



Power-of-Siberia 2 deal still in limbo as China aims for better price

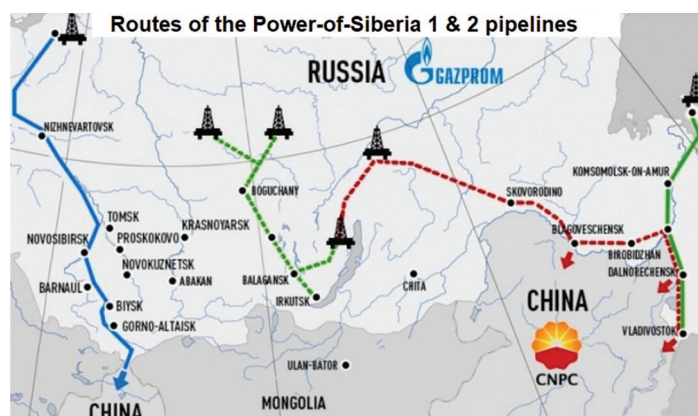
Though "practically all parameters" for Power-of-Siberia 2 – a new 50 bcm/y interconnector to China – are agreed, the Russian President Vladimir Putin claims, no deal has been signed as China seems to bargain for a better price for gas deliveries. Gazprom wants to supply up to 98 bcm of gas by 2030, but analysts doubt China will need that much.

Putin invited the Chinese leader Xi Jinping to Moscow last week when they also discussed the interconnector. Talks ended with them stating the parties involved "will make efforts to advance work on the study and approval" of project – even though Gazprom began a feasibility study back in 2020 already.

The pipeline route years 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/year it used to deliver to Europe. 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.

Gazprom seeks to pivot supplies 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 \$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

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EU paves out legal options for member states to ban Russian LNG

Energy ministers in the EU have backed a proposal allowing them to restrict LNG imports from Russia, though traders doubt it is feasible. Spain's Repsol and Enagas claim to not purchase Russian LNG while France's TotalEnergies has no intention to give up its 20% share in the Yamal export facility from where is sources a steady stream of cargoes.

The proposal, launched by Kadri Simson, EU Commissioner for Energy, paves out a legal option to prevent Russian companies from booking regas slots at European import terminals.

So far, there are no concrete sanctions or a timeline for withdrawing from Russian LNG, hence traders keep chasing profits and continue to ship super-chilled gas from Russia to the EU. Nearly 94% of Russian LNG imports come from the Yamal terminal which liquefies gas supplies from the South Tambey field.

In fact, Europe needs all the gas it can get to compensate for Gazprom downscaling contractual supplies to near zero. Though leaders of the 27 EU member states pledged to phase out the EU's de-



Ice-breaking tanker *Christophe de Margerie*, loading at Yamal LNG

pendence on Russian fossil fuels as soon as possible, imports of Russian LNG increased by 12% in 2022 compared to 2021. Analysts note this was as gas-fired power generation increased to help compensate for lower hydropower output due to

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volumes before reaching its full capacity of 38 Bcm by 2027.

"The original target is for China to import 38 bcm of Russia 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.

China holds back and diversifies supplies

In February 2022, China already agreed to purchase gas from Sakhalin in the Russian Far East, which will be transported via a new pipeline across the Japan Sea to Heilongjiang province. Agreed volumes will reach up to 10 Bcm/y starting from

around 2026.

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. Beijing Gas just procured a spot cargo for April, inspired by CNOOC's large spot tender early this year but analysts reckon rising long-term LNG deliveries will meet the bulk of China's gas demand for the time being.

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. Instead, they could be again in a lucky position to re-sell term LNG deliveries to the higher-priced European spot market at a profit – just like in summer and autumn of 2022 when PetroChina, Sinopec and CNOOC were over-contracted for LNG. Yet things could be substantially different if China's economic growth exceeds expectations. ■

China's reopening creates substantial upside for coal and gas prices

As the Chinese economy opens after three years of lockdowns, Wood Mackenzie sees significant upside for coal and LNG demand in case of a construction-led boom. Though China strives to primarily source thermal coal at home, it still needs an additional 49 million tons of seaborne coal which could push the benchmark Newcastle HA coal prices to \$151/t.

