



German energy demand falters as economy heads for deep slump

Economists see the corona-struck German economy shrink between 4.5% and 9% this year, pushing down energy demand and fuel use which lowers emissions well below targets. Though the German government pledged some €550 billion in 'virus aid' to shore up companies, economists at the IfW in Kiel and RWI in Essen still anticipate a full-blown recession.

Deutsche Bank analysts pointed out that unlike in 2009, when the recession mainly impacted manufacturers, the services sector is severely hit this time, too. The Leibniz Institute for Economic Research (RWI) in Essen, meanwhile, cut its forecast less drastically, predicting a decline in GDP by 0.8 percent in 2020.

Investors turn to utilities stocks

Though short-term profits of power and water utilities are hit by the lockdowns of energy-intensive industries to contain the coronavirus pandemic, investors are seeing energy companies as "safe havens" as a recession looms large and stock markets plunge. Amid falling bond yields, investors turn to steady payouts from regulated utilities.

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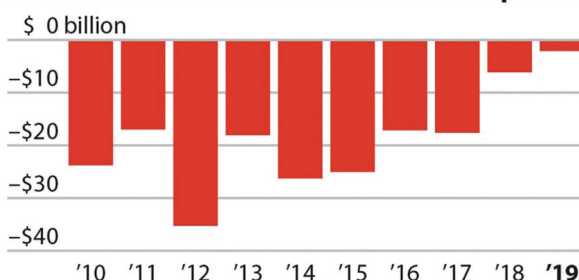
Cash flow losses could trigger bankruptcies among U.S. fracking firms

North American shale-focused oil and gas producers are found to have spent \$189 billion more on drilling and other capital expenses over the past decade than they generated from selling oil and gas. Wild-cats are struggling to pay off their debts which could trigger write-downs or bankruptcies, analysts warn.

The Saudi-Russia oil price war and the coronavirus-induced slump in demand have hit the oil and gas companies hard. However, large numbers of U.S. shale fracking firms were already distressed before that latest double-whammy.

Total long-term debt rose to \$106 billion at the end of 2019, an increase of \$1.5 billion from the prior year, and the highest level since 2015, according to figures by the Institute for Energy Economics and Financial Analysis (IEEFA).

Free Cash Flow at 34 Shale-Focused Companies



Sources: Morningstar; company reports

2019, according to IEEFA findings, largely due to accounting impairments and write-downs of oil and gas assets.

Looking at quarterly results, IEEFA's cross-section of fracking-focused enterprises achieved modest positive free cash flows in the second and

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The utilities sector is the only one of the Stoxx Europe 600 subgroups to have gained value, up about 11 percent so far this year as investors are buying 'defensive stocks' to shore up their portfolios for a looming recession. Regulated utilities tend to generate fairly stable returns even at times of economic weakness.

Shares in Italy's Enel have consequently gained 14% since January, the UK's National Grid also added 10% this year, while EDF shares surged 34.7% in the same period, including a 17% jump in February. In the United States, several utilities stocks gained well over 10% over the past week notably American Water Works, Southern Company and NextEra Energy.

Lockdown helps curb emissions

The pandemic's economic impact will likely be more profound than during the financial

crisis, as all regions of the world are affected, and because it is both a supply and demand crisis. Energy use is faltering as many European states are in a state of lockdown to contain the spread of the virus, but it is difficult to extrapolate the effect on emission.

"The CO2 intensity of electricity is lower today than it was in 2009, meaning that a decline in power consumption might have a smaller impact than it did then," said Martin Comes head of energy at the German Öko-Institute. "On the other hand, the oil price collapse, falling prices for coal and cheaper emissions certificates could boost demand for fossil fuels – for example coal demand in power stations at the expense of gas."

Corona-struck Italy has seen demand for natural gas plunge 8% from the previous week, with similar declines likely in other EU countries as national government impose

lockdowns to contain the virus. Industrial demand is "particularly volatile," while gas generators will "bear the brunt of demand loss," Wood Mackenzie says, as a carbon price decline is bolstering coal.

