questions about diversity in its ranks from state regulators. And utilities frequently cite a sense of responsibility to look like the people they serve.

For companies that already have women on their boards, the threat of being punished by investors is less of a worry. Patti Poppe, president and CEO of utility company CMS Energy, puts it this way: "As opposed to pressure because you'll get in trouble if you don't, it's more of a belief that a diverse team makes better decisions. So it's a desire to have a diverse team [versus] how hard it is to actually create that when there's a limited pipeline pool," she said.

At her company, 45% of board members are women, as are about 30% of its officers, she said.

Internal drivers often mentioned in interviews included:

A need to draw strong talent from more than 50% of the population;

Trust in consultant research findings that diverse teams help drive innovation, or that companies with diverse leadership have better performance; and

A need for a workforce that will match future customers.

"The way that investors are standing up in terms of sustainability to the big corporations is quite vocal now, especially in the context of climate change" **Christina Verchere**

Even as many CEOs strive to diversify because they think it's the right thing to do, "I don't think you can extricate the fact that there are a lot of these external pressures, and truly commercial pressures to be mindful of this and purposeful about this," said Jennifer Rockwood, global power and utilities practice leader for recruiting firm Russell Reynolds.

That was particularly true for publicly traded companies, she said. Meanwhile, companies that sell directly to individuals may be more vulnerable to consumer reactions or social media campaigns.

Another source of momentum: some trade groups have urged CEOs of their member companies to sign pledges to advance diversity and inclusion. ■

Renewables sector acknowledges uphill climb

By Maya Weber

The renewables sector might edge past the oil and gas sector by some measures of gender parity, but that has not stopped it from taking a hard look the mirror.

The Solar Energy Industries Association, a trade group, and the Solar Foundation, a non-profit geared toward accelerating solar adoption, this year released a self-assessment based on two US surveys of employers and employees. The overall verdict: women and African Americans were underrepresented, and there was a major gender gap in wages and opportunities to move up the career ladder.

"Among all senior executives reported by solar firms, 88% are white and 80% are men, presenting a pronounced lack of diversity across gender, ethnicity and race at the executive level," the report said.

"We have a long way to go, unfortunately," said Abigail Ross Hopper, CEO of the SEIA, even as she explained the desire to take an unflinching look. "There are multiple people in the solar industry who share the deeply held belief as we create this entire new industry ... we need to get it right at the beginning, and make sure the issues of equality and equity are addressed and we don't repeat the mistakes of some of our brethren in other energy sectors who have had a whole different workforce that are more recently coming to the conclusion that they need to be more diverse."

The report identified several competitive advantages of expanding recruitment to more diverse candidates. One was broadening the base of potential employees to create a better pipeline of skilled workers. Diverse employees also could also help tap into new markets and build a more diverse customer base.

"We've really worked to see if we can help that pipeline issue as we bring women into these fields, but it's tough" **Laura Beane**

Hopper notes the study showed that many people get jobs in the sector through word of mouth. "Our friends often look like us. One of the biggest challenges is recognizing that culture and then challenging it and doing it differently," she said.

She is not particularly convinced by the notion that companies would hire women positions if they could find them. "It takes work, you have to perhaps use pathways that are not familiar to you, that are a little outside of your area of comfort zone," she said.

Still, she said, the industry is making strides by having the conversation. More than 80 solar company CEOs have signed an action pledge, committing personally to

have programs in place. And the SEIA has signed MOUs with a number of organizations, including historically black colleges and universities in the US, to provide career opportunities, she added.

Wider talent pool

To fully reach its potential, the renewables sector needs to tap a wide pool of talent as it expands. Concerns about talent shortages caused the International Renewable Energy Agency to launch its own study this year. It found that renewable energy employed more women than the energy sector overall, 32% compared with 22%. However, female participation in renewables is lower for STEM jobs than in administrative jobs. Just 40% of men in the study perceived the existence of gender-related barriers, it noted, as opposed to 75% of women.

Kristen Graf, executive director of the Women of Renewable Industries and Sustainable Energy, said that the overall numbers in the sector clearly need work, but there is an exciting shift in conversations around diversity and inclusion. "Now I feel like so many companies are saying this is really important and we are not there yet and have a lot of work to do."

"I've seen a sharp uptick in the number of companies reaching out to us, asking questions like what should we be doing, where can we find more information on parental leave policies, on how to build better relationships so that we get a diverse hiring slate," she said.

According to Graf, the overall representation of women in renewables has been floating closer to 30% in the last few years, but is still low at the far ends of the spectrum – the C-suite level and entry-level technicians.

Laura Beane, CEO of Avangrid Renewables, said a large percentage of employees in the sector are often in the field, as line workers or technicians at wind or solar facilities, in roles that still tend to be male-dominated. "We've really worked to see if we can help that pipeline issue as we bring women into these fields, but it's tough, there's not a whole lot of women that appear to be interested in those career fields." There is stiff competition to draw and retain those people, amid rapid growth in the industry, she adds.

Among efforts to tackle that, she points to scholarship programs and outreach to technical colleges. She also sees more deliberate effort than ever before at her company to address the need for women to move up to leadership positions, with steps such as putting networking groups in place. ■

China's quest for balance

As China's supply-side reform turns five years old, has the state succeeded in trimming excess capacity in core oil and steel industries? Jing Zhang and Oceana Zhou assess the results of the policy

China's supply-side reform agenda was launched by President Xi Jinping in late 2015 with a view to stripping out excess capacity that had built up in key industries during China's emergence as an economic power.

Industries targeted in a five-year plan presented in 2016 by the country's top economic planner, the National Development and Reform Commission, included steel, coal, cement and aluminum. These sectors were deemed to have become too big, too polluting, and in some cases too dependent on export markets.

Beijing wanted to lift the quality of China's industrial production, improve the environment and lower dependence on external markets. Supply-side reform was a key plank in China's ambition to transition to a sustainable, consumption-driven economy – rather than one that relied on investment in heavy industry.

To a large extent, the policy has been successful. Chinese companies became more profitable, helped by industry consolidation, capacity reduction initiatives and healthy domestic demand. But success has been a double-edged sword. Stronger margins and profits incentivized companies to lift production and build new capacity.

Leaner, greener steel mills

At the start of the millennium, China produced 129 million metric tons (mt) of crude steel but last year this rose to more than 900 million mt. China now produces 50% of the world's crude steel.

Supply-side reform initiatives in this sector appeared to be making great progress. The country achieved its target of stripping out 150 million mt/year of capacity over 2016-2020, some two years ahead of schedule. China removed an additional 140 million mt/year of "unlicensed" induction furnace capacity – small, low quality producers of construction steel – in 2017. On top of this, steel mills have been ordered to upgrade their environmental protection facilities to meet "ultra-low" emissions targets. This is another way of weeding out inefficient (read: polluting) steelmakers as installing facilities to lower emissions is extremely expensive.

Before China embarked on its supply-side reform agenda, the country's steel industry was in very bad shape. In 2015, more than half of the China Iron & Steel Association's 94 member mills were lossmaking, posting a combined loss of yuan 64.53 billion ($9.33 billion) that year. Their debt-to-asset ratio was around 71%, which improved to just below 70% as the reforms took effect.

China now produces 50% of the world's crude steel

To protect market share and generate liquidity, in order to roll over mounting debts and avert insolvency, steel mills had to maintain high production levels. This caused a price war as they elbowed out competitors, and huge losses. For mills with high debt-to-asset ratios, any signs of slowing or suspending production could result in lenders withdrawing credit and precipitating bankruptcy.

Meanwhile, domestic demand for steel had slumped. This scenario resulted in China significantly lifting its finished steel exports, causing tremendous grief to international competitors who were unable to compete with lower-priced Chinese material. China's steel market started to improve from early 2016 as the supply-side reforms began to take effect, reducing the need to export and helping global prices to recover.

Chinese mills enjoyed bumper profits in 2017 and 2018 as good times returned to the steel industry. With improved profitability and sufficient liquidity, Chinese mills carried out M&As, replaced existing facilities

with newer, more efficient ones, and improved their environmental protection performance.

Capacity creep

The net result is that production capacity has begun creeping up again this year. S&P Global Platts estimates there will be 142 million mt/year of new crude steel capacity commissioned in China over 2019-2020. China can only build new capacity if it closes old facilities with similar capacity. But as replacement facilities are bigger and better than the old ones, a net increase is likely.

China's crude steel output reached 87.53 million mt in June, taking the total output in the first six months of 2019 to 492.17 million mt, up 9.9% on year, according to the National Bureau of Statistics. China's crude steel capacity will reach 1.17-1.2 billion mt/year by the end of 2019, Platts estimates.

Higher steel production this year has coincided with high iron ore prices and a relaxation of curtailments on production for environmental reasons. Ongoing tensions with the US, and Beijing's deleveraging program, have contributed to softer demand from key consumer-driven segments, such as auto and white goods. Steel profit margins have been hit hard, but as in years gone by no one wants to be the first to cut production.

Oil refining capacity on the rise

Many of the same issues have been seen in China's oil sector. Beijing has tried to close independent polluting refineries with inefficient refining capacity since 2015 in a bid to lower crude oil imports.

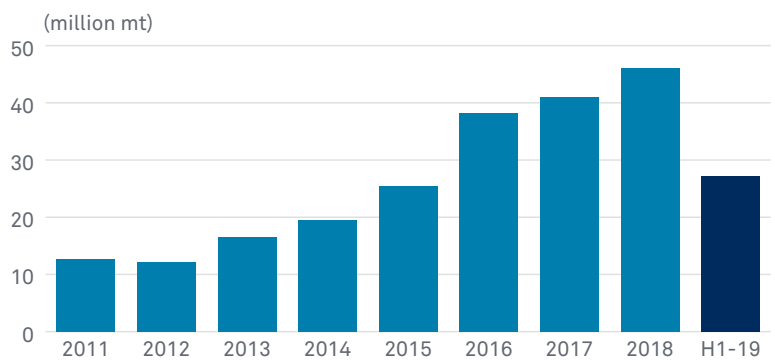
Independent refineries have been able to gain their crude oil import quotas provided they eliminate inefficient capacity. This has seen larger players buy up smaller companies with older units that typically had low utilization rates, and in effect take over their market share.

Under the supply-side reform agenda, around 95 million mt/year of primary capacity has been eliminated since 2015 in exchange for import quotas of up to 116 million mt/year, according to S&P Global Platts Analytics.

However, almost all of the eliminated capacity had already been idled for a long time, and had no impact on China's operating capacity.

In early 2018, the NDRC, together with nine other national government bodies, announced plans to enforce environmental rules that could lead to non-compliant refineries of less than 2 million mt/year of capacity being shut down.

China's key oil product exports surge



Key products are gasoline, gasoil and jet/kerosene
Source: General Administration of Customs

These measures phased out some operating capacity, including some illegal expansions in the independent refining sector. But the volume was small with only 1.5 million mt/year of primary refining capacity understood to be eliminated.

Strong growth of oil product exports in recent years has been evidence of refining overcapacity. Data from the General Administration of Customs showed total gasoil, gasoline and jet fuel exports totaled 46.08 million mt in 2018 from only 12.24 million mt in 2012, an increase of 277%.

But like steel, capacity remains on an upward trend, with 40 million mt/year of refining capacity set to be commissioned this year, while another 26 million mt/year is under construction. This is on top of current capacity of more than 800 million mt/year.

New capacity was approved by the government to lift petrochemical production and reduce reliance on imports. These expansions are in line with supply-side reform's aim of higher value-added products. But oil byproducts from petrochemical output have added to the surplus.

When 20 million mt/year Hengli Petrochemical, based in Dalian, ramped up its run rate to 110% in June this year, its oil products – which account for about 40% of its production yield – flowed into the domestic market. The company's rivals suffered refining losses of about yuan 600/mt ($86/mt) from profits of yuan 300-400/mt in previous years.

"Refining capacity must be removed from the market within a year or two as competition intensifies," a general manger at a Shandong-based independent refinery said.

Refiners in Shandong expected that about one third of the 50 independent refineries with capacity ranging from 2 million-7.5 million mt/year would be weeded out. Shandong is home to 70% of China's independent refineries, which account for about 25% of China's total refining capacity.

New refining and petrochemical complexes provide stable outlets for high-value-added products as many of the owners are textile manufacturers, which are also the main consumers of the products. The relatively high profits from the petrochemical sector allow them to offer oil products at lower prices, which oil product-driven refiners are not able to compete with.

This has hit state-owned refineries that have plans to build new refining and petrochemical complexes. As a result, the oil giant PetroChina and Sinopec said they will phase out small-scale and old refining capacity.

For both oil and steel, China needs to monitor closely the new capacity additions to ensure some of the problems of the past do not re-emerge. Given China's propensity to export when domestic demand does not keep up with production, supply-side reform is a global issue as much as a Chinese one. ■

The trouble with tariffs

The US-China trade conflict has gone from being a tariff dispute to an imminent threat to the global economy, with growth in demand for oil and other commodities at stake. Eric Yep reports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The US-China trade dispute has evolved into a very different animal in the past year. In August, it spilled over into currency, with China allowing the yuan to breach the 7 per US dollar level for the first time in 11 years.

This was in retaliation for the US imposing new 10% tariffs on $300 billion of Chinese goods, and was followed by the US Treasury officially designating China as a currency manipulator—a move that had been avoided by previous administrations due to its controversial nature.

These developments have taken the trade dispute into uncharted territory, with risks now enveloping everything from international currency and financial markets to global economic growth. The impact on crude oil and other commodity markets too will be felt on many levels, far beyond the reconfiguration of trade flows.

Since the start of 2019, governments, businesses and investors were already digging in for a fundamental repositioning of the economic relationship between the US and China, potentially extending well beyond the Trump era. Now, the yuan devaluation has triggered market turmoil and raised the specter of an escalation on several fronts.

"Overall, we are maintaining our views that RMB will depreciate on a multi-month basis and reach around 7.20 by end-Q3 2019 and 7.40 by end-2019," economists at Japan's Nomura bank said in August. Nomura said the devaluation had created numerous negative risks including the US increasing the tariff rate to 25% on all imports from China before year-end; China allowing for yuan flexibility; the risk of China halting US agriculture purchases; the US refraining from issuing licenses to Huawei; and a lack of long USD forex hedging from Chinese corporates.

The tariff battles since mid-2018 may reduce global Gross Domestic Product (GDP) in 2020 by 0.5%, Gita Gopinath, Economic Counsellor and Director of the Research Department at the International Monetary Fund, said at a press conference in mid-July.

"So this is a significant cost to the global economy, and at a time when global trade is already very weak and investment is weak in the world," Gopinath said, adding that prolonged trade uncertainty was weighing on business sentiment everywhere in the world, which then has implications for demand.

S&P Global Ratings' chief economist Paul Gruenwald wrote in early July that the so-called second-order effects of the trade dispute, which were working through the indirect channel of confidence rather than directly through tariff-related price increases, are new. "Where once we had identified them as a downside risk, they have now begun to move into our baseline forecast. These risks are slower moving and cumulatively larger than the first-round effects," Gruenwald said. S&P Global Ratings expects global GDP growth to slip to 3.4% in 2019 and 3.6% in 2020, from 3.7% in 2018.

Oil demand growth slows

Slower global growth is a much bigger threat to underlying oil and commodity demand than the short-term diversion of US-China trade flows, as disruptions are temporary, but weakness in demand is more structural, particularly if a recession is imminent.

For the last few years global oil demand growth has been above the 1 million b/d mark, and for the first time in human history global oil demand hit 100 million b/d (depending on who you ask this happened either in 2018 or 2019). Economists are increasingly factoring

in the possibility of demand growth falling below the psychologically important 1 million b/d level.

Market concerns were stoked on August 1, when WTI crude oil prices fell 7.9% day-on-day, the largest decline since 2015, after Trump's unexpected tariff announcement. Warnings were being sounded even in June, when Morgan Stanley slashed its 2019 global oil demand growth estimate to 1 million b/d from 1.2 million b/d, which it said was "broadly half-way between trend growth and a recession scenario."

Other banks including Citigroup, Barclays, Goldman Sachs and Australia's ANZ have significantly downgraded their oil demand forecasts in the last two months, with estimates now ranging from just over 1 million b/d to 1.275 million b/d.

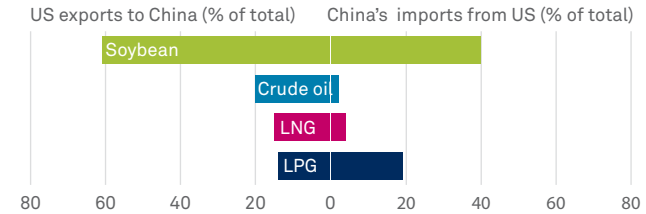
In late July, S&P Global Platts Analytics slashed its oil demand growth outlook to 1.2 million b/d for 2019,from 1.5 million b/d in 2018, citing subdued economic growth and global trade. Separately, Platts Analytics estimated that the US-China struggle over trade will lower diesel demand in the US by 90 million b/d: "In the US, when GDP was growing 4% a couple of quarters last year, distillate demand increased 200 million b/d year on year. Now that GDP growth has slowed to 2%, distillate is in decline with the trade war estimated to be contributing 90 million b/d of negative growth."

The impact on crude oil and other commodity markets too will be felt on many levels, far beyond the reconfiguration of trade flows

While it was too early to call a recession, oil demand does slow materially or even decline in recessions, by several hundred thousand barrels per day at least, Morgan Stanley said. Daniel Hynes, senior commodity strategist at ANZ, said if world GDP growth fell below 3%, global oil consumption will fall by 1% to around 99.5 million b/d. "Even without a global recession, we are already seeing demand weaken," Hynes said, adding that a recession driven 1% decline would reduce the call on OPEC crude to only 30 million b/d in 2019.

