



Hanwha develops technology to run gas turbines 50% on hydrogen

South Korean petrochemical manufacturer Hanwha Impact has developed technology to combust up to 50% hydrogen blends in medium-sized gas turbines. A demonstration of the technology was carried out at Hanwha's Daesan plant in Seosan City at an 80 MW LNG gas-fuelled turbine, operated by Korea Western Power, with further co-firing projects in the making.

Going forward, Hanwha Impact plans to implement its technology also at the 150 MW unit 1 gas turbine of the West Incheon Power station.

Co-firing hydrogen with natural gas can significantly reduce carbon emissions: Gas combustion with a 30% hydrogen blend lowered CO₂ emission by 10.4%, compared to LNG-fuelled generation, and once hydrogen will make up 50% of the fuel, emissions are ex-



pected to fall by 21.4%. However, hydrogen has a substantially higher combustion speed and flame temperature than natural gas, hence the manufacturers need to adapt the material of the combustor and the turbine coating to withstand it.

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VPPs could save U.S. utilities up to \$35bn in capacity investment

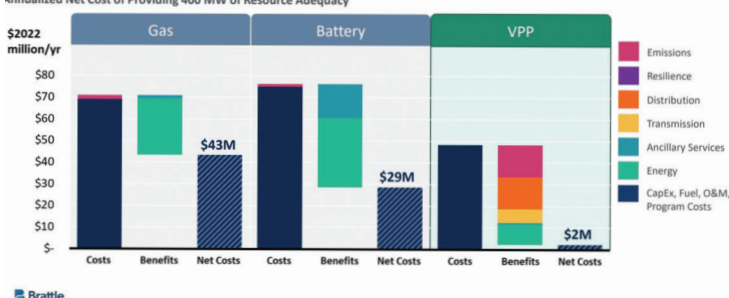
Distributed energy sources, bundled into virtual power plants (VPPs), are becoming a low-cost alternative compared to centralised, utility-scale power plants, the Brattle Group finds. Over the past decade, U.S. utilities spent over \$120 billion on 100 GW new power gen capacity and analysts estimate they could save \$35 billion by 2033 by using VPPs for peaking power.

“By deploying grid assets more efficiently, an aggregation of distributed resources lowers the cost of power for everybody, especially VPP participants,” explained Jigar Shah, director of the US Department of Energy (DoE) Loans Programs Office.

The Brattle Group's 400 MW resource adequacy study models an illustrative mid-size utility with 1.7 million residential customers. The power producer has 5.7 GW of gross peak demand and 3.6 GW of net

The VPP could provide the same resource adequacy at a significant cost discount relative to the alternatives.

Annualized Net Cost of Providing 400 MW of Resource Adequacy



peak demand from solar and wind resources. Its aim is to source half its electricity from renewables by 2030. The study found VPP peaker

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South Korea's Ministry of Trade, Industry and Energy called on investors and developers to continue setting up domestic and international clean hydrogen production bases and related supply infrastructure. "We plan to expand the share of hydrogen and ammonia power generation to 2.1% by 2030 and 7.1% by 2036," Lee Ok-heon, the ministry's Director of Hydrogen Economy Policy, said, expressing high hopes that Korean companies could lead the hydrogen turbine market.

Doosan works on 100% hydrogen-fuelled turbine

Another Korean major, Doosan Enerbility, previously known as Doosan Heavy Industries, is working complete the development of a 380 MW gas turbine that is run purely on hydrogen by 2027. The combustor for this turbine is meant to be ready a year earlier, the manufacturer said.

The global market for hydrogen is expected to reach 40 trillion won (\$20 billion) in 2030, according to the Yano Economic Research Institute in Japan, and global turbine makers like Siemens and GE are developing hydrogen turbines ready for commercialisation by the end of the decade or earlier.

Eager to win the race, Doosan Enerbility is preparing to test a 50% hydrogen co-fired combustor for a 300 MW turbine together with the Korea Institute of Machinery and Materials. Following successful tests of co-firing 30% hydrogen in August last year, the manufacturer will now blend natural gas and hydrogen in equal volumes and start test runs later in 2023. ■

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Siemens Energy shares plunge over 30% on wind turbine issues

Shares of Siemens Energy have plunged 31.52% this morning after the energy group withdrew its profit guidance for the year, citing "significantly higher costs" of possibly over €1 billion to remedy a failure of wind turbine components at its business unit Gamesa. Siemens Energy took full control of its Spanish unit this month to consolidate the business.

