



## Russia to sell gas to China at half the price compared to EU buyers

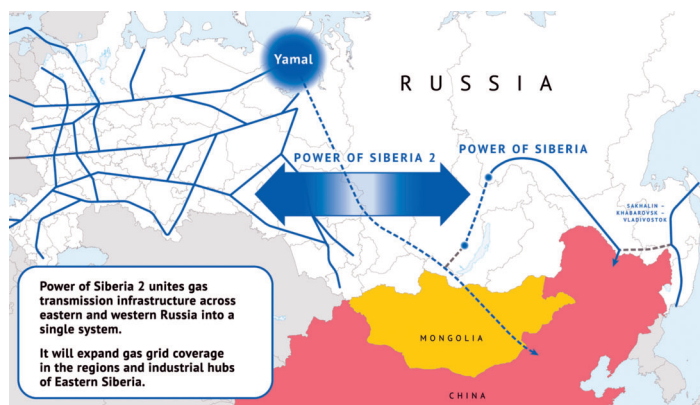
Russia's Gazprom seems willing sell gas to China at a steep discount over the next three years – almost half the price European buyers will pay. Prime Minister Mikhail Mishustin indicated that pipeline gas will be sold to CNPC for \$271.6 per thousand cubic meters from 2024, while buyers in the EU and Turkey are charged \$481.7 on average.

Those price differences could stay in place through to 2026, according to a new economic outlook compiled by Mishustin. This year, in contrast, Gazprom has been selling pipeline gas to state-owned CNPC at an average of \$297.3 per thousand cubic metres, so prices are bound to fall starting from next year as Gazprom is preparing to supply greater volumes to China via the second leg of the Power-of-Siberia pipeline.

### Hard bargain for cheaper price

Though "practically all parameters" for Power-of-Siberia 2 – a new 50 bcm/y interconnector to China – have been agreed, China had long abstained to sign a deal as it wanted to bargain for a better price for gas deliveries. Gazprom wants to supply up to 98 bcm of gas by 2030, but analysts doubt China will need that much.

Clearly, Russia's latest offer for pipeline gas deliveries to China shows that it pays off for CNPC to wait for prices to fall as Gazprom



is desperate to find alternative buyers outside Europe.

The route for Power-of-Siberia 2 has been set out years ago but the plan has become more pressing as the state-owned Russian gas company is seeking to replace parts of the over 80 bcm/y it used to deliver to the European Union before Putin started to wage war on Ukraine. But China is not expected to need additional supplies until after 2030, having just increased domestic gas production and delayed the coal-to-gas switch in power generation in reaction to soaring prices on global commodity markets.

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## Israel shuts down Tamar offshore gas field amid rocket fire

The Israeli energy minister has suspended production at the Tamar offshore gas field following three days for violence in the country, causing a gas shortfall that affects regional power producers and sent prices soaring. The NYMEX front-month future price increased 20 cents to \$3.383/MMBtu while prices at Europe's benchmark TTF hub jumped by \$2 to the equivalent of \$13.30/MMBtu.

Chevron is operating the Tamar field, situated offshore Israel's southern Mediterranean coast and not far from the Gaza strip where terrorists attacked Israeli civilians. The Israeli military retaliated which may prompt further unrest.

"In the wake of the situation, Israel's defense establishment has ordered the temporary suspension of natural gas supplies from the Tamar field," the Israeli energy ministry said in a statement, suggesting: "The economy's energy needs will be supplied by alternative fuels. The power industry is preparing to use alternative fuels to power its stations."

Some of the gas produced at Tamar, situated some 25 kilometres off the Israeli city of Ashdod,



Rig at Tamar gas field

is exported to Egypt and Jordan, though most of the supply is used for industry and power generation in Israel itself. Ashdod had been repeatedly hit by rockets from Gaza since the start of the conflict on October 7, and the ministry fears the Tamar field might be within Hamas' rocket firing range.