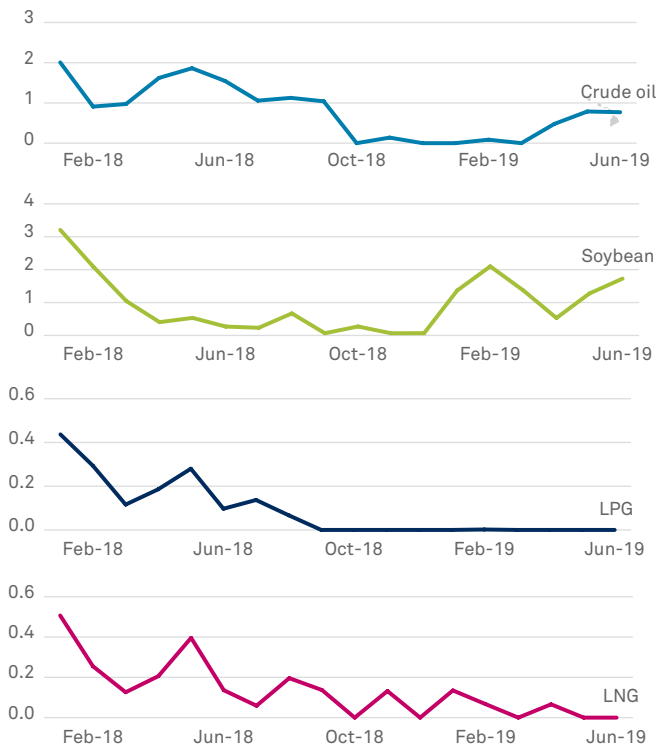
The second-round effects of the trade conflict will only worsen. Business sentiment has already soured as Chinese NOCs shun longer-term oil and gas investments in the US. For the rest of this year, financial market risk and macroeconomic concerns will only exacerbate the decline in physical commodity demand. ■

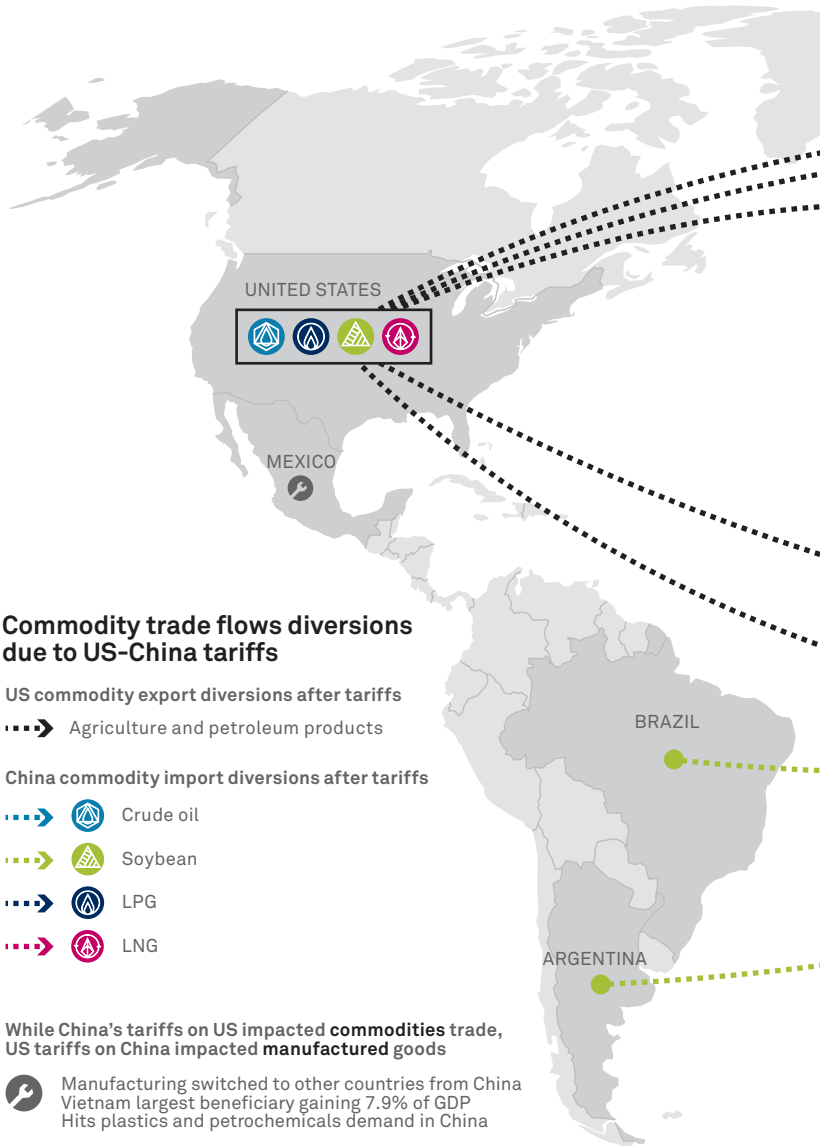
US depended more heavily on China for commodities trade in 2017 before dispute began



Note: Based on 2017 full-year data

US-China commodity trade flow declines (million mt)





KEY EVENTS IN TRADE DISPUTE

2017

Aug
US starts investigating China's trade practices under Section 301 of Trade Act.

23-Mar
US files WTO complaint on China's trade practices. Trump instructs USTR to publish a tariff list in 15 days.

6-July
US slaps 25% tariff on $34 billion Chinese goods; China retaliates. US soybeans hit.

24-Sep
US puts 10% tariff on $200 billion Chinese goods, China retaliates with tariffs on $60 billion US goods.

China puts 10% tariff on US LNG. Crude oil excluded.

18-Nov
China gets first US LNG cargo since tariffs, but volumes have otherwise collapsed.

2018

22-Jan
Trade skirmish begins - US puts tariffs on washing machines and solar parts, hitting Chinese suppliers.

20-May
US in trade talks with Beijing to reduce trade deficit. China offers to buy more US agricultural and energy products.

Unipec buys 16 million barrels of US crude, its biggest purchase to date, to help trade talks.

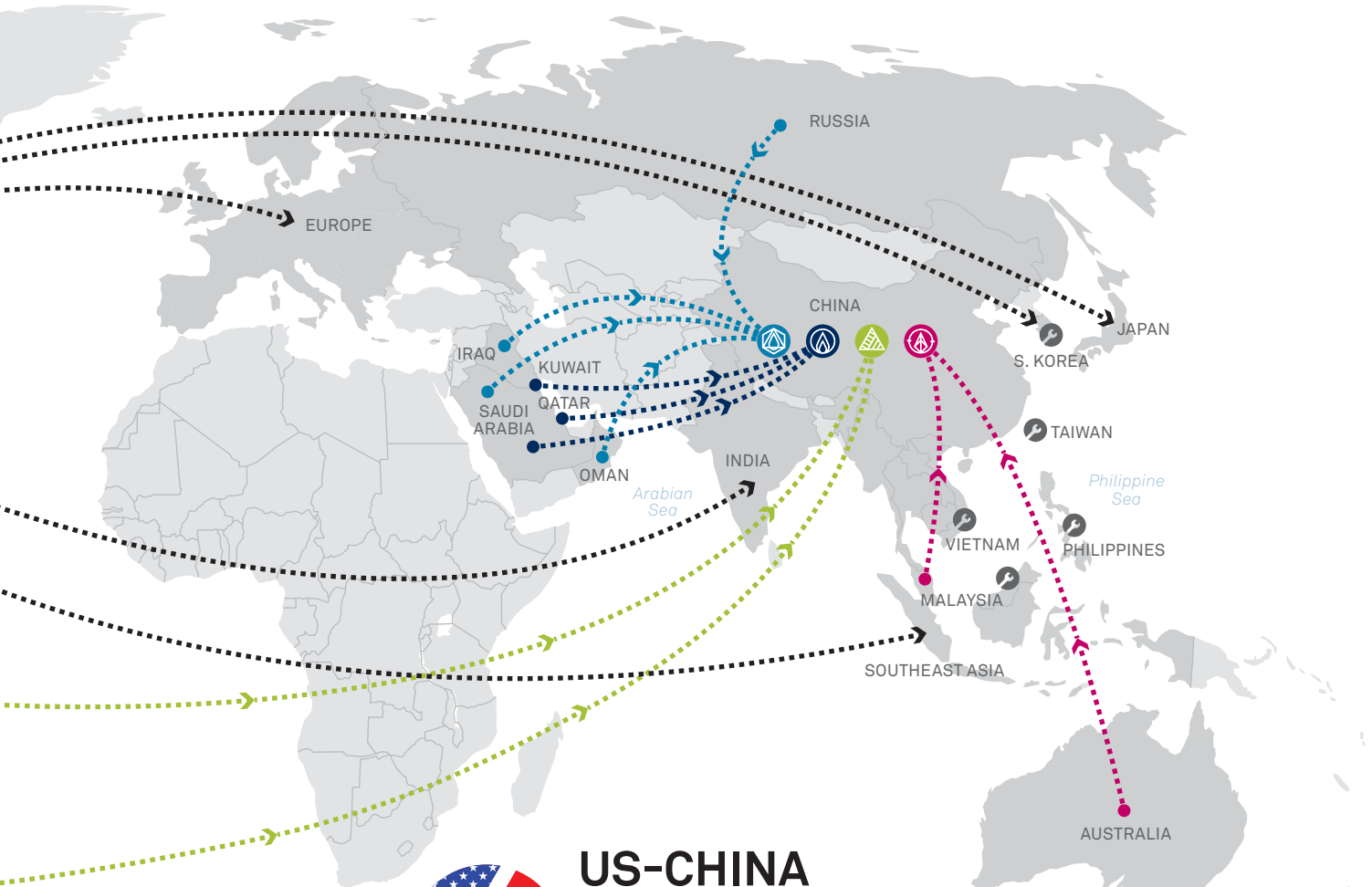
23-Aug
US slaps 25% tariff on $16 billion Chinese goods, China retaliates. US propane, butane, naphtha, jet fuel and coal are hit.

25-Sep
Chinese LNG importers with US contracts scramble. Oil traders hedge exposure.

Unipec head says buying of US crude will continue and trade spat is temporary.

1-Dec
US and China sign 90-day truce in Buenos Aires, commodity traders relieved.

Sources: S&P Global Platts, US EIA, USGS, US Census Bureau, China customs data, USTR Office, Nomura Research



US-CHINA TRADE DISPUTE DISRUPTS COMMODITY TRADE FLOWS

1-Jan
China pledges to buy 'substantial amount' of US agricultural, energy goods, again.

11-Mar
China's Sinopec buys more US crude oil after a lull to help talks.

5-May
Cheniere Energy in talks with Sinopec for long-term LNG deal.

10-May
US raises tariffs on $200 billion Chinese goods, to 25% from 10%. Threatens 25% more tariffs on $325 billion untaxed goods.

1-Jun
China raises tariffs on $60 billion US goods by 5%-25%.

China raises tariffs on US LNG to 25% from 10% from June 1. Crude still off the hit list.

2-Aug
Trump slaps new 10% tariff on $300 billion of Chinese goods.

13-Aug
Trump postpones new China tariffs until Dec 15.

2019

24-Feb
Trump extends March 1 tariff deadline, citing progress in talks.

30-Mar
US-China soybean trade falls 81% in July-March period.

US-China wheat exports plunge 95% July-March period.

6-May
US-China talks break down.

16-May
Trump puts Huawei on blacklist.

Trade tensions hit new high.

Trade flows collapse.

29-Jun
US-China resume talks after Osaka meeting, tariff hikes halted. China restarts buying US crude oil and soybeans, again.

5-Aug
China turns trade battle into currency battle. Yuan is devalued.

Small-scale LNG making market inroads

Overshadowed by their bigger, more eye-catching counterparts, small-scale LNG projects in fact make up the majority of US LNG facilities. And during the coming years, their number is expected to grow, writes Jim Magill

Large-scale LNG liquefaction and export facilities are helping to write the demand story for US natural gas reserves. But there is a newer demand factor for that gas: small-scale facilities sending LNG to otherwise little-tapped markets and finding new applications for the fuel.

Small LNG plants, usually with production capacities of less than 1 million mt/year, are springing up across the US to service niche markets, such as providing IMO-compliant bunker fuel to oceangoing vessels, meeting peak-shaving demand and serving a growing export market in the nearby Caribbean.

These small facilities can be sited and built more quickly and cheaply than their behemoth world-class cousins. Construction costs range into the millions rather than billions and construction takes months rather than years. The smaller plants can be built almost anywhere, allowing siting near gas production or near markets. Containerized shipment can be by truck or vessel. The timing also seems right. The Trump administration is pursuing a rulemaking to allow long-distance shipment of LNG by rail.

Demand for LNG

With the increase in US shale gas production over the past decade and a half, the demand for LNG for both domestic use and export has also increased dramatically.

According to the US Pipeline and Hazardous Materials Safety Administration, as of January 2018, there were more than 110 LNG facilities operating in the US, performing a variety of services including liquefaction, storage, transportation and regasification.

According to PHMSA, there are 160 US LNG facilities built or approved, with the vast majority small-scale projects. Of the 160 plants, four are categorized as large-scale exporting plants already in operation, while seven large-scale plants have been approved.

PHMSA also reports that the volume of LNG storage capacity in the US has grown to 55.7 million barrels in 2018 from 45.4 million barrels in 2010.

One source of LNG demand growth has come from the maritime industry, where LNG can be used as a bunkering fuel, replacing dirtier fuel oil and diesel. Increased demand is being driven by standards set by the International Maritime Organization to limit greenhouse gas emissions from oceangoing ships.

Under the IMO 2020 rule, beginning January 1 ships operating in international waters will be required to slash their sulfur emissions by more than 80%. Switching to lower-sulfur fuels, such as LNG, is one option.

A Shell executive recently predicted that LNG's share of the bunker fuel market mix would reach 25 million mt by 2035. Nick Potter, general manager for shipping and maritime, Asia Pacific, Middle East, at Shell Trading, said while LNG had historically been used to power ships plying the coastal waters of Europe, it was increasingly being used for oceangoing vessels.

For example, Carnival Corporation has one LNG-fueled cruise ship in use and a second one on order.

"We invested in LNG because, frankly, it's the best, most widely available fuel today, which addresses all of the current regulations," Tom Strang, Carnival senior vice president for maritime affairs, said in June at a sustainable energy event.

Using LNG to power cruise ships means zero SOx, a 75%-85% reduction in NOx, and almost zero particulate matter, Strang said.

Servicing maritime, land-side demand

Several small-scale LNG plants have started operations in recent years to service the bunker fuel and other LNG markets. The Florida Atlantic Coast seems to be the preferred location for these plants, although at least one is sited on the Louisiana Gulf Coast.

JAX LNG, a plant capable of producing 120,000 gal/day of LNG, went into operation last fall in the Port of Jacksonville, Florida. A joint venture of Pivotal LNG and NorthStar Midstream, it is the first LNG plant with both dockside and truck-loading capabilities, allowing it to supply both the maritime and onshore markets.

JAX LNG sources its gas from the Peoples Gas distribution system in Jacksonville.

"In addition to that, we have invested in upstream pipeline capacity so we have firm supply," Tim Hermann, president of Pivotal LNG and manager of the JAX LNG plant, said in a recent interview.

The plant has contracted for firm transportation capacity of just under 15 MMcf/d, enough to supply 100% of its liquefaction capacity, Hermann said.

For smaller ships, JAX LNG can deliver directly from its docks, while Hermann said larger oceangoing ships "prefer to be fueled on the water side by a bunkering barge," such as the Clean Jacksonville owned by TOTE Maritime Puerto Rico.

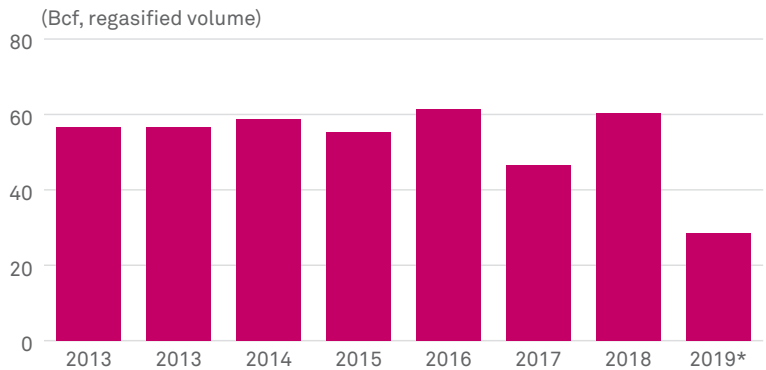
Exports to Puerto Rico and Caribbean countries represent another growing market for LNG liquefaction facilities in Florida such as JAX LNG.

According to S&P Global Analytics, LNG deliveries to the Caribbean and Central America averaged roughly 440 MMcf/d in June (regasified volume), a 90 MMcf/d, or 25%, increase over the year-ago month.

The year-on-year increase came primarily from Puerto Rico and the Dominican Republic, which both saw roughly 40 MMcf/d increases in deliveries this year. Additionally, Panama took roughly 40 MMcf/d of LNG in the first half of 2019 through its Costa Norte LNG import terminal commissioned in June 2018.

The US Energy Information Administration reports that LNG imports into Puerto Rico last year totaled 60.3 Bcf, to near 2016's 61.3 Bcf, and rebounding from 46.4 Bcf in 2017 when the flow of imports was

Puerto Rico LNG imports



*through May
Source: US Department of Energy

disrupted by Hurricane Maria, the Category 4 hurricane that devastated the island in September of that year.

Another example of a small-scale LNG project finding a bunker fuel market is NuBlu Energy's Port Allen Liquefaction facility, a 30,000 gal/d project situated along the Mississippi River near Baton Rouge, Louisiana, about 140 miles north of the Gulf of Mexico.

In commercial operation for more than a year, the project is an example of the proprietary micro-scale liquefaction technology NuBlu hopes to market in the US and overseas, Josh Payne, vice president of business development, said in an interview.

"Our goal is to engineer and sell plants worldwide," he said. "Our tag line is making LNG local, by putting liquefaction closer to where they need the liquid."

With the imminent implementation of IMO 2020, the company is already seeing increased demand for LNG as a bunkering fuel out of Port Fourchon, Louisiana – the jumping-off point of the US Gulf of Mexico offshore oil and gas industry – from customers such as Shell and Harvey Gulf International Marine's LNG bunkering facility, Payne said.

"If ports want to get that fueling business, they're going to have to offer LNG, and more than likely they're not going to be able to spend $10 billion on a huge export facility; they're going to need to build a small-scale facility and grow with the market," he said.