Coal also accounts for 60% of China's power generation, where demand is forecast to increase by 7% or 158 million tons from last year in Wood Mackenzie's high-growth case. The steel and cement sector, two other major coal consumers, will also add to non-thermal demand and increase the need for coal imports to complement domestic production.

Rebound in gas demand

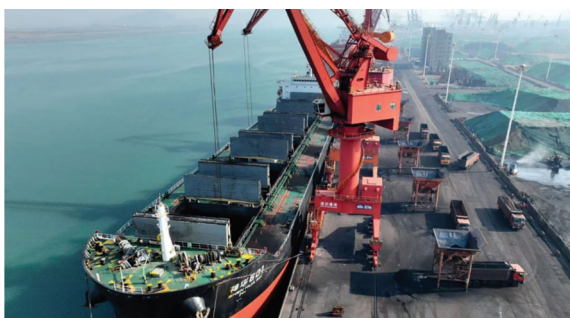
Gas demand is already seen to rebound strongly. Analysts expect consumption to rise by more than 30 billion cubic meters, or 9%, driven by strong GDP growth and lower

prices on global markets. But booming domestic gas production, up 14 bcm, and a ramp up in Russian pipeline gas imports by about 7 bcm is expected to constrain China's LNG imports to 97 bcm, or 71 million tons in 2023. "This would be just 7.4 million tons more than last year and still far less than the record 80 million tons imported in 2021," analysts noted.

In Wood Mackenzie's high-growth case,

gas demand is growing by an additional 10 bcm – which would have to come from spot LNG imports. Yet analysts do not expect this to lead to "a repeat of the chaos seen in 2022" when cuts in Russian gas deliveries and Europe's sudden turn to LNG sent prices soaring. Even in the high-growth case, China's LNG demand is forecast to "only" reach 78 million tons this year – still short of 2021 imports.

Stronger Chinese LNG demand will, however, boost global competition for supply at a time when no new liquefaction and export projects are due to be commissioned before 2025. In this case, prices will inevitably rise although analysts expect that moderating demand elsewhere will limit the price upside to \$25/MMBtu. ■



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draught and record nuclear outages in France over corrosion issues.

LNG imports to Europe keep rising

Commissioner Simson conceded that LNG imports to Europe "increased substantially," up from 80 bcm in 2021 to 135 bcm last year and this trend is expected to continue in 2023 at sustained levels.

"EU regas and terminals are very busy, and their capacity is being increased to receive additional LNG imports," she said. Five new projects are ongoing, with 50 bcm still to come by 2024, on top of the more than

20 bcm capacities commissioned last year.

Prices at Europe's benchmark TTF gas trading up have retreated and are now in the range of €40. "The differential with Asian prices is now very narrow, but Europe still remains an attractive LNG destination," Simson said.

Despite storage levels at 55% – much higher than at the same time last year – she proposed to prolong demand reduction measures for another 12 months. The EU Council approved this proposal on Tuesday, and Simson vowed the measure "can save us 60 bcm of gas until April 2024." ■

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UK oil and gas output shrinks as 90% of offshore firms cut investment

Windfall taxes have made UK North Sea operators cut investment in new fields which risks to reduce oil and gas production by 15% a year, even though Britain's reliance on these fuels increased from 73% in 2020 to nearly 76% last year, OEUK warns. Instead, operators progress with offshore wind projects by committing to spend £30 billion by 2030.

Nine out of 10 of North Sea operators are cutting back investment after having been burdened with a rise in their overall tax rate has risen from 40% to 75% in just 10 months. Offshore wind operators face a similar – though smaller – windfall tax, rated at 45%. Both taxes will remain in place until 2028, even as prices have started to drop.

These tax rises render it more difficult to finance new projects and operators' cuts in investment mean that the UK's potential oil and gas resources have been downgraded and some 500 million barrels less likely to be produced.

"OEUK estimates that oil and gas equivalent to 250 million barrels of oil (boe) have been removed from company plans and another 250mn boe have been downgraded from 'probable' to possible meaning a less than 50% chance of progressing ... It means 500 million boe have been lost, equivalent to a year of UK North Sea output," the lobby group said.

Gas production fell by 7% and oil by 26% since 2018 due to falling investment and regulatory delays. Still, twelve new gas and condensate fields have started up over that period, which now provide 30% of the UK's gas production, according to OEUK figures. A continued lack of investment "could lead to overall production falling by as much as 15% a year by 2030, so output in 10 years will be 80% less than now," it added, warning this will widen the import gas and im-

pact on Britain's future energy security and economic prosperity.

