

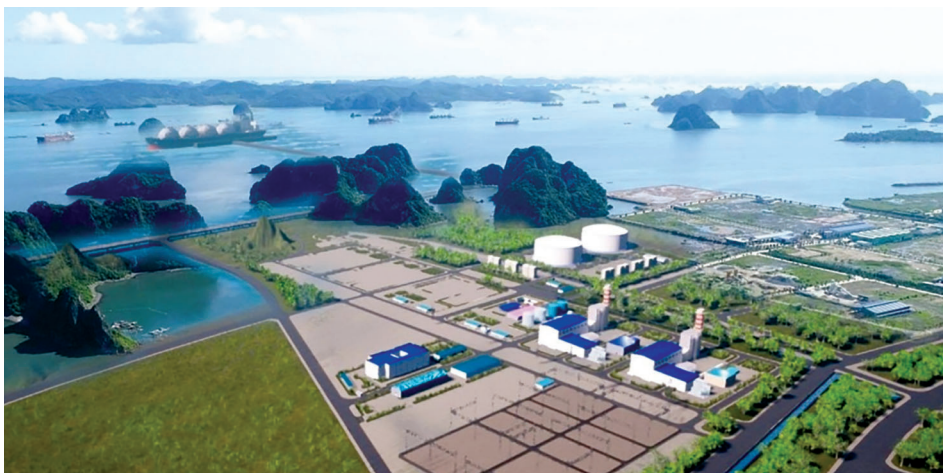


Vietnam's energy transition slowed by gas-fired power growth

Vietnam is leading the build-out of gas-fired power generation capacity in Southeast Asia, with 56 GW in advanced planning or construction stages. Stark growth in gas power may hamper Vietnam in achieving its net-zero by 2050 target, although the International Partners Group (IGP) contributes \$15.5 billion to reduce peak coal-fired capacity from 37 GW to 30.2 GW.

The IGP, co-lead by Japan and the United States and comprising the EU, Norway, Canada and the UK, agreed to mobilise nearly \$16 billion of public and private finance over the next three to five years to reduce Vietnam's power sector emissions by up to 30%, from 240 megatons to 170 megatons, and bringing forward the peaking date by five years to 2030.

These ambitious plans, set out by the IGP in a Just Energy Transition Partnership (JETP) for Vietnam, are meant to be realised by sourcing at least 47% of the country's power output from renewable



Render of Quang Ninh LNG-to-power project in northern Vietnam

energy sources by 2030, up from the currently planned 36% share.

But Fitch Solutions warned that although JETP for Vietnam limits peak coal power capacity by nearly 6 GW to 30.2 GW, the impact of this target on the dominance of thermal power generation will be marginal. Analysts are bullish on the country's outlook for natural gas production and gas-burn in the power sector.

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EIA slashes Henry Hub forecast on mild weather and growing supply

As gas prices dwindle in a mild winter, the US Energy Information Administration has slashed its 2023 Henry Hub spot price forecast to \$3.40/MMBtu on average, down almost 50% from last year. Record dry gas production and delays with the restart of Freeport LNG have caused a supply overhang, with inventories above the five-year average.

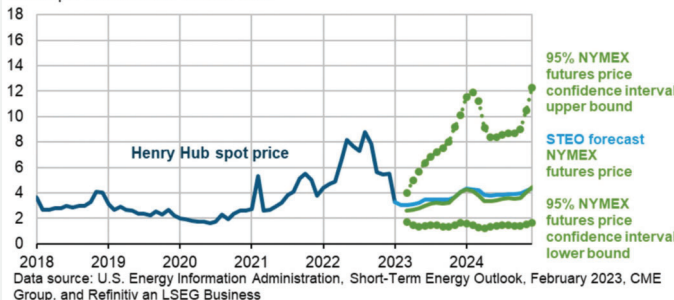
Temperatures across the United States in January were the mildest since 2006, which reduced gas consumption for space heating while production growth has been outpacing demand growth over the past several months, pushing down prices.

Record dry gas production

In January, dry gas production set a new record at 100.2 billion cubic feet per day (Bcf/d) and analysts expect it to hover around this level for most of this year. Rising production and tepid demand build up stocks. Inventories will end the gas withdrawal season

(November through March) at more than 1.8 trillion cubic feet (Tcf), some 16% above the five-year average largely due very mild weather. High gas stocks add a further bearish element to prices.