The market structure for small-scale plants in the Florida and Gulf Coast regions differs substantially from that of in the US Northeast. In the latter region small-scale LNG facilities have been operating for years, chiefly providing a source of fuel for electric power plants in the winter months, when fuel demand is high. Recently, however new small-scale projects have been proposed to serve other markets, in addition to peak-shaving, such as manufacturing plants and potentially even exporting LNG to other countries.

In June, the Philadelphia City Council approved a plan for a public-private partnership to create the Passyunk Energy Center (PEC) a 120,000 gal/d liquefaction project on the site of an existing gas receipt, storage and distribution facility owned by Philadelphia Gas Works in southwestern Philadelphia. When completed, the project will provide LNG for power generation and industrial uses in the southeastern Pennsylvania area.

Under the partnership agreement, PEC, owned by privately held Liberty Energy Trust, will build a liquefaction plant, as well as truck-loading and unloading infrastructure, within the footprint of PGW's existing Passyunk Plant. The plant will source its feedgas from the PGW system.

Once the LNG plant is built, PGW will operate it and sell related services to PEC. The contract allows PEC to sell LNG produced from the plant to its customers in the region, with PGW earning up to $4 million per year through fees and revenue sharing.

New Fortress Energy, a New York-based company that completed an IPO on the NASDAQ in January, is pursuing another model for marketing LNG. The company plans to become a leading player in the development of small-scale LNG plants in the Marcellus Shale of Pennsylvania, as well as other US gas-producing regions.

In documents filed with the US Securities and Exchange Commission, the company said it was "currently developing two liquefiers in the Marcellus area of Pennsylvania, each of which is expected to have the capacity to produce approximately 3 to 4 million gallons of LNG (which is the equivalent of 250,000 to 350,000 MMBtu) per day."

The company added that it plans to develop five or more additional liquefaction plants over the next five years, although it did not disclose the siting of these facilities. New Fortress proposes to establish a "logistics pipeline" to deliver LNG to its customers.

"Tanker trucks will transport LNG from our liquefiers to a port on the Delaware River for Marcellus-sourced LNG or the Gulf of Mexico for Midcontinent sourced LNG, at which point LNG will be transloaded directly to large marine vessels," the company states.

At least one aspect of this plan, the creation of an LNG shipping port on the Delaware River, has generated pushback from local residents. Earlier this month, the Delaware River Basin Commission approved a project to dredge the channel and build a dock at the Gibbstown Logistics Center, located on the river in New Jersey. Environmental groups objected to the site improvement project, saying New Fortress plans to use the site, owned by Delaware River Partners, a New Fortress-affiliated company, to export LNG. The groups say such an export project has not been given adequate public notice or received the proper government approvals.

Regardless of the controversy, which is similar to that encountered with the construction of virtually any form of energy infrastructure, the number of small-scale LNG plants can be expected to grow over the next several years. This growth will likely be driven by several demand factors: the increase in demand for clean-burning natural gas for traditional uses such as supplying electricity, fueling manufacturing plants and heating homes; and the emergence of new markets for gas, to power boats and oceangoing ships, as well as land-based forms of transport, such as long-haul trucks and railroad locomotives.

In addition, because small-scale LNG plants convert gas to an easily transportable liquid form, they provide an affordable solution for owners of stranded gas assets to monetize their resources in regions far removed from pipeline infrastructure. ■

Accelerating growth within the LNG market

Platts JKM benchmark has brought transparency and efficiency to global LNG markets for the past 10 years, and will continue to do so as the market evolves further.

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Marking the 10th anniversary of the JKM

Insight from Brussels

Siobhan Hall

Trading tags guaranteeing renewable or low-carbon properties could be a key way to secure the EU gas industry's long-term future in a decarbonized energy system.

The EU will soon consider enshrining a 2050 net-zero emissions goal into law, after the European Commission's president-elect, Ursula von der Leyen, promised to propose this by early 2020.

A net-zero commitment is a step up from the current EU goal to cut emissions by at least 80% on 1990 levels. Von der Leyen promised to focus on decarbonizing energy demand from transport and buildings – both sectors where renewable and decarbonized gases could contribute to emission cuts.

Setting up an EU-wide guarantees of origin (GO) system for such gases would be an efficient way to promote them, according to energy traders and gas industry representatives.

GOs are tradeable electronic documents already used in the EU's electricity market to prove that a specific amount of electricity comes from a specific renewable energy or cogeneration source. This is a small but growing market, with almost 510 TWh demand in 2018, according to ECOHZ.

GOs enable customers to choose their preferred electricity source, creating a market-based mechanism for supporting 'green' electricity that is more efficient than subsidies, according to Jan van Aken, secretary general of the European Federation of Energy Traders.

Creating a similar system for gas could help transport and industrial energy customers prove they are decarbonizing their fuel sources, a growing concern within corporate social responsibility efforts.

"There are a lot of environmentally-conscious consumers and companies who are interested in green electrons and green molecules. They are willing to pay more and they are creating demand for this," van Aken said at an EU sustainable energy event in Brussels in June.

Setting up GOs for "green" gas would require cooperation between many parties, including EFET, the European Commission, EU standards agency CEN, European gas suppliers' body Eurogas, and gas infrastructure operators' bodies Entsog and GIE, he said.

"We must go for one harmonized European system in the long run for all GOs – for renewable and low-carbon gases and liquids," van Aken said.

Creating a successful GO system means developing credible products based on clear, EU-agreed definitions, he said.

Agreeing those definitions is more complex in gas than power, as the varied ways renewable and low-carbon gas can be produced create many product options.

The International Council on Clean Transportation identified 19 possible variations in a paper presented to the EU's Madrid gas regulatory forum in June.

These included high level definitions such as standard natural gas versus renewable gas, which covers biogas, renewable methane and renewable hydrogen.

There were also more detailed definitions taking life cycle emissions into account, such as carbon-neutral hydrogen, which reduces life cycle greenhouse gas emissions by at least 100% after being burnt compared to natural gas.

The 100% reduction takes into account upstream greenhouse gas emissions from direct and indirect land use change, methane leakage and indirect changes to electricity production.

Legal framework

Formal EU gas grid operators' body Entsog is keen to see an EU obligation to use GOs for gas, according to its network codes markets manager Irina Oshchepkova.

The EU extended the legal framework for GO systems to cover gas, including hydrogen, when it updated its renewable energy directive last year.

But only electricity suppliers are required to disclose the renewables share of their energy mix on consumer bills, which is proved with GOs.

National governments are free to implement something similar for gas, but the gas sector wants more certainty, Oshchepkova said.

It would help if there was an energy source disclosure obligation in the EU gas directive, for example, she said.

The EC has been analyzing what to put in a potential EU gas legislation package that could be proposed next year, if the incoming EU commissioners who are due to take office in November approve.

EU power sector lobby group Eurelectric has also supported the idea of GOs for green gases, while being against specific targets for their share of EU final energy demand.

Transport demand

EU-funded pilot project CertifHy is trialing the first European GOs for green and low-carbon hydrogen.

The project offers GOs for hydrogen produced from either renewable (green) or low-carbon energy with life cycle emissions 60% below those of hydrogen produced from natural gas without carbon abatement.

It issued more than 2,700 renewable hydrogen GOs in January and February, equivalent to 2.7 GWh.

Two big customers so far are Transport for London, which has fuel cell buses, and H2Mobility Germany, which provides hydrogen refueling station infrastructure.

The hydrogen suppliers in the project are Air Liquide, Belgian retailer Colruyt, Uniper, and Air Products/ Nouryon, with plants in France, Belgium, Germany and the Netherlands. ■

Uncharted waters

The shipping industry has had years to prepare for tighter emissions standards coming into force next year, but it is in the coming months that much of their planning will be translated into action. By Surabhi Sahu

Benjamin Franklin once said: "You may delay, but time will not." This is certainly true for the international shipping industry as it prepares for a plethora of stricter environmental rules that are set to bring escalating costs and operational challenges.

Among the upcoming rules, the International Maritime Organization's global sulfur limit for marine fuels, which will be cut to 0.5% from January 1, 2020, is among the most significant.

While restrictions on sulfur emissions in shipping are not an entirely new concept, as Emission Control Areas in certain regions have long existed, the transition to the IMO 2020 rule is daunting. The majority of bunker demand will have to switch from high-sulfur fuel oil (HSFO) to 0.5% sulfur almost overnight, calling for extensive planning by shipowners, charterers, ship crew and refiners, among others.

The operational challenges will be manifold, and the costs astronomical. S&P Global Platts Analytics estimates the total global impact of this rule on various sectors in the energy space, as well as other industries, will be in excess of $1 trillion over five years.

Shipowners will have to choose a marine fuel strategically, considering factors such as the age of their vessels, trading routes and locational availability of the various fuel options. They will also have to manage the fuels after bunkering, with critical factors being how many receiving tanks the vessel has and tank segregation requirements.

According to Platts Analytics, the global bunker fuel specification changes in 2020 mean some 3 million b/d of HSFO will have to be replaced. As a result, LSFO, marine gasoil and blended distillates will all play important roles in the bunker fuel mix in 2020 and onward.

The exact bunker fuel mix that will prevail is still an unknown, as it will depend on availability of the different fuels as well as their relative pricing. Still, there is growing consensus in the industry now that very low sulfur fuel oil (VLSFO) will be one of the main marine fuel choices come 2020. In fact, either through direct use or blending, gasoil will also be in greater demand because of the sulfur limit change for marine fuels under IMO 2020.

Recent announcements by oil majors such as ExxonMobil, BP, Total, Cepsa, Sinopec on the supply of 0.5% sulfur bunker fuels to meet rising demand have quelled some concerns in the industry about their availability.

There is also the option of equipping a vessel with scrubber technology, which removes sulfur oxides from the exhaust gas of ship engines, meaning HSFO can still be burnt.

Most shipowners have already made a conscious choice regarding their bunker fuel choice post-2020.

This includes many big shipping companies such as AP Moller-Maersk, Hapag-Lloyd, Teekay Tankers, BW Group, CMA CGM, Pacific International Lines and Mitsui OSK Lines.

Japan's MOL, for example, will mainly use low-sulfur fuel oil, but also plans to install sulfur oxides scrubbers on about 50 vessels, mainly VLCC and capesize bulkers, the company said in May.

The company is also advancing plans to use other cleaner fuels – LNG and methanol – for bunkering.

Some container shipping companies, such as Maersk and Hapag Lloyd, plan to use both 0.5% sulfur marine fuels and scrubbers with HSFO to comply with the rule.

But in any case, taking no action is arguably a decision on the part of a shipowner, implying that VLSFO or 0.5% sulfur compliant bunker fuel will likely become their default marine fuel choice.

An important procedure to carry out before switching, as emphasized by the International Bunker Industry Association last year, is cleaning of fuel oil tanks. Failure to do so could see a vessel breach the sulfur limit despite being loaded with compliant fuel, and also carries operational risks, according to the IBIA.

Some global shipping companies, such as Thailand's Precious Shipping and Norway headquartered Hoegh Autoliners, have already said that they are cleaning bunker tanks on their vessels.

For those who plan to use 0.5% sulfur bunker fuels and haven't started the clean-out, there should be an urgency to do so to ensure there is no residual heavy sulfur fuel left in them.

Clean break

Tank cleaning comes with its challenges. Manual tank cleaning is considered the best method, but this needs the vessel to be in dry-dock or anchorage. Tank cleaning can be done with additives but this process requires some cycles.

Another option is to load LSMGO or VLSFO into the tank and flush out the fuel system with the low sulfur fuel oil. There is still a risk that tanks will not be 100% clean at the end of this process.

One large shipowner told Platts that November 30 could be a potential "sweet spot" date to shift to compliant fuels as it would give some leeway to finish off the remainder of HSFO in ships' tanks and ensure a smooth transition to 0.5% sulfur bunkers.

While tank cleaning is important, tank segregation is also vital. With the multitude of fuels being launched in time for 2020, there is likely to be a wider range of viscosity, requiring temperature adjustments. The risk of compatibility issues may be greater. Therefore, the challenge will still be to keep the fuels segregated to the maximum extent possible.

IMO 2020 cost to energy and other industries

$1 trillion

over 5 years

Alongside fuel switching, exhaust gas cleaning systems – known as scrubbers – will be an important solution for compliance with IMO 2020, at least initially, and will help alleviate some of the pressure on 0.5% sulfur bunker fuels.

The Exhaust Gas Cleaning Systems Association, or EGCSA, reckons that around 4,000 ships will be fitted with scrubbers globally by January 1, 2020, though other estimates are lower. CE Delft, which acts as a consultant to the IMO, has forecast some 3,000 ships will be fitted with the technology by 2020, while Platts Analytics estimates that around 2,200 ships will be ready with scrubbers by January 1, 2020.

But scrubbers have their own issues. Some argue that "open-loop" scrubbers – which discharge wastewaster – do not address environmental issues as they simply take sulfur out of the air and put it into the ocean. Others argue that this is an oversimplification and ignores the fact that the IMO has set out guidelines for cleaning systems which include washwater discharge and monitoring criteria to safeguard against environmental damage.

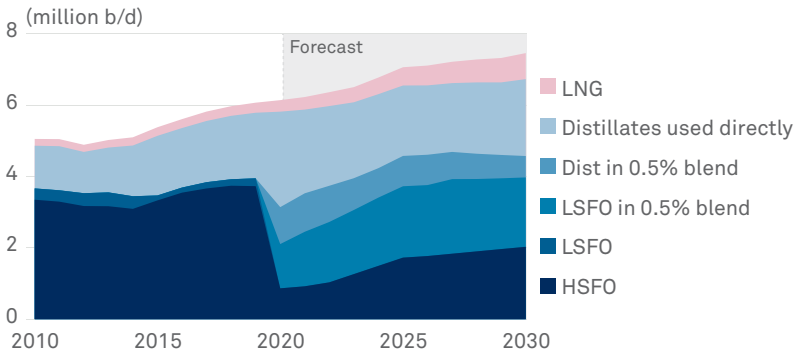
However, a handful of nations and ports have decided to operate independently of the IMO and have introduced local requirements for the operation of scrubbers.

In January, the Port of Fujairah – the key bunkering location in the Middle East – issued a notice banning the use of open-loop scrubbers in its port waters. China has already implemented a ban, from January 1, in its emission control areas covering inland waters and most of its coastline including Bohai Bay waters. Singapore is set to implement a ban from January 1, 2020, with ships that wish to dispose of exhaust gas cleaning residues in Singapore required to engage a licensed toxic industrial waste collector.

Washwater discharge from open-loop scrubbers has also been banned in many other regions including Belgium, California and Massachusetts in the US, along Germany's Rhine River as well as the Irish Port of Waterford.

Despite some skepticism towards open-loop scrubbers, Japan has decided it will support their use after a study conducted by its Ministry of Land, Infrastructure, Transport and Tourism concluded

Global bunker fuel demand



Source: S&P Platts Analytics

that no short-term or long-term effects on marine organisms were likely to be caused by the use of this technology.

Meanwhile, the Clean Shipping Alliance 2020 in June said it welcomed the preliminary results of an independent study presented by CE Delft, which indicated that accumulated concentrations of exhaust gas cleaning systems washwater components are at very low levels, and well below applicable regulatory limits.

Another issue cited against scrubbers is their high upfront capital costs. Costs generally range between $2 million and $10 million per vessel. If a company such as Maersk were to outfit its roughly 300 vessels with scrubbers at an average cost of $5 million per vessel, this would amount to $1.5 billion, Moody's Investors Service said recently in a research report.

Maersk has so far disclosed about $263 million of contractual commitments for scrubber investments.

Sulfur spreads

Still, for some market participants, the investment case for a scrubber remains fairly strong with widespread expectations that the price of HSFO will decline sharply after 2020, while the price of LSFO/MGO will remain high, at least in the initial years following 2020. This means that the payback time for scrubbers could still be relatively short despite their initial costs.

Although there is still a lot of uncertainty over how great the premium of LSFO over HSFO will be, the expected tight supply of compliant fuels suggests

that the premium will be strong enough to recover the cost of scrubbers within the first two years, Drewry Maritime Research said in May.

Drewry expects the average price premium of LSFO over HSFO to be around $240/mt in 2020, gradually declining to close to $80/mt by 2023 once the LSFO supply improves.

Under the Platts Analytics reference case, gasoil-HSFO spreads are expected to reach the peak of a little over $350/mt early in the year, but then will ease back.

"We don't know what the price of compliant fuel is going to be, and the market doesn't know," Hamish Norton, the president of Star Bulk Carriers, said in April. "The only way to hedge is to put in a scrubber that allows you to use residual fuel oil, which will always exist."

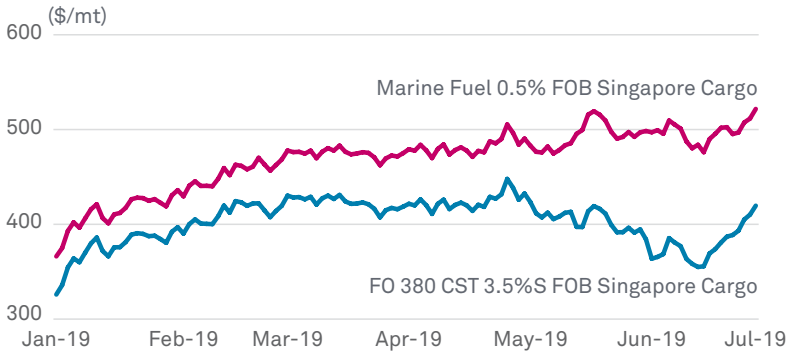
BIMCO, the world's largest international shipping association, said last year that there was anecdotal evidence that there might be a significant premium on long-term charters for oil tankers with a scrubber installed over similar ships without one.

Some expect the adoption of scrubbers to split the time-charter market into two tiers. Some charterers are likely to be willing to pay higher prices for scrubber-installed ships because it would allow them to burn a cheaper fuel, thereby trimming their operational costs. As the deadline on the new marine fuel norms draws closer, the trend of compliant ships fetching a premium will only gather steam, according to some analysts.

Green loans are also paving the way for shipowners to install this technology as banks and other financial institutions lend their support to environmental goals. In October 2018, Star Bulk Carriers said it had secured a $310 million loan including a $70 million tranche to exclusively finance the procurement and retrofitting of scrubbers for up to about 50 vessels in its fleet.

