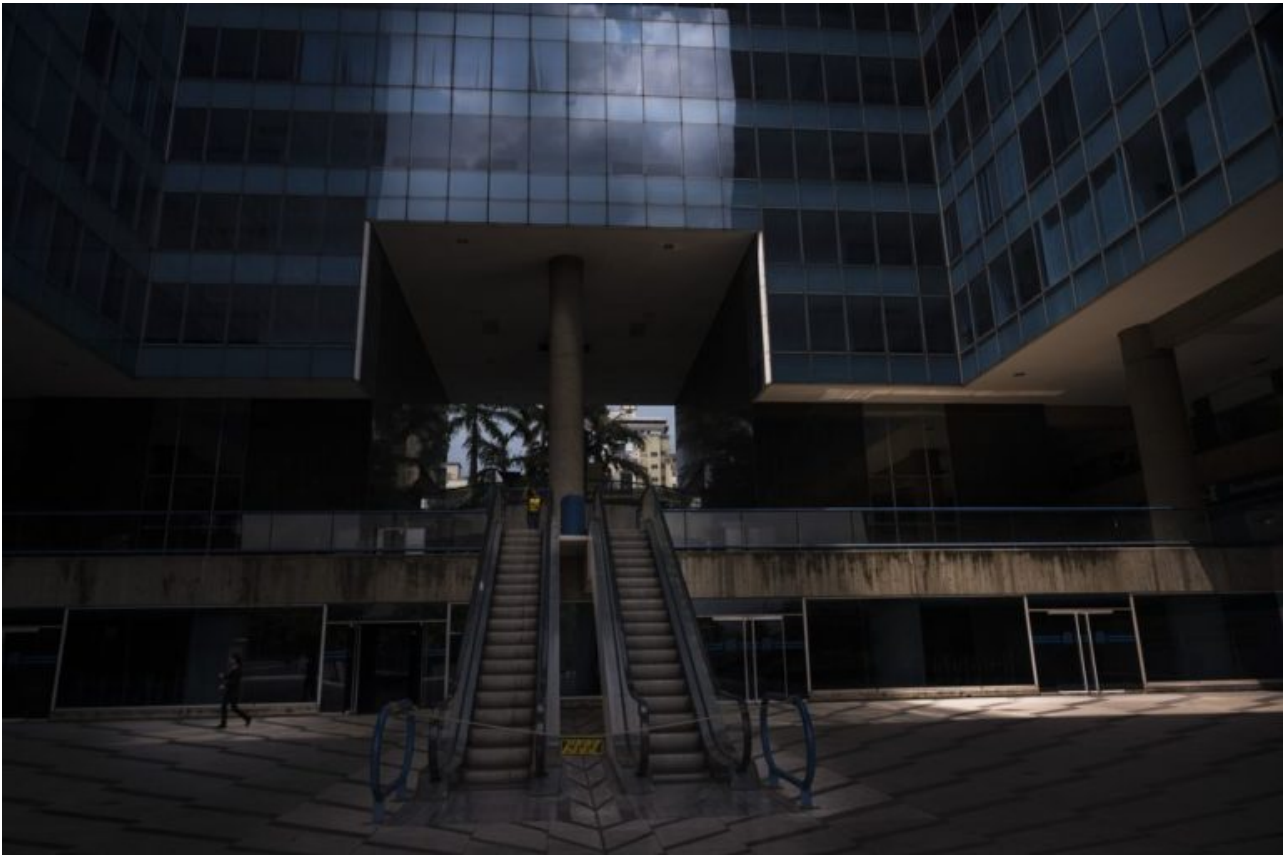


# Venezuela Blackouts Cut Oil Output by Half During March



Power failures that plunged Venezuela into darkness for much of March also briefly slashed the country's crude production by half, according to people familiar with the situation.