In Spain, the power transmission operator REE said electricity demand had already fallen 2.7 percent in 2019 compared to 2018, the first year-on-year drop in the past five years. Industrial energy demand has fallen off a cliff. Turbine maker Siemens Gamesa, for example, reportedly closed its San Fernando de Henares plant in Madrid after an employee tested positive for the coronavirus.

In China, emissions plunged 25% below normal levels as a consequence of the pandemic and analysts expect this trend will replicate around the globe. Germany could see emissions fall between 50 and 120 million tons in 2020 depending on the depth of the economic slump. ■

Gas turbine market forecast to top \$10 billion by 2026

Rising need for renewables grid-integration will propel up the market value of gas turbines beyond \$10 million by 2026. According to Global Market Insights, turbine technology with 70 MW to 200 MW capacity will be particularly in high demand and see annual installments exceed 10 GW over the next five years.

Deployment of these medium-sized turbines is spurred by the need to repower existing infrastructure, or set up new integrated gasification combined cycle (IGCC) and combined cycle power with over 60% efficiency.

As combustion systems adopt a multi-fuel approach, combining natural gas, propane and distillate oil. Analysts expect these technical variations across combustion systems will enhance the product applicability and further increase demand.

Growing environmental awareness and a

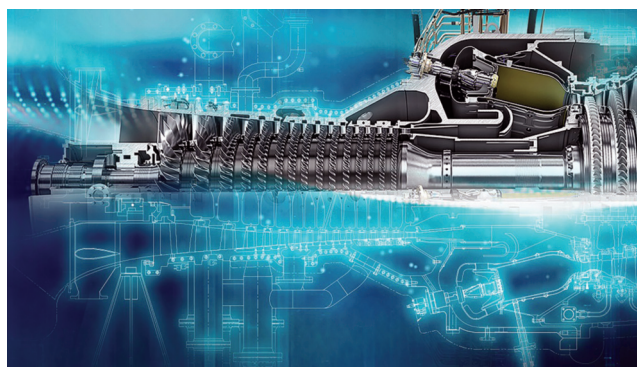
subsequent trend to sustainable energy also spurs demand for hybrid power solutions, combining flexible gas turbines, renewables and energy storage.

Upstream sector drives demand

Rising upstream spending, notably in unconventional oil and gas resources, are expected to drive the related gas turbine market to an estimated \$1.2 billion, growing at 3.5 percent annually through 2024. Major suppliers in this sector are GE, Siemens, Mitsubishi Heavy Industries, Solar Turbines, and Kawasaki Heavy Industries.

Gas turbines for mechanical drive is will witness high-

est growth from use in the offshore platforms and for remote exploration. By turbine size, the '1-20 MW' turbine will remain most widely used but the turbine size '20 MW and above' will see the highest growth, as the industry prefers high efficiency over a small turbine footprint. ■



Model of Siemens SGT-800

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fourth quarters of 2019. But those gains were outweighed by the losses in the first and third quarters.

The shale revolution has, in fact, propelled the U.S. into becoming the world's most prolific oil producer. "In financial terms, however, fracking has been an unrelenting money loser for at least a decade,

and investors are taking notice," said IEEFA analyst Clark Williams-Derry. "It is getting harder and harder for these companies to raise the capital they need to stay afloat."

As the coronavirus pandemic deepens and a global recession looms large, the oil and gas sector's financial distress will likely accelerate. ■

South Korea's power consumption could fall 1.9% due to pandemic

Fallouts of the corona pandemic could slow South Korea's electricity consumption by nearly 2% this year as manufacturing, exports and private consumption grind to a near-halt. Fitch Solutions says that Korea's manufacturing sector is hit hard due to its large exposure to Chinese supply chains in the first half of 2020.

Quarantines and industry lockdowns in China have caused substantial supply chain disruptions, causing shortages of imported equipment for Korea's energy-intensive industries, according to a Fitch Solutions report.