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## Gazprom seeks to pivot some volumes to China

The proposed Power-of-Siberia 2 pipeline would carry natural gas from Russia's huge reserves in the Yamal peninsula in western Siberia over 2,600 km through eastern Mongolia to China's northeast Heilongjiang province. If all goes to plan, the pipeline would supply 50 bcm/y of Russian gas to China – just 5 bcm less than the now dysfunctional Nord Stream 1 pipeline linking Russia with Germany.

But Beijing is holding back given that Gazprom already delivers gas to China through the first Power-of-Siberia pipeline under a 30-year contract, worth some \$400 billion which was concluded in 2019 after

hard-fought negotiations on price. The interconnector is anticipated to deliver 22 bcm of gas this year, continuing to ramp up volumes before reaching its full capacity of 38 bcm by 2027.

"The original target is for China to import 38 bcm of Russian gas by 2025. Now Russia is saying this will reach 98 bcm by 2030. That is a very big jump, so it pays to be slightly cautious on that," ICIS's China gas analysts Wang Yuanda commented.

## Beijing keen to diversify supplies

Keen to not put all eggs in one basket, China is also trying to source additional gas from Central Asia. A new pipeline could source some 25 bcm/y of gas over a period

of 30 years from Turkmenistan via Tajikistan and Kyrgyzstan. The latest decline in LNG prices has also tempted Chinese buyers to return to the market, though they already covered much of their needs with long-term LNG import contracts.

Nine new LNG term contracts began deliveries in 2023, more than offsetting the two short-term contracts that expired at the end of last year. With about 13 bcm of new LNG contracts starting shipments, contracted volume is on course to reach nearly 110 bcm this year – substantially higher than projected demand. Chinese buyers could hence ramp up LNG imports back to 2021-peak of 108 bcm without having to buy comparatively expensive spot cargoes. ■

# Construction costs drop in US for solar, wind and gas-fired generators

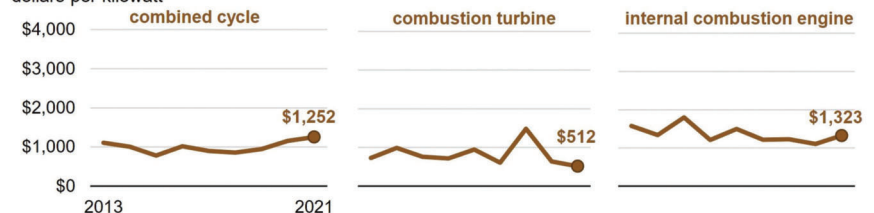
Average construction costs for solar photovoltaic, wind turbines and gas-fired power generators have all decreased in the United States, according to government data. Costs for building a gas power plant fell by 18% from 2020-levels, by 5% for wind turbines and by 6% for solar PV systems while new investment in power gen capacity jumped 10% to \$50.8 billion dollars.

Gas-, solar- and wind-based power generation technologies made up more than 91% of capacity added in the US in 2021, while investment increased by 10% last year from 2020-levels and kept growing through 2023.

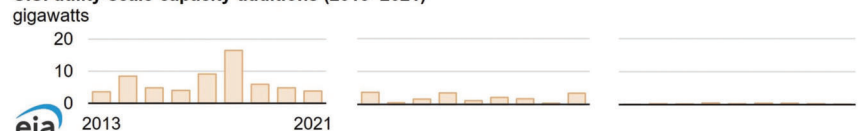
## Turbines cheaper to make and install

Costs for building natural gas-fired generators plunged 18% between 2020 and 2021 mainly due to cheaper turbines manufacturing and installation, according to the US Energy Information Administration's (EIA) Annual Electric Generator report. The average con-

Average U.S. construction costs for natural gas-fired generators (2013–2021)  
dollars per kilowatt



U.S. utility-scale capacity additions (2013–2021)  
gigawatts



Data source: U.S. Energy Information Administration, *Electric Generator Construction Costs* and *Annual Electric Generator Report*

struction cost for combustion turbines fell by 19% in 2021 to \$512/kW in 2022 and is expected to ease off further this year.