Fitch says profits stay high despite windfall taxes

Earnings and profits in the oil and gas sector will remain high despite windfall taxes imposed in some countries and softening hydrocarbon prices in a slowing economy, Fitch Rating says. Shell, Eni, BP and Total-Energies are expected to have a strong post-dividend free cash flow in 2023, though Capex remains tight as companies stay focussed on cost control.

Majors are raising dividends and buybacks over and above existing policies as they have not fully tracked record earnings in 2022, analysts commented. For example, Shell has increased 4Q22 dividends a share by 15% against the target 4% annual growth outlined in its policy and Eni has increased its initial €1.1 billion buyback for 2022 to €2.4 billion.

"Inflation [and windfall taxes in some countries] will bite but most companies have significantly reduced costs during the period of low oil prices, which will contribute to their cash flows. Overall, the sector performance will remain broadly in line with that in 2022 and significantly stronger than in the mid-cycle," commented Fitch analyst Dmitry Marinchenko.

Comparatively lower windfall taxes of offshore wind have made oil and gas companies turn to low carbon technologies.

Upstream players embrace offshore wind

Upstream companies, diversifying from oil and gas, have plans to develop over 8 GW of UK wind power capacity, and up to £20 billion in capital investment, by 2030. Including companies that solely focus on wind project, proposed investment amounts to a Capex of £30 billion for 13 GW new capacity which could cumulatively power over 14 million homes.

Today, the UK has 2,700 wind turbines installed with 14 gigawatts of capacity and the target is to reach 50 GW by 2030 which would require installing more than 40 new wind farms. Marine engineering skills of oil and gas companies will be essential to achieving this ambition.

"The net zero transition will need £1.4 trillion of investment – which should be benefiting British companies and workers. But the current windfall levies and political statements about the future of such levies risk driving that investment away," said Ross Dornan, OEUK's market intelligence manager, warning: "They give the [UK] exchequer a short-term boost in terms of tax income – but the long-term impacts could be disastrous for consumers and the economy."

NEWS NUDGES

EU extends gas crisis measure

The European Commission has proposed extending emergency measures to reduce gas demand for one year to help the countries meet demand next winter. A voluntary target to curb gas demand by 15% compared to the 2017-2022 average is due to expire at the end of March, but could be extended until March 2024.

JERA tackles sulfuric acid leak

Japan's largest power generator JERA had to cope with an emergency on March 27 after sulfuric acid starting leaking from the pipes of a wastewater treatment facility at the 1,200 MW Hirono coal-fired power plant in Fukushima Prefecture. The utility notified the fire department, stopped the leak and contained the acid within the plant.



Shell's Nelson platform in UK North Sea



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GE demonstrates DAC prototype in the lab, plans larger demo in 2024

Following successful testing of its first Direct Air Capture (DAC) prototype unit for carbon dioxide removal in the lab, GE is planning larger scale demonstrations in 2024. Together with the government's Advanced Research Projects Agency (ARPA-E) and other academic partners, GE is working to have commercially-deployable DAC solution around the end of this decade.

The DAC system combines GE's experience in designing thermal management solutions and heat exchangers for its power turbines and jet engines with chemistry and material systems expertise to develop sorbent materials for CO₂ capture. By designing a sorbent to remove CO₂ from the air, the team employed a similar approach as in a project for the US defense agency to capture clean, potable water from extremely arid, desert-like air.

The U.S. Department of Energy and ARPA-E have been supporting much of the DAC-related work underway, including the two-year, \$2 million AIR2CO₂ Contactor project. GE is also involved in projects led by TDA Research and UC Berkeley, respectively, to advance sorbent and integrated material system technologies involved in DAC. Augmenting the government funding, GE is investing internally in developing and

advancing sorbent-based carbon capture solutions as one of the promising pathways to enable the energy transition.

CAGE lab

The Climate Action@GE lab has become a major research hub for the company's decarbonisation technologies. In addition to direct air capture, the team is working on related efforts in post-combustion carbon capture technologies, and atmospheric water extraction.

The lab has testing and characterization tools for sorbent structure, property, and performance evaluation. This includes the CAGE dashboard – a database that incorporates data analytics and leverages machine learning from >45 external and



Five of the 50+ scientists and engineers that make up GE's Carbon Capture Breakout team.