Manufacturing accounts for a large share of Korea's power consumption, hence the Purchasing Managers' Index (PMI) contracted in January and analysts anticipate the sector will continue to struggle well into the summer months.

Coal loosens out to LNG

Sluggish electricity demand will likely lead to a decline in coal-fired power plant dispatch, which may work in favor of gas-fired generation, based on imported and regasified LNG.



Prior to the corona pandemic, the Government in Seoul already announced a temporary suspension of 15 coal plants by the end of February, and to idle up to 28 coal plants by March. The remaining coal plants will have a cap on operational capacity of

80%, and six ageing coal plants will be retired by 2021.

The coal caps are part of a new energy policy roadmap, released in 2019, that includes bans on new-build coal power unit and a conversion of several existing ones to run on regasified LNG.

Looking ahead, Fitch sees a significant slowdown in electricity demand growth as South Korea's GDP is projected to grow just 1.7% in 2020. Weak private consumption due to corona contingency measures will impact retail and services sectors. ■

Oil market spat may boost Asia's gas demand for power gen

Though the latest oil price crash hits U.S. upstream companies, for Asian buyers it's a blessing as the pricing of oil-indexed long term gas contracts is bound to come down from late 2020. Sustained lower oil price will substantially lower the price of gas which could prompt large scale coal-to-gas switching for power gen in Japan, South Korea and parts of China.

The price of gas under long-term contracts has been at a premium to hub-priced gas in recent times - but the plummeting oil prices have turned things on its head. "For China, at an oil price of \$35/bbl, contracted LNG arrives at a cost lower than domestic wholesale price benchmarks," said Wood Mackenzie senior manager Miaoru Huang.

"While there is strong incentive for NOCs to retain the benefits to compensate for years of import losses, the import cost reduction will be partially passed through to downstream and will allow the government to push through its policy of lowering gas prices to end users," she explained, adding; "This will help coronavirus-affected businesses to resume operations but stimulating new coal-to-gas switching will require further policy support even under a low oil price environment."

Gas squeezed out in India

But in other markets, gas demand will come under pressure from oil as a competing fuel.

Notably in India, analysts suggest "a lower oil price could slow the shift from oil to gas in the industrial sector," as both long and spot LNG prices will compete with fuels like heating oil, LPG and naphtha.

European gas demand and flows will face little impact from even a sustained oil price

collapse. Oil-indexed Russian pipeline contracts now account for less than 25% of Gazprom's portfolio and, regardless, the current market share strategy is unlikely to change.

Algerian pipeline contracts into Spain remain fully oil-indexed and have been sitting at take-or-pay levels. "If oil prices remain low, Spanish buyers would take more Algerian piped volumes," Ms Huang said. This would not become a possibility until October 2020 due to the lag on the contract - "but in 2021 it would reduce the space for LNG into Spain by 2 billion cubic metres, placing even more pressure on the oversupplied LNG market." ■



Lockdowns fast-forward power systems 10 years into the future; IEA

NEWS NUDGES

Electricity "more indispensable than ever"

Disruptions caused by the coronavirus crisis lay bare how much modern societies rely on electricity, according to the International Energy Agency (IEA). Millions of people are mandated to stay home, causing a surge in teleworking, e-commerce and video streaming which pushes up domestic electricity use.

U.S. frackers cut Capex

Sharp cuts in capital spending among Appalachian gas producers are now being replicated in other U.S. basins, with Energy Aspects anticipating the deepest impact on production and earnings to take place starting from the second half of 2020. So far, E&P companies just hedged 52% of this year's expected production even though some Appalachian producers are seen "lock in some pure gas volumes at prices above the curve."

Italy's gas demand plunges

Corona-struck Italy has seen demand for natural gas plunge 8% from the previous week, with similar declines likely in other EU countries as national governments impose lockdowns to contain the virus. Industrial demand is "particularly volatile," while gas generators will bear the brunt of demand loss, Wood Mackenzie says, as a carbon price decline is bolstering thermal coal.