Early this year, law firm Watson Farley & Williams said it advised BNP Paribas as coordinating bank and agent, together with a syndicate of four other banks as lenders, in connection with a $439 million financing backed by China's export credit agency Sinosure of 86 scrubbers for the Mediterranean Shipping Company (MSC), which are to be fitted in China.

High and low sulfur fuel prices diverge



Source: S&P Global Platts

Japan's Nippon Yusen Kabushiki Kaisha, or NYK Line, said in March it had entered into a Yen 9 billion ($81.5 million) syndicated loan agreement to fund installation of scrubber systems on its vessels. According to the company, that was Japan's first syndicated loan to be certified by the Japan Credit Rating Agency with its highest ranking of "Green 1," demonstrating the loan was aligned with the core components of the internationally recognized Green Loan Principles.

Ensuring compliance

It is expected there will be a high degree of compliance with the IMO 2020 rule, particularly in the major ports, as stringent checks will be in place with stiff penalties likely to be enforced.

Shipowners who do not comply run the risk of considerable damage to their reputation among charterers and customers. A growing number of shipowners and operators are already developing ship implementation plans, which will mitigate risks and help with compliance.

The largest sources of bunker demand – the biggest container ships, dry bulk carriers – will have to be compliant, so non-compliance will only ever represent a small fraction of global bunker demand. One industry consultant told Platts that non-compliance will at most be 10% in the initial months following 2020.

Meanwhile, port authorities are also stepping up efforts to aid checks. Singapore, the world's largest

bunkering port, has already unveiled a list of measures to help the industry.

MPA will inspect Singapore-registered ships and foreign-registered ships calling at Singapore in accordance with the Flag State and Port State Control regimes, respectively.

"Like the violation of other MARPOL Annex VI requirements, the owner and the master of the ship may be fined up to S$10,000 ($7,392) or imprisoned for a term not exceeding two years, or both, for non-compliance of these regulations," an MPA spokeswoman told Platts in April.

Collaborate for success

The automaker Henry Ford once said: "Coming together is a beginning. Keeping together is progress. Working together is success." This could not be more apt in the context of the IMO 2020 rule, where so many stakeholders are involved.

The charterer, owner, ship crew and manager, for example, must be involved while planning for the fuel switchover, to ensure a smooth transition. The ship's crew will likely have to deal with more varied fuels. Trialing such fuels ahead of 2020 could help them manage the many challenges.

Refiners also need to educate their customers about the fuels specifications they intend to supply and the ports where such fuels will be available. Many of them are already engaging with their customers.

Meanwhile, bunker traders are providing credit to both buyers and suppliers at a time when shipping faces headwinds due to this rule and other impending environmental regulations.

Pricing agencies are also playing their part to bring transparency to a market that currently has limited liquidity, while international shipping industry associations such as BIMCO are already developing bunker clauses to supplement contracts, to aid preparations for 2020.

Platts, for its part, has been publishing daily price assessments for IMO-compliant Marine Fuel 0.5% bunkers on delivered and ex-wharf bases at key ports globally since July 1, 2019. Platts has also launched daily cargo and barge assessments for Marine Fuel 0.5% reflecting residual marine fuels with a maximum sulfur limit of 0.5% at key ports across the globe starting January 2, 2019.

In the end, as IBIA says, "the best course of action is for all parties to try their best to be ready for 2020... Society will judge the entire sector harshly if it fails." ■

Insight from Washington

By Meghan Gordon

Like many ways the Trump administration has reshaped US policy norms, the use of tariffs and tariff threats to address non-trade policy issues with other countries is here to stay, and companies like US Gulf Coast refiners are learning to adapt.

That reality has set in for the energy sector not only because of the ongoing trade conflict with China, but also since President Donald Trump's threat to impose a 5% tariff on all Mexican imports.

Although the threat was called off at the 11th hour, it was a huge shock to the US refining sector, which depends on Mexico as one of its top sources for heavy crude imports and the most valuable customer for its refined product exports.

Refiners turn $14 billion worth of annual Mexican crude imports into $30 billion worth of gasoline, diesel and other fuels exported back to Mexico. Additionally, Mexico's heavy Maya grade has been key to refiners as other sources of heavy crude dwindle on the global market as a result of turmoil in Venezuela, US sanctions against Iran, and pipeline constraints out of Canada.

"Not having access to Maya would definitely make things much more challenging" for US refiners, said Susan Grissom, chief industry analyst for the American Fuel & Petrochemical Manufacturers, a trade group.

Derrick Morgan, AFPM's senior vice president for government affairs, said that since the Mexico tariff threat, the group and its refinery members have had many meetings with White House and federal agency staffers on how energy-sector tariffs would hurt the overall US economy.

While Trump pulled back on the tariff threat, he could revive it if he does not like how the Mexican administration handles the Central American migrant issue.

"We made a little bit of headway and progress on our point that a tariff on crude oil in particular was counterproductive," Morgan said, stopping short of saying he was confident the administration would not seek to target energy trade in the future. "If tariffs

were to come up again, I think we'd be picking up that conversation with a higher level of knowledge about why the crude oil piece of this doesn't make sense."

Exports are becoming increasingly important to the US energy sector and Gulf Coast refiners in particular, as the country has gone from the top importer of fuels to the top exporter.

Grissom said refiners' response to the Mexico tariff threat was not unlike what they have to do every day when watching factors that may affect global supply and demand, be they production outages, hurricanes or geopolitical tensions. They are constantly examining alternative supply sources and export markets for the best fit.

"The global market is very resilient," Grissom said. "Solutions are found when there are disruptions. One of the reasons the market is resilient is because all of the participants in the market are going through and looking at the alternatives, so they don't often get taken by surprise. When something is no longer available on the market, chances are they've already figured out what the best alternative option might be."

Duncan Wood, director of the Wilson Center's Mexico Institute, said that even if Trump revives his Mexico tariff threats, he doubts the administration would ever apply it to petroleum trade, which "would be hugely damaging to US refiners."

"However, it has raised the prospect that North American free trade is not a given and refiners are beginning to think of alternate logistical arrangements," Wood said.

On the other side of the border, Mexico was already trying to diversify trade partners, and Trump's tariff threat underlined the need to do so. In July, China's West Pacific Petrochemical Corp. refinery exported 900,000 barrels of gasoline to Mexico, its largest monthly shipment to the country.

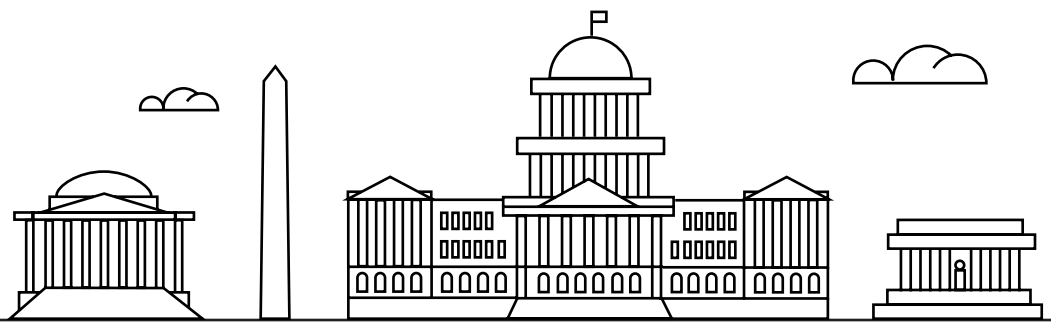
"Mexico is certainly interested in diversification," Wood said. "Recent engagements with China and India highlight this. However, reorienting Mexico's crude exports away from Texas and bringing in refined product from other parts of the world is tricky."

Wood pointed to the Deer Park refinery in Texas, a 50-50 joint venture between Shell and Pemex, which processes 275,000 b/d of Mexican crude. "Finding another taker for that would be very difficult and wholly illogical for Pemex."

"On the other hand, [Mexican President Andres Manuel Lopez Obrador's] plan to build a new refinery and refit existing plants poses a long-term threat to the integrated petroleum supply chain between Mexico and Texas," Wood said.

S&P Global Platts Analytics expects these trade tensions to stick around, with the US continuing to use tariffs and tariff threats to pursue other policy goals.

"In a sense, we are seeing the weaponization of tariff policy," Platts Analytics said in a recent global economic outlook. "This threat will remain part of the global framework for the foreseeable future." ■



Opening up

Gas market liberalization in Japan is helping pave the way for other countries in Asia to follow suit. More players means more liquidity in LNG markets, as the lines between buyers and sellers blur. By Shi Yun Fan and Jeffrey Moore

Demand growth in the global LNG market will hinge not only on new infrastructure and growing economies, but will also require an influx of additional buyers entering the market in search of clean, reliable and affordable energy.

Nowhere is this more true than in Asia where steps have already been made to open up markets, add new participants and promote price discovery.

However, demand prospects are very different in the established Northeast Asian market compared with the emerging economies in South and Southeast Asia. Competing fuels, energy efficiency and infrastructure constraints all play a role in dampening the outlook for demand in Northeast Asia.

China, though, is set to continue to see strong LNG import demand growth given supportive government policy and could well overtake Japan as the world's biggest LNG importer in the early-to-mid-2020s.

Other established buyers such as Pakistan, Bangladesh, India and Thailand will help prop up demand across the rest of Asia as they look to grow total power generation, industrial end-use and transportation demand while building out infrastructure to support LNG.

And emerging buyers elsewhere in Asia – countries such as Sri Lanka, Vietnam and the Philippines, which are looking for a reliable source of energy supply to help support their growing economies and in some cases replace diminishing domestic supplies – will help fuel the next wave of LNG importers.

Legacy buyers

The traditional markets of Japan, South Korea, Taiwan and China represent over 55% of global LNG demand. But shifts in the profiles of these large buyers are likely in the coming years.

Japan, in particular, has traditionally been the driver of much of global LNG consumption, though the country's recent market liberalization has prompted the relaxation of destination clauses in LNG supply contracts, revolutionizing the role of Japan as a traditional buyer.

With a steady rate in the return of the country's nuclear fleet post-Fukushima over the next three years, Japan could also see a gradual reduction in its LNG imports. Nine nuclear power plants have come back online as of 2019, with 14 more expected in the next few years, sparking a significant shift in demand away from more expensive LNG.

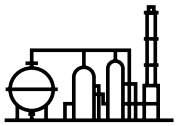
As a result, S&P Global Platts Analytics estimates the issue of over-contracting to emerge this year among Japanese utilities, while the situation could peak in 2020, with the over-contracted volumes reaching 19.5 million mt.

While it used to be that Japan was heavily geared toward LNG supply security in a post-Fukushima world, now the buzzword is increasingly "flexibility" given its importance when dealing with downstream demand fluctuations amid growing fuel-on-fuel competition.

South Korea, meanwhile, shares a similar story to Japan, albeit with competition coming to a larger extent from coal and renewables.

Seoul wants to increase the share of gas in its energy mix from 17% in 2017 to 19% by 2030, while the share of renewable energy is targeted to rise from just 5% to 20%. Coal, in contrast, is set to see its share of the country's energy mix drop from 45% to 36% in the same timeframe.

Liberalizing the country's gas market would mean allowing new and independent entrants to procure from the international market, while reducing the monopolistic power of state-owned Korea Gas Corp.

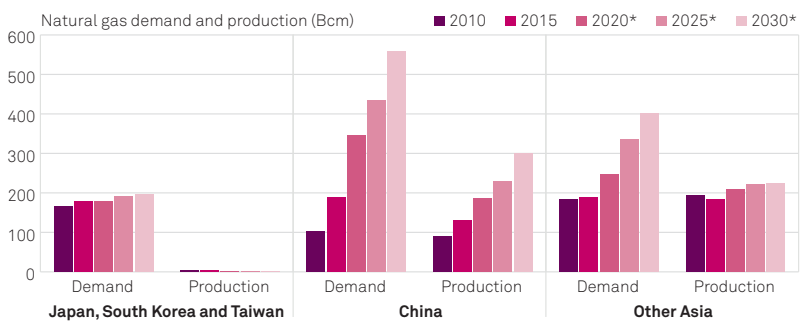


Japan, Taiwan, South Korea and China represent

55%

of global LNG demand

Asia's expanding economies drive LNG demand growth



Source: S&P Global Platts Analytics

*Forecast

Opening up its receiving terminals to the downstream markets will also bring more price competitiveness.

Despite the decision to cut LNG taxes by 74% and raise coal taxes concurrently by 27% from April 1, the economics of buying LNG versus coal in South Korea still seem to favor the latter, not least given that new power generation capacity in recent years has been focused on coal rather than gas.

Chinese growth

Of all the traditional importers in Northeast Asia, China's LNG demand paints the most promising growth picture. The country's growing appetite for LNG has been on an irreversible upward path since 2017 against the backdrop of supportive government policy on coal-to-gas switching, an attempt to combat nationwide air pollution.

Third-party access to LNG terminals owned by China's national oil companies as part of a market liberalization initiative has been in place since 2018, while state-planner NDRC is also supporting infrastructure development projects by independent gas distributors and power utilities through the approval of new terminals, storage tanks and import capacity.

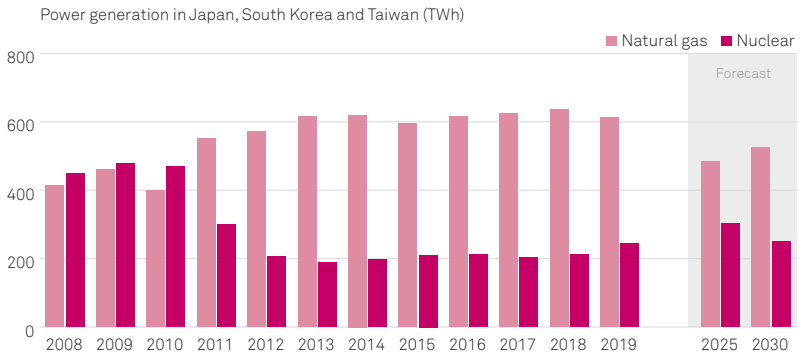
Market reforms are opening up the floodgates, creating additional demand that was previously held back by infrastructure constraints and the monopoly power of China's state-owned oil and gas companies.

With at least seven new import terminals planned for startup by 2022 – as well as the expansion of existing sites – over 20 million mt/year of receiving capacity could be added, increasing the number of independent buyers from the current eight.

This will free up access to the more fragmented and market-oriented downstream gas and trucked LNG sectors.

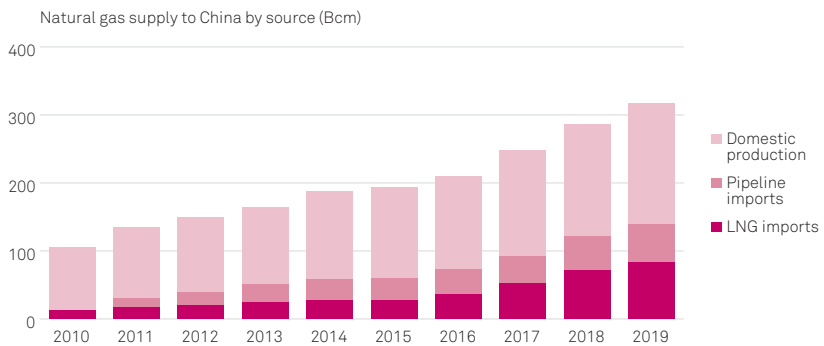
Platts Analytics forecasts China to overtake Japan as the world's largest LNG importer in the early-to-mid 2020s, with total imports at more than 80 million mt in 2024, a 57% increase from 51.2 million mt in 2018.

Limited demand upside from legacy markets



Source: S&P Global Platts Analytics

LNG supplements Chinese domestic output, pipeline imports



Source: S&P Global Platts Analytics

Emerging buyers

Away from Northeast Asia, many countries that currently import LNG are looking to established energy economies in Europe and North America for guidance on market liberalization. As more and more countries enter the global LNG market, this trend should help spur demand and increase the total number of players within the region. This will lead to a strengthening of LNG commoditization and increase the opportunity for spot trading.

Emerging economies are seeing increased energy intensity, growing populations and a desire for relatively inexpensive and environmentally-friendly options to support energy demand growth.

The potential market for LNG in Asia outside of the established buyers in Northeast Asia is significant, and Platts Analytics expects LNG demand from this market to reach roughly 130 million mt/year by 2030, up 42 million mt from 2018 levels.

Furthermore, because many of these countries already have established gas markets, the prospect of declining domestic supplies should continue to support the market for LNG.

Countries across Southeast Asia – such as Malaysia and Thailand – will also soon allow end-users access to import terminals, which in turn means more buyers with a diverse set of procurement needs out in the market looking for supplies.

This could easily spread to other less established markets by the end of the next decade.

The biggest obstacle to continuing to integrate LNG and spur strong growth will likely be the ability to implement infrastructure economically.

As the number of buyers increases and the fragmentation in buyers emerges, the literal fragmentation around the geography in Southeast Asia will also become apparent. Buyers will need to invest in significant infrastructure to get volumes to sparse and spread out end-users.

The very reason that LNG is a viable option for much of Southeast Asia – that it can access a wide variety of markets with a diverse set of supplies – could become its biggest hurdle to overcome as buyers will need to look for economically viable options, especially to compete with other forms of energy supply such as renewables or coal.

LNG will need to prove itself as a flexible, affordable fuel in which buyers can have confidence. Increasing competition and the diversification of buyers will help drive the market forward over the next decade, opening up the potential for regional hubs and new pricing points. ■

China forecast to import

80m

metric tons in 2024

Insight from Shanghai

By Sebastian Lewis

The International Maritime Organization's new emissions regulations are ushering in a reorganization of refining and bunkering across the globe. Could China emerge as a winner by ramping up production of compliant fuels and attracting more vessels to its ports?

China is one of the world's largest importers of energy and raw materials, and its ports handle nearly a third of global container traffic. Little wonder then, that in terms of the number of ships owned, China has the largest merchant fleet in the world.

Given the size of its fleet and the number of ships that pass through its ports, China plays a surprisingly small role in bonded bunkering – the provision of fuel sold tax-free to ships travelling between countries across international waters.