Gamesa CEO Jochen Eickholt revealed that while rotor blades and bearings were partly responsible for the turbine problems, it could not be ruled out that design issues also played a role. Commenting on turbine component failures, Siemens CEO Christian Bruch also blamed the corporate culture at Gamesa, suggesting: "Too much has been swept under the carpet."

"The potential magnitude of the impact leads us to withdraw the profit assumptions for Siemens Gamesa and consequently the profit guidance for Siemens Energy Group for fiscal year 2023," the company stated. Chief finance officer Maria Ferrano indicated

that the majority of the extra costs will be incurred over the next five years.

In May, Siemens Energy said it expects its profit margin will come in at the lower end of its 1% to 3% target range due to a €374 million (\$412m) loss at Siemens Gamesa. CEO Christian Bruch cited supply chain issues, slow offshore activities and loss-making legacy contracts at the Spanish wind turbine maker as reasons for the ongoing problems. Losses in wind power were, however, more than offset by a strong performance in Gas Services and Grid Technology which helped the company return a small profit of €41 million in the second quarter. ■



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usage would be 40% to 60% cheaper than alternatives, including gas peakers and grid-scale batteries.

Looking ahead, analysts reckon some 60 GW of virtual power plant capacity could meet America's resource adequacy needs through 2033 – costing between \$15 billion to \$35 billion less than alternative utility-scale plants at a substantially lower carbon footprint.

Google already set up one of the largest

virtual power plants in the United States by helping thermostat users avoid carbon and earn rewards through the Rush Hour Rewards (RHR) program and its Nest Renew service. Parag Chokshi, Director of Product Strategy and Operations at Google Nest pointed out: "We believe the continued growth and support of virtual power plants in the residential sector is crucial to continue building towards a decarbonized, reliable grid of the future." ■

IEA sees growth-stage funding for energy start-ups plunge in 2023

Though energy start-ups still get plentiful funding for early-stage research, growth-stage funding which requires more capital to fund less risky innovation could fall by nearly 60% in 2023, the International Energy Agency (IEA) warns. With banks restraining their lending and venture capital firms reducing their risk exposure, investment is not expected to bounce back quickly.

Rising interest rates and the March collapse of Silicon Valley Bank – a US-based financier for start-ups – have brought a nervous atmosphere to a previously buoyant sector. Loans are becoming smaller even for innovative firms, with the IEA noting that start-ups will have to survive longer between funding rounds with less access to bridging capital.

More equity funding than loans

Bumper revenues in 2022 in the energy sector mean many innovations will be funded with equity, rather than loans. But analysts cautioned that research budgets are typically set in advance and high energy prices were unanticipated, so the effect was not felt in 2022.

Looking at 2023 and beyond, energy companies can increase clean energy R&D budgets just by maintaining the average ratio of R&D to revenue. In areas like clean energy manufacturing, companies take advantage of public support like the US Inflation Reduction Act.

Considering that public spending on energy R&D grew by 10% in 2022, to nearly

\$44 billion, with 80% devoted to clean energy, analysts advise that “pairing internal R&D with new public funding can make capital more productive in an environment of greater capital discipline.”

Outsized role of large economies

China, Europe and North America, plus Japan and Korea, dominate R&D spending and play an “outsized role in energy innovation” compared with their future energy investment needs. In fact, the IEA Net Zero Emissions by 2050 Scenario requires over half of clean energy investment to be in emerging market and developing economies, yet higher inflation and rising risk perception are hitting emerging and developing economies the hardest.

G7 leaders on May 20 issued an action plan to support research, development, and deployment of clean technologies as a critical enabler of an accelerated clean energy transition in low- and middle-income countries. India’s presidency of the G20 is fostering the exchange of ideas for scaling up capital for early-stage climate technologies. ■

EU state aid rules may derail German incentives for gas power build-out

Concerns are mounting in the European Commission (EC) over the German government’s plan to incentivise the construction of new hydrogen-ready gas power stations with 25 GW combined capacity. Brussels stressed German plans must comply with EU rules for capacity mechanism, whereby operators are paid to be ready to generate electricity when needed, not just for their actual output.