IEA models 50% Carbon-Free Generation

Analysts at the U.S. Energy Information Administration (EIA) have drawn up the 50% Carbon-Free Generation case - assuming a stark shift in state-level policies. In this event, the U.S. would have 19% more nuclear power generation, 10% more wind power and 17% more solar PV contribution than in its Annual Energy Outlook 2020 (AEO2020) reference case, completed before year-end.

Confinement measures and industry lockdowns, caused by the coronavirus, have slashed electricity demand in most countries by around 15%. In Spain and California, sunny and windy weather conditions mean grid operators have to handle a substantially higher share of variable renewables, which "fast forwarded these power systems 10 years into the future," the International Energy Agency (IEA) commented.

The Spanish economy is underpinned by some of the highest shares of wind and solar electricity generation in the world. As demand plunged amid the coronavirus lockdown, the share of variable wind and solar power in-feed to the grid can become higher than normal.

"This is an important moment for our understanding of cleaner electricity systems, including some of the operational challenges," said the IEA's executive director, Dr Fatih Birol.

Staying flexible

With weaker electricity demand, power generation capacity is abundant but TSOs still need to maintain the balance on the grid in real time. In fact, some of the most high-profile blackouts in recent times took place during periods of low demand.

"The abrupt slowdown in industrial and business activity across much of Europe has reduced electricity demand, but it is also depriving power systems of a key source of flexibility," Birol explained. "Under normal circumstances, large-scale electricity consumers such as factories can adjust their usage to help balance the system," he added, "but that option is hardly open today."

When electricity from wind and solar is

covering the majority of demand, systems need to maintain flexibility through fast-ramp fossil gensets in order to mitigate a sudden shift in supply. A very high share of wind and solar in-feed in a given moment makes maintaining grid stability more challenging.

Technical advancements allow renewables to also provide some degree of flexibility. Wind power can be gradually ramped down when demand drops late at night. Some solar power can be shut off at noon when there is more than needed. The IEA indicated that "in time, electricity generation from renewables may no longer simply follow the weather but will have to be managed in an intelligent way in order to reduce costs and improve electricity security."

Storing excess energy

Though new forms of short-term flexibility such as battery storage are on the rise, most electricity systems rely on fast-ramp gas peaking plants to provide flexibility.

"Today, most gas power plants lose money if they are used only from time to time to help the system adjust to shifts in demand. The lower levels of electricity demand during the current crisis are adding to these pressures," IEA analysts warned. Hydropower hence remains an essential source of flexibility. ■



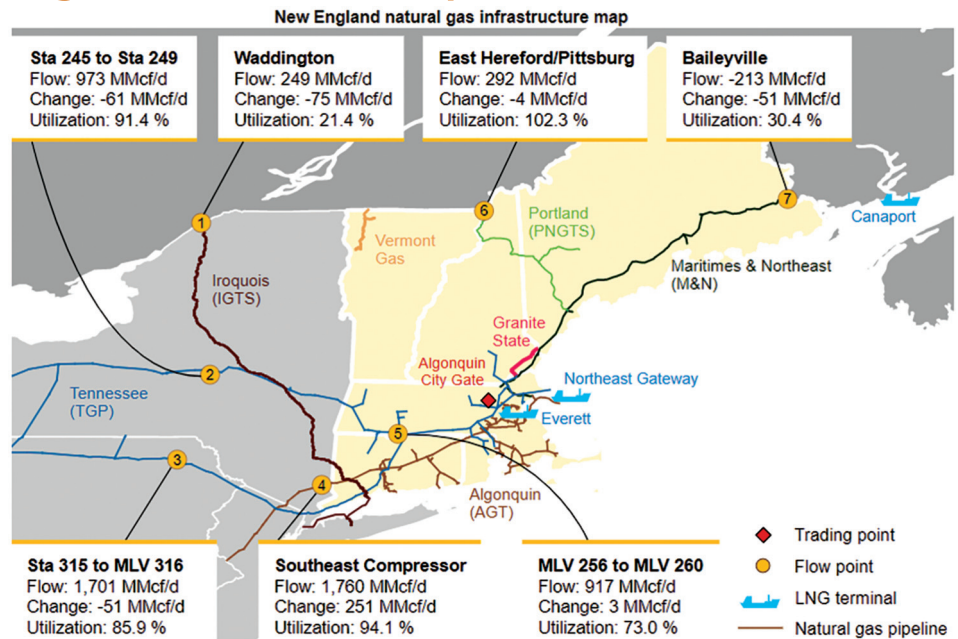
New England boosts gas deliverability with infrastructure upgrades