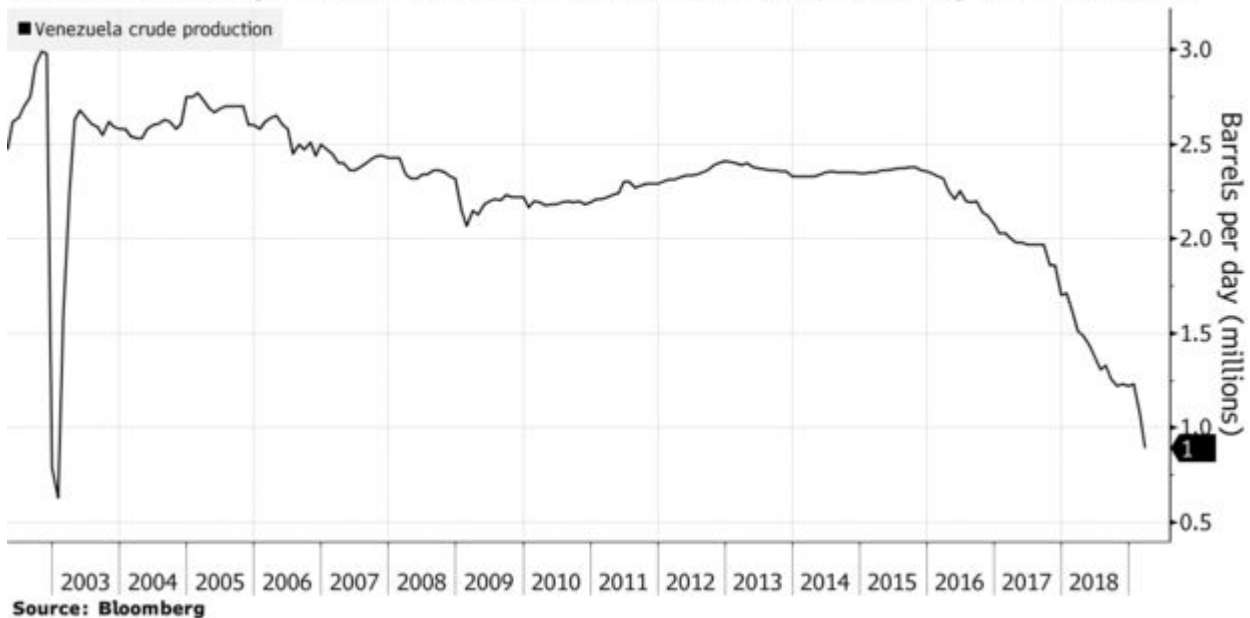
Rolling blackouts across much of the country that started on March 7 paralyzed most of the country's oil wells and rigs, which have slowly come back online. Oil output averaged less than 600,000 barrels a day during the blackouts, the people said, who asked not to be identified because the information isn't public. For the full month, daily production was 890,000 barrels, according to a Bloomberg survey of officials, analysts and ship-tracking data.

The loss of production due to the blackouts deals another blow to Venezuela's already-crippled oil industry, already reeling from years of mismanagement and U.S. sanctions that removed its biggest customer. The nation's crude output, one of the

few sources of cash for Nicolas Maduro's regime, has tumbled by two-thirds since before PDVSA workers went on strike in December 2002.

## Heading Lower

Venezuela crude production fell well below 1 million barrels a day after blackouts



Near the Orinoco basin in the East, where four out of every five barrels is pumped, heavy tar-like oil has begun to clog pipelines and tanks after the heating system lost power, according to Wills Rangel, a former PDVSA board director and president of the United Workers Federation of Oil, Gas and Related Derivatives of Venezuela. Cleaning or removing the pipes could take months, he said.

“Damage caused by the blackouts at the Orinoco Belt oil fields is substantial,” Rangel said in an interview.

## Production Drop

Because of the blow to Orinoco Belt production, a huge drop will be reflected in the March numbers Venezuela will report to OPEC, Rangel said. During the blackouts, production was down to a level similar to Venezuela's January 2003 reported production to OPEC, which plunged after the PDVSA strike against then-president Hugo Chavez.

The Orinoco Belt area hasn't recovered fully from the

electricity blow and is currently producing about 300,000 barrels a day, he said.