Consequently, the Commission wants Germany to “precisely assess” its future electricity needs which can then be put out to tender. Such tenders for new-build capacity needs to be “technology open” for all eligible generating technologies as well as power imports.

The Commissions’ approach, however, clashes with the German government’s quest for a “fast and uncomplicated solution,” which is why energy minister Robert Habeck is in intensive talks with Brussels. Reaching an agreement is vital if Germany wants to realise an early coal exit, possibly before 2030.

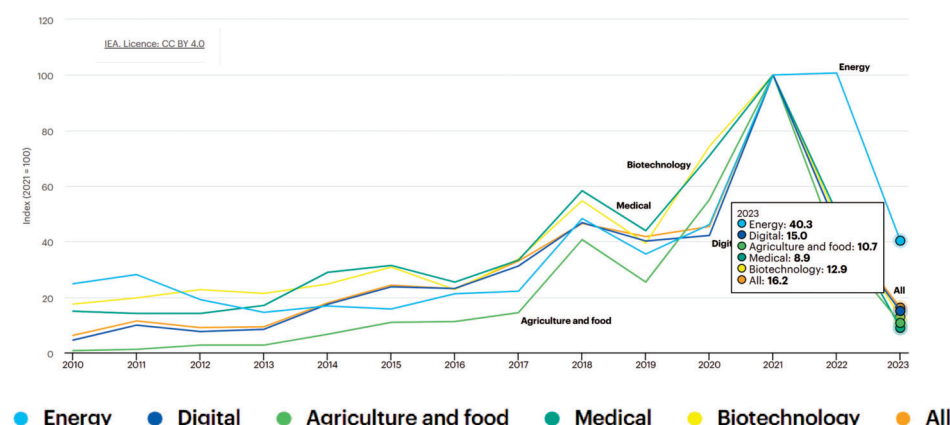
Considering the lengthy lead-times to build and commission new power stations, the government is facing pressure to step up incentives. It might take five to seven years to find suitable locations and get planning permission for these plants, hence the energy ministry wants to present a “power plant strategy” by the summer.

Auctions were meant to be set to ensure some 25 GW of new gas-fired power plants will get built by 2030 to balance renewables. The government already used auctions to accelerate the wind and solar capacity expansion, so Habeck wants to use similar instruments to advance hydrogen-ready gas power projects.

Keeping such gas-fired plants ready would have to be paid, instead of only the kilowatt hours produced, the German energy industry association (BDEW) argues, calling for a capacity market. Potential power plant operators fear they will not be able to recuperate their investment if their new-build gas power plants end up running for just a few hours per year. ■

“...pairing internal R&D with new public funding can make capital more productive in an environment of greater capital discipline...”

Growth-stage start-up global venture capital investment by sector, 2010-2023



Bangladesh to pay \$1.76bn to boost power imports from India in FY24

Over \$1,760 million will need to be allocated to import up to 2,650 MW of electricity from neighbouring India in the fiscal year 2023/24, Bangladesh Power Development Board (BPDB) calculated. The state-owned utility called on the government to source these proceeds through public and private funding to keep the lights on and help BPDB repay part of its debt.

B PDB currently imports electricity from six different sources under a public-private partnership with India, a senior official told local media. He also confirmed that BPDB has an existing arrear of \$475 million in unpaid electricity bills.

Adani to receive lion's share

Most of the required \$1.76 billion will have to be paid to Adani's 1,496 MW power plant in Jharkhand, India. Adani is expected to ask for \$1.10 billion to export electricity while running the plant on a 65% capacity factor and at an assumed coal price of

\$162 per metric tonne.

In addition, BPDB plans to procure 510 MW of electricity from Indian state-owned NTPC Vidyut Vyapar Nigam through three different agreements totalling \$340.34 million. Another 200 MW will be purchased from PTC India at \$135.58 million, and 250 MW from Sembcorp Energy India Limited in the upcoming fiscal year, the BPDB official told the Daily Sun.