Four pipelines – currently in planning or under construction – will significantly step up gas deliverability into New England, in the northeastern United States. Once operational, these interconnectors will gradually add more than 350 million cubic feet per day (MMcf/d) of pipeline capacity into the region by 2023.

Pipeline capacity into New England from both Canada and New York was 5,200 MMcf/d at the turn of the year 2019/20, according to U.S. government estimates. During days of peak demand in the winter, most of this capacity is fully utilized, which can lead to spikes in spot natural gas prices and, in turn, wholesale electricity prices.

Winter utilization on the Algonquin Gas Transmission pipeline near the New York and Connecticut border, for example, has averaged about 89% so far this winter (Nov 1, 2019 – March 6, 2020), according to EIA's New England Dashboard reports on daily pipeline utilization. The four new pipeline projects are hence hoped to ease the pipeline constraints and ease gas deliveries.

The largest pipeline upgrades, proposed to the Federal Energy Regulatory Commission (FERC) in February, is the Iroquois Enhancement by Compression Project. By increasing the horsepower at three com-



pression stations in New York and Connecticut, the capacity of the Iroquois pipeline will increase by 125 MMcf/d. If approved, the project is expected to start construction in spring 2023 and be placed in service by November of that year.

Two upgrades are in planning on the Portland Natural Gas Transmission System, designed to increase gas imports from Canada received from the TransQuébec and Martimes pipelines at Pittsburg, New Hampshire. These projects are the Portland Xpress Project Phase III, which will add

24 MMcf/d of capacity in 2020, and the Westbrook Xpress Project Phase II, which will add 63 MMcf/d of capacity after its expected completion in 2021.

Better onward gas flows from New England to New York will be facilitated by the 92.7 MMcf/d Algonquin's Atlantic Bridge Phase II project which is expected to enter service either later in 2020 or in 2021. Moreover, the Tennessee Gas Pipeline's Station 261 Upgrade Projects will provide an additional 72 MMcf/d of capacity, if put into service as planned in the autumn of 2020. ■

India's LNG imports seen surge 15% as utilities snap up cheap cargoes

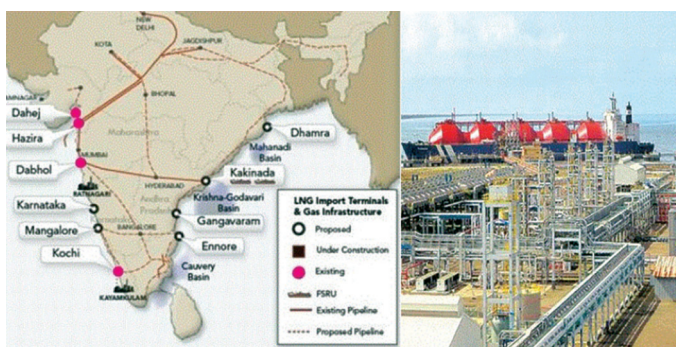
India keeps snapping up distressed cargoes for cheap. Coal-to-gas switching allows Indian power generators to absorb a large share of cargoes left uncommitted as the coronavirus dampens demand in China, and analysts see India's annual LNG imports to rise by up to 15% this year.

Ship-tracking data from Refinitiv Eikon shows that India imported some 2.36 million tonnes of LNG in February, which surpassed an earlier record of 2.3 million tons set in October.