It is not China but Singapore that dominates Asian bunkering. Just under 50 million mt of bunker fuel were sold in Singapore last year, making it the world's largest bunkering hub. No other port comes close. Rotterdam and Fujairah, the world's second- and third-largest bunker ports, each sold under 10 million mt last year. In comparison, China's total bunker fuel demand is about 12 million mt/year across all its ports.

Most of the world's shipping fleet runs on high sulfur fuel oil – a cheap, dirty byproduct of the refining process. Asian refineries' output of HSFO is not enough to meet regional demand. S&P Global Platts Analytics estimates that Singapore imported nearly 90% of its bunker fuel in 2018 with just under two thirds coming from outside the region. In the first three months of 2019 just under a quarter of Singapore's imports came from Russia, and just over a quarter from Europe and the Americas, with the remainder being supplied by the Middle East and other parts of Asia.

The key to Singapore's dominance of Asian bunker markets is its huge commercial storage capacity and fuel blending capabilities. This allows it to take in arbitrage cargoes of different qualities from across the globe and blend them to meet requirements for end users throughout Asia.

Because of its pivotal role suppling the region, Singapore is also the Asian price benchmark for bunker fuel. The pricing for cargoes sold to Chinese importers is typically based on S&P Global Platts Singapore benchmarks. Imports make up around 90% of China's bonded bunker fuel supply, with Singapore and Malaysia being the main supply sources.

But could IMO 2020 – technically the implementation of Annex VI of MARPOL, a global protocol to reduce pollution from ships – erode Singapore's bunkering dominance? Could it see a Chinese port, or ports, rise to become a rival bunkering center, and even challenge Singapore's status as the regional benchmark?

IMO 2020 will limit maximum sulfur content in marine fuels to 0.5% from 3.5%, effective January 1, 2020. This will require all ships to either use fuel that meets the new sulfur cap, or to install scrubbers to reduce emissions if they continue using HSFO.

So far, only a few shipowners have been willing to commit the considerable capital investment required to install scrubbers. Platts Analytics estimates that scrubbers will only be able to scrub 13-15% of global bunker demand by January 2020, meaning most ships will have to use 0.5% sulfur marine fuel when the protocol comes into effect.

Singapore's storage infrastructure makes it well placed to be a blending hub for IMO compliant fuels. Indeed, the price of 0.5% sulfur marine fuel in Singapore has risen considerably this year, driven by stockpiling of low sulfur fuel oil components.

By the middle of August, 0.5% sulfur marine fuel was fetching a $105/mt premium to Platts 380 CST high sulfur fuel oil, up from $40/mt on January 2, 2019 when Platts started assessing cargoes of IMO-compliant bunker fuels.

But IMO 2020 also presents an opportunity for Asia's largest refiners, notably those in China. The country is second only to the US in terms of refining capacity, much of which is equipped with secondary processing units capable of producing low-sulfur products from high-sulfur crude.

Platts Analytics estimates that scrubbers will only be able to scrub 13-15% of global bunker demand by January 2020, meaning most ships will have to use 0.5% sulfur marine fuel

At the time of publication Chinese refiners and blenders were unable to claim back consumption and value-added taxes on domestic fuel sold as bonded bunkers. This puts them at a significant cost disadvantage compared with their peers in other locations such as Singapore. However, this could change before the end of the year, when the government is expected to announce changes that will allow refiners and blenders to claim back the tax on bonded low-sulfur marine fuel sales.

China National Petroleum Corporation (CNPC) recently announced it plans to produce 4 million mt/year of low-sulfur marine fuel, while Sinopec, the world's largest refiner, plans to produce 10 million mt/year of IMO compliant marine fuel by 2020. Sinopec will turn out IMO compliant marine fuel at 10 of its coastal refineries, with three having already started as of July 2019. This will likely involve processing lower sulfur crude and desulfurizing residues, then diverting feedstock including vacuum gasoil away from the secondary units into the marine fuel blending pool.

But this rapid transition brings its own risks. Higher prices for IMO-compliant fuels will incentivize production. But if the spread between 0.5% sulfur marine fuel and HSFO holds at elevated levels over a sustained period, this will shift the economics in favor of installing scrubbers and burning HSFO, reducing demand for low-sulfur fuel.

In the end the market will find its equilibrium. The question is whether this will be at a level that economically incentivizes Sinopec to produce as much as 10 million mt/year of 0.5% sulfur marine fuel, bearing in mind that each of Sinopec's refineries has different economics.

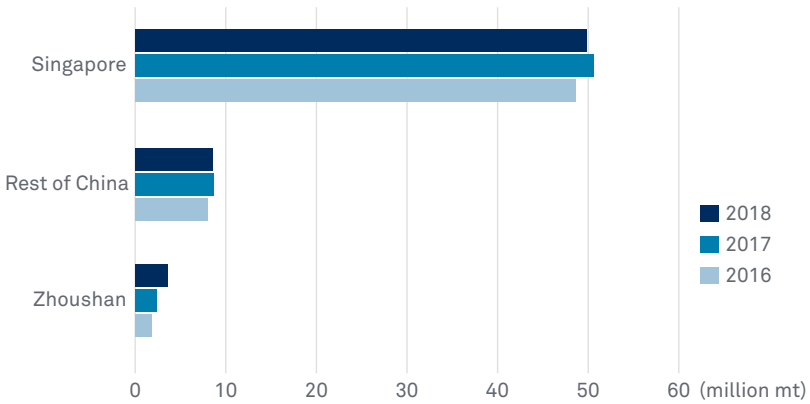
China has quite restrictive policies around blending imported fuel components. The consequent lack of ability to mix fuels to produce IMO compliant 0.5% sulfur fuels may make it hard for many Chinese ports to compete with established hubs like Singapore. The exception is Zhoushan, part of the Zhejiang Free Trade Zone. China's commerce ministry relaxed blending restrictions in the FTZ in July 2018 to allow locally registered oil companies to blend imported components for sale as bonded bunker fuel.

Zhoushan, located between Shanghai and Ningbo ports, is already China's largest bunkering hub. Sales of bonded bunkers reached 3.6 million mt last year, accounting for 30% of China's total. It also has tank capacity to rival Singapore. Zhoushan boasts 22 million cubic meters of storage, just above the 21.7 million cubic meters found in Singapore. But the headline numbers don't tell the whole story and just over a third of Zhoushan's storage is accounted for by the national strategic petroleum reserve.

However, with a further 10 million cubic meters under construction in Zhoushan, it is very likely that there will be sufficient commercial bonded tank capacity to store and blend IMO compliant marine fuel as bonded bunkering and blending develops and the market for low sulfur marine fuels at Zhoushan grows.

Market interest in Zhoushan has been strong, and to reflect this Platts launched assessments of IMO-compliant bunker fuel and marine gasoil delivered at Zhoushan on July 1, alongside IMO compliant bunker assessments at other key global ports.

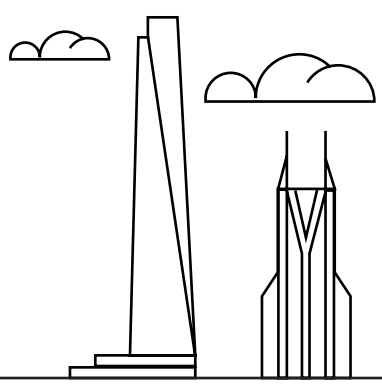
Rising Zhoushan bunker sales still dwarfed by Singapore



Source: S&P Global Platts Analytics, Maritime and Port Authority of Singapore, media reports

It is the market that will ultimately decide whether Zhoushan evolves into a major bunkering location, or even a regional price benchmark for bunker fuel.

On paper Zhoushan looks like a good bet. It is at the nexus of bunker supply and East Asian shipping demand. Physical storage and government policies are in place. And there is plenty of refinery supply to support the port's evolution into a major low-sulfur bunkering location. If Zhoushan manages to take advantage of the disruption caused by IMO, its bunkering volumes are unlikely to rival Singapore's any time soon, but it may not be long before the port becomes as important as other bunkering hubs like Rotterdam or Fujairah. ■



S&P Global
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TOP 250 GLOBAL ENERGY COMPANY RANKINGS

Europe's show of strength

LNG flows, demand growth and trade tensions lift Shell to first place in this year's S&P Global Platts Top 250 Global Energy Company Rankings. Article by Harry Weber, with editing by Keiron Greenhalgh

Europe seized market power while the US and China battled over trade in 2018.

As the world's two biggest economies levied punishing tariffs against each other, impacting a range of commodities from LNG to petrochemicals to oil, countries including France, Spain, Poland and Norway moved quickly in 2018 to open their doors to increasing volumes of supplies, while also working to market their own resources.

A 31.6% rise in the annual average Brent crude oil price, to $71.31/b from $54.19/b in 2017, coupled with a narrowing of the spread between prices in the two major LNG markets also boosted Europe's energy fortunes.

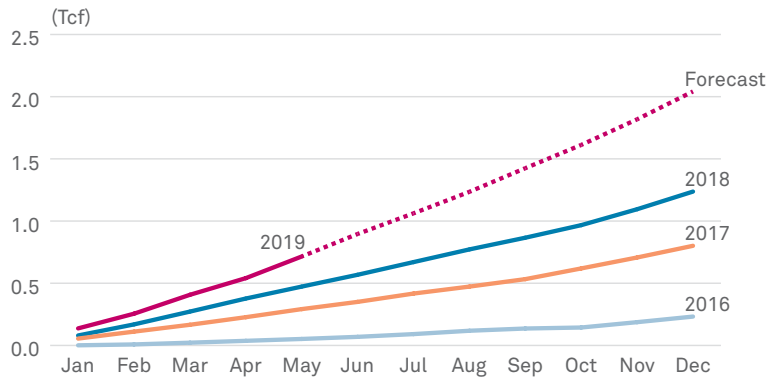
Amid the competing headwinds and tailwinds, scale mattered, as Royal Dutch Shell took the No. 1 spot in the 2019 S&P Global Top 250 ranking of energy companies, up 15 notches from the year before. In dethroning Irving, Texas-based ExxonMobil, which fell one spot to No. 2, the integrated oil and natural gas company (IOG) was atop the list for the first time since 2004. The 2019 list was based on data from 2018, including assets, revenue, profits and return on invested capital.

Global primary energy consumption grew at its fastest rate in almost a decade in 2018, led by natural gas and renewables, according to BP's annual statistical review of world energy, issued in June 2019. Oil and coal consumption, as well as electricity generation, also advanced, although by modest margins. China, the US and India together accounted for more than two thirds of the global increase in energy demand, the report showed.

Chinese retaliatory tariffs on imports of US LNG forced trade flows to shift in the final quarter of 2018, and the impact continued in 2019 as the tariffs increased. In one snapshot of the impact, in the second quarter of 2019, no US LNG cargoes were delivered to China, versus nine during the same period in 2018 before the initial tariffs were imposed, S&P Global Platts Analytics trade flow data showed.

The result? Shipments to Spain, France and Chile helped pick up the slack as the US saw a 55% increase in overall worldwide export deliveries during the three-month period that ended June 30, 2019.

Aggregate LNG feedgas deliveries to US terminals



Source: S&P Global Platts Analytics

The global landscape – characterized by robust competition, volatile prices, shifting market fundamentals and geopolitical uncertainty – favored the majors in the 2019 rankings, with IOGs from the US, Europe, the Middle East and Africa taking nine of the top 10 spots. They benefited from deep pockets, vast portfolios and tentacles in multiple commodities. At No. 7, down four spots from No. 3 the year before, Houston-based Phillips 66, a refining and marketing company, took the remaining spot.

Coal India, at No. 43 versus No. 57 the previous year, saw the biggest return on invested capital globally, at 60%, and state-run China Petroleum & Chemical Corp., an IOG also known as Sinopec, generated the most revenues at $418.4 billion, although it fell a spot in the 2019 rankings to No. 10 from No. 9 the year before. ConocoPhillips, an exploration and production company based in Houston, was the biggest mover on

Chinese retaliatory tariffs on imports of US LNG forced trade flows to shift in the final quarter of 2018, and the impact continued in 2019 as the tariffs increased

Ben van Beurden
CEO, Royal Dutch Shell

the 2019 list among companies that were also on the 2018 list, jumping 161 spots to No. 12 from No. 173 in the 2018 rankings.

For its part, London-based BP, an IOG, came in at No. 16 in the 2019 rankings, up 24 spots from No. 40 the year before.

"It feels like the oil market rollercoaster will run for some time to come," Spencer Dale, BP's chief economist, said when the statistical review was released. "The gyrations in supply, together with a host of macroeconomic factors, including the festering trade dispute between the US and China, were reflected in oil prices, which trended higher through much of the year, before tumbling in the final quarter."

Top 10

Shell benefited from higher oil and gas prices, divesting non-core assets to allow more money to be spent on growth projects, and cutting its debt further, reducing borrowing costs, the company said in its annual report for 2018, issued in March 2019.

Those projects included the completion of a chemical plant expansion in China and the ahead-of-schedule start of production from a deepwater development in the US Gulf of Mexico, where it also announced two large discoveries.

It was boosted in the rankings by strong revenues, profits and assets, while it registered an 8% return on invested capital and a three-year compound growth rate of 13.6%.

Perhaps most significantly for Shell, the company expanded its LNG portfolio, backing with a 40% stake the LNG Canada export project in British Columbia that made a positive final investment decision in October 2018. In recent years, gas in general, and LNG in particular, has played a key role in Shell's growth. Beyond Canada, Shell also is making significant investments in LNG export projects in the US, both as a developer and an offtaker.

France's Total, which maintained its No. 8 spot in the 2019 rankings, was another European energy giant that got a lift from LNG.

It was a foundation customer at Cheniere Energy's Sabine Pass LNG export facility in Louisiana and is a partner in Sempra Energy's Cameron LNG export terminal, also in Louisiana. Overall, it registered a 7% return on invested capital in 2018 and a three-year compound growth rate of 8.7%.

With the help of an investment it made in May 2019 in the Freeport LNG export project, via the acquisition of Toshiba's US LNG business and the Japanese company's offtake obligations at the Texas facility, Total was expected to see a benefit in future rankings, giving Shell a run for its money in terms of dominance in the North American LNG space.

At No. 5 in the 2019 rankings, up nine spots from No. 14 on the 2018 list, Norway's Equinor rounded out the European IOGs in the top 10. Formerly known as Statoil, the company has worked to broaden its global reach in commodities other than crude. Equinor posted an 11% return on invested capital in the 2019 rankings, up from 7% in the previous year's rankings.

There were also three Russian companies – OJSC Lukoil, OJSC Gazprom and Surgutneftegas OJSC – and three US companies – which in addition to Phillips 66 and ExxonMobil included San Ramon, California-based Chevron in the 2019 top 10.

Chevron jumped seven spots to No. 6 in the 2019 rankings from No. 13 the previous year. The company was aided in 2018 by increasing its oil and gas production by more than 7%, posting its highest ever annual output. The IOG has been making significant investments in the Permian Basin, a prolific shale play that spans West Texas and southeastern New Mexico. While oil has been the main draw for drillers there, significant amounts of associated gas are being lifted too, providing another revenue stream to players such as Chevron.

"In 2018, we had takeaway capacity for oil and liquids that was more than sufficient, and we've already added more capacity this year," CEO Michael Wirth told investors during a conference call in February 2019. "We are pleased with our position and leading performance in the Permian. In just two years, we've doubled our rig count, increased our resource base, decreased unit development and operating costs and more than doubled our production."

Gas could play a larger role for Chevron in future rankings as it lost a bidding war in May 2019 for The Woodlands, Texas-based exploration and production firm Anadarko Petroleum, which instead agreed to be gobbled up by Occidental Petroleum.

Fastest growing

Houston-based Cheniere Energy, the biggest LNG exporter in the US, was the fastest growing company in the world in the 2019 rankings for a second consecutive year, advancing to No. 166 from No. 242 in the previous year's rankings.

Fastest Growing

Fastest Growing Rank	Company Name	State or Country	Industry	3 Year CGR %	Platts Top 250 Rank
1	Cheniere Energy Inc	Texas	S&T	209.4	166
2	Parsley Energy Inc	Texas	E&P	90	241
3	Seven Generations Energy Ltd	Canada	E&P	81.2	222
4	Diamondback Energy Inc	Texas	E&P	69.2	159
5	Lundin Petroleum AB (publ)	Sweden	E&P	67.1	230
6	Yancoal Australia Ltd	Australia	C&CF	54.3	161
7	Oil & Natural Gas Corp Ltd	India	IOG	54	17
8	Pioneer Natural Resources Co	Texas	E&P	48.3	92
9	Aker BP ASA	Norway	E&P	47.4	146
10	Gulfport Energy Corp	Oklahoma	E&P	43.3	213
11	YPF Sociedad Anónima	Argentina	IOG	40.8	95
12	Brookfield Infrastructure Partners LP	Bermuda	DU	35.9	220
13	Türkiye Petrol Rafinerileri A.S.	Turkey	R&M	33.9	100
14	Yanzhou Coal Mining Co Ltd	China	C&CF	33.2	60
15	Emera Incorporated	Canada	EU	32.7	171
16	Elia System Operator SA	Belgium	EU	32.7	245
17	CNX Resources Corp	Pennsylvania	E&P	32.7	153
18	Shanxi Lu'an Environmental Energy Development Co Ltd	China	C&CF	31.1	188
19	Electricity Generating Public Co Ltd	Thailand	IPP	30.7	174
20	Concho Resources Inc	Texas	E&P	29.1	72
21	Andeavor Logistics LP	Ohio	S&T	28.9	179
22	PBF Energy Inc	New Jersey	R&M	27.5	204
23	Inner Mongolia Yitai Coal CoLtd	China	C&CF	26	155
24	Reliance Industries Ltd	India	R&M	25.6	19
25	EOG Resources Inc	Texas	E&P	25.6	31
26	Yangquan Coal Industry (Group) Co Ltd	China	C&CF	24.7	210
27	CGN Power Co Ltd	China	IPP	24.5	101
28	ENN Energy Holdings Ltd	China	GU	23.7	156
29	Continental Resources Inc	Oklahoma	E&P	22.4	112
30	Cenovus Energy Inc	Canada	IOG	21.8	201
31	China Coal Energy Co Ltd	China	C&CF	20.7	130
32	PAO NOVATEK	Russia	E&P	20.7	51
33	Shaanxi Coal Industry Co Ltd	China	C&CF	20.7	68
34	Evergy Inc	Missouri	EU	20.2	168
35	Shanxi Xishan Coal & Electricity Power CoLtd	China	C&CF	20	233
36	Phillips 66 Partners LP	Texas	S&T	19.6	196
37	Canadian Natural Resources Ltd	Canada	E&P	19.4	53
38	Vistra Energy Corp	Texas	IPP	19.4	217
39	Power Grid Corp of India Ltd	India	EU	19.3	89
40	China Gas Holdings Ltd	Hong Kong	GU	18.6	119
41	PJSC Tatneft	Russia	E&P	18.1	40
42	ONEOK Inc	Oklahoma	S&T	17.5	82
43	Cimarex Energy Co	Colorado	E&P	17.2	148
44	Rabigh Refining & Petrochemical Co	Saudi Arabia	R&M	17.1	214
45	Bharat Petroleum Corp Ltd	India	R&M	16.7	44
46	Pembina Pipeline Corp	Canada	S&T	16.6	122
47	Huaneng Renewables Corp Ltd	China	IPP	16.6	224
48	China Resources Gas Group Ltd	Hong Kong	GU	15.9	129
49	OJSC Rosneft Oil Co	Russia	IOG	15.8	11
50	Equatorial Energia SA	Brazil	EU	15.8	246

The growth came as it ramped up production at Sabine Pass by bringing additional trains online. And the first two trains at its export terminal near Corpus Christi, Texas, were shipping cargoes in 2019, in what could portend a further boost in future rankings.