While pumping oil from fields in the Orinoco Belt requires some electricity, the bigger power demand comes from the upgraders – facilities that convert the extra-heavy oil to more commercial blends – located some 300 kilometers away in the north near the coast. The country's four upgraders are still working to restart.

“If PDVSA restores power at full to all its four upgraders, jointly owned by Chevron, Total, Equinor and Rosneft, it can have an impact on the national grid,” Rangel said.

Upgraders will only have total power once the state run utility allows it, Rangel said. The flow of electricity from the national grid needs to be stabilized before it can bring power back to other high-demand services such Caracas's subway and water pumping systems. In the fields, oil wells and pumps are expected to be connected under a government-ordered power rationing plan that's in effect.

*– With assistance by Lucia Kassai*

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**Petrobras agrees to sell pipeline unit to Engie for \$8.6 billion**



SAO PAULO/RIO DE JANEIRO (Reuters) – A consortium led by France’s Engie SA submitted the highest offer for a major gas pipeline unit owned by Brazil’s Petroleo Brasileiro SA, the state-run oil firm said on Friday, as the company’s biggest divestment draws to a close.

In a filing, Petrobras, as the company is known, said the Engie consortium, which includes Canada’s Caisse de Dépôt e Placement du Québec, presented an \$8.6 billion bid for 90 percent of the TAG gas pipeline unit in northern and northeastern Brazil.

That topped offers by two competing consortia, led by Itausa Investimentos Itau SA and EIG Global Energy Partners with Mubadala Investment Co, respectively.

Two sources with knowledge of the matter said the difference between the bids was very small. The second highest bid, delivered by EIG Global Energy Partners and Mubadala Investment Company, was less than 1 percent below Engie’s bid, they said.

Engie subsidiaries in different countries account for 75 percent of the winning consortium and the Canadian pension fund the other 25 percent, one of the sources added, asking for anonymity to discuss undisclosed details.

Around 60 percent of the bid was financed by Itau Unibanco Holding SA , Banco Bradesco SA and Banco do Brasil SA .

The EIG-Mubadala group was financed by JPMorgan Chase & Co and Goldman Sachs. The third group, led by Brazilian holding

Itausa Investimentos Itau SA, was also financed also by local banks. Banco Santander Brasil SA was Petrobras adviser on the deal.

The price tag includes the payment by the Engie group of \$800 million in debts to Brazilian state development bank BNDES. At an exchange rate of 3.85 reais to \$1, Petrobras said, the deal values all of TAG at 35.1 billion reais.

The divestment represents a victory for current Petrobras leadership and Chief Executive Roberto Castello Branco, who is pushing to aggressively unload assets in a bid to cut debt and refocus on exploration and production.

The sale process began in October 2017 but was interrupted last year by a Supreme Court injunction.

In September 2016, Petrobras sold a larger gas network pipeline, Nova Transportadora do Sudeste, for \$5.2 billion to Brookfield Infrastructure Partners LP, which beat out a bid by Engie.

Petrobras will continue to distribute natural gas through the TAG system under the terms of long-term contracts, the company said in the statement.

Bloomberg reported on the TAG sale earlier on Friday.

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**Greater flexibility is key to  
LNG infrastructure growth**

# revealed in DNV GL research



OSLO – A new report published by DNV GL has revealed that the vast majority (85%) of professionals working in the liquefied natural gas (LNG) sector believe that more investment is needed in LNG infrastructure to satisfy forecasts for growing global demand after 2025. However, more than two-thirds (69%) stated that uncertainty over prices is limiting spending in the megaprojects needed to feed the world's growing appetite for LNG.

DNV GL forecasts global LNG production will increase from 250 MMtpa in 2016 to around 630 MMtpa by 2050.

According to DNV GL's new report: The LNG era takes shape, oil-indexed LNG pricing is part of the issue. Recent oil price swings have made LNG sellers reluctant to peg decades-long contracts to volatile crude markets, yet they still need long-term commitments to make infrastructure investments viable. Half (49%) of the LNG professionals questioned expect contracted LNG prices to continue to be linked to the oil price, while a significant proportion (30%) disagree.