Construction costs for onshore wind turbines dropped 5% to \$1,328/kW, although the cost for large wind farms with more than 200 MW capacity stayed relatively flat at \$1,328/kW. For wind farms with 100 MW to 200 MW in size, average construction costs fell 4.4% while the plunge by a substantial 22% for smaller windfarms with 1 MW to 100 MW capacity.

As for solar PV, the average construction cost across all solar panel types fell 6% to \$1,561 per kilowatt, mainly due to a 10% fall in the cost for building crystalline silicon tracking panels which are now available for just \$1,423/kW. In contrast, the average cost for fixed-tilt panels has risen by 5%, making them the most expensive of the major solar technologies at \$2,047/kW. Meanwhile, the cost for Cadmium telluride panels stayed fairly stable, easing off only 1% to \$1,626/kW. ■

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Six wells at Tamar normally produce up to 8.5 million cubic metres of gas per day, catering of more than 60% of Israel's energy needs. Israel will be hard pressed to replace the missing volumes, though Chevron will be trying to temporarily boost output from the larger Leviathan gas field which continues to operate.

European markets are not directly affected as they source their supplies mostly from Qatar, Northern Africa complemented by US LNG since Russia reduced pipeline gas flows to near-zero. The jump in TTF gas prices is hence seen by some as an overreaction in a tight and increasingly nervous European market. ■

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## Global gas demand to slow as consumption drops in mature markets

The world's gas demand will grow by just 1.6% a year between 2022 and 2026, down from 2.5% in the previous five years, as consumption in Asia Pacific, Europe and North America dwindles by 1% annually as the renewable rollout accelerates. But influx of new US LNG capacity from 2025 will unlock some price-sensitive demand, the International Energy Agency (IEA) forecasts.

“After their heyday between 2011 and 2021, the world's gas markets have entered a new and more uncertain period that is likely to be characterised by slower growth and higher volatility – and could lead to a peak in global demand by the end of this decade,” says Keisuke Sadamori, IEA Director of Energy Markets and Security.

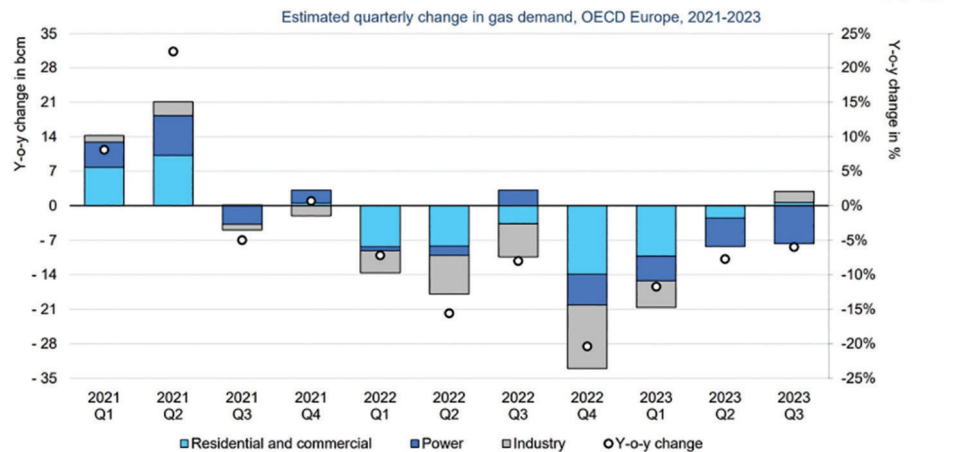
Though gas prices decreased from record highs in the first three quarters of 2023, supply risks remain for the coming winter. Steep demand reductions, notably by industrial consumers in Europe and some Asian markets helped reduce strain, but supplies remain tight. According to IEA findings, “the increase in LNG supply was not enough to offset the sharp declines in deliveries of pipeline gas from Russia to Europe.”

The risk of price volatility is cause for grave concern: Though Europe's gas storage sites entered the winter heating season at 96% capacity, this is no guarantee for stable prices – particularly in the event of an exceptionally cold winter, analysts warn.