Henry Hub natural gas price and NYMEX confidence intervals
dollars per million British thermal units



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"Putting this into the context of Vietnam's power mix, we estimate 2022's conventional thermal power generation to be about 161 terawatt-hours (TWh), corresponding to 62% of the year's power mix. By 2030, we expect this dominance to persist, and even slightly increase to 64%, which is about 250 TWh in power generation," Fitch said.

One project announced in November by Tokyo Gas, Marubeni in a joint venture with the Vietnamese manufacturer Colavi and

PetroVietnam Power is to build an onshore LNG receiving terminal and 1.5 GW gas-fired power station in Quang Ninh province. The project will cost an estimated \$1.92 billion, with commercial operations slated to start in the second half of 2027.

PetroVietnam aims to put the gas-fuelled Nhon Trach units 3&4 in operation in 2025. The two LNG-fuelled units, powered by combined-cycle turbines in 1-1-1 configuration, will have 1,642 MW combined capacity

and are due onstream within 36 months from the award of an EPC contract to Samsung C&T and Lilama Corp in March last year.

Moreover, a 3,200 MW combined-cycle power plant is under way in Bac Lieu Province in Vietnam's Mekong Delta. Fuelled by LNG, the plant is developed by Delta Offshore Energy and due operational in late 2023 – to name just a few of Vietnam's flurry of gas-fired power ventures. ■

Hydrogen patents focus on electrolysis, research led by Japan and EU

Research into hydrogen technology is shifting towards low-emission solutions, notably electrolysis, led by the European Union and Japan which filed 28% and 24% of all patent applications, according to the European Patent Office (EPO). Germany leads on hydrogen in Europe, while the US – with 20% of all H₂-related patents – is the only country to see applications decline in the past decade.

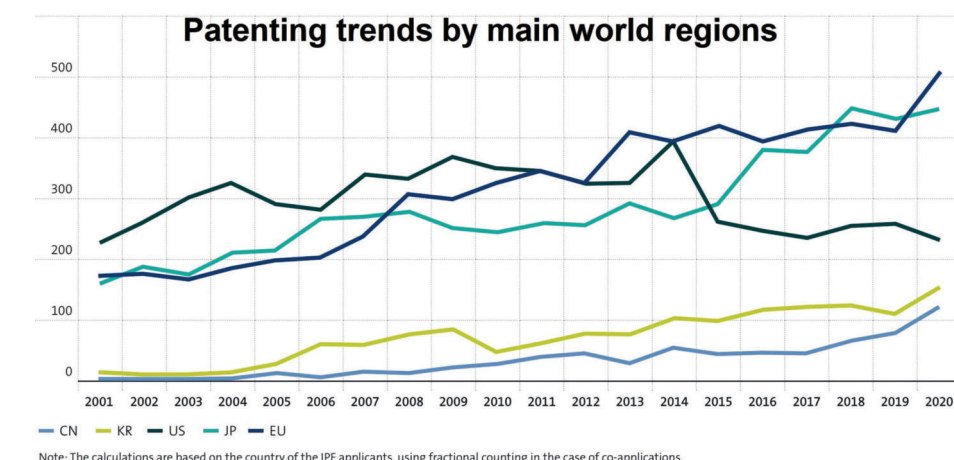
In contrast, the patenting of hydrogen technologies "remained modest" in South Korea and China but is "on the rise," analysts commented. In addition, a significant volume of hydrogen research is underway in Canada, Switzerland and the UK.

Competing to host roll-outs

The most innovative regions are now competing to host the first industrial roll-out phase, with EPO data suggesting that Europe is gaining an edge as a location for investment in new electrolyser manufacturing capacity.

"Harnessing the potential of hydrogen is a key part of Europe's strategy to achieve climate neutrality by 2050," said EPO President António Campinos. "But if hydrogen is to play a major role in reducing CO₂ emissions, innovation is urgently needed across a range of technologies," he stressed.

A report, compiled by the EPO and the International Energy Agency (IEA), reveals what analysts call "some encouraging tran-



sition patterns" across countries and industry sectors. It also highlights the contribution of start-ups to hydrogen innovation, and their reliance on patents to bring their inventions to market.

More than half of the \$10 billion of venture capital investment into hydrogen firms in 2011-2020 went to start-ups with patents, though they make up less than a

third of all start-ups in the EPO's data set.