Respondents expect the U.S. (36%) and Australia (16%) to experience the greatest growth in LNG exports over the next three years. Other nations, such as Canada, Russia, and Africa are also making moves for a slice of the LNG action. However, conventional gas from the Middle East and North Africa, as

well as North American unconventional gas, will account for 70% of LNG liquefaction capacity by mid-century, according to DNV GL's 2018 Energy Transition Outlook.

China is the country expected to have the greatest growth in LNG imports over the next three years, according to the survey. This is largely driven by the country's 'blue sky' policies, aimed at reducing fossil fuel emissions and improving air quality. Other emerging economies, particularly in the Indian Subcontinent and Sub-Saharan Africa, will also drive demand towards 2050.

The level of supply and demand growth predicted by DNV GL will require significant investment; particularly facilities to re-gasify, store and distribute new liquefaction capacity. The cost of financing new infrastructure will have the greatest impact on the global LNG market in 2019, according to a third of respondents (36%). Political risk (including trade agreements) was the leading market barrier (17%).

"The new era we see emerging for the LNG sector will demand new thinking from our industry to ensure that a rapid evolution in demand and supply can be met. For example, our research shows signs of the sector opening up to new players, contracting models and pricing strategies. As reservations over capital spending and uncertainty over LNG pricing persist, the study reveals increasing interest in the sector finding more agile and flexible approaches to LNG production and trading," said Hans Kristian Danielsen, senior V.P. and marketing & sales director, DNV GL – Oil & Gas.

Agile approaches to LNG production are most likely to come in the form of smaller-scale floating liquefied natural gas (FLNG) projects. Smaller FLNG vessels and LNG tanker conversions are preferred by 59% of LNG professionals over the development of large-scale floating production units. These are cheaper to build and operate, faster to deploy and more effective at exploiting smaller volumes of stranded gas for

more markets.

Contractor-led operating models are also becoming increasingly favorable for LNG production, according to the findings of the report. In these instances, a contractor liquefies gas on behalf of an operator, who can reduce risk by purchasing a service instead of a costly asset. More than half (55%) of senior oil and gas professionals globally believe it is likely that operators will outsource or lease critical field development assets (such as FLNG vessels) in 2019.

Agility will also be key to protecting LNG buyers against risk. Three quarters (72%) of LNG professionals believe that buyers need more flexible contracts, where LNG volumes can be reduced, tenures shortened, and delivery locations changed.

“New market actors could be key to bridging the divergent interests of LNG buyers wanting flexibility, and sellers, who demand long-term cash-flow certainty to support major investments. This was once the domain of oil majors, but commodity traders are now emerging as a significant new breed,” added Danielsen.

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**IEA's climate models criticised as too fossil-fuel friendly**



The world's top energy body has come under fire from leading investors and scientists who say that its energy forecasts are not in line with the latest climate science, and could contribute to higher levels of carbon dioxide emissions.

In a letter to the International Energy Agency seen by the Financial Times, businesses including Hermes Investment Management, Allianz Group and Legal & General Investment Management have asked the IEA to develop a new model with lower emissions that would line up with 1.5C of warming.

The IEA's benchmark annual World Energy Outlook is considered the definitive assessment of the energy sector, but critics say its models do not go far enough in mapping the deep cuts in carbon emissions needed to limit the worst climate impacts, and are too fossil-fuel friendly as a result.

"Without the inclusion of a central and realistic 1.5C scenario going forward, the World Energy Outlook would abdicate its responsibility to continue to chart the boundaries of the path of the global energy sector," the letter warned.

Under the 2015 Paris deal, nearly 200 countries agreed to limit the global temperature rise to well below 2C while pursuing efforts to keep it to less than 1.5C.

The global energy body, which was founded in 1974 to ensure the energy security of its members, including big consumer nations such as the US, produces a range of energy scenarios that are considered the gold standard for policy planning. Many asset managers also rely on these scenarios as they try to bring their portfolios in line with climate goals.

“The IEA scenarios that could be used as a centralised benchmark are not really fit for purpose,” said Ingrid Holmes, head of policy at Hermes, which has £33.5bn of assets under management. “What we have seen over the last couple of years is, as the climate crisis becomes more urgent, the credibility of the scenarios from the IEA has been reduced.