### Power sector drives down EU gas demand

Lower gas-burn for power generation in Europe caused a substantial drop gas con-

European gas consumption dropped by over 9% in Q1-Q3 2023



Sources: IEA analysis based on Enagas (2023), Natural Gas Demand; ENTSOG (2023), Transparency Platform; EPIAS (2023), Transparency Platform; Trading Hub Europe (2023), Aggregated consumption.

sumption in the first three quarters of 2023, amid lower electricity use and stronger renewable power output. Gas-to-power demand fell by 16%, or 18 billion cubic meters (bcm) year-on-year and made up 55% of Europe gas demand reduction over this period.

Subdued activity of energy-intensive industries, energy efficiency improvement and behavioural changes lowered electricity consumption by an estimated 5%, or 58 Tera-watt-hours, in the second and third quarter. In addition, an 8% rise in renewable power output and strong nuclear availability in France, up 25%, further reduced the need

to dispatch gas-fired power plants. Industrial gas use fell by 3%, or 3 bcm, in the first three quarters of this year, though lower gas prices helped to gradually improve industrial activity.

For the full year of 2023, OECD Europe's gas demand is forecast to dwindle by 7%, mainly due to a massive 15% drop in gas-burn in the power sector and rangebound gas use from industry. Come 2024, European gas demand is forecast to grow by a moderate 2%, as higher demand in the residential, commercial and industrial sectors is expected to offset the decline in gas-to-power demand.

## Renewables still don't replace fossil fuels in global energy mix

Despite rapid renewables build-out, fossil fuels have still met half of the world's new energy demand over the last five years and energy-related CO2 emissions are only likely to peak in 2024. “The energy transition has not started, if, by transition, we mean that clean energy replaces fossil energy in absolute terms,” said DNV chief executive Remi Eriksen.

Limiting global warming to 1.5°C warming is less likely than ever. To reach the goals of the Paris Agreement, CO2 emissions would need to halve by 2030, but DNV forecasts that this will not even happen by 2050.

Technology is not the main challenge, but rather the incentives to drive fast deployment of renewables & storage and disincentives to drive down emissions from fossil fuel are lacking.

“Clearly, the energy transition has begun at a sector, national, and community level, but globally, record emissions from fossil energy are on course to move even higher next year,” Eriksen said today when launching DNV's latest Energy Transition Outlook. Energy-related emissions are forecast to

not peak before 2024, which is effectively the starting point of the transition, and then be just 4% lower than today by 2030 and possibly 46% lower by mid-century.

Energy security is centre stage following Russia's war in Ukraine and the resulting gas crisis in Europe. Governments are willing to pay a premium for locally sourced energy, which strengthened the EU's drive towards renewables but also India's move to favour domestic coal for power generation.

### Renewables to outspurt fossil fuels

Once the transition gets going, DNV expects renewables will outspurt fossil fuels. From now, most energy additions are wind

and solar, which grow 9-fold and 13-fold respectively between 2022 and 2050.