Holding a patent is a good indicator of whether a start-up will keep attracting finance: more than 80% of late-stage investment in hydrogen start-ups in 2011-2020 went to companies that had already filed a patent application in areas such as electrolysis, fuel cells, or low-emissions methods for producing hydrogen from gas. ■

Gas to Power Journal

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The EIA hence forecasts Henry Hub gas prices to stay below \$4.00/MMBtu until December, as supply growth outpaces sluggish demand. In fact, US gas demand is forecast to fall in 2023 due to lower industrial gas consumption as a result of an expected drop in manufacturing, and lower gas-burn in the power sector as the renewable build-out accelerates. The share of renewable energy is forecast to rise from 24% last year to 26% in 2026, reducing the share of gas from 39% to 37% over the same period.

Waiting for Freeport LNG restart

Utilisation of US LNG export facilities are expected to be slightly lower in the next few months due to high natural gas stock levels

in Europe. But once the Freeport liquefaction facility is back operational, total US LNG exports are anticipated to increase by 11%, or 1.2 Bcf/d on an annual basis in 2023 compared with 2022.

Freeport LNG, which went offline in June due to a fire, is expected to return to market in the first quarter of 2023 and will add over 2 billion cubic feet per day (Bcf/d) of gas demand to the US market once fully operational.

But most Asian offtakers of LNG cargoes from Freeport doubt substantial shipments will materialise until the end of March, at the earliest. Many have taken precautionary measures and procured gas from elsewhere, often at a higher cost. ■

Moody's expects Europe's economy to slow despite lower gas prices

Markedly lower natural gas prices, down 80% from their summer peaks, support Europe's economy but Moody's expects growth to decelerate due to a tighter monetary policy and the roll-back of support schemes for industry and households. European utilities benefited from record power prices over, though many faced a temporary liquidity squeeze due to higher margin calls.

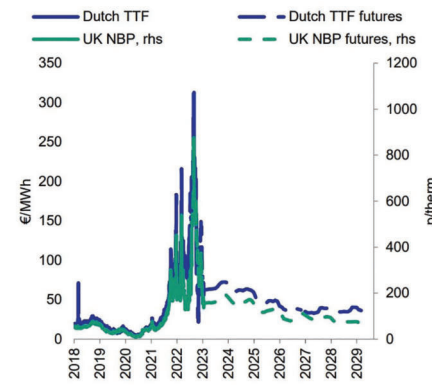
European power producers faced margin calls close to €1 trillion in total over the past autumn, analysts assume, as they had to deposit additional funds to meet the margin requirements in their trading accounts for electricity futures. Soaring prices for electricity over the course of 2022 had propelled up those margin requirements for hedging electricity sales to unprecedented levels. Several utilities found themselves short of cash and called for government intervention.

Financial advisors like Baringa had urged governments to hand out the required short-term loans given that power producers just needed the financing for trading and hedging while they were not at risk of insolvency as they actually benefitted from high prices in the physical market.

Gas prices fall, though still higher than average

A mild winter and higher than expected gas in storage had made prices fall off a cliff, though they are still higher than normal. Gas future at the Dutch TTF, the most liquid trading hub in Europe, are currently trading at around €60/MWh – three times their five-year average for this time of the year. Moody expects prolonged geopolitical uncertainty and the need to fundamentally

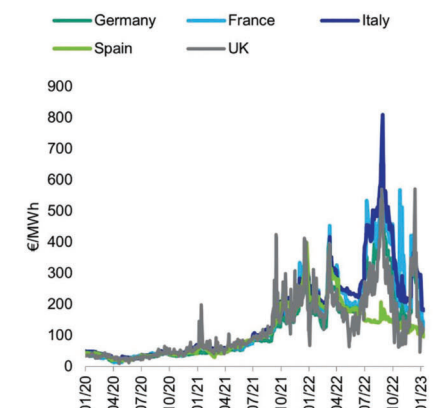
Gas prices have declined from their peaks last summer but will likely remain elevated



TTF: Title transfer facility. NBP: National balancing point.

Sources: Factset and Moody's Investors Service

European power prices have decreased sharply from the August peak
Month-ahead baseload price



change Europe's energy mix will keep the region's energy prices well above historical levels at least over the next three years.