“From a company’s perspective, at worst these scenarios could be used as a fig leaf for inaction,” she added. “From a government perspective, one of the risks is complacency.”

The IEA has varying models that are used by the world’s biggest energy companies, governments, banks and investors to plan their businesses and policies.

The energy body said the scenarios in its World Energy Outlook – which include a central “new policies scenario”, a “sustainable development scenario”, and a “current policies scenario” – are hypothetical models, rather than predictions of the future.

In response to the letter, Fatih Birol, IEA executive director, said the central scenario was “a mirror” that reflected policymakers’ decisions.

“Our latest energy demand and emissions data for 2018 show that the world in which we live in is unfortunately in line with the new policies scenario, as emissions continue to

increase. Highlighting the reality of the established trajectory is of cardinal importance,” he wrote.

“The World Energy Outlook has been, and remains, at the forefront of global efforts to combat climate change,” he added, pointing out that the sustainable development scenario was in line with the goals of the Paris accord.

Several of the world’s top climate scientists were also signatories to the letter, which called on the IEA to publish another scenario, one that has a two-thirds probability of limiting warming to 1.5C.

“By not providing more ambitious scenarios, it makes it much harder for those stakeholders to set more ambitious targets, or targets which would be consistent with limiting to 1.5C,” said Joeri Rogelj, a lecturer at Imperial College London and a lead author of the UN’s annual emissions report.

Currently, the IEA’s most ambitious model, the sustainable development scenario, includes a level of carbon dioxide emissions that implies a 50 per cent chance of limiting global warming to 1.7C, compared to pre-industrial times. Its new policies scenario implies between 2.7C to 3C of warming.

“Given the influence of the World Energy Outlook and its currently central new policies scenario, it is no surprise that the current national commitments to reduce emissions under the Paris Agreement would track us on to an unacceptable warming pathway,” the letter said.

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# Gas supply glut in Europe drives prices to multiyear lows



## Global markets have become more connected as LNG shipments grow more flexible

Utilities across Europe are enjoying a windfall, as a gas glut caused by excess liquefied natural gas shipments from Asia drives prices to multi-year lows.

A mild Asian winter coupled with nuclear-plant restarts in Japan and ample supplies from the US and Russia have cut down deliveries of LNG to large buyers in the region. As prices for the supercooled fuel have fallen, hitting a three-year low, cargoes have been directed instead to Europe.

That is pushing down prices there, too: the UK wholesale day-

ahead gas price, for example, is trading just above 31p per therm, the lowest seasonal level since 2016 and below a 5-year average of 46p per therm.

The price moves show how gas markets around the world have become more connected thanks to increasing volumes of LNG cargoes moving the gas from one continent to another, freed from an old regime of rigid contracts with fixed destinations.



“In the future, gas prices in Europe will be driven by LNG,” said Niall Trimble, managing director of oil and gas consultants The Energy Contract Company.

LNG will also gain greater influence on European and UK gas markets as volumes from the region’s production areas in the North Sea, Netherlands and Norway decline. The UK became a net importer of natural gas in the mid-2000s as North Sea production fell.

The UK is among the leading destinations for LNG cargoes thanks to plentiful terminal storage capacity. The amount of LNG used in the UK gas pipeline system quadrupled in the fourth quarter of 2018 from the previous year and jumped 4.5 times in the first quarter of this year.

Asia and Europe are the two main LNG importing regions, and until recently, robust demand from China, South Korea and Japan have kept the Japan-Korea Marker (JKM), the Asian benchmark, higher than the European equivalent.

Sam Laidlaw, a former chief executive of Centrica, the gas and electricity company, who now leads the private equity-backed Neptune Energy, said he expected the drop in gas prices to be a “short-term phenomenon” as demand picks back up in Asia.

He said any resolution of the trade spat between Washington and Beijing would likely see more oil and LNG flow from the US to Asia, tightening supplies available to Europe.