A trade deal is also being prepared to allow Bangladesh to import hydropower from Nepal through India's electricity grid. Nepal produces nearly 30% more hydropower than it needs during the wet season

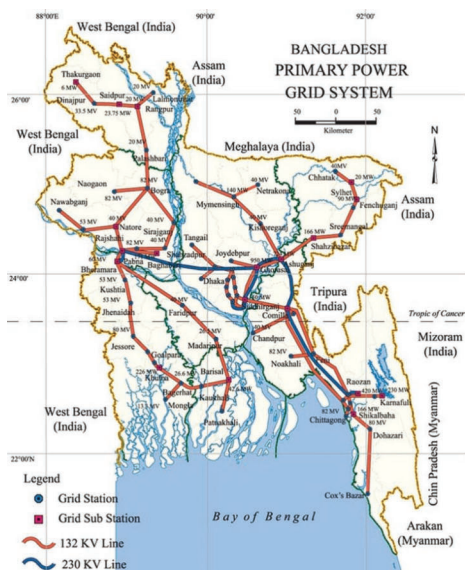
and is eager to export some of the surplus.

To ensure stable power supply, BPDB also needs to pay \$17.34 million in wheeling charges to the grid operator, he said, warning there is a risk of penalties due to a delayed settlement of bills amounting to \$475 million for the current fiscal year.

Undue advantage for imports?

Critics, notably from the Bangladesh Independent Power Producers Association (BIPPA), urged the government to levy import duties on electricity imports similar to charges on local power producers. The lobby group argues that power imports have an "undue advantage" due to lower costs incurred.

The Government's Power Division promised to look into the issue and is suggesting an allocation of \$5.921 billion for the 2023-24 fiscal year to guarantee and safeguard uninterrupted electricity supply. Analysts reckon this "substantial budget" will be spent on electricity from rental assets, Independent Power Producers (IPPs), imports from India, supply from about 1,000 diesel-fuelled genset, service agreements for power plants in the public sector and loan repayments of ECA-funded projects.



KEPCO to freeze Q3 electricity rates despite rising fuel prices

Korea Electric Power Corp. (KEPCO) has decided to freeze electricity rates in the third quarter of this year to ease the burden on households and industry, even though fuel costs for imported LNG are beginning to rise. KEPCO announced it will fix the adjusted unit fuel cost at 5 won (\$0.004) per kilowatt-hour between July and September.

The move to freeze third quarter rates comes after the government had hiked electricity rates by 5.3 percent on-year for the second quarter, or by 8 won per kWh, following a 13.1 won increase per kWh in the first quarter due to high global commodity prices costs and KEPCO's mounting losses.

KEPCO, owned 51% by the government, had been unable to reduce the rising electricity prices charged to consumer due to high cost for fuel imports. The electricity

rates had even fallen below the cost of power generation, making KEPCO rack up an operating loss of 32.62 trillion won (\$23 billion) in 2022, more than four-times than in the previous year.

To help stop losses and restore KEPCO's balance sheet by 2026, electricity tariffs would need to rise by 51.6 Won per kilowatt-hour this year, or nearly 43% from last year's average, the industry ministry told parliament in Seoul. But a significant rise in consumers' power tariffs is unlikely before



the next general election, hence KEPCO can only resort to sell assets to stay afloat.

Arizona regulators approve revised expansion of Salt River Project

Utility regulators in Arizona have issued an amended Certificate of Environmental Compatibility for Salt River Project's proposed addition of 12 gas-fired peaking power units to the existing Coolidge Generating Station. The developer conceded to reduce the number of additional power units from 16 to 12 and limit the units' operation to a 30% capacity factor.

The location of the new units will also have to be moved slightly to make them less visible to the public eye of the community. Arizona regulators had rejected Salt River Project's previous expansion proposal in 2022 over concerns from residents about noise, emissions and air quality.



Coolidge Generating Station

Eager to gain public support, the developer agreed to implement additional emission mitigation measures and help fund the paving of roads and the construction of a community centre for the nearby black community of Randolph.

Once operational, the fast-ramp 575 MW Coolidge Expansion Project will help balance the growing volumes of inherently intermittent electricity from renewable power sources on the grid. Salt River Project itself wants to add 2,025 MW of solar and wind generation and 1,100 MW of battery storage capacity by 2025 as it aims for 75% of its electricity delivered to end-customers to come from carbon-free sources by 2035.