The low spot prices are creating some downstream demand in India, especially from the city-gas sector and for power generation. Some cargoes headed for China

have been diverted to India, and a few bargain-hunting Indian buyers have issued tenders for spot cargoes – some even for several months.

Reliance Industries is understood to have issued a tender for five cargoes for April to June delivery, while Gujarat State Petroleum Corp (GSPC) sought nine cargoes for February to April.



However, demand-side growth in some opportunistic buying markets like India is threatened by the spread of the virus, analysts at Energy Aspects cautioned. India has just declared 114 cases, which is up from three at the start of the month.

Infrastructure bottlenecks

Though power producers are eager to switch fuel and take advantage of cheap LNG imports, there are some infrastructure constraints that hamper a quick and substantial shift to gas generation. The start-up of Mundra LNG terminal and H-Energy's Jaigarh terminal as well as the timing of the completion of GAIL's Kochi-Mangalore pipeline are expected to greatly determine Indian LNG demand growth in 2020.

According to our LNG Market Tracker, H-Energy is preparing to start commercial operations at its FSRU-based LNG terminal at Jaigarh Port in the second quarter this year. Movements of the chartered FSRU GDF Suez Cape Ann have been tracked off the Maharashtra coast, and the vessel is about to approach the port of Jaigad, where it will nominal LNG capacity 4 million tonnes per annum (mtpa). ■

"Hybrid power units need other profitability metrics than LCOE"

Lowest levelized cost of energy (LCOE), a widely-used metric to compare the profitability of power sources, is "not the right approach" when it comes to hybrid units, according to the U.S. National Renewable Energy Laboratory (NREL). "A paradigm shift is underway," NREL said, stressing hybrid plants that include energy storage need to be rewarded for providing flexibility and grid ancillary services.

In its latest paper, entitled "Research Opportunities in the Physical Design Optimization of Hybrid Power Plants," NREL looks at the opportunities utilities can have when moving beyond the traditional LCOE focus for hybrid renewable energy systems.

Hybrid plants combine multiple generation assets, e.g. energy storage technologies, wind, solar power and gas-fired

generator sets. When producing electricity, they can shift between the various power gen technologies, which provide more predictable and controllable power output to help enhance grid system reliability.

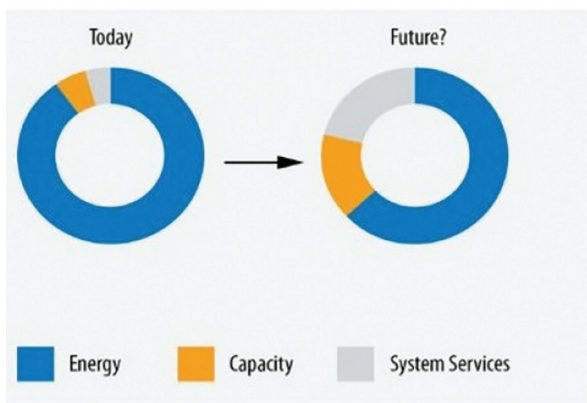
Capitalizing on various fuel options

"By combining generation assets – notably storage, solar, and wind – into 'hybrid

power plants, an individual plant owner can develop economies of scope in terms of land usage, infrastructure costs, and operational expenditures. This increases the assets' system value by capitalizing on revenue streams through forward capacity markets (where present), 'dispatchable' operation in markets with time-varying energy pricing, and ancillary service markets," NREL researchers, led by Katherine Dykes, wrote in the paper.

To date, feasibility studies for most power plant projects are being designed with Power Purchase Agreement (PPA)-type structure in mind, focused on LCOE optimization. However, NREL researchers pointed out that such an approach is "sub-optimal" for hybrid power system.

"The complexity and uncertainty involved in the physical design optimization of hybrid power plants goes beyond current practice," the report concludes, "... and creates opportunity for research and innovation to realize the full potential of future hybrid power plants with low cost and high value to the electric grid system."