Energy supply in the winter of 2023-24 will be tight since Russian gas flows will be, at best, around 20% of 2022 energy flows assuming no further cuts, Moody's forecast. Moreover, China's is unlikely to redirect any contracted LNG cargoes to Europe this year, leaving Europe at risk of a supply gap of around 30 Bcm this summer which will be very difficult to close as no additional liquefaction and export capacity is seen to enter the market until late 2025.

Spot gas prices, in particular, will remain higher and more volatile than prices under

long term contracts while Europe is struggling to replace missing Russian deliveries. Power generators reacted to the gas shortage by firing up thermal coal power plants or shifting to renewables combined with energy storage.

As long as governments claw back utilities' extra profits to subsidise end-customers' electricity bills, it will be difficult for power generators to invest into new capacity. Record power prices made government impose windfall tax regimes but Moody's suggests the "scope of such interventions will likely be limited by the essential nature of services that the utilities provide and by their role in facilitating the energy transition." ■

Global gas turbine market forecast to top \$61 billion by 2033

Rapid urbanisation and electrification could increase the value of the global gas turbine market from currently \$40.8 billion to \$61.1 billion through 2033, up 4.1% per year. Hybridizing gas turbines with storage and renewables, as well as hydrogen co-firing fuels medium-term growth, according to Future Market Insights, while further out CCUS could make turbines reach zero emissions.

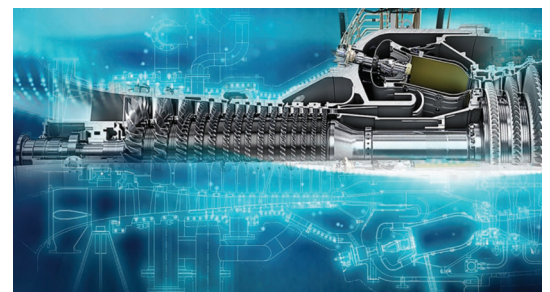
CCUS, short for carbon capture utilisation and storage, can be installed at existing fossil-fuelled turbines to turn power stations into clean energy sources. Retrofitting carbon capture technologies is vital to avoid the "lock-in" of emissions from the vast fleet of existing fossil-fuelled power plants while also providing plant owners with an asset protection strategy for recent investments. This is of particular relevance in Asia, where the average age of coal-fired power plants is just 12 years.

Combined-cycle gas turbine technology is set to grow by 4.2% as operators replace oil coal-fired power generation capacity. Large CCGTs are served by gas turbines with more

than 300 MW capacity, which includes the most expensive turbines in the market, FMI analysts pointed out.

Asia Pacific will yield high growth for gas turbines, backed by rising oil and gas production in the region. China is set to emerge as a significant shareholder in the gas turbine industry due rising investment in new large combined-cycle gas power plants, as well as a presence of low-cost raw materials and labour.

Likewise, India also invested in the upstream sector as well as in its local manufacturing capability of turbines which will likely attract international turbine makers, seeking joint ventures or other forms of co-operation, FMI analysts commented.



Manufacturers worldwide have developed gas turbines that have fuel flexibility and run at high temperatures with little or no failures. Flexible gas turbines have a competitive advantage for backup power due to their efficient and stable operation. The focus of research is on design improvement for facilitating combustion with as little emissions as possible. ■

Siemens Energy Q1 net loss more than doubles, though orders increase

Siemens Energy has reported a widening first quarter net loss to €598 million, up from last year's loss of €246 million, as strong operational performance at Gas Services and Transformation of Industry was more than offset by €0.5 billion charges at Siemens Gamesa. Growing revenues and order intake could not compensate for the company's wind power woes.

A full takeover and delisting of its wind turbine arm Gamesa will allow Siemens Energy to restructure its loss-making business unit. The German engineering company had issued multiple profit warnings as supply chain issues hampered the ramp-up of its 5.X wind power platform which dragged down Siemens Energy's overall revenue and profitability. After full integration, the combined group is hoped to achieve cost synergies of up to €300 million within three years.

Large orders at Grid Technology boosted the orderbook to €12.7 billion in value, equalling 49.2% growth despite a high basin of comparison, while revenue increased 16% to €7.1 billion. "Our order

growth demonstrates that we have the right portfolio to capitalize on the energy transition," CEO Christian Bruch said, adding: "The intended delisting of Siemens Gamesa will further support the team to focus on solving the operational problems and the turnaround."