The growth made Cheniere the biggest individual consumer of gas in the US. That continued into 2019, with feedgas deliveries to its two facilities topping 5 Bcf/d during the second half of the year. As the year wound down, Cheniere was developing a mid-scale liquefaction expansion at its Texas terminal and was building a gas pipeline to boost takeaway capacity from the Midcontinent region in Oklahoma to downstream markets including the US Gulf Coast.

While Cheniere adjusted its strategy for shipping spot cargoes and looked beyond China due to the tariffs on imports of US LNG imposed by Beijing, it was managing to continue to find buyers in Europe and elsewhere and sign long-term offtake agreements.

It topped the 2019 fastest-growing list with a three-year compound growth rate of 209.4%, more than double the CGR of the second fastest-growing company in the rankings – Austin, Texas-based exploration and production firm Parsley Energy, which ranked No. 241 in 2019 after not making the previous year's list.

Yancoal Australia, that country's largest pure coal producer with five mines in operation and five others it manages, and Argentina's YPF, an oil and gas exploration and production company that also operates in the refining and

marketing sectors for gas and petroleum products, also registered among the top 50 fastest-growing companies in the 2019 rankings.

Yancoal, the sixth fastest-growing, posted a three-year compound growth rate of 54.3%, while YPF, the 11th fastest-growing, recorded a three-year CGR of 40.8%, bumping it up 34 spots to No. 95 in the overall rankings from No. 129 on the 2018 list. Yancoal was No. 161 in the 2019 overall rankings. It wasn't in the Top 250 the previous year.

Electric utilities and power producers also fared well among the fastest-growing companies in the 2019 rankings.

Belgium's Elia, which operates the country's electric transmission system, notched a three-year compound growth rate of 32.7%, helping elevate it into the 2019 overall rankings at No. 245, while Thailand's Electricity Generating Public Co., an independent power producer, scored a three-year compound growth rate of 30.7%, lifting it to No. 174 in the overall rankings from No. 243 a year earlier.

Elia's growth was part of an effort to become a leading European energy company.

"In Belgium, we want to enhance our role as a European energy hub by further developing offshore activities, building additional interconnectors and upgrading the domestic grid," Bernard Gustin, chairman of the group's supervisory board, said in an April 2019 message to shareholders. "Our projects in Germany include the construction of the SuedOstLink, which will carry the growing volumes of renewable power generated in northern

Biggest Movers – Up

Platts Rank 2019	Platts Rank 2018	UP	Company Name	State or Country	Region	Industry
12	173	161	ConocoPhillips	Texas	Americas	E&P
27	79	52	Occidental Petroleum Corp	Texas	Americas	IOG
28	147	119	Petróleo Brasileiro SA - Petrobras	Brazil	Americas	IOG
38	110	72	OMV Aktiengesellschaft	Austria	EMEA	IOG
39	216	177	Centrais Elétricas Brasileiras SA - Eletrobras	Brazil	Americas	EU
72	125	53	Concho Resources Inc	Texas	Americas	E&P
78	172	94	Kinder Morgan Inc	Texas	Americas	S&T
82	155	73	ONEOK Inc	Oklahoma	Americas	S&T
85	144	59	AGL Energy Ltd	Australia	Asia/Pacific Rim	DU
90	162	72	Sempra Energy	California	Americas	DU
97	NA	154	Marathon Oil Corp	Texas	Americas	E&P
103	219	116	The AES Corp	Virginia	Americas	IPP
113	167	54	Inpex Corp	Japan	Asia/Pacific Rim	E&P
115	209	94	FirstEnergy Corp	Ohio	Americas	EU
117	204	87	Anadarko Petroleum Corp	Texas	Americas	E&P
128	192	64	Korea Gas Corp	South Korea	Asia/Pacific Rim	GU
131	238	107	NRG Energy Inc	New Jersey	Americas	IPP
146	197	51	Aker BP ASA	Norway	EMEA	E&P
150	NA	101	Santos Ltd	Australia	Asia/Pacific Rim	E&P
153	NA	98	CNX Resources Corp	Pennsylvania	Americas	E&P
161	NA	90	Yancoal Australia Ltd	Australia	Asia/Pacific Rim	C&CF
166	242	76	Cheniere Energy Inc	Texas	Americas	S&T
173	NA	78	World Fuel Services Corp	Florida	Americas	R&M
174	243	69	Electricity Generating Public Co Ltd	Thailand	Asia/Pacific Rim	IPP
192	NA	59	SM Energy Co	Colorado	Americas	E&P
205	NA	46	Murphy Oil Corp	Arkansas	Americas	E&P
207	NA	44	Energisa SA	Brazil	Americas	EU
217	NA	34	Vistra Energy Corp	Texas	Americas	IPP
221	NA	30	California Resources Corp	California	Americas	E&P
232	NA	19	PT Perusahaan Gas Negara Tbk	Indonesia	Asia/Pacific Rim	GU
240	NA	11	Whiting Petroleum Corp	Colorado	Americas	E&P
241	NA	10	Parsley Energy Inc	Texas	Americas	E&P

Biggest movers have ascended or descended more than 50 ranks year on year, or entered into the Top 250 this year

Industry abbreviation key

C&CF Coal and consumable fuels

DU Multi-utilities

E&P Oil & gas exploration and production

EU Electric utilities

GU Gas utilities

IPP Independent power producers and energy traders

IOG Integrated oil & gas

R&M Oil & gas refining and marketing

S&T Oil & gas storage and transportation

Germany to consumption centers in the south of the country, and the further expansion of offshore activities, like the development of the Westlich Adlergrund 2 cluster."

Regional breakdown

IOGs dominated in the Americas, Europe, the Middle East and Africa in the 2019 rankings, but refining and marketing companies showed strength in Asia and the Pacific Rim.

Enterprise Products Partners, a midstream oil, gas and NGLs infrastructure operator based in Houston, was seventh among companies in the Americas and ranked No. 23 overall, after failing to make the list in 2018.

Along the US Gulf Coast, Enterprise's connectivity to export markets, geared toward serving robust demand in Asia, was a growth driver.

In Brazil, meanwhile, Petrobras benefited from a surge in offshore production capacity installations in 2018, including several in the highly productive subsalt region. It was ninth among companies in the Americas on the 2019 list, good for No. 28 in the overall rankings, a 119-spot advance from No. 147 in the 2018 rankings.

Whether the jump will be short-lived is an open question, as Petrobras cut its 2019 crude and gas production forecast amid declines at mature onshore and shallow-water reservoirs.

Japan's JXTG Holdings, a refining and marketing company, was seventh among companies in Asia and the Pacific Rim. But it slipped nine spots to No. 24 in the overall rankings from No. 15 in 2018, amid a decline in demand for fuel oil in Japan.

State-owned Indian Oil Corp., also a refining and marketing firm, notched the eighth spot among companies in Asia and the Pacific Rim. It, too, fell in the overall rankings, dropping 13 spots to No. 25 from No. 12 in 2018.

Biggest Movers – Down

Platts Rank 2019	Platts Rank 2018	Down	Company Name	State or Country	Region	Industry
114	20	94	EnBW Energie Baden-Württemberg AG	Germany	EMEA	EU
121	70	51	ENGIE SA	France	EMEA	DU
154	96	58	CEZ a. s.	Czech Republic	EMEA	EU
160	24	136	RWE Aktiengesellschaft	Germany	EMEA	DU
162	81	81	Naturgy Energy Group SA	Spain	EMEA	GU
164	59	105	PG&E Corp	California	Americas	EU
170	55	115	CenterPoint Energy Inc	Texas	Americas	DU
178	113	65	Edison International	California	Americas	EU
186	122	64	Polska Grupa Energetyczna SA	Poland	EMEA	EU
191	68	123	S-Oil Corp	South Korea	Asia/Pacific Rim	R&M
193	119	74	Thai Oil Pcl	Thailand	Asia/Pacific Rim	R&M
198	61	137	The Williams Companies Inc	Oklahoma	Americas	S&T
201	48	153	Cenovus Energy Inc	Canada	Americas	IOG
204	115	89	PBF Energy Inc	New Jersey	Americas	R&M
211	132	79	Hellenic Petroleum SA	Greece	EMEA	R&M
234	86	148	Apache Corp	Texas	Americas	E&P

Biggest movers have ascended or descended more than 50 ranks year on year.

Italy's Eni, an IOG, came in tenth among companies in Europe, the Middle East and Africa, which was the same market position as in the 2018 list, although its overall ranking in 2019 improved five spots to No. 20 from the previous year.

A letter from senior executives to shareholders discussing the company's performance in 2018 said the growth was aided by an overhaul of Eni's business model that began in 2014 ahead of a downturn in oil markets. The company said its operations were more resilient to price volatility.

"The reloading of the exploration asset portfolio was made with the objective of expanding the geographic reach of our operations, targeting material assets with high working interests located in strategic areas," the letter said.

Eni pinned future production growth in large part on new projects in several countries, including Mexico, Indonesia, Egypt and Angola. The company also had its hooks in the LNG sector in 2018, growing in that segment by adding 8.8 million mt/year of contracted volumes, up 70% compared with 2017. In Mozambique, Eni and ExxonMobil are developing the 15.2 million

Top 50 Companies 2019 vs. 2018

Platts Rank 2019	Platts Rank 2018	Company Name	State or Country	Region	Industry
1	16	Royal Dutch Shell plc	Netherlands	EMEA	IOG
2	1	Exxon Mobil Corp	Texas	Americas	IOG
3	2	OJSC LUKOIL	Russia	EMEA	IOG
4	17	OJSC Gazprom	Russia	EMEA	IOG
5	14	Equinor ASA	Norway	EMEA	IOG
6	13	Chevron Corp	California	Americas	IOG
7	3	Phillips 66	Texas	Americas	R&M
8	8	TOTAL SA	France	EMEA	IOG
9	35	Surgutneftegas OJSC	Russia	EMEA	IOG
10	9	China Petroleum & Chemical Corp	China	Asia/Pacific Rim	IOG
11	36	OJSC Rosneft Oil Co	Russia	EMEA	IOG
12	173	ConocoPhillips	Texas	Americas	E&P
13	26	CNOOC Ltd	Hong Kong	Asia/Pacific Rim	E&P
14	5	China Shenhua Energy Co Ltd	China	Asia/Pacific Rim	C&CF
15	4	E.ON SE	Germany	EMEA	DU
16	40	BP p.l.c.	United Kingdom	EMEA	IOG
17	21	Oil & Natural Gas Corp Ltd	India	Asia/Pacific Rim	IOG
18	6	Valero Energy Corp	Texas	Americas	R&M
19	7	Reliance Industries Ltd	India	Asia/Pacific Rim	R&M
20	25	Eni S.p.A.	Italy	EMEA	IOG
21	10	PTT Plc	Thailand	Asia/Pacific Rim	IOG
22	18	NextEra Energy Inc	Florida	Americas	EU
23		Enterprise Products Partners LP	Texas	Americas	S&T
24	15	JXTG Holdings Inc	Japan	Asia/Pacific Rim	R&M
25	12	Indian Oil Corp Ltd	India	Asia/Pacific Rim	R&M
26	29	Enel SpA	Italy	EMEA	EU
27	79	Occidental Petroleum Corp	Texas	Americas	IOG
28	147	Petróleo Brasileiro SA - Petrobras	Brazil	Americas	IOG
29	47	PetroChina Co Ltd	China	Asia/Pacific Rim	IOG
30	31	Ecopetrol SA	Colombia	Americas	IOG
31	39	EOG Resources Inc	Texas	Americas	E&P
32	30	OJSC Transneft	Russia	EMEA	S&T
33	22	Suncor Energy Inc	Canada	Americas	IOG
34	11	Marathon Petroleum Corp	Ohio	Americas	R&M
35		Plains All American Pipeline LP	Texas	Americas	S&T
36	33	Iberdrola SA	Spain	EMEA	EU
37	53	Ørsted A/S	Denmark	EMEA	EU
38	110	OMV Aktiengesellschaft	Austria	EMEA	IOG
39	216	Centrais Elétricas Brasileiras SA - Eletrobras	Brazil	Americas	EU
40	54	PJSC Tatneft	Russia	EMEA	E&P
41	28	Tokyo Electric Power Co Holdings Incorporated	Japan	Asia/Pacific Rim	EU
42	32	Repsol SA	Spain	EMEA	IOG
43	57	Coal India Ltd	India	Asia/Pacific Rim	C&CF
44	41	Bharat Petroleum Corp Ltd	India	Asia/Pacific Rim	R&M
45	45	Polski Koncern Naftowy ORLEN Spólka Akcyjna	Poland	EMEA	R&M
46	27	SK Innovation Co Ltd	South Korea	Asia/Pacific Rim	R&M
47	23	Exelon Corp	Illinois	Americas	EU
48	37	China Yangtze Power CoLtd	China	Asia/Pacific Rim	IPP
49	42	Formosa Petrochemical Corp	Taiwan	Asia/Pacific Rim	R&M
50	49	Duke Energy Corp	North Carolina	Americas	EU

mt/year Rovuma LNG project, with a final investment decision expected by fall 2019.

Rising renewables

In the power sector, increases in renewables consumption shifted the landscape.

Some utilities and system operators jumped in with additional investments in wind, solar and new equipment. Others, because of the uncertainty in the marketplace, shed renewables assets to focus on their core distribution businesses, which are often regulated and provide for more stable returns.

Germany's E.ON, which runs one of the world's largest investor-owned electric utility service providers, encountered some bumps adjusting to the dynamics.

It slid to No. 15 in the 2019 rankings from No. 4 the previous year, after rising in 2017 to No. 2 from No. 114 in 2016. E.ON's assets fell in 2018 to $61 billion from $65.4 billion in 2017, while revenue plunged to $33.7 billion in 2018 from $45 billion the year before. Its return on invested capital was 20% in the 2018 rankings, higher than the 16% ROIC in the 2019 rankings.

According to BP's annual statistical review, renewable power grew 14.5% worldwide in 2018, led by increases in solar and wind generation and contributions by China. But despite this, in E.ON's view, the renewable energy business was increasingly exposed to market price risks and needed to interact with the wholesale market.

So, in March 2018, it announced an asset swap with German

power producer RWE. Under the deal, E.ON would transfer substantially all of its renewables business to RWE, while in exchange it would acquire RWE's 76.8% stake in energy provider Innogy. E.ON would keep Innogy's network and retail businesses and focus on electricity distribution, while RWE would keep Innogy's renewables businesses and focus on electricity production, with renewables complementing its fuel stack.

It was expected to take some time to see whether the new strategy reverses E.ON's fortunes.

On the electricity generation side, meanwhile, global output rose by an above-average 3.7% in 2018, lifted by China (which accounted for more than half of the growth), India and the US, BP said. Coal continued to account for the largest share of power generation at 38%, while nuclear generation rose by 2.4%, its steepest growth since 2010, BP said.

The power sector trends had uneven results.

They helped independent US power producers AES, based in Arlington, Virginia, and NRG Energy, based in Princeton, New Jersey, and Houston. Both were among the top 50 biggest movers up the 2019 rankings.

On the flip side, Czech Republic's CEZ, an electric utility, was among the biggest movers down the 2019 rankings, dropping 58 places to No. 154 from No. 96 in the 2018 list.

AES, which owns and operates power plants and delivers energy in 14 countries, rose 116 spots to No. 103 from No. 219 in the 2018 rankings, while NRG, which among other things owns 15 gas-fired power plants that produce almost 10,000 MW of electricity and one nuclear power plant with a capacity of over 1,100 MW, advanced 107 notches to No. 131 from No. 238 in the previous year's rankings.

According to BP's annual statistical review, renewable power grew 14.5% worldwide in 2018, led by increases in solar and wind generation and contributions by China

"We refocused our business on our core strengths of integrating retail and generation. We sold non-core assets or underperforming assets, and we rightsized our generation portfolio to better match our retail business," NRG CEO Mauricio Gutierrez told analysts during a conference call in February 2019. "So the bottom line is this: our company today is stronger than it has ever been and what gets me excited is that the best is still yet to come. We're now a streamlined cash flow machine that for the first time have the financial flexibility to create significant and sustainable shareholder value."

Influential investment

Growth in the oil sector was driven in large part by expansion of petrochemicals facilities. BP's statistical review pointed to products most closely related to petrochemicals, such as ethane, LPG and naphtha, accounting for around half of overall oil demand growth in 2018.

Middle Eastern nations, including Saudi Arabia, invested heavily in downstream activities in 2018, including petrochemicals. In November 2018, Saudi Aramco pledged to invest $160 billion over 10 years on gas developments and said it planned to direct more feedstock into petrochemicals.