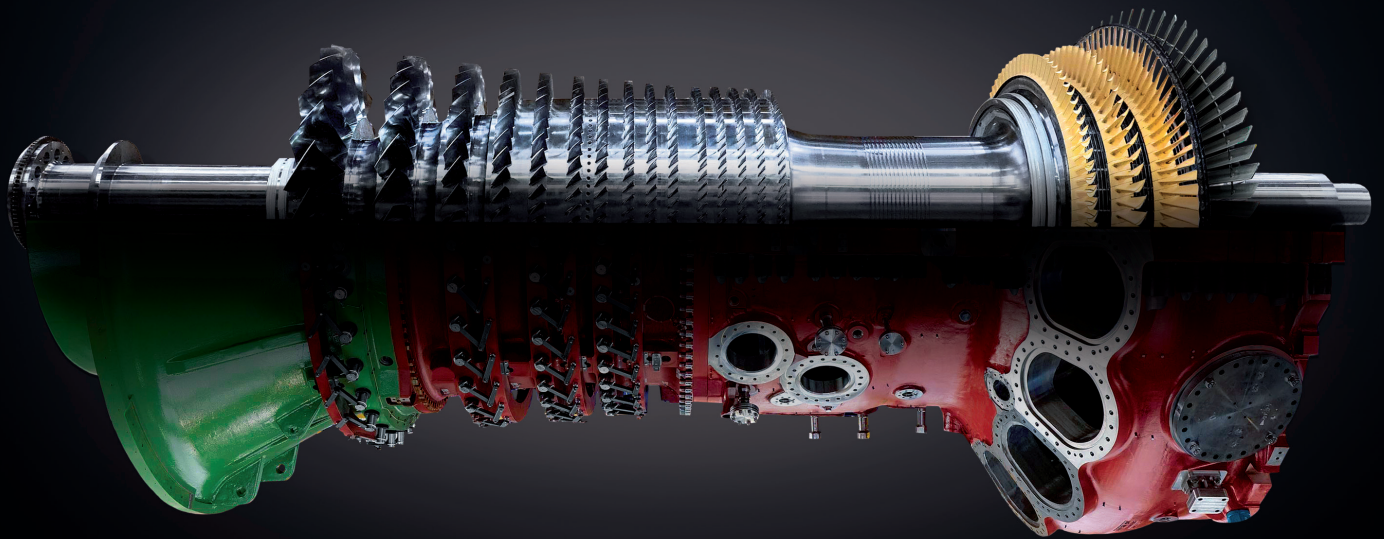
Electricity production will more than double between now and 2050, bringing efficiencies to the energy system. The fossil to non-fossil split of the energy mix is currently 80/20 but this is expected to move to a 48/52 split by mid-century.

Solar installations reached a record 250 GW in 2022. Wind power will deliver 7% of global grid-connected electricity and installed capacity will double by 2030 – despite inflationary and supply chain headwinds. But in the near term, grid constraints are a main bottleneck for adding more renewable power sources to the system.

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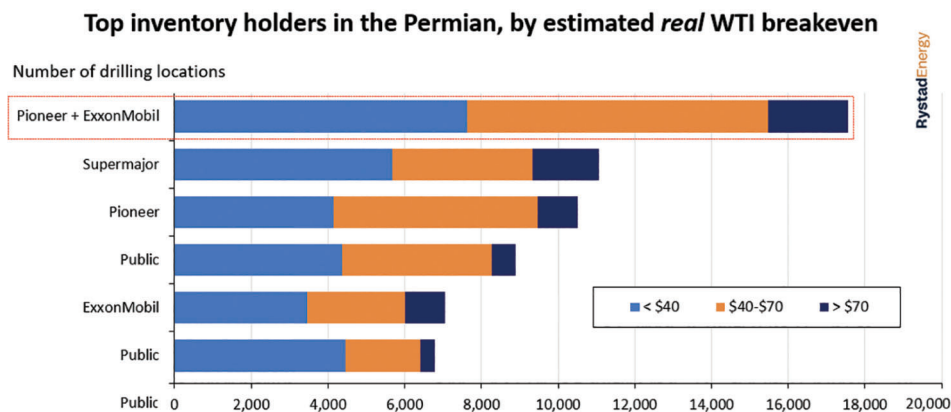
## Exxon merger with Pioneer could usher in era of shale consolidation

**ExxonMobil is in advanced talks to acquire Pioneer Natural Resources in a \$60 billion deal that could herald a new era of mega-deals, analysts reckon, whereby the long-fragmented sector would be consolidated by takeovers from a handful of supermajors. Combining Exxon and Pioneer would form the undisputed leader in the Permian Basin in western Texas and New Mexico.**

The US shale industry's trademark 'wildcatting' spirit had catapulted the US to become the one of the world's top oil and gas producers, as thousands of independent operators used hydraulic fracturing technology to tap high yielding, short-cycle wells. Since 2019, the sector's capital-conscious nature stood in stark contrast to the technological advancements and free-spending spirit of the industry's early beginnings. A deal the size of ExxonMobil's potential acquisition of Pioneer, however, could usher in a new 'Shale 4.0' era which would be unmistakably marked by consolidation.