Adjusted outlook

However, the charges at Siemens Gamesa forced the parent company to adjust its outlook for fiscal year 2023. Management now expects Siemens Energy Group's Profit margin before Special items between 1% and 3% and the group's overall net loss to be on prior fiscal year's reported level.

Free cash flow was negative at €58 million mainly due to outflows at Gamesa, although the overall development was better than expected thanks to advance payments from customers in relation to the strong order development. CEO Bruch hence expects free cash flow pre-tax for fiscal year 2023 to be positive. ■



Cummins reports strong Q4 revenues but margin pressure persists

Cummins has posted \$7.8 million in fourth quarter revenues and projects a 12-17% rise in full-year 2023 revenues but analysts were disappointed by the manufacturer's EBITDA margin guide of just over 14.5%. Sales in North America were up a quarter but fell 1% globally as strong demand was offset by a slowdown in China and suspended operations in Russia.

Net income attributable to the US engine maker Cummins in the fourth quarter was \$631 million, and the company's 2023 outlook implies sales of around \$32 billion, up nearly 15% over year, and EBITA up 25% to around \$4.8 billion – both a bit higher than

Wall Street analysts had expected.

"In 2023, we anticipate that demand will remain strong in most of our key regions and markets, especially in the first half of the year. We will continue monitoring global economic indicators closely and ensure we are prepared should economic momentum slow further," CEO Jennifer Rumsey said. "We expect revenue growth and margin expansion in our core business and strong growth in our New Power segment in 2023."

The New Power business focusses on hydrogen, fuel cells and vehicle electrification. The unit is still comparatively small, generating 0.7% of Cummins' sales in



NEWS NUDGES

Shell's profits double

Global energy major Shell said today its adjusted earnings in the final three months of 2022 had more than double to \$39.9 billion on the back of soaring oil and gas prices in the wake of Russia's invasion of Ukraine. Shell posted its record earnings just days after US-based Exxon Mobil announced annual profits of \$55.7 billion.

Semcorp opens large energy storage

Singapore's Sembcorp Industries has opened southeast Asia's largest energy storage system on Jurong Island. The utility-scale ESS has a maximum storage capacity of 285 MWh, and can meet the electricity needs of around 24,000 four-room households for one day, in a single discharge. Its rapid response time is essential in mitigating solar intermittency in Singapore's fast-changing tropical weather.

Tsubame helps INPEX synthesise ammonia

The Japanese technology firm Tsubame has received its first order for a commercial ammonia synthesis plant, targeting to produce 500 tons of ammonia per year. Daiichi Jitsugyo, the main contractor, will oversee the overall construction of the plant on behalf of Japan's biggest oil and gas explorer INPEX, with production is scheduled to start in fiscal 2025.

2022, worth around \$200 million.

CEO Rumsey pointed out Cummins advanced its Destination Zero growth strategy through the acquisitions of Jacobs Vehicles Systems, Meritor and the Siemens Commercial Vehicles business. "The innovative talent, technology and capabilities these acquisitions bring will position Cummins for success as the industry decarbonizes," she said.

Cummins acquired Meritor in August against the backdrop of accelerating demand for decarbonised solutions. ePowertrains will integrate hybrid and electric drivetrains to help Cummins provide advanced clean mobility products and scale-up its offering within its New Power business. ■

India's LiFE initiative could save \$440 billion globally by 2030; IEA says

The 'Lifestyle for Environment' (LiFE) initiative of India could save \$440 billion if rolled out globally, the International Energy Agency (IEA) reckons. LiFE incurs energy savings through both lower consumption and lower prices, IEA modelling shows but India's minister for petroleum and natural gas, Singh Puri, cautioned the country's clean energy targets need to be weighted against the country's growing economy.

India is set to become the world's third largest economy and most populous country this year, in need for more and more energy. Around 50 million Indians – equivalent to the total population of South Korea – have gained access to electricity every year since 2010, mostly through the national grid. Nonetheless, India's economy is 10% more energy efficient than both the global and G20 average – not least thanks to the LiFE initiative, launched by Prime Minister Narendra Modi of India at COP26 in Glasgow in November 2021.

Already the world's third largest market for renewables, India has seen the growth of consumer-centric distributed green power take off, with rooftop solar growing 30-fold in less than a decade. Supportive policies have boosted electric vehicles uptake to nearly 5% market share, with sales tripling over the past two years. Eager to domesticate supply chains linked to clean energy, the government promotes initiatives to manufacture solar PV, advanced batteries and electric vehicles in India.