The morphing electricity market system (Source: NREL, based on a figure in [5])



Hawaii's battery systems get paired with wind & solar power units

Nearly all of Hawaii's utility-scale energy storage is installed adjacent to onshore wind turbines or solar photovoltaic (PV) systems. Pairing battery storage with wind and solar helps mitigate some operational challenges of non-dispatchable renewables, as Hawaii aspires boost its green energy share from 30% at present to 100% by 2045.

Such hybrid power systems help reduce operational costs as they make the best possible use of Hawaii's sun-soaked and windy weather, while storing excess energy for later. In addition, battery storage is used for peak shaving, frequency regulation, reducing curtailments, and ramping/spinning reserves.

Peak shaving — when storage is used to lower peaks in demand — is the second most common application for such systems on Hawaii. Shifting portions of electricity demand from peak hours to other times of day also reduces the need for higher-cost, seldom-used generation capacity to be dispatched, which helps reduce wholesale electricity prices.

Averting costly HFP peaking plants

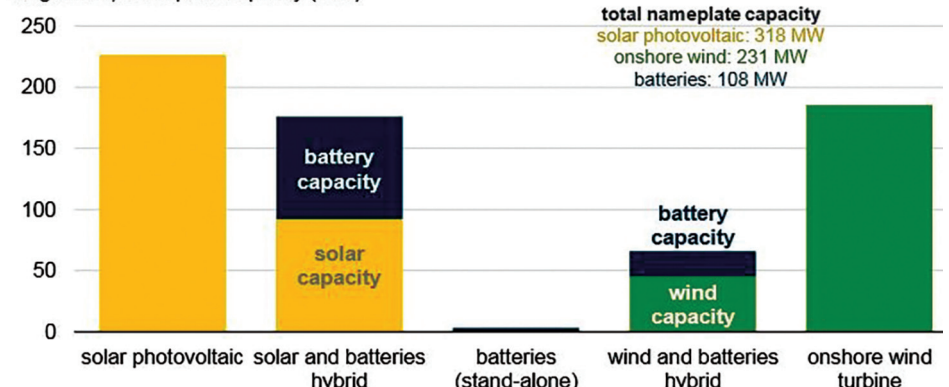
Without battery storage, Hawaiian utilities would have to rely on fast-ramp fossil power

sources to back up renewables. Traditionally utilities used petroleum-, heavy fuel oil (HFO)- and coal-fired peaking power units, despite their high emissions intensity. Energy storage is virtually emissions free, helping to lower Hawaii's carbon footprint.

Batteries are characterized by two

metrics: power capacity and energy capacity. Power capacity is the maximum instantaneous amount of power that can be produced on a continuous basis. Energy capacity is the total amount of energy that can be stored or discharged by the battery.

Hawaii operating utility-scale capacity for selected technologies (Jan 2020)
megawatts, nameplate capacity (MW)



Source: U.S. Energy Information Administration, Preliminary Monthly Generator Report

Fairview Energy Center is now using ethane in combustion mix

Competitive Power Ventures' (CPV) new gas-fired Fairview Energy Center has been adapted to use ethane in its combustion mix. Using GE's DLN2.6+ AFS combustion system, the Fairview combined-cycle plant successfully completed testing with 25% ethane mix and is now ready for full commercial operation.

Built at a cost of \$1 billion near Johnstown, Pennsylvania, the 1,050 MW Fairview Energy Center is "the first and only facility of its scale in the world to possess high content ethane blending with natural gas capabilities," the operator stressed.

Through GE's DLN2.6+ AFS combustion system, CPV Fairview can switch to using ethane when the cost of natural gas increases. This fuel flexibility helps reduce operating costs without compromising emissions or efficiency.

Gary Lambert, CPV chief executive, said "completion of commissioning with 25 percent ethane mixed with natural gas at our Fairview Energy Center, making it the first plant of its kind as well as one of

the most efficient combined-cycle power plants in the world."