"With Pioneer currently the second largest holder, the potential combination with currently fourth-ranked ExxonMobil would blow all others out of the water in terms of size and scale, Rystad's senior shale analysts Matthew Bernstein commented. The combined entity's inventory would be just shy of 18,000 drilling locations.

The potential \$60 billion price tag would be equivalent to a 6.34x multiple of Pioneer's forecasted 2023 earnings before in-



terest, taxes, depreciation and amortization (EBITDA) proxy, and a 5.75x multiple on its 2024 forecast. Rystad's proxy, however, proxy excludes production taxes as these are typically reported as production costs.

"This multiple would stand in stark contrast to the 2x-3x multiples seen in recent acquisitions of private E&Ps, indicating the tremendous upside potential associated with Pioneer's scale," Bernstein said, explaining: "Using our forecast for fundamen-

tal upstream free cash flow in the Permian in 2024, we project that a standalone ExxonMobil would generate \$14.47 per boe in the Permian next year at our base case price, as opposed to \$16.95 per boe from a merged ExxonMobil-Pioneer."

The deal would be the largest ever in the history of US shale upstream but "would appear to be a relatively fair price" he noted, when assuming a \$70 per barrel long-term WTI oil price. ■

## Missouri utility to invest in gas power, renewables and battery storage

**US utility Ameren Missouri has released its 2023 Integrated Resource Plan which stipulates sizable investment in gas-fired power plants, renewable energy and battery storage. Highlights include the deployment of an 800 MW on-demand, open-cycle gas power station by 2027 at a projected cost of \$800 million as well as the addition of 4,700 MW of new renewable energy by 2036.**

Ameren serves some 1.2 million electric and 135,000 natural gas customers, and stressed the latest IRP is in line with its goal of reaching net-zero emissions by 2045.

The fast-ramp 800 MW open-cycle gas power plant will be mostly dispatched to provide backup power at times of peak demand in the winter and summer season.



Ameren's coal-fired Sioux Energy Center is due for retirement

The start-up of an earlier announced 1,200 MW combined-cycle gas power plant has, however, been postponed until after the large coal-fired Sioux Energy Center will be retired in 2032.

Accelerating the clean energy build-out, Ameren plans to grid-connect some 4,700 MW of new wind and solar power capacity by 2036 at a combined investment of approximately \$9.5 billion. More than half of the additions, or 2,800 MW, is meant to be installed by 2030.

To balance intermittent electricity supply from renewables, Ameren also plans to add 800 MW of battery-based energy storage, including 400 MW by 2030 – five years earlier than planned. An additional 400 MW of battery storage is scheduled to come online by 2035 which would bring total in-

vestment in storage to \$1.3 billion.

New on-demand generation from various, decentralized resources of 1,200 MW is meant to serve customers in rural areas in 2040, complemented by another 1,200 MW by 2043.

"Thoughtfully integrating a new, diverse mix of generation sources while maintaining the availability of our existing energy centers through retirement is essential for a reliable, resilient and affordable clean energy future," commented Ameren Missouri chairman and president, Mark Birk.

Since publishing its latest IRP update in June 2022, Ameren retired the coal-fired Meramec Energy Center and proposed the 2024 retirement of the coal-fired Rush Island Energy Center in a clear shift to solar PV of which 350 MW has been acquired and another 550 MW is meant to be built from 2024. ■

## Pre-FEED underway for producing & exporting ammonia from Houston

INPEX, Air Liquide, LSB Industries and Vopak are carrying out a pre-FEED study for a large-scale ammonia production and export project on the Houston Ship Channel. Phase 1 is targeted to produce more than 1.1 million tonnes per annum (mtpa) of ammonia by the end of 2027, to be sold mostly to power generators in Asia.

Tokyo-based INPEX, with stakes in both hydrogen and ammonia production, will likely be the largest investor in the overall project – from production to export. “The majority of the product would be used for power generation in Asia with some volumes going to Europe and the US,” CEO Takayuki Ueda disclosed, stressing “numerous parties have expressed interest” in signing offtake agreements.