National Grid, which plays a role in ensuring UK energy supply matches demand, said in a recent report that it was expecting much higher deliveries of LNG this summer than in 2018. This was because LNG shipping costs had risen over the winter, making Europe, which is a closer destination, a more profitable market than Asia for cargoes from the US and Russia.

However, some analysts said that the weakness in the Asian price was encouraging some producers to shut down their facilities for maintenance. Meanwhile, the LNG flows to Europe could push prices down in the region, making the Asian markets more attractive again.

Samer Mosis, LNG analyst at S&P Global Platts, said that the Asian discount to European price benchmarks was unsustainable. He noted that Qatar had already “swung its flexible production towards Europe alongside continued US and Russian deliveries, which is threatening to lead to oversupply”.

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## **Aramco's bond sale is part of a grand plan**



It is not every day that a company asks to borrow money while at the same time explicitly stating that it has absolutely no need for it.

Then again, it is not every day that the most profitable company in the world emerges from a shroud of secrecy, to tap international bond markets for the first time.

Saudi Aramco's debut bond sale is just days away, prompting the jewel in the crown of the desert kingdom to open its books and reveal some staggering numbers. The Saudi Arabian oil company booked \$111bn of net income in 2018, more than that of Apple and Alphabet combined.

Companies that make that much money do not usually have much cause to borrow more.

Apple, for example, has only ever raised bonds to cover its mountains of cash trapped offshore. Since President Donald Trump introduced a new tax code at the end of 2017, encouraging companies to bring money back home, the US tech group has been conspicuously absent from the bond market. Google's owner, Alphabet, meanwhile, which has an equity value of \$845bn, has a grand total of \$300m in bonds.

Saudi Aramco's treasurer has been clear that the company does not need the funding, telling investors that it has a "fortress-like corporate position".

The bond sale has very little to do with corporate finance, therefore, and everything to do with the grand plans of Saudi Crown Prince Mohammed bin Salman.

The wheels may have come off Prince Mohammed's aim to sell shares in the Saudi oil giant but he has not abandoned the idea entirely. And opening Aramco to the rigours of disclosing its balance sheet is seen as a stepping stone to that bigger prize of an initial public offering.

Fortunately for the prince, bond investors love lending money to companies that do not need the funds and are very unlikely to default. While Aramco has indicated that it will raise \$10bn, investors expect this to hit at least \$15bn given the strength of demand.

At one point last year, bankers and advisers were even talking about Aramco issuing \$70bn of bonds in one shot. That was before the grisly killing of Jamal Khashoggi at the Saudi consulate in Istanbul last October.

But Khashoggi's death has had no long-term impact on fund managers' desire to load up on Saudi bonds. (That \$70bn number was only ever floated because it would have been a record-breaking corporate debt sale.)

Nor have investment banks shied away from the kingdom. In October, Jamie Dimon, the JPMorgan chief executive, was the first bank boss to pull out of Prince Mohammed's "Davos in the Desert". Less than six months later, the US investment bank is leading Aramco's bond sale.

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## **U.S. LNG in high demand**



LONDON (Bloomberg) – U.S. gas companies at the LNG2019 conference in Shanghai this week have announced deals to sell a combined 4.5 million tons of LNG a year from proposed multi-billion dollar projects. Nearly all of that was sold without a link to the U.S. Henry Hub benchmark, the most-widely traded gas price in the world.

The novel price links for U.S. gas included:

Japan-Korea Marker: Tellurian Inc. agreed to sell Total 1.5 million tons a year from its Driftwood LNG venture in Louisiana linked to Asian spot LNG marker, which has traded as much as \$9 above Henry Hub in the past year. Brent oil: NextDecade Corp. will supply Royal Dutch Shell with 1.5 million tons annually, for 20 years, linked to the global crude benchmark, which U.S. exporters in the past argued has no connection with gas fundamentals.

LNG has traditionally been priced against oil, since the gas market lacked a liquid, global benchmark. The rise of U.S. exports, and the ease of pricing against Henry Hub, was a way to break the link with oil, but left costs dominated by factors unique to North America.