US tax credits could boost hydrogen production six-fold by 2025

Tax credits under the US Inflation Reduction Act (IRA) make it cheaper to produce hydrogen locally in the United States than to import it. Unit economics of clean hydrogen "dramatically improved" with breakeven across various use cases achievable in three to five years, McKinsey finds, anticipating production to rise six-fold to six million tons by 2025.

The IRA's clean-energy tax credits and product credits could catalyse and potentially amplify the \$70 billion in clean-energy technology and demonstration projects under the Bipartisan Infrastructure Law. The two acts together mount an estimated \$370 billion in federal funding over the next five to ten years.

Substantial incentive for green H2

Asked to specify IRA incentives, McKinsey partner Joscha Schabram and consultant Arun Thomas explained that green hydrogen producers who hit the threshold of <0.45 kg CO₂ per kg H₂ can get a tax credit of \$3/kg over ten years. This is directly paid out for the first five years and, on a lifetime basis, translates into a benefit of roughly \$1.8/kg of hydrogen.

"That is a substantial incentive to produce green H₂, which could cost somewhere between \$4-5/kg to produce by mid-decade with all costs included,"

Schabram and Thomas told Gas to Power Journal. By 2030, the amount of clean hydrogen production in the US is consequently expected reach 14 million tons versus 3.5 million tons in a pre-IRA scenario.

As of today, there are 131 announced hydrogen projects in the United States. The main sites of planned production are in the Gulf Coast area, the Mid-West and along the East Coast. In total, some 5.5 million tons per annum of blue production is planned versus 1.8 million tons p.a. of green production, all by 2030.

German regulator to step up permits for grid expansion

The German Federal Network Agency (BNetzA) vowed to accelerate plans to build 'electricity highways' to transmit wind power from the north to customers in the south. Though progress is so far only visible in individual sections, BNetzA head Klaus Müller promised "from next year we will be issuing building permits on a large scale."

Some 14,000 kilometres of high voltage power lines will have to be added to facilitate Germany's clean energy transition, of which 7,400km fall into the regulator's responsibility. Up to now, permits for only 440km have been issued largely due to disputes over the route of overhead lines and lengthy planning procedures. But Müller promised this figure will more than double to 900km by the end of the year.

From 2024, the number of permits is meant to rise significantly, notably for Suedlink which is planned to be operational in 2028 and SuedOstLink due on-stream in 2027. Once the planning approval decision has been made, the exact route of the power transmission line is finalised and the responsible grid operator can start construction.

BNetzA is also seeking to accelerate the power grid expansion by raising the equity interest rates for new projects by 40%, allowing companies to reap a higher return on their invested capital. Adjusted for tax, the regulated equity yield for 2024 is now 7.09% for new investment, the regulator said.

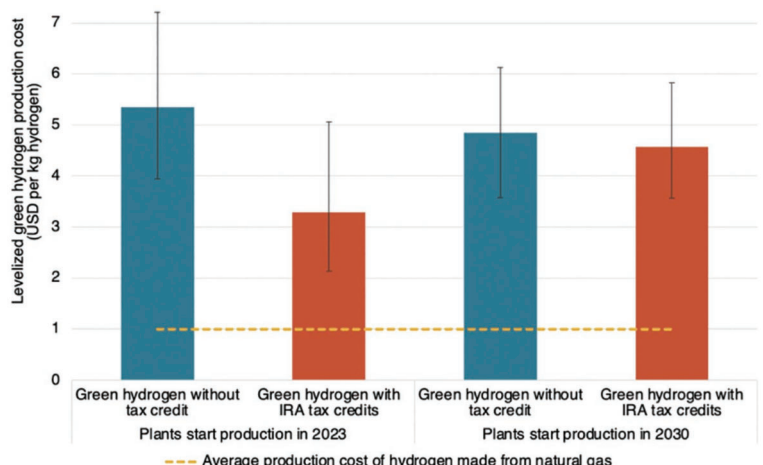


Figure 1. Modeled production cost of green hydrogen with and without IRA tax credits for a new project built in 2023 or 2030

Kexim to finance \$3bn LNG-to-power complex in southern Vietnam

Export-Import Bank of Korea (Kexim) has signed a memorandum to finance a \$3 billion integrated LNG regas and power generation project in southern Vietnam. The deal was signed with Vietnam's VinaCapital Group and Korea's GS Energy which co-develops an adjacent 3 GW power complex in Long An province near Ho Chi Minh City, previously known as Saigon.