Houston Ship Channel, the second largest petrochemical corridor in the world, where Vopak Moda operates an ammonia terminal that includes storage tanks and a newbuild dock with multiple deep-water berths. If situated here, the project would be near multiple pipelines that could supply raw materials like natural gas and water.

Project partners will bring their respective expertise:

- Paris-headquartered Air Liquide would supply its AutoThermal Reforming (ATR)

technology for producing hydrogen at scale, combined with carbon capture systems that are meant to sequester at least 95% of direct CO<sub>2</sub> emissions. Air Liquide would be responsible for onsite nitrogen and oxygen production.

- Oklahoma City-based LBS Industries and Tokyo-based INPEX would work on the ammonia production. LBS would select an ammonia loop technology provider and would then be responsible for day-to-day operations. Together, LBS and INPEX would carry out pre-FEED and engineering, procurement and construction of the facility.
- INPEX and LBS would sell the ammonia and finalize off-take agreements with



Vopak's Houston marine terminal

prospective offtakers and could also sign on further partners in the project. Japan's largest power generator JERA might be interested in taking a stake given that is pioneering ammonia co-firing in its coal power stations. ■

## Masdar launches utility-scale wind project in UAE, impacts gas power

Abu Dhabi Future Energy Company, better known as Masdar, has launched a 103.5 MW wind park based on technology that captures low wind speeds at utility-scale. The United Arab Emirates' (UAE) clean energy project is meant to power more than 23,000 homes per year and will lower the need to dispatch gas- and oil-fired power plants.

Wind energy previously was not viable due to low wind speeds in the UAE but bigger turbine sizes, cheaper hardware and the discovery of a weather phenomenon that generates higher winds at night time made the project scalable. Strong wind power at night complements the UAE's existing solar PV and further shifts the emirate's energy mix away from fossil fuels.

The project spans four locations including Sir Bani Yas Island, Abu Dhabi, where a 45 MW capacity wind farm plus 14 MWp (megawatt peak) solar farm has been developed. The other wind farm locations include the pearl-diving center, Delma Island (27 MW) in Abu Dhabi, Al Sila, Abu Dhabi (27 MW) and Al Halah, Fujairah (4.5 MW). EPC for the wind parks was carried out by PowerChina, while GoldWind Group was the main supplier of equipment.

Oil and gas have been the dominant fuels



Wind turbine at Al Halah, Fujairah

powering the UAE's economy, with gas power plants generating over 110 billion kilowatt-hours of electricity, but the government is striving to diversify the country's energy mix as Dubai will host the COP28 Climate Summit from November 30 to December 12, 2023. The latest landmark utility wind power project adds to the country's substantial clean energy sources like the 5,380 MW Barakah nuclear power plant and a cumulative 3.5 GW of solar power which is about to be expanded to 6 GW. ■

## Samsung and Svante collaborate on CCUS projects

South Korea's Samsung Engineering will work with and invest in Svante Technologies, a Canadian carbon capture and removal solutions provider. Svante developed 'structured adsorbent beds', known as filters, that will be used to identify, develop, and deliver commercial carbon capture, utilisation and storage (CCUS) projects in the Middle East and Asia.

Made by coating solid adsorbents on stacked sheets of laminate, these “filters” are used in post-combustion carbon capture. Svante CEO Claude Letourneau claims the company's unique technology of structured adsorbent beds can be applied to 85% of the total carbon capture and removal segment.

Samsung will become a strategic partner in Svante to explore design iterations of Svante's post-combustion carbon capture plants and help the Canadian company scale up its filter manufacturing capacity. The two companies will then seek to deliver commercial-scale carbon capture projects, ensuring cement, steel, fertilizer makers in these regions have more viable pathways to decarbonise. Integrated project delivery models for CCS plants will be on offer to optimise performance. ■

## GE to provide two 9HA turbines for combined-cycle plant in China

Chinese State Development & Investment Corp has ordered two GE 9HA.02 gas turbines for a new combined cycle power plant in the Zhoushan archipelago, south of Shanghai. The plant will deliver nearly 1.7 GW of electricity, some of which from other sources than gas, with the first unit due operational by the end of 2025.