### **Not Willing**

“Nobody wants Henry Hub” pricing in Europe, Mark Gyetvay, CEO

for Russian LNG developer Novatek, told reporters on the sidelines of the conference. “Most of these people are not willing to take Henry Hub because they can’t hedge it” against European benchmarks.

No global marker has been established amid the robust growth in spot LNG demand and trading, reflecting a desire by buyers and sellers to secure a diversity of pricing options. Trading of JKM futures on the Intercontinental Exchange Inc. grew 10-fold between January 2017 and December 2018, while trading of Dutch Title Transfer Facility futures has grown nearly five times faster than U.S. trading in the past two years.

Europe has long had domestic gas markets that set prices LNG producers are willing to sell against. But that hasn’t been the case in Asia, where gas markets are typically disconnected and regulated by governments.

That’s started to change in the past two years as spot LNG trading in the region increased, bolstering confidence in the JKM price, assessed by S&P Global Platts. Nearly two-thirds of the world’s LNG was bought by Japan, China, South Korea or Taiwan last year, according to the International Group of LNG Importers.

## **Asian Index**

“We don’t believe LNG should continue to trade on an index to something else. It should be buying and selling on an LNG index,” said Meg Gentle, Tellurian’s chief executive officer. “Today JKM is really the market clearing index. Over time there will be additional LNG price points.”

The pricing mechanism that raised eyebrows this week in Shanghai was NextDecade’s Brent-linked deal with Shell. NextDecade CEO Matt Schatzman said he wanted to sell against Brent because his Rio Grande LNG venture will rely on gas that’s a byproduct of oil drilling in the Permian Basin, where output will likely increase along with oil prices.

Total CEO Patrick Pouyanne said he didn't understand that logic.

"Continuing to price gas linked to oil is somewhat the old world," Pouyanne said on Wednesday. "I was most surprised to see new contracts linked to Brent, especially from the U.S. Someone will have to explain this to me."

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## **LNG exports finally taking off in Egypt – Oilprice**



What a difference just a few years can make. After more than a decade of uncertainty for Egypt's natural gas sector, leading even to importing LNG for years, Cairo is heading to a much brighter gas future. Two weeks ago, Egypt re-joined the ranks of global LNG exporters when its state gas company EGAS tendered to sell four cargoes of LNG for loading in April from

the Idku liquefaction plant on the Mediterranean coast. Bloomberg said the tender marked a revitalizing of its gas industry, where sagging domestic production forced it to halt most exports of LNG in 2014. Around the same time period, LNG producers, especially Qatar and Australia, looked to Egypt to help soak up extra production as well as cargoes not linked to off-take agreements. Moreover, Egypt was seen as a bright new spot for LNG producers to sign new supply deals as the ongoing LNG supply overhang gathered momentum.

### **Mid-year goals**

Cairo recently said the Idku facility would be operating at full capacity by mid-year on the back of an ongoing surge in local gas production. However, Egypt's second LNG plant remains offline, pending resolution of a financial dispute with the operators relating to the earlier breach of the government's gas supply commitments.

In addition to the four cargoes commissioned by EGAS for April, another four and three cargoes are being marketed for May and June respectively. The offer is the largest since the country's two liquefaction plants at Idku and Damietta were gradually taken offline in the early years of the decade. February exports were around 390 mcm, with Turkey emerging as the main buyer. These initial tenders are viewed as a means for EGAS to test the market before embarking on term contracts.

Egypt began importing LNG in 2015 and received its last cargo in September 2018. In the last quarter of 2018, the country regained its position of self-sufficiency, according to several reports. This rapid turnaround was made possible due to the discovery and rapid exploitation of the offshore Zohr field. First discovered in August 2015, the field began producing in December 2017. Production reached 12.2 bcm in 2018 and, as of late January, was running at around 56.6 mcm per day. It is expected to reach 76 mcm per day by the end of

2019.

A presentation from Eni two weeks ago said the field should ramp up to 580,000 boepd (92.8 mcm per day). Progress at Zohr has been backed up by other gas fields as well. British oil major BP commissioned the second phase of the company's West Nile Delta (WND) project in February, raising output by around 19.8 mcm per day.