>215 internal GE materials.

The team has designed and constructed customized, dynamic sorption breakthrough and cycling test rigs and prototype units to conduct carbon capture and atmospheric water extraction performance across relevant operational conditions. ■

Cost of direct air capture to fall below \$100/tCO₂ in best locations

Costs for capturing carbon directly from the air could fall \$100 per tonne of CO₂ by 2030 in places with high renewable energy potential like the Middle East and China and using best available technologies. For a large-scale plant built today, cost estimates range between \$125 and \$335 per tonne of CO₂, researchers reckon.

Europe, North Africa and the United States are also being scanned in search of least-cost location for direct air capture, but analysts at the International Energy Agency (IEA) pointed out costs will only fall substantially if there is enough public and private financing for technology innovation and deployment.

Selling the captured CO₂

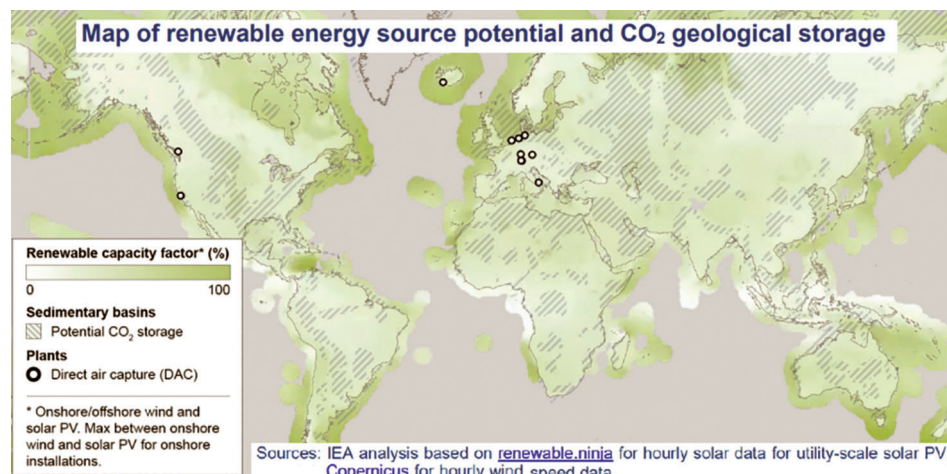
Currently more than 18 Direct Air Capture (DAC) facilities are operating in Canada,

Europe and the United States. All but two of these facilities sell their CO₂ for use, and the largest such plant – commissioned in Iceland in September 2021 – is capturing 4,000 tCO₂/year for storage via mineralisation. The first large-scale DAC plant of up to 1 MtCO₂/year is in advanced development and is expected to be operating in the United States by the mid-2020s.

- GE just finished testing of this first DAC prototype in the lab in Niskayuna, New York State, and plan a larger scale

demonstration in 2024.

- Climeworks, founded as a spin-off of the research university ETH Zürich, has to date commissioned 15 plants worldwide. This includes a large-scale DAC Hinwil, Switzerland, which can capture 900 tons of CO₂ from the atmosphere per year.
- Carbon Engineering has so far commissioned one pilot plant, and recently signed a licensing agreement with 1Point5 to finance and deploy the world's largest DAC facility which should start capturing CO₂ from the atmosphere by 2024. The Squamish-based company also just started engineering on an air-to-fuel plant that is due to become operational in Canada in 2026.
- Global Thermostat is working with ExxonMobil to advance and scale up its capture technology. Porsche's Haru Oni eFuels pilot plant in Chile will use Global Thermostat's DAC technology to capture CO₂ blended with electrolytic hydrogen to produce synthetic gasoline. The plant is designed to capture up to 250 kg of CO₂ per hour, equivalent to around 2,000 tCO₂/year. ■



Commercially operated Wärtsilä engine runs on 25% hydrogen blend

The Finish manufacturer Wärtsilä has successfully tested an engine running on 25% hydrogen-blended fuel at WEC Energy Group's 55 MW A.J. Mihm power plant in Michigan, U.S. Tests were carried out at an unmodified Wärtsilä 50SG engine which continued to supply power to the grid throughout the test series in what operators call a "world-first achievement."