Kexim is now exploring ways of providing credit to Long An Energy Corp, jointly owned by VinaCapital and GS Energy.

Large-scale gas power plants, fuelled by imported LNG, will help Vietnam reduce its reliance on more emission-intensive thermal coal. In fact, Long An I and Long An II are Vietnam's first approved conversions of a coal-fired plant to an LNG-fired power complex.

Situated in Can Giuoc district near Ho Chi Minh City, Long An I & II will be fuelled by regasified LNG. When fully operational, the

two plants will have a combined capacity of up to 3,000 MW, with all electricity to sold via a power purchase agreement to the state-utility Vietnam Electricity (EVN).

The integrated project is included in Vietnam's latest Power Development Plan VIII, issued last month. With construction of 30-36 months per LNG-fuelled unit, project implementation will be much faster than a coal-fired power plant.

Yoon Hee-seong, CEO of Kexim, underlined the 3 GW complex is a "symbolic co-operation project that has obtained business rights from the Vietnamese government."

He hence vowed the bank will "actively support Korean companies like business owners and engineering procurement and construction contractors to join it."

Huh Yong-soo CEO of GS Energy, Korea's largest power producer, was quick to add that "Korean companies have long understood that investing in Vietnam is mutually beneficial."



Long An I&II will switch to LNG

TVA repowers former coal plant in Alabama to run on natural gas

Having shut all coal-fired units at the Colbert Fossil Plant, the Tennessee Valley Authority (TVA) is now preparing to start up new gas turbines at the plant. Built at a cost of \$500 million, the three new gas-fired units will generate 750 MW of electricity at the former coal plant site, helping to meet regional peak power demand.

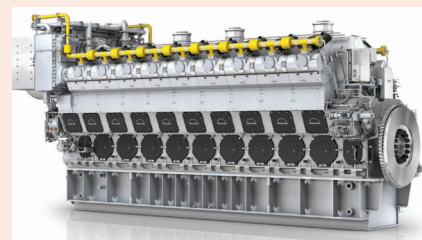
The first of three new gas turbines was fired up late last week in an initial test, with TVA planning to have all units in operation before the end of this year or in early 2024.

Apart from Colbert, TVA is also investing to re-power its Paradise Fossil Plant in Kentucky, where the last coal-fired unit ceased operation in 2020. Similar to the project in Alabama, TVA is also adding three new gas turbines to convert to plant from coal to cleaner-burning natural gas.



Colbert Fossil Plant

A draft environmental assessment also backs TVA's intention to build new fast-ramp gas units to replace the remaining coal-fired power blocks at its Kingston Fossil Plant. Additional gas peaking units are also envis-



MAN 51/60DF engine

Four MAN engines bound for Borneo

MAN Energy Solutions has been awarded a contract to supply four MAN 51/60DF dual-fuel engines for a gas-fired power plant currently under construction near the city of Kota Kinabalu in northern Borneo. The plant will power a factory producing solar glass – vital for photovoltaic modules – on behalf of Kibing Solar.

The factory requires reliable and flexible supply of electricity; hence the power station is being built at the same industrial park as the factory. Upon completion, up to 1,800 people will work at the factory producing solar glass, a vital component to accelerate the green energy transition both in Malaysia and abroad.

Scope of supply includes three 18V51/60DF engines and one 8L51/60DF engine, which as gensets will provide a total of 65 MW of generation capacity.

The four engines will mainly run on compressed natural gas (CNG) which consists largely of methane, compressed to less than 1% of the volume of natural gas at normal atmospheric pressure. CNG is easily transported by ship and truck – ideal for remote areas that have no natural gas or LNG infrastructure.

aged for TVA's coal-fired power plants at Allen, Cumberland and New Johnsonville.

"As we evolve our generation portfolio, natural gas is the right choice because it provides the flexibility and reliability we need to add more solar energy," Jacinda Woodward, TVA's senior vice president of power operations, said when TVA launched work on the new units. "Current and retired coal plant sites are prime locations for new gas generation because the electrical infrastructure is already in place."

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