The Idku plant, owned through a joint venture between Shell, Malaysia's Petronas, France's Total, and several Egyptian owned firms, has 7.2 million tons per annum (mtpa) of liquefaction capacity and is located about 50 km east of Alexandria. Speaking in an interview in mid-March, Egyptian Petroleum Minister Tarek el-Molla said Idku's backers aimed to reach full throughput capacity of 32 mcm per day by the end of June, from around 22.7 mcm per day at present. Moreover, the supply outlook for Egypt continues to improve.

### **New gas synergies**

Yesterday, Bloomberg reported that the companies, Delek Drilling, Noble Energy, and Ratio Oil Exploration, developing Israel's largest natural gas field are in discussions to increase the amount of supply to Egypt beyond the \$15 billion deal inked last year. "The potential in the Egyptian market is endless," Chief Executive Officer Yossi Abu said. "We're going to clear up a lot of question marks in the coming months, once we start flowing gas through the EMG pipeline," which will transport gas to Egypt, he added.

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# Aramco's Accounts Show \$2 Trillion Valuation Remains a Challenge



Saudi Aramco may be the world's most profitable company, but that likely still won't be enough to persuade investors the energy behemoth is worth \$2 trillion.

New financial details, disclosed today by Moody's Investors Service, show a company that paid \$58.2 billion in dividends to the Saudi government last year. Working back from that, the valuation would be closer to \$1.2 trillion if investors judge Aramco by the same metrics as other giant oil companies.

Saudi Arabia has stuck to its original \$2 trillion aspiration, even after some investors made it clear in the early stages of the mooted initial public offering that they didn't share that view. Aramco instead pushed back the timeline for its IPO to 2021, from 2018, and embarked on the acquisition of a majority stake in petro-chemical group Sabic worth about \$69 billion.

It's in the context of that purchase that Aramco's financials are being released to prospective bondholders funding the acquisition. They may look for comparisons with other energy companies such as Exxon Mobil Corp., Royal Dutch Shell Plc, Chevron Corp., Total SA, and BP Plc, who on average offer a

dividend yield of 4.9 percent. Applied to Aramco's dividend payout last year, that implies a valuation of about \$1.2 trillion.

## Potential Bondholders

If however investors demand a higher yield to compensate them for the risks involved with the government continuing to control a majority stake, then they might set the valuation even lower. For example, if they were to seek a similar yield to that of Shell, 6 percent, the valuation would drop to just short of \$1 trillion.

It will all depend on what metrics investors choose to focus on. Those favoring price to earnings or enterprise value to underlying earnings, for instance, might well value Aramco higher. But right now in an era of vanishing yields, dividends are king, particularly in the hydrocarbons sector where worries about stranded assets are multiplying, even if they aren't shared by Aramco's management.

Aramco declined to comment via a spokesperson.

While Moody's gave a dividend figure of \$58.2 billion, Aramco itself in a presentation to potential bondholders said its "ordinary dividend" was \$52 billion last year. There wasn't an immediate explanation for the discrepancy.

Saudi Arabia has a few options to boost the valuation before resuming efforts on the IPO. One way would be to cut the amount of tax the company pays, something the government already did in 2017. Aramco paid \$102 billion in income tax last year, almost double the dividend amount, according to the presentation to potential bondholders. A further cut would reduce tax revenue at a time when the state is already struggling to cover its budget.

Aramco's acquisition of a stake in Sabic and the subsequent IPO are cornerstones of Crown Prince Mohammed bin Salman's

economic agenda to move the nation away from its dependence on hydrocarbons.

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## A 'magic bullet' to capture carbon dioxide?



CO<sub>2</sub> is a powerful warming gas but there's not a lot of it in the atmosphere – for every million particles of air, there are 410 of CO<sub>2</sub>.

The gas is helping to drive temperatures up around the world, but the comparatively low concentration means it is difficult to design efficient machines to remove it.

But a Canadian company, Carbon Engineering, believes it has found a solution.

Air is exposed to a chemical solution that concentrates the CO<sub>2</sub>. Further refinements mean the gas can be purified into a

form that can be stored or utilised as a liquid fuel.