The 50SG engine is the largest commercially operated flexible balancing engine ever to run on a hydrogen fuel blend, Wärtsilä pointed out. The Electric Power Research Institute (EPRI) led assessment of the engine's performance during the testing. During three days of continuous testing, the capability of the engine to co-fire hydrogen blends was successfully demonstrated, showing clear improvements in engine efficiency and reduced greenhouse gas emissions, while staying compliant with NOx emissions.

A 95% engine load was achieved with the 25 vol% H2 blend. "This verifies the fuel flexibility of Wärtsilä engines without compromising efficiency," the manufacturer pointed out. Further testing showed that

with a 17 vol% H2 blend, a 100% engine load was attainable.

The EPRI hence concluded in a report that a 50SG engines can maintain its higher efficiency compared to simple-cycle gas turbines. Looking ahead, Wärtsilä Energy's chief operation officer Anja Frada promised to have an engine and power plant concept for operating with pure hydrogen available by 2026.

Amongst other sustainable fuels, hydrogen will be critical to reaching net zero emissions, and is expected to contribute 20% of the total abatement of CO2 needed in 2050. Hydrogen electrolyser manufacturing capacity sits at nearly 8 GW per year today, but it could exceed 60GW/yr by 2030 based on industry announcements. ■



A.J. Mihm power plant during testing

MHI aims to co-fire hydrogen, ammonia at Indonesian power plants

Mitsubishi Heavy Industries (MHI) and PLN Nusantara Power, part of Indonesia's state energy firm Persero, have agreed to start technical studies to co-fire hydrogen, ammonia and biomass. Tests at the Muara Karang power plant will examine hydrogen combustion in a M701F Series gas turbine that is currently in operation, as well as ammonia co-firing in a gas-fuelled boiler.

Situated just outside of the Indonesian capital Jakarta, Muara Karang is a 1,233 MW combined-cycle gas power plant currently in full operation. Most of the CCGTs generating equipment has been supplied by MHI, notably several gas turbines, boilers, and steam turbines. The Japanese manufacturer will test and evaluates various blends of natural gas and hydrogen as well as ammonia at the plant – similar to tests at comparable power plants in Thailand and Singapore.

In Thailand, MHI is participating in a feasibility study on co-firing up to 20% ammonia to fuel the 1,434 MW BCP Power Station in Rayong province in southeast Thailand. To that end, MHI agreed to provide ammonia burners and boilers, while JERA would procure and transport the clean-burning fuel to designated ammonia receiving and storage facilities.

In Singapore, MHI and JERA are exploring to build a 60 MW combined-cycle gas power plant that will be fully fuelled by ammonia on Jurong Island. Ammonia consists of hydrogen and nitrogen. It is a highly efficient hydrogen carrier and can be directly

combusted without producing any carbon emissions. Moreover, ammonia can efficiently transport and store hydrogen in a liquid state at low cost.

Tests at Suralaya to start in early 2030s

MHI's plans in Indonesia build on two feasibility studies underway at the 4,025 MW Suralaya power station and at an unnamed gas peaking plant.

At Suralaya, MHI are looking to use ammonia in a mixed fuel combustion process together with thermal coal, while the existing gas peaking plant is meant to run on up to 100% ammonia in the long-run. The Suralaya project will be conducted jointly with Mitsubishi and Nippon Koei starting from the early 2030s.

The study at the gas peaking plant, meanwhile, will look at reducing emissions either by co-firing ammonia or hydrogen – both produced in Indonesia. This project will be carried out by MHI jointly with Tokyo Electric Power Services (TEPCO) and is expected to commence the second half of this decade. ■

Two electrolyzers to produce green H2 for INNIO at Jenbach

INNIO has ordered two electrolyzers with 2 MW capacity from H-Tech Systems to convert green electricity to hydrogen for producing 'Ready for H2' gas engines at the Austrian town of Jenbach. The entire Jenbacher engine product line is expected to be rolled out for 100% hydrogen operation as of 2025, while the factory is aiming for Net Zero operations.

The 2 MW green power-to-hydrogen system will be built in a containerized design and situated on the premises of the Achensee power plant of Tiroler Wasserkraft AG (TIWAG), whose subsidiary TINEXT will supply the necessary compressor and storage terminals. Locally produced hydrogen will then be transported by pipeline from the TINEXT compressor and storage terminals to INNIO's primary operations in Jenbach.