**Z**houshan is China's largest archipelago, comprised of 1,390 islands, and the CCGT will be supporting the developing of nearby marine industrial clusters. The first gas-fired unit is envisaged to eventually burn up to 10% by volume of green hydrogen blended with natural gas.

The project is the first H-class gas-fired power generation project in Zhejiang Province and is consistent with the 14th Five-Year Plan of the People's Republic, where Zhoushan has been positioned as a pivotal maritime hub. Two maritime industrial clusters are meant to be built through 2025 along with a green hydrogen hub.

"We ordered GE's H-Class technology for its ability to generate significant electrical output in a flexible and efficient way – crucial for the development of the maritime cluster – while helping to ensure reliability of supply in the over 130 urbanized islands of the archipelago," said Tan Peidong, general

manager of SDIC Jineng Gas Power Generation.

With their large capacity and flexibility, HA turbines can support the growth of renewables, enhancing Zhejiang Province's power supply capacity and power grid peak shaving capability. The regional government is turning to gas-fired generation to implement a national goal of peak carbon emissions and subsequent carbon neutrality by 2060.

GE Vernova has secured five projects powered by ten GE H-class gas turbines in mainland China with a combined capacity of more than 8GW. Orders include three 9HA.02 gas turbines for the Guangdong Energy' Dongguan Ningzhou power plant, two 9HA.01 gas turbines for Guangdong



Render of Zhoushan CCGT

Huizhou power plant expected to burn up to 10% by volume of hydrogen blended with natural gas upon start of operation and three 9HA.01 gas turbines for Shenzhen Energy's Guangming power plant. ■

## First Ansaldo-built OCGT in Germany starts operation

**Ansaldo Energy has delivered and commissioned unit 6 of the Irsching power plant in Bavaria, built on behalf of Uniper. The 300 MW open-cycle project was the first plant that Ansaldo delivered in Germany and will be followed by the Marbach OCTG, also created for the country's strategic network reserve.**

**T**he Irsching OCGT, driven by an AE94.3A gas turbine, is dispatched solely on request of the regional grid operator TenneT. The fast-ramp plant is part of Germany's grid reserve project, aimed at ensuring reliable electricity supply as the country transitions towards a greater use of inherently intermittent wind and solar

power sources which require backup from dispatchable units that can also supply grid inertia.

Start-up of the 300 MW reserve power plant in Bavaria will soon be followed by the commissioning of the similar-sized OCGT Marbach 4, built on behalf of the regional utility Energie Baden-Württemberg (EnBW) just north of Stuttgart.

With over 4 million equivalent hours of operation accumulated worldwide, the Ansaldo's AE94.3A turbine is a product of proven reliability. The Italian manufacturer stressed the operational flexibility of its turbine and its high capacity of hydrogen combustion was a "winning element" in the context of Germany's transition strategy, which requires growing support for grid stability in the face of an increasing use of renewable energy. ■



Uniper's Irsching unit 6

## NEWS NUDGES

### Cummins rebuilds engines in Poland

US-based engine maker Cummins has opened a new rebuild centre in Krakow, Poland. Developed at a cost of \$10 million, the centre remanufactures Cummins high horsepower engines with displacements of 19 to 78 litres, and in the 450 to 3500 horsepower range. This includes QSK19, QSK38 and QSK60 engines.

### mtu biogas gensets launched

New mtu Series 4000 biogas gensets, offered by Rolls-Royce for heat and power gen, produce CO<sub>2</sub>-neutral and reliable electricity to serve industrial customers' own needs or help stabilise the grid as balancing power. The first 12-cylinder L64FB biogas engine is being installed to supply electricity and hot steam for the factory of starch producer Tongjit in Thailand.

### West Burton Energy buys 2.9 GW energy storage

West Burton Energy, operator of a 1,270 MW power station in Nottinghamshire, has acquired the Thorpe Marsh battery storage project near Doncaster from Banks Renewables for an undisclosed amount. The asset comprises of a 1.4 GW project (2.8 GWh) to be connected to the UK national grid and a 50 MW project to be connected to the distribution network.

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