Striving to bring down energy prices, the Indian government has set a target of non-

fossil fuel sources contributing to 50% of India's power gen capacity, of producing 5 million tons of green hydrogen and blending 30% of ethanol in petrol – all by 2030.

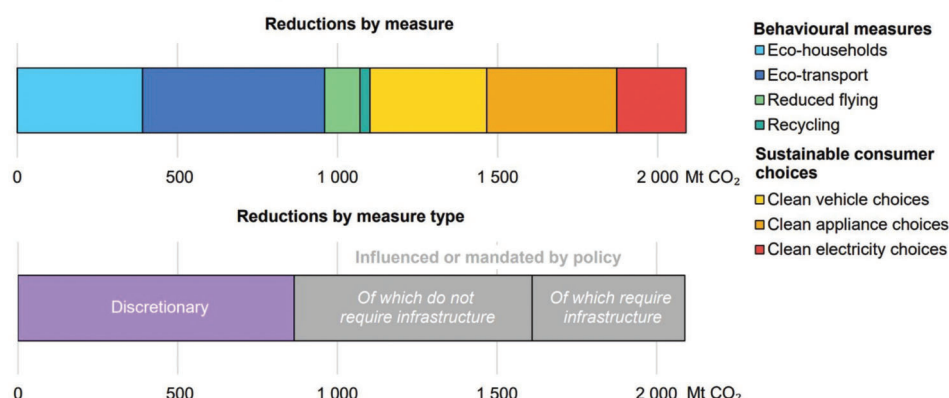
Saving on fuel mitigates emissions

"India's example shows the importance of behavioural change and consumption choices in driving energy transitions," analysts pointed out. If adopted globally, LiFE measures – including behavioural changes and sustainable consumer choices – would

save end-customers around \$440 billion by 2030, equivalent to 5% of all spending on fuels across the global economy that year.

Such fuel savings and green energy adoption would reduce CO₂ emissions by more than 2 billion tonnes by 2030. Though around 60% of the emissions saving by LiFE measures could be directly influenced or mandated by governments, analysts cautioned that how individuals behave and choose to consume is ultimately shaped by the norms, policies, incentives and infrastructure around them. ■

Reductions in annual global CO₂ emissions from LiFE measures, 2030



Minnesota utilities may have to switch to CO₂-free electricity by 2040

Power generators in the US state of Minnesota could be obliged to transition to 100% carbon-free electricity by 2040 under a new bill debated in Parliament. Xcel Energy, Minnesota's biggest utility, said the proposed legislation was in line with its own goals, but rural electric cooperatives and municipal utilities warned it would incur higher costs to their customers.

Democrats support the bill while Republicans prepare a long list of amendments that they claim would reduce the costs for consumers and risks to balance the power grid. Critics dismissed the proposed legislation as a "blackout bill," claiming it would undermine reliability of supply on cold winter nights and hot summer days while forcing

industry and households to play more for their electricity.

Republicans openly oppose the bill: "Democrats are pushing for strict mandates to force utilities and our energy producers to use carbon-free energy at a pace that current technology does not support," Senator Andrew Matthews, of Princeton, told reporters. "Hoping that cleaner technology becomes available along the way up to the goals is not a plan."

Minnesota's previous green energy standard, targets to reduce greenhouse gas emissions to 15% below 2005 levels by 2015, further by 30% by 2025 and ultimately by 80% by 2050. In contrast, 21 US states plus the District of Columbia and Puerto Rico have already committed full clean energy goal, target-

ing dates between 2040 and 2050.

State regulators pointed out that Minnesota's emissions had already fallen by 23% between 2005 and 2020, hence regulators see the state "well on track" to achieve 30% by 2050. The biggest contribution to mitigate emissions was made by the power sector, where emissions declined by 54% due to a widespread switch from coal to gas and renewable energy.

The proposed bill wants to utilities to further decrease the dispatch of fossil-fuelled power plants, although it allows them to co-fire biomass and hydrogen to go near carbon free. Utilities that are unable to completely exit coal and gas can ask for regulatory permission to use "off ramps" to delay compliance with more stringent emission rules, or use renewable energy credits to compensate for the difference. ■



Minnesota House of Representatives

GE ships aeroderivative gas turbine to Ukraine to help restore power

GE Gas Power has worked with USAID and Tetra Tech to purchase and ship a TM2500 aeroderivative gas turbine to help restore electricity in wintry, war-torn Ukraine. The trailer-mounted turbine was flown out to Ukraine from Arizona on a Ukrainian Antonov cargo plane where it will be trucked to location and installed within a fortnight.