Blending local gas and ethane

CVP and Osaka Gas, the co-developers of the Fairview Energy Center, pronounced the CCGT in December 2019 to be "fully operational on budget and significantly ahead of schedule." The peaking power plant is driven by GE's 7HA.02 gas turbines, capa-

ble to deliver full power to the grid in 60 minutes or less.

"By utilizing blends of locally sourced natural gas and ethane, CPV Fairview will be unique in the industry for efficient performance, enhanced economics, and operational flexibility," said Tom Dreisbach, 60 Hertz Product Line Leader for GE Gas Power. The CCGT uses GE Digital's Operations Performance Management (OPM) software to run more efficiently and increase fuel flexibility.

Situated on an 86-acre former brownfield site, CPV Fairview uses regionally sourced natural gas and ethane. It also uses industrial raw water for cooling purposes, which can be reused, to boost its green energy credentials.

Headquartered in Silver Spring, Maryland, CPV has ownership interest in 4.2 GW of clean generation across the United States. In addition the company manages more than 9,300 MW of fossil and renewable energy assets. ■



CPV's Fairview CCGT can now run on a 30:70 ethane and natural gas blend

MHPS starts building Units 1-3 at JERA's Anegasaki power plant

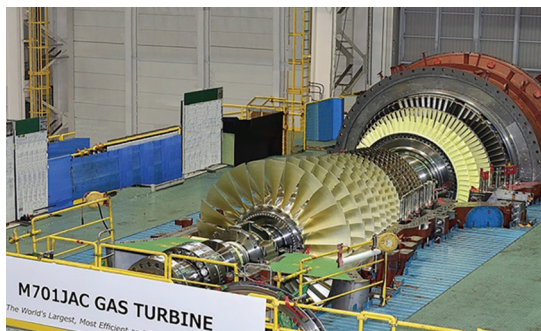
Mitsubishi Hitachi Power Systems (MHPS) has begun work on a full turnkey contract to build Unit 1-3 at the Anegasaki Power Station, operated by JERA in Japan. Three 650 MW combined-cycle gas power units will replace four ageing units at the plant, and are due to start operations successively from early 2023.

Once all commissioned through the summer, the three new units will reach a combined output of 1,950 MW. The new CCGT plants will be driven by 1,650°C class forced air-cooled M701JAC gas turbines.

The turnkey project is carried out jointly by MHPS and Mitsubishi Electric, which will supply three generators and control systems. Works are conducted under a full turnkey EPC (engineering, procurement, and construction) contract.

As for the scope of supply, MHPS specified the three gas turbines and related equipment will come from its Takasago Works, the three steam turbines are sourced from Hitachi Work, and the heat recovery steam generators and exhaust gas denitrizer systems from its Kure Works.

The JAC gas turbines used for this project are equipped with a forced air-cooled combustor system. Air emitted from the combustor casing is cooled in an external



cooler, and the pressure boosted in a forced air-cooled compressor, after which the air is used to cool the combustor, and returned to the casing.

"This process optimizes the cooling structure," MHPS underlined, adding the system also includes turbine blade cooling through an extra thick film thermal insulation coating, and high pressure compressors. According to the manufacturer, "this allows for shorter start-up times compared to steam cooling methods, and improves operational efficiency." ■

NEWS NUDGES

EV makers face bankruptcy

Electric vehicles (EVs) remain particularly exposed to the corona effect of supply-side constraints and demand erosion. Gigafactory facilities are likely to be delayed and fledgling EV manufacturers could face bankruptcy, Wood Mackenzie warns. On the flip side, declines in EV sector demand may be gains for the stationary energy storage segment.

American ISOs to delay grid investments

North America's independent system operator (ISO) are considering delaying investments in grid upgrades and enhancement as electricity demand weakens due to industry shutdowns to contain the coronavirus pandemic. PJM Interconnection, the largest U.S. bulk power market which spans 13 Mid-Atlantic and Midwestern states, revised its daily forecast of about 100,000 MW of load but actual demand came in at 95,500 MW.

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