At a system efficiency of 74%, the two PEM electrolyzers will produce up to 900 kg of green hydrogen daily to power the 2 MW Jenbacher H2 engines test bench. That way, the primary operations can also be supplied with green electricity and heat generated from green hydrogen in addition to solar, battery, and hydropower. ■



Doosan to carry out EPC for 1 GW combined-cycle plant in Kazakhstan

South Korea's Doosan Enerbility has signed a 1.15 trillion won (\$882m) contract with Turkestan, part of the Kazakh sovereign wealth fund Samruk-Kazyna, to build a combined-cycle power plant in Shymkent, an industrial area in southern Kazakhstan. Construction of the 1,000 MW plant will be carried out with the local firm Bazis and is due completed by August 2026.

Being an EPC project, Doosan Enerbility will be taking on the overall process including the design to equipment supply, installation and commissioning process. The order win for the so-called Turkistan CCGT followed after Doosan's successful completion of the 310 MW Karabatan power plant.



Karabatan CCGT, built by Doosan in 2020

"The successful construction of the Karabatan combined-cycle power plant in 2020, despite the challenges of the Covid-19 situation, helped us win the trust of our client, which in turn served as the foothold to win this project," Yeonin Jung, President and COO of Doosan Enerbility said, vowing the latest Turkistan project will help solidify the

Korean company's position in the Kazakh power generation market.

Together with Karabatan Utility Solutions (KUS), Doosan had won the contract for the Karabatan project back in 2015 and managed to complete the plant in five years' time despite supply-chain disruptions and labour shortages during the pandemic.

Kazakhstan is making progress to improve grid sta-

bility and is committed to modernize its power infrastructure as part of the government's long-term objective to reach net-zero carbon emissions by 2060. Several other projects are also under development, including a 240 combined heat and power project due operational in 2025 and 1 GW wind power and energy storage project to be completed by the end of the decade. ■

GE helps PetroMasila accelerate diesel-to-gas transition in Yemen

Yemen's state oil and gas producer PetroMasila has turned to GE to help reduce wasteful flaring by using the associated gas from oil fields to produce electricity. A TM2500 gas turbine will hence be installed at Block 14 in the Hadramout region, capable to provide up to 34 MW of electricity output while transitioning the site from diesel-to-gas generation.

Some 144 billion cubic meters of gas was burnt in flares at upstream oil and gas facilities across the globe in 2021, according to the World Bank, resulting in approximately 400 million tons of CO₂ equivalent emissions. By utilizing that gas, upstream companies could end wasting a readily available resource while curbing substantial reducing their carbon footprint.

The TM2500, a "power plant on wheels," will create onsite electricity from excess gas found in a mixture with crude oil within PetroMasila's reservoir. Once interconnected to the local grid, over half of the electricity produced from the unit at Block 14 will be delivered to the grid, with GE targeting to achieve commercial operation in 2023. ■



Trailer-mounted TM2500 gas turbine

INNIO commissions six J320 engines at Wuhan waste-to-energy plant

The Austrian manufacturer INNIO has helped Wuhan Environmental Investment and Development Co. (WEID) to commission six additional Jenbacher J320 engines at the local landfill gas project. The waste-to-energy plant now runs with 14 engines with a combined capacity of 14.9 MW, generating enough electricity to meet demand of 35,000 homes in Wuhan.

WEID turned to INNIO's landfill gas power generation technology in 2020 and selected eight J320 gen-sets in their Wuhan City Changshankou LFG phase 1 project. The gen-sets were commissioned in April 2021.

Convinced by the engine's operational reliability and Shenfa's services, WEID purchased six additional J320 gen-sets in April 2022 for Phase II of the LFG project which were already commissioned in December and provided stable electricity supply since then.

The city of Wuhan aims to increase the production of renewable and alternative, distributed power. "The engines within the Jenbacher power generation portfolio can operate on captured landfill and sewage gas, generating power and enabling efficiency while simultaneously reducing envi-



Waste-to-energy plant at a landfill site in Wuhan

ronmental pollutants," said Dong Guo, deputy general manager, Shenfa – INNIO's authorized distributor. "Jenbacher engines are flexible, scalable and resilient, meeting the needs of our customers and supporting China in its goal to become carbon neutral by 2060."

More than 300 Jenbacher J320 generator sets have been delivered across China, mostly for distributed power generation. ■

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