The company identified petrochemicals as a major source of future growth, and that was a key reason it moved to acquire government-controlled SABIC, the Middle East's largest producer of plastics and chemicals.

Besides its efforts at home, Saudi Aramco has also been investing heavily in the US and promising renewed energy cooperation with Russia, partly involving petrochemicals.

The Aramco investment spree was expected to give a lift to other energy companies with ties to the NGLs and petrochemicals industries, though in the 2019 rankings moves were uneven.

A SABIC-ExxonMobil partnership is developing a steam cracker near Corpus Christi, Texas, that would add about 160,000 b/d of ethane demand to the market. SABIC also has two petrochemical manufacturing joint ventures in Louisiana, one with Total and the other with ties to Tulsa, Oklahoma-based Williams.

While ExxonMobil and Total mostly held their own in the 2019 rankings, Williams, a major operator of gas pipelines, fell 137 spots to No. 198 from No. 61 the previous year.

In May 2019, Aramco reached a preliminary deal to take a 25% stake in Sempra's proposed Port Arthur LNG export project – which would be the state-owned oil company's first direct investment in a US LNG facility. Sempra, a San Diego-based energy provider, jumped 72 rungs to No. 90 in the 2019 rankings from No. 162 the previous year.

Aramco in 2019 expressed interest in taking part in Novatek's growing LNG production in the Russian Arctic, though it may have missed out on the next project to be developed there – Arctic LNG 2 – when Novatek sold minority stakes to Chinese and Japanese investors. Novatek moved up nine spots to No. 51 in the 2019 rankings from No. 60 in 2018.

Future outlook

The momentum many of the companies in the 2019 rankings were seeing, and the fortunes of those that had declines, could be impacted in the future by how and when the US-China trade war is resolved.

In 2018, both countries imposed 10% tariffs on imports of certain goods the other produces, and in 2019, tariffs were raised to 25% on certain goods.

The conflict, which continued into the second half of 2019, was consequential for the LNG sector, but it also affected the oil sector, as traditional LNG contracts have been linked to oil prices.

Growing flexible US volumes are expected to reinforce global interconnectivity in the future, reducing overall voyage lengths, lowering delivery costs and creating an environment favorable for the development of spot and risk markets.

By the late 2020s, China is expected to become the world's largest importer of LNG. US exporters well into 2019 were negotiating for a sizable chunk of the Chinese import market to support the construction of new liquefaction facilities along the Gulf Coast. The longer the tariffs remain in place, the more challenging it was expected to be for new projects to get off the ground.

During the latter part of 2018 and into 2019, the spread between LNG netbacks to the US from hubs in Asia and Europe narrowed, Platts Analytics data show. That provided another reason for offtakers and portfolio players to take cargoes to points in Europe over China, portending perhaps another good showing for European diversified energy companies in the 2020 rankings. ■

2019 Top 250 Ranking

Platts Rank 2019	Company	State or Country	Region	Assets		Revenues		Profits		Return on invested capital		3-Year	Industry
				$million	rank	$million	rank	$million	rank	ROIC%	rank	CGR%	
1	Royal Dutch Shell plc	Netherlands	EMEA	399194	1	388379	2	23352	1	8	57	13.6	IOG
2	Exxon Mobil Corp	Texas	Americas	346196	3	279332	5	20840	3	9	51	5	IOG
3	OJSC LUKOIL	Russia	EMEA	87894	30	123214	9	9494	7	13	16	11.8	IOG
4	OJSC Gazprom	Russia	EMEA	319085	4	126101	8	22329	2	8	59	10.6	IOG
5	Equinor ASA	Norway	EMEA	112508	24	78556	20	7535	13	11	28	10.7	IOG
6	Chevron Corp	California	Americas	253863	8	158902	7	14824	4	8	69	9	IOG
7	Phillips 66	Texas	Americas	54302	53	111461	11	5589	19	15	11	9.4	R&M
8	TOTAL SA	France	EMEA	256762	7	184106	6	11446	6	7	78	8.7	IOG
9	Surgutneftegas OJSC	Russia	EMEA	78747	34	23572	60	12138	5	18	5	15.7	IOG
10	China Petroleum & Chemical Corp	China	Asia/Pacific Rim	230509	9	418384	1	8920	9	6	88	12.7	IOG
11	OJSC Rosneft Oil Co	Russia	EMEA	201827	11	120042	10	8418	10	6	83	15.8	IOG
12	ConocoPhillips	Texas	Americas	69980	41	37491	38	6257	17	13	18	7.5	E&P
13	CNOOC Ltd	Hong Kong	Asia/Pacific Rim	98263	26	32779	45	7627	11	10	38	9.7	E&P
14	China Shenhua Energy Co Ltd	China	Asia/Pacific Rim	85646	31	38232	36	6389	16	9	43	14.3	C&CF
15	E.ON SE	Germany	EMEA	61059	46	33673	44	3301	31	16	8	-11.5	DU
16	BP p.l.c.	United Kingdom	EMEA	282176	6	297220	4	9382	8	5	112	10.2	IOG
17	Oil & Natural Gas Corp Ltd	India	Asia/Pacific Rim	71473	40	65383	25	4397	22	9	49	54	IOG
18	Valero Energy Corp	Texas	Americas	50155	57	111407	12	3113	34	10	35	10.8	R&M
19	Reliance Industries Ltd	India	Asia/Pacific Rim	144533	16	83775	17	5708	18	6	94	25.6	R&M
20	Eni S.p.A.	Italy	EMEA	133048	17	85966	16	4638	21	5	104	1.9	IOG
21	PTT Plc	Thailand	Asia/Pacific Rim	75111	38	74495	23	3781	26	6	81	4.9	IOG
22	NextEra Energy Inc	Florida	Americas	103702	25	16727	79	6638	15	9	51	-1.5	EU
23	Enterprise Products Partners LP	Texas	Americas	56970	49	36534	39	4151	23	8	61	10.6	S&T
24	JXTG Holdings Inc	Japan	Asia/Pacific Rim	78245	35	102719	13	2975	35	6	93	13.9	R&M
25	Indian Oil Corp Ltd	India	Asia/Pacific Rim	48325	59	76152	22	2505	42	8	57	15.1	R&M
26	Enel SpA	Italy	EMEA	185932	12	82993	18	5383	20	5	136	-0.1	EU
27	Occidental Petroleum Corp	Texas	Americas	43854	72	17824	73	4114	24	13	21	12.6	IOG
28	Petróleo Brasileiro SA - Petrobras	Brazil	Americas	222897	10	80295	19	6678	14	4	155	0.9	IOG
29	PetroChina Co Ltd	China	Asia/Pacific Rim	352104	2	340715	3	7613	12	3	184	10.9	IOG
30	Ecopetrol SA	Colombia	Americas	37755	86	20780	66	3447	27	12	25	9.4	IOG
31	EOG Resources Inc	Texas	Americas	33934	90	17266	75	3419	30	13	16	25.6	E&P
32	OJSC Transneft	Russia	EMEA	48908	58	15026	91	3440	29	8	61	6.3	S&T
33	Suncor Energy Inc	Canada	Americas	66729	45	28711	49	2453	43	5	104	9.7	IOG
34	Marathon Petroleum Corp	Ohio	Americas	92940	27	96706	14	2779	36	4	170	14.5	R&M
35	Plains All American Pipeline LP	Texas	Americas	25511	118	34055	42	2009	50	10	38	13.7	S&T
36	Iberdrola SA	Spain	EMEA	127052	18	39424	35	3445	28	4	170	3.7	EU
37	Ørsted A/S	Denmark	EMEA	26276	111	11367	111	2682	37	16	9	4.2	EU
38	OMV Aktiengesellschaft	Austria	EMEA	41543	77	25774	53	1616	61	7	78	0.6	IOG
39	Centrais Elétricas Brasileiras SA - Eletrobras	Brazil	Americas	46941	61	5548	173	3922	25	14	14	-12.7	EU
40	PJSC Tatneft	Russia	EMEA	18419	143	13961	95	3248	33	27	2	18.1	E&P
41	Tokyo Electric Power Co Holdings Incorporated	Japan	Asia/Pacific Rim	117743	22	58500	26	2145	47	3	182	1.5	EU
42	Repsol SA	Spain	EMEA	68313	43	48981	29	2136	48	4	158	9.1	IOG
43	Coal India Ltd	India	Asia/Pacific Rim	19136	140	13394	98	2518	40	60	1	7.1	C&CF
44	Bharat Petroleum Corp Ltd	India	Asia/Pacific Rim	19743	136	43000	31	1125	78	9	45	16.7	R&M
45	Polski Koncern Naftowy ORLEN Spólka Akcyjna	Poland	EMEA	16849	154	28818	48	1459	64	12	24	7.5	R&M
46	SK Innovation Co Ltd	South Korea	Asia/Pacific Rim	30572	99	46182	30	1369	69	6	94	4.1	R&M
47	Exelon Corp	Illinois	Americas	119666	21	35985	40	2010	49	3	184	6.9	EU
48	China Yangtze Power CoLtd	China	Asia/Pacific Rim	42777	74	7414	150	3273	32	10	38	2.6	IPP
49	Formosa Petrochemical Corp	Taiwan	Asia/Pacific Rim	12905	179	24411	56	1911	54	17	6	6.8	R&M
50	Duke Energy Corp	North Carolina	Americas	145392	15	24116	57	2642	38	3	190	3.1	EU

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51	PAO NOVATEK	Russia	EMEA	18651	142	11915	107	2511	41	15	10	20.7	E&P
52	Energy Transfer LP	Texas	Americas	88246	29	54087	27	1923	53	2	195	14.4	S&T
53	Canadian Natural Resources Ltd	Canada	Americas	53306	56	15664	83	1930	51	5	121	19.4	E&P
54	The Southern Co	Georgia	Americas	116914	23	23495	61	2226	46	3	184	10.3	EU
55	Hindustan Petroleum Corp Ltd	India	Asia/Pacific Rim	15465	161	39544	34	965	98	12	26	15.6	R&M
56	American Electric Power Co Inc	Ohio	Americas	68803	42	16196	81	1924	52	4	149	-0.5	EU
57	Dominion Energy Inc	Virginia	Americas	77914	36	13366	99	2447	44	4	149	4.6	DU
58	Enbridge Inc	Canada	Americas	124331	19	34548	41	1873	56	2	215	11.1	S&T
59	SSE plc	United Kingdom	EMEA	32126	95	9294	132	1751	59	9	48	-36.6	EU
60	Yanzhou Coal Mining Co Ltd	China	Asia/Pacific Rim	29485	101	23598	59	1233	75	6	100	33.2	C&CF
61	National Grid plc	United Kingdom	EMEA	79816	32	18930	69	1900	55	3	180	4.2	DU
62	CLP Holdings Ltd	Hong Kong	Asia/Pacific Rim	29397	102	11659	109	1728	60	8	71	4.2	EU
63	NTPC Ltd	India	Asia/Pacific Rim	45764	65	13805	96	1823	58	5	127	9.2	IPP
64	TC Energy Corp	Canada	Americas	73688	39	10190	123	2636	39	4	146	6.4	S&T
65	MOL Hungarian Oil & Gas Co	Hungary	EMEA	16096	156	18041	72	1051	90	10	33	8.1	IOG
66	Empresas Copec SA	Chile	Americas	23487	124	23970	58	1071	85	6	99	9.7	R&M
67	HollyFrontier Corp	Texas	Americas	10995	190	17715	74	1094	82	12	23	10.2	R&M
68	Shaanxi Coal Industry Co Ltd	China	Asia/Pacific Rim	17448	148	8284	141	1591	62	13	20	20.7	C&CF
69	The Kansai Electric Power Co Incorporated	Japan	Asia/Pacific Rim	66981	44	30528	46	1062	87	2	200	0.6	EU
70	Rosseti OJSC	Russia	EMEA	38618	83	15664	82	1395	67	4	146	10	EU
71	PPL Corp	Pennsylvania	Americas	43396	73	7785	147	1825	57	5	104	0.5	EU
72	Concho Resources Inc	Texas	Americas	26294	110	3879	192	2269	45	10	35	29.1	E&P
73	Husky Energy Inc	Canada	Americas	26240	112	16576	80	1059	89	6	102	10.8	IOG
74	OJSC Inter RAO UES	Russia	EMEA	11171	188	14759	92	1085	83	13	21	5	EU
75	Electricité de France SA	France	EMEA	318275	5	77527	21	667	125	0	234	-2.8	EU
76	Public Service Enterprise Group Incorporated	New Jersey	Americas	45326	67	9696	128	1438	66	5	127	-2.4	DU
77	Xcel Energy Inc	Minnesota	Americas	45987	64	11537	110	1261	73	4	149	1.5	EU
78	Kinder Morgan Inc	Texas	Americas	78866	33	14144	94	1473	63	2	209	-0.6	S&T
79	Idemitsu Kosan CoLtd	Japan	Asia/Pacific Rim	26676	108	40841	32	752	119	4	140	7.4	R&M
80	Consolidated Edison Inc	New York	Americas	53920	54	12337	106	1382	68	4	172	-0.6	DU
81	DTE Energy Co	Michigan	Americas	36288	88	14212	93	1118	79	4	140	11.2	DU
82	ONEOK Inc	Oklahoma	Americas	18232	144	12593	105	1151	77	7	74	17.5	S&T
83	Galp Energia SGPS SA	Portugal	EMEA	14260	171	19382	68	833	109	8	65	3.5	IOG
84	Neste Oyj	Finland	EMEA	9244	212	15135	87	874	102	14	14	14.1	R&M
85	AGL Energy Ltd	Australia	Asia/Pacific Rim	10218	202	8946	136	1108	80	14	12	6.3	DU
86	GAIL (India) Ltd	India	Asia/Pacific Rim	9863	203	10985	114	944	100	14	13	13.5	GU
87	Woodside Petroleum Ltd	Australia	Asia/Pacific Rim	27088	104	5240	177	1364	70	6	88	1.4	E&P
88	Chubu Electric Power Co Incorporated	Japan	Asia/Pacific Rim	55261	52	28012	50	733	120	2	218	2.1	EU
89	Power Grid Corp of India Ltd	India	Asia/Pacific Rim	35665	89	5055	178	1447	65	5	112	19.3	EU
90	Sempra Energy	California	Americas	60638	47	11687	108	1049	91	2	201	4.5	DU
91	WEC Energy Group Inc	Wisconsin	Americas	33476	92	7680	148	1059	88	5	121	9	DU
92	Pioneer Natural Resources Co	Texas	Americas	17903	146	9384	131	973	96	7	77	48.3	E&P
93	Entergy Corp	Louisiana	Americas	48275	60	11009	113	849	105	3	180	-1.5	EU
94	Tokyo Gas Co Ltd	Japan	Asia/Pacific Rim	22410	125	18111	71	780	116	4	146	1.4	GU
95	YPF Sociedad Anónima	Argentina	Americas	22237	127	9750	127	864	103	6	102	40.8	IOG
96	Polskie Górnictwo Naftowe i Gazownictwo SA	Poland	EMEA	13993	172	10831	117	844	107	8	65	4.2	IOG
97	Marathon Oil Corp	Texas	Americas	21321	130	5844	168	1096	81	6	83	8.6	E&P
98	The Hong Kong & China Gas Co Ltd	Hong Kong	Asia/Pacific Rim	16922	153	4983	179	1188	76	8	56	9.7	GU
99	Beijing Enterprises Holdings Ltd	Hong Kong	Asia/Pacific Rim	22253	126	8642	139	966	97	5	104	4.1	GU
100	Türkiye Petrol Rafinerileri A.S.	Turkey	EMEA	6966	236	15407	85	646	128	13	18	33.9	R&M