“Our mobile aero technology has a proven track record for emergency power response situations due to its mobility, reliability, and flexibility,” said Aman Joshi, the general manager of GE’s aeroderivatives business at GE Gas Power, which is part of GE Vernova. He signalled out the arrangement with USAID as “symbolic” of the kind of support GE can provide to countries in need of urgent power infrastructure.

Once in place, the turbine could help keep Ukraine’s lights on and water flowing into taps. “The situation is pretty severe,” Joshi said. “The Ukrainians know they need a lot of electricity, but it’s like a moving chessboard, because every week something new is happening and something new is getting damaged.”

Power plant on wheels

In simple terms, the TM2500 is a giant, mobile gas generator — a power plant on wheels, he explained. Whereas building a new plant takes one to four years, the approximately 28-megawatt machine, capable of powering the equivalent of more than 100,000 homes in Ukraine, can be trucked to a location and attached to a damaged power plant, or hooked directly into the electrical

grid, within a few weeks.

Based on the technology behind GE’s CF6 jet engine, the aeroderivative turbine can power up and shut down in just five minutes, providing emergency responsiveness and reducing fuel waste. And where fuel is limited, the TM2500 can run on natural gas or diesel, aviation fuel blends — as well as on up to 85% hydrogen. ■



TM2500 loaded into the Antonov plane

JERA launches upgraded LNG-fuelled Anegasaki power Unit 1

Japan’s largest power producer JERA has brought its revamped LNG-fuelled Anegasaki power Unit 1 into operation. The unit’s aging equipment has been replaced with a state-of-the-art gas turbine combined-cycle system with 650 MW generating capacity. Upgrades of Unit 2 and Unit 2, with 650 MW each, are planned to be completed in April and August, respectively.

Gas-fuelled power generation is gaining attractiveness for JERA as LNG procurement costs are less than expected due to lower demand from rival European buyers in a mild winter. “We had assumed a tight global LNG market during the winter, but the market has eased thanks to warmer weather in Europe, improving our procurement environment in terms of volume and prices,” Tetsuo Yoshida, the head of finance, told a post-earnings news conference.

The Japanese LNG and power gen major buys on average 35 million tonnes of LNG per year and controls a fleet of about 20 LNG carriers. The company currently operates and provides fuel for a total of 26 power plants in

Japan and imports LNG into 11 of Japan’s network of 37 terminals.

“We own the entire supply chains for fuel and thermal power generation, from fuel upstream business (development of gas fields) to transportation and storage (fuel terminal operation) to power generation and wholesaling,” Yoshida said, highlighting the company’s full market exposure. ■



The LNG-fuelled Anegasaki power complex

Texan utility orders Wärtsilä engines for grid-balancing plant

Lower Colorado River Authority (LCRA), a regional utility based in Texas’ capital city Austin, has contracted Wärtsilä to supply the equipment for a 190 MW gas-fuelled power plant due operational in 2025. As several blue-chip companies move to Central Texas which caused a 30% rise in population, the region needs additional generating capacity to meet peak power demand.

“We sometimes need more power that can be available quickly, depending on market conditions and demand,” said Randa Stephenson, LCRA chief commercial officer, stressing the new dispatchable peaker power plant will support the Texas power grid within minutes.

Situate in Central Texas, near Austin, the fast-ramp 190 MW plant will be powered by ten Wärtsilä 50SG engines running on natural gas. Each engine consumes “little to no water every week,” according to Wärtsilä, which in Texas — an area often affected by drought — is an important feature.

Flexibility is vital as the green energy transition progresses, particularly in Texas where sharply rising electricity is currently being served by an aging fleet of rather inflexible power plants. Dispatchable gas peaking plants help balance the grid as electricity feed-in from wind and solar power sources progresses; hence LCRA envisages to add further flexible gensets to its portfolio.

Wärtsilä has installed over 70 engine power plants in the United States since 1981, as well as 15 energy storage facilities with a total combined capacity of over 4,500 MW. ■

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