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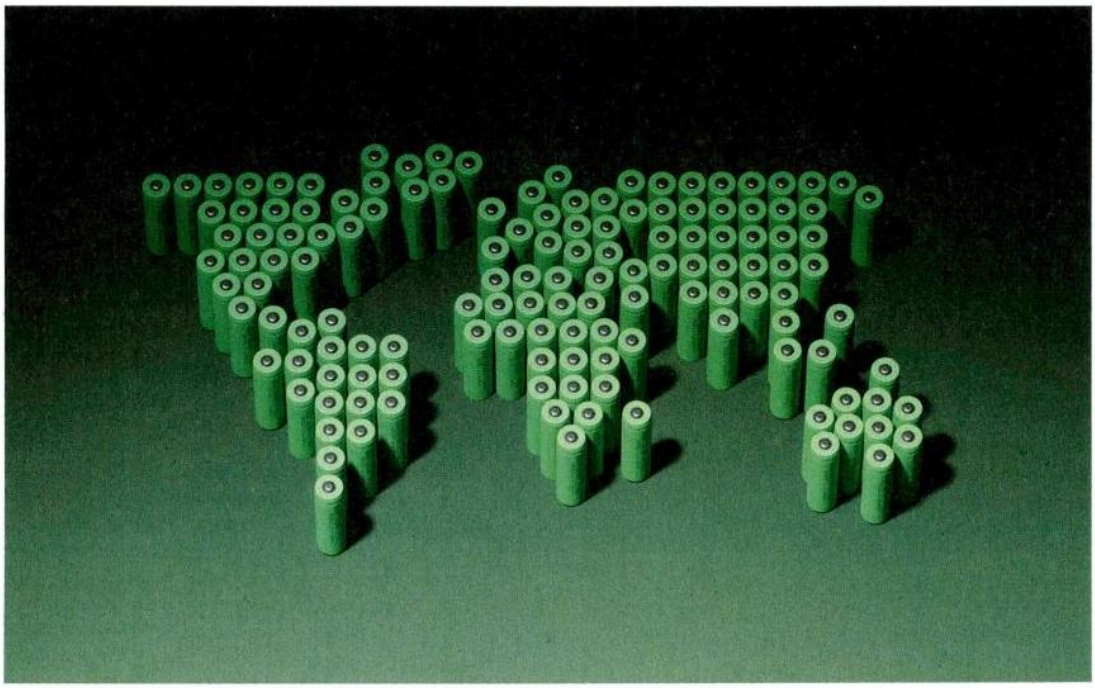

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Energy's next big thing

NEW YORK

From giant batteries to compressed gas, grid-scale energy storage is booming

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ENERGY STORAGE for the electrical grid is about to hit the big time. By the reckoning of the International Energy Agency (IEA), a forecaster, grid-scale storage is now the fastest-growing of all the energy technologies. In 2025, some 80 gigawatts (GW) of new grid-scale energy storage will be added globally, an eight-fold increase from 2021.

Grid-scale energy storage is on the rise thanks to four potent forces. The first is the global surge in deployment of solar and wind power, which are intermittent by nature. That did not matter when only small amounts were used on the grid, but they can now make up half or more of generation capacity in some markets, creating a headache for grid operators on cloudy and still days. Big batteries attached to the grid, which store energy when it is abundant and release it when it is needed, solve that problem neatly. The IEA predicts that in 2025 the combination of solar-photovoltaic generation and battery storage will be cheaper than the cost of coal-fired power in China, and new gas-fired plants in America.

The second factor boosting energy storage for the grid is Chinese overcapacity in battery manufacturing, which has led to a big drop in the price of lithium-ion batteries, the kind used in laptops, smartphones and more recently electric vehicles (EVs). Since 1991 the price has plunged by 97%, and in 2025 prices for grid batteries will converge with the historically much lower prices for EV batteries (see chart). As growth in EV sales has slowed and the lithium-ion battery glut has expanded, battery-makers in Asia have been forced to find new buyers. For the first time, the market for grid batteries in China now exceeds that for consumer electronics, and will grow further thanks to policy mandates requiring the deployment of grid-scale storage with wind and solar farms.

A third boost for energy storage is the power-guzzling surge driven by the rise of artificial intelligence (see next story). Goldman Sachs, a bank, reckons that global power demand at data centres will rise from 240 terawatt hours (TWh) in 2020 to 600TWh in 2025. But tech giants have noisily committed to

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climate-friendly goals such as net-zero emissions, which means they cannot turn to coal and gas plants. They need vast amounts of renewable energy, with storage to ensure power is provided round the clock.

The fourth and most intriguing of the forces at work, though, is the rapid emergence of innovative energy-storage alternatives that go beyond conventional lithium-based batteries. Sodium-ion batteries are a promising alternative, being cheaper and less flammable. This is particularly attractive for operators of data centres, who can get cheaper insurance by avoiding lithium. BloombergNEF, a research firm, expects makers of sodium batteries, led by China's HiNa, to begin large-scale manufacturing for grid storage in 2025. Form Energy, an American startup, has raised $1.2bn to develop a low-cost battery based on iron-air chemistry. It will start operations in 2025 in California and Minnesota.

Other energy-storage systems use gravity. Switzerland's Energy Vault has developed a hybrid system involving pumped water and lithium batteries which it plans to test in 2025 in a 500-metre mineshaft in Sardinia. The firm has an agreement with SOM, the architectural firm behind Dubai's soaring Burj Khalifa, to embed its gravity-based storage system into future skyscrapers in order to reduce their carbon footprints.

Old-fashioned pumped-hydro storage, in which water is shunted between reservoirs at different heights, still makes up most of the world's grid-scale energy-storage capacity. India's Greenko, a big renewable-energy developer, has modernised this gravity-based approach and found an economical way to build lots of it. The firm plans to have 50GWh of storage operational in 2025, with another 50GWh coming within the next few years.

Compressed gas is another approach showing promise. Italy's Energy Dome stores carbon dioxide under pressure in distinctive white domes. When energy is needed, the gas is expanded and passed through a turbine. The firm has a facility in operation in Italy, and plans to start building one in America in 2025. The system developed by Canada's Hydrostor, by contrast, uses air as its working fluid. The firm will start construction at a big facility in Australia in 2025, with an even bigger one planned for California.

In sum, an energy-storage revolution is under way. Lithium batteries will rule for the time being, but many alternatives are following behind, promising cleaner and more reliable energy in the future. ●

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