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Renewable energy

US launches large-scale project to store renewable energy

Consortium plans to hold hydrogen or compressed air in huge salt cavern in Utah

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A pioneering $1bn project for large-scale storage of energy from wind and solar power has been launched in Utah, offering a way to manage the variability of renewable generation.

A consortium including Mitsubishi Hitachi Power Systems of Japan on Thursday announced a plan to use a huge salt cavern to store hydrogen or compressed air, which could be used to generate up to 1,000 megawatts of power.

The variable output of wind and solar power, both within a day and seasonally, is one of the principal obstacles impeding the rise of renewable energy, and cost-effective large-scale storage using hydrogen or compressed air would be a significant breakthrough for the industry.

The Utah project, known as Advanced Clean Energy Storage, is intended to serve customers on the west coast of the US and in Nevada that have growing shares of renewable power generation, storing energy when electricity prices are very low or negative, and then releasing it when supplies are tighter and prices rise. The consortium partners aim to have it in operation in 2025, with an initial output of 250MW, rising to 1,000MW later.

Paul Browning, chief executive in the Americas for MHPS, which is a joint venture between Mitsubishi Heavy Industries and Hitachi, said the project would be the world's largest energy storage facility designed to manage the variability of renewable power sources.

"We're doing something that's of foundational importance," he said. "We've still got work to do, but we're really excited."

The consortium is aiming to deliver power at a cost that is the same as, or lower than, the lithium ion battery storage units that are now starting to be deployed to help manage variations in electricity supply and demand in many markets.

Those battery systems are limited to a maximum storage capacity of a few hours, however, meaning they are useful only for managing intraday variations. Storage using hydrogen or compressed air can last indefinitely, meaning that it can be used to cover seasonal downturns in wind or solar generation.

The size of the Utah cavern, which is about one mile deep and three miles across, meant the storage capacity of the site was effectively unlimited, Mr Browning said.

Market conditions in areas with rising shares of renewable generation on the grid have created favourable conditions for energy storage. At times when power supplies are high, in the middle of the day for solar or often at night for wind, and demand is relatively low, electricity prices can drop below zero, and some generators can be forced to shut off their output. The economics of the ACES plant will depend on using that costless electricity to fill its storage facility.

The consortium has not yet decided whether to use hydrogen or compressed air or some combination of the two. Using hydrogen would mean taking free electricity from the grid and using it to electrolyse water. The hydrogen would be injected into the facility and then released to burn in a gas turbine to generate power as needed.

The air version would similarly use free power for compression, then use the air to turn a turbine as needed.

The choice between the two does not need to be made immediately because the first step is preparing the cavern, which will take up to two years, and MHPS will meanwhile work on developing the most cost-effective generation technology. The site is also intended to have batteries and fuel cells to provide some shorter-term storage and quick-start power.

Although the ACES plant could make a useful contribution to power markets in California and other western states, the unusual geology of the site means it will not be easily replicated elsewhere.

The project consortium, which also includes a company called Magnum Development that owns the site and has been developing other caverns to store liquid fuels, says it is the only site in the western US that could be used for energy storage in this way.