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101	CGN Power Co Ltd	China	Asia/Pacific Rim	53354	55	7358	151	1260	74	3	190	24.5	IPP
102	Chesapeake Energy Corp	Oklahoma	Americas	10947	191	10107	124	775	118	10	38	-7.2	E&P
103	The AES Corp	Virginia	Americas	32521	94	10736	118	985	94	4	166	-1.6	IPP
104	Encana Corp	Canada	Americas	15344	164	5457	175	1069	86	9	49	12.5	E&P
105	Eversource Energy	Massachusetts	Americas	38241	85	8448	140	1033	92	4	166	2	EU
106	Saudi Electricity Co	Saudi Arabia	EMEA	123878	20	17083	77	469	161	1	231	15.5	EU
107	Veolia Environnement SA	France	EMEA	42253	75	29123	47	476	159	2	209	1.2	DU
108	Kunlun Energy Co Ltd	Hong Kong	Asia/Pacific Rim	20352	132	15268	86	671	124	4	149	7.6	S&T
109	Cosmo Energy Holdings Co Ltd	Japan	Asia/Pacific Rim	15711	158	25569	54	490	155	5	127	7.3	R&M
110	EDP - Energias de Portugal SA	Portugal	EMEA	46788	63	17172	76	584	138	2	218	-0.5	EU
111	Ameren Corp	Missouri	Americas	27215	103	6009	164	815	111	5	127	0.7	DU
112	Continental Resources Inc	Oklahoma	Americas	15298	165	4380	186	988	93	8	63	22.4	E&P
113	Inpex Corp	Japan	Asia/Pacific Rim	44241	71	8965	134	887	101	2	204	-1.3	E&P
114	EnBW Energie Baden-Württemberg AG	Germany	EMEA	44520	69	23288	63	376	184	2	195	-0.9	EU
115	FirstEnergy Corp	Ohio	Americas	40063	79	11261	112	655	127	2	195	-8.3	EU
116	UGI Corp	Pennsylvania	Americas	11981	184	7651	149	719	121	8	59	4.6	GU
117	Anadarko Petroleum Corp	Texas	Americas	40376	78	12906	100	606	131	2	205	10.8	E&P
118	Magellan Midstream Partners LP	Oklahoma	Americas	7748	227	2827	215	1334	71	19	3	8.9	S&T
119	China Gas Holdings Ltd	Hong Kong	Asia/Pacific Rim	10465	199	6738	160	777	117	9	43	18.6	GU
120	Fortum Oyj	Finland	EMEA	25187	120	5994	165	948	99	5	136	15.2	EU
121	ENGIE SA	France	EMEA	172757	13	68108	24	-176	243	0	241	-4.6	DU
122	Pembina Pipeline Corp	Canada	Americas	19863	135	5476	174	859	104	5	108	16.6	S&T
123	CK Infrastructure Holdings Ltd	Hong Kong	Asia/Pacific Rim	20120	133	958	249	1332	72	7	76	7.4	EU
124	Korea Electric Power Corp	South Korea	Asia/Pacific Rim	156944	14	51364	28	-1114	247		244	1.2	EU
125	Snam S.p.A.	Italy	EMEA	25382	119	2907	213	1079	84	5	121	0.5	S&T
126	Tohoku Electric Power Co Incorporated	Japan	Asia/Pacific Rim	39304	82	20714	67	429	171	2	221	2.3	EU
127	GS Holdings Corp	South Korea	Asia/Pacific Rim	19173	139	15033	90	568	139	3	174	13.4	R&M
128	Korea Gas Corp	South Korea	Asia/Pacific Rim	33625	91	22184	64	451	166	2	223	0.2	GU
129	China Resources Gas Group Ltd	Hong Kong	Asia/Pacific Rim	9382	210	6525	161	568	141	10	32	15.9	GU
130	China Coal Energy Co Ltd	China	Asia/Pacific Rim	38313	84	15076	89	497	154	2	218	20.7	C&CF
131	NRG Energy Inc	New Jersey	Americas	10628	198	9478	130	460	164	9	54	-8.4	IPP
132	Fortis Inc	Canada	Americas	39519	80	6250	162	819	110	2	195	7.5	EU
133	Uniper SE	Germany	EMEA	56879	50	87957	15	-508	245	-3	246	-5.4	IPP
134	Devon Energy Corp	Oklahoma	Americas	19566	137	10456	121	595	134	4	166	-6.9	E&P
135	CMS Energy Corp	Michigan	Americas	24529	121	6873	157	657	126	4	161	2.1	DU
136	Plains GP Holdings LP	Texas	Americas	26830	107	34055	42	334	195	2	223	13.7	S&T
137	CPFL Energia SA	Brazil	Americas	10934	192	7289	152	533	144	6	83	11	EU
138	Huaneng Power International Inc	China	Asia/Pacific Rim	58404	48	24590	55	159	233	0	239	9.6	IPP
139	China National Nuclear Power Co Ltd	China	Asia/Pacific Rim	46828	62	5690	170	686	122	2	221	14.5	IPP
140	Centrica plc	United Kingdom	EMEA	26059	114	37632	37	232	222	2	205	2	DU
141	Manila Electric Co	Philippines	Asia/Pacific Rim	6485	240	5872	167	444	168	19	4	5.6	EU
142	Kyushu Electric Power Co Incorporated	Japan	Asia/Pacific Rim	44246	70	18617	70	286	211	1	229	3.2	EU
143	Peabody Energy Corp	Missouri	Americas	7424	232	5582	172	518	147	11	30	0.1	C&CF
144	Terna SpA	Italy	EMEA	19254	138	2578	219	794	113	5	112	4.2	EU
145	Power Assets Holdings Ltd	Hong Kong	Asia/Pacific Rim	11661	186	198	250	974	95	9	51	5.9	EU
146	Aker BP ASA	Norway	EMEA	10777	193	3711	197	476	158	10	38	47.4	E&P
147	China Resources Power Holdings Co Ltd	Hong Kong	Asia/Pacific Rim	26554	109	9812	126	504	152	2	201	2.5	IPP
148	Cimarex Energy Co	Colorado	Americas	6062	242	2339	225	781	115	16	7	17.2	E&P
149	Red Eléctrica Corporación SA	Spain	EMEA	12658	181	2260	227	792	114	8	68	0.9	EU
150	Santos Ltd	Australia	Asia/Pacific Rim	17134	150	3660	200	630	130	5	112	14.4	E&P

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151	Zhejiang Zheneng Electric Power Co Ltd	China	Asia/Pacific Rim	15880	157	8199	143	584	137	4	158	12.6	IPP
152	SDIC Power Holdings Co Ltd	China	Asia/Pacific Rim	31951	97	5937	166	632	129	2	205	9.4	IPP
153	CNX Resources Corp	Pennsylvania	Americas	8592	217	1754	237	797	112	11	31	32.7	E&P
154	CEZ a. s.	Czech Republic	EMEA	30894	98	7925	145	451	165	3	190	-4.3	EU
155	Inner Mongolia Yitai Coal CoLtd	China	Asia/Pacific Rim	13688	174	5673	171	599	133	5	121	26	C&CF
156	ENN Energy Holdings Ltd	China	Asia/Pacific Rim	10700	196	8787	137	408	178	6	88	23.7	GU
157	Atmos Energy Corp	Texas	Americas	11874	185	3116	210	602	132	7	75	2.1	GU
158	Grupa LOTOS SA	Poland	EMEA	5838	247	7912	146	417	176	10	33	9.9	R&M
159	Diamondback Energy Inc	Texas	Americas	21596	128	2164	230	846	106	4	140	69.2	E&P
160	RWE Aktiengesellschaft	Germany	EMEA	90039	28	15098	88	-890	246	-5	247	-33.7	DU
161	Yancoal Australia Ltd	Australia	Asia/Pacific Rim	8661	215	3388	205	595	135	9	55	54.3	C&CF
162	Naturgy Energy Group SA	Spain	EMEA	45668	66	27356	51	-3161	249	-9	248	-2.2	GU
163	Southwestern Energy Co	Texas	Americas	5797	249	3862	195	535	143	11	27	7.2	E&P
164	PG&E Corp	California	Americas	76995	37	16759	78	-6851	250	-20	250	-0.1	EU
165	Pinnacle West Capital Corp	Arizona	Americas	17664	147	3691	198	511	150	5	127	1.8	EU
166	Cheniere Energy Inc	Texas	Americas	31987	96	7994	144	471	160	2	223	209.4	S&T
167	Ultrapar Participações SA	Brazil	Americas	7901	223	23494	62	298	206	5	136	6.2	S&T
168	Evergy Inc	Missouri	Americas	25598	116	4276	188	536	142	3	184	20.2	EU
169	Huaneng Lancang River Hydropower Co Ltd	China	Asia/Pacific Rim	24373	122	2246	228	840	108	4	172	6.2	IPP
170	CenterPoint Energy Inc	Texas	Americas	27009	106	10589	119	333	196	2	213	12.8	DU
171	Emera Incorporated	Canada	Americas	24071	123	4860	180	529	145	3	188	32.7	EU
172	Datang International Power Generation Co Ltd	China	Asia/Pacific Rim	41680	76	13519	97	179	230	0	234	14.7	IPP
173	World Fuel Services Corp	Florida	Americas	5677	250	39750	33	128	235	5	119	9.4	R&M
174	Electricity Generating Public Co Ltd	Thailand	Asia/Pacific Rim	6583	239	1133	247	672	123	11	29	30.7	IPP
175	Electric Power Development Co Ltd	Japan	Asia/Pacific Rim	25530	117	8282	142	427	172	2	209	4.8	IPP
176	Huadian Power International Corp Ltd	China	Asia/Pacific Rim	32576	93	12792	101	245	218	1	229	7.6	IPP
177	Alliant Energy Corp	Wisconsin	Americas	15426	163	3534	204	512	149	5	127	2.8	EU
178	Edison International	California	Americas	56715	51	12657	104	-457	244	-2	245	3.2	EU
179	Andeavor Logistics LP	Ohio	Americas	10295	200	2380	222	587	136	6	88	28.9	S&T
180	China Longyuan Power Group Corp Ltd	China	Asia/Pacific Rim	21209	131	3820	196	568	140	3	182	10.3	IPP
181	OJSC Federal Hydro-Generating Co - RusHydro	Russia	EMEA	14289	168	6140	163	479	157	4	161	3.4	EU
182	VERBUND AG	Austria	EMEA	13156	177	3210	208	487	156	5	108	-1.4	EU
183	Osaka Gas Co Ltd	Japan	Asia/Pacific Rim	18733	141	12661	103	310	202	2	205	1.2	GU
184	Acciona SA	Spain	EMEA	16789	155	8960	135	369	188	3	178	5.5	EU
185	Companhia Energética de Minas Gerais	Brazil	Americas	15505	160	5768	169	357	191	4	140	0.6	EU
186	Polska Grupa Energetyczna SA	Poland	EMEA	19939	134	6816	158	393	180	3	190	-3.1	EU
187	GD Power Development CoLtd	China	Asia/Pacific Rim	39450	81	9481	129	198	227	1	233	4.9	IPP
188	Shanxi Lu'an Environmental Energy Development Co Ltd	China	Asia/Pacific Rim	9448	206	3639	202	386	183	6	80	31.1	C&CF
189	A2A S.p.A.	Italy	EMEA	11614	187	7080	155	363	190	4	140	9.9	DU
190	The Chugoku Electric Power Co Inc	Japan	Asia/Pacific Rim	30103	100	12709	102	106	238	0	234	3.8	EU
191	S-Oil Corp	South Korea	Asia/Pacific Rim	13517	176	21573	65	211	224	2	213	12.5	R&M
192	SM Energy Co	Colorado	Americas	6353	241	1573	240	508	151	9	47	3	E&P
193	Thai Oil Pcl	Thailand	Asia/Pacific Rim	8565	218	10588	120	324	198	4	149	8.6	R&M
194	PT Adaro Energy Tbk	Indonesia	Asia/Pacific Rim	7061	234	3620	203	418	175	7	73	10.5	C&CF
195	OGE Energy Corp	Oklahoma	Americas	10749	194	2270	226	426	173	6	94	1.1	EU
196	Phillips 66 Partners LP	Texas	Americas	5819	248	1046	248	519	146	9	45	19.6	S&T
197	Oil India Ltd	India	Asia/Pacific Rim	7560	230	1987	233	467	162	8	63	12	E&P
198	The Williams Companies Inc	Oklahoma	Americas	45302	68	8686	138	-156	242	0	243	5.7	S&T
199	Hera S.p.A.	Italy	EMEA	10241	201	7244	153	317	201	5	136	10.9	DU
200	Grupo Energía Bogotá SA E.S.P.	Colombia	Americas	7658	228	1212	246	516	148	8	71	5.4	GU

Platts Rank 2019	Company	State or Country	Region	Assets		Revenues		Profits		Return on invested capital		3-Year	Industry
				$million	rank	$million	rank	$million	rank	ROIC%	rank	CGR%	
201	Cenovus Energy Inc	Canada	Americas	26202	113	15527	84	-2172	248	-11	249	21.8	IOG
202	National Fuel Gas Co	New York	Americas	6036	245	1593	239	392	181	10	37	-3.3	GU
203	Enagás SA	Spain	EMEA	10707	195	1455	243	498	153	5	112	2.7	S&T
204	PBF Energy Inc	New Jersey	Americas	8005	220	27186	52	128	236	2	195	27.5	R&M
205	Murphy Oil Corp	Arkansas	Americas	11053	189	2587	218	415	177	5	121	-2.5	E&P
206	Inter Pipeline Ltd	Canada	Americas	8538	219	1932	234	441	169	6	83	15.6	S&T
207	Energisa SA	Brazil	Americas	9434	207	4090	191	297	207	5	108	9	EU
208	Companhia Paranaense de Energia - COPEL	Brazil	Americas	9307	211	3869	194	364	189	5	119	0	EU
209	Aboitiz Power Corp	Philippines	Asia/Pacific Rim	7515	231	2538	220	419	174	6	88	15.6	IPP
210	Yangquan Coal Industry (Group) Co Ltd	China	Asia/Pacific Rim	6678	237	4731	182	285	212	6	83	24.7	C&CF
211	Hellenic Petroleum SA	Greece	EMEA	7865	224	10980	115	238	220	4	158	10.2	R&M
212	Interconexión Eléctrica SA E.S.P.	Colombia	Americas	13620	175	2173	229	462	163	4	155	10.8	EU
213	Gulfport Energy Corp	Oklahoma	Americas	6051	243	1445	244	431	170	8	65	43.3	E&P
214	Rabigh Refining & Petrochemical Co	Saudi Arabia	EMEA	17091	151	10933	116	178	231	1	228	17.1	R&M
215	Origin Energy Ltd	Australia	Asia/Pacific Rim	16932	152	10194	122	195	228	1	226	7.1	IOG
216	Jiangsu Guoxin Corp Ltd	China	Asia/Pacific Rim	7767	225	3204	209	370	186	5	108	12.8	EU
217	Vistra Energy Corp	Texas	Americas	26024	115	9144	133	-54	241	0	242	19.4	IPP
218	Shanghai Electric Power Co Ltd	China	Asia/Pacific Rim	14284	169	3269	206	401	179	3	177	9.9	IPP
219	MDU Resources Group Inc	North Dakota	Americas	6988	235	4532	185	269	214	6	98	4.1	DU
220	Brookfield Infrastructure Partners LP	Bermuda	Americas	36580	87	4652	184	163	232	0	234	35.9	DU
221	California Resources Corp	California	Americas	7158	233	3062	211	321	199	6	100	10.5	E&P
222	Seven Generations Energy Ltd	Canada	Americas	6048	244	2398	221	328	197	6	82	81.2	E&P
223	The Tata Power Co Ltd	India	Asia/Pacific Rim	12135	183	4262	189	318	200	3	178	0.1	EU
224	Huaneng Renewables Corp Ltd	China	Asia/Pacific Rim	12836	180	1687	238	447	167	4	166	16.6	IPP
225	Italgas S.p.A.	Italy	EMEA	7597	229	1816	236	353	192	6	94	5	GU
226	Hawaiian Electric Industries Inc	Hawaii	Americas	13104	178	2861	214	202	225	5	135	3.2	EU
227	NHPC Ltd	India	Asia/Pacific Rim	9621	205	1295	245	374	185	5	117	2.4	IPP
228	ACEA S.p.A.	Italy	EMEA	9168	213	3220	207	305	205	5	127	0.4	DU
229	Hokkaido Electric Power Co Incorporated	Japan	Asia/Pacific Rim	18043	145	6943	156	193	229	1	226	1.3	EU
230	Lundin Petroleum AB (publ)	Sweden	EMEA	5842	246	2641	217	222	223	8	70	67.1	E&P
231	Abu Dhabi National Energy Co PJSC	United Arab Emirates	EMEA	27046	105	4830	181	108	237	0	234	-2.8	DU
232	PT Perusahaan Gas Negara Tbk	Indonesia	Asia/Pacific Rim	7939	222	3870	193	305	204	4	140	8	GU
233	Shanxi Xishan Coal & Electricity Power CoLtd	China	Asia/Pacific Rim	9418	208	4672	183	261	216	4	155	20	C&CF
234	Apache Corp	Texas	Americas	21582	129	7216	154	40	240	0	240	4.3	E&P
235	DCP Midstream LP	Colorado	Americas	14266	170	9863	125	87	239	1	232	10.5	S&T
236	Iren SpA	Italy	EMEA	9630	204	4231	190	272	213	4	161	8.5	DU
237	EVN AG	Austria	EMEA	8802	214	2353	223	286	210	5	121	-0.9	EU
238	Cosan Ltd	Brazil	Americas	14600	166	4363	187	253	217	2	201	10.9	R&M
239	HK Electric Investments & HK Electric Investments Ltd	Hong Kong	Asia/Pacific Rim	13759	173	1481	242	389	182	3	174	1.2	EU
240	Whiting Petroleum Corp	Colorado	Americas	7760	226	2081	231	342	193	5	127	2.9	E&P
241	Parsley Energy Inc	Texas	Americas	9391	209	1826	235	369	187	4	149	90	E&P
242	Shenergy Co Ltd	China	Asia/Pacific Rim	8637	216	5244	176	264	215	3	174	8.1	IPP
243	Reliance Infrastructure Ltd	India	Asia/Pacific Rim	14523	167	3662	199	202	226	3	190	11.5	EU
244	ATCO Ltd	Canada	Americas	17389	149	3641	201	244	219	2	215	5.8	DU
245	Elia System Operator SA	Belgium	EMEA	15459	162	2049	232	309	203	3	189	32.7	EU
246	Equatorial Energia SA	Brazil	Americas	6607	238	2915	212	238	221	5	117	15.8	EU
247	Shikoku Electric Power Co Incorporated	Japan	Asia/Pacific Rim	12496	182	6805	159	157	234	2	215	4.1	EU
248	Huadian Fuxin Energy Corp Ltd	China	Asia/Pacific Rim	15678	159	2653	216	289	209	2	209	6	IPP
249	Oil Search Ltd	Papua New Guinea	Asia/Pacific Rim	10674	197	1536	241	341	194	4	161	-1.1	E&P
250	Beijing Jingneng Clean Energy Co Ltd	China	Asia/Pacific Rim	7954	221	2351	224	289	208	4	161	4.2	IPP

Top 250 Methodology

This annual survey of global energy companies by S&P Global Platts measures companies' financial performance using four key metrics: asset worth, revenues, profits, and return on invested capital.

All companies on the list have assets greater than US $5.5 billion. The fundamental and market data comes from a database compiled and maintained by S&P Global Market Intelligence.

Energy companies were grouped according to their S&P Global Primary Industry Classification code. Each company is assigned to an industry according to the definition of its principal business activity.

Because the survey is global, and because all countries do not share a common financial reporting standard, the information presented is for each company's most current reporting period. Since then, material changes to a company's financial health may have occurred. Data for US companies came from Securities and Exchange Commission (SEC) Form 10K.

The company rankings are derived using a special S&P Global Platts formula. We added each company's numerical ranking for asset worth, revenues, profits, and ROIC and assigned a rank of 1 to the company with the lowest total, 2 to the company with the second-lowest total, and so on.

Finally, ROIC figures-widely regarded as a driver of cash flow and value were calculated using the following equation: ROIC = [(Income before extraordinary items) - (Available for common stock)] ÷ (Total invested capital) x 100 where "Income before extraordinary items" is net income less preferred dividends and "Total invested capital" is the sum of total debt, preferred stock (value), noncontrolling interest, and total common equity.

Financial data were compiled and translated into USD on June 4, 2019.

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