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BUSINESS

Pumped Up: Renewables Growth Revives Old Energy-Storage Method

Moving water uphill lets producers of solar and wind power bank energy for use when it is needed most

The Ludington pumped-storage plant in Michigan. *PHOTO: CONSUMERS ENERGY*

By **REBECCA SMITH**
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Forget about Tesla Motors Inc.'s batteries: The hottest way to store energy in the electricity business today is a century-old technology that involves moving water to stash power.

Known as pumped storage, the giant facilities push large volumes of water uphill when there is surplus electricity, and then let gravity move it back down through turbines to generate hydroelectric power when extra kilowatts are needed.

Newer technologies for energy storage—including batteries, flywheels, compressed air and ice—are under development, but the proven, old-school solution of storing water as a proxy for power is attracting renewed respect from utilities and environmentalists aiming to fight climate change. It helps solve a big problem as power companies invest in renewable energy, which doesn't always produce electricity when it is most needed.

California, for example, set a record for solar-power production in early July. But peak demand for electricity comes in the early evening, long after solar production has peaked. Pumped storage gives producers a way to bank energy for future use.

"We're seeing just a huge resurgence of interest," says Jeff Leahey, deputy director of the National Hydropower Association.

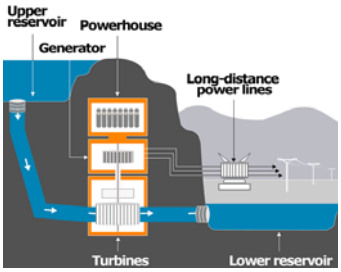
Renewable-energy sources produced 10% of the nation's power last year, and are growing so fast that they are now expected to overtake nuclear energy by 2021 and coal by 2030, according to the Energy Information Administration. Even at existing levels, excess renewable output is disrupting electricity markets, flooding the wires with power during certain times of day and sending wholesale power prices plunging.

When PG&E Corp. and environmentalists brokered a deal last month to shut down the Diablo Canyon nuclear plant by 2025, green activists weren't just looking to close California's last remaining nuclear facility and replace it with renewable energy. They also wanted the nuclear plant's pumped-storage

The Economics of Pump Storage

When energy usage is high, such as during the day, hydro-electricity is generated from water flowing down from an upper reservoir.

High Demand | Low Demand



"battery pack" to be even more available for green energy.

Known as the Helms Pumped Storage Plant, the facility built in 1985 consists of two reservoirs linked to a 1,200-megawatt hydroelectric powerhouse in the Sierra Nevada mountains.

"I don't think people know what a big deal pumped storage is," says S. David Freeman, a former general manager of the Los Angeles Department of Water and Power who is a senior adviser to Friends of the Earth, one of the environmental groups involved in the deal. "It's by no means a futuristic thing. It's been around for decades."

Helms is one of 42 pumped storage plants in the U.S. Combined, they have a capacity of 23,000 megawatts, equal to about 20 reactors, according to the Energy Department. That may nearly double in coming years: Proposals to add 18,000 megawatts of pumped-storage capacity are currently before the Federal Energy Regulatory Commission.

Pumped-storage facilities are expensive to build. Still, they remain the cheapest form of large-scale electricity storage according to the Energy Department, which estimates they make up about 99% of such storage world-wide.

On the surface, pumped storage makes no sense—there is a net loss of energy from moving water uphill and then generating power. It often takes five units of electricity to pump water that makes four units of power.

But for decades, pumped storage was a cost-effective way to store surplus energy from nuclear plants—which produce the same amount of electricity at all times of day—and convert it into electricity for peak demand during the day.

Now it is increasingly being used to even out peaks and valleys of renewable production. And unlike fossil-fuel or nuclear plants—which often take hours or even days to reach full output from a dead stop—hydroelectric plants hit peak production in minutes, a big asset to grid operators trying to keep electric systems running smoothly.

CMS Energy Corp., a Michigan-based utility, now sees its Ludington, Mich., pumped-storage facility on Lake Michigan as "truly, the crown jewel of power plants here," says plant manager Bill Schoenlein.

Built in the early 1970s as a sidekick to coal and nuclear plants, it is midway through an $800 million upgrade to boost production. It is helping integrate 14,000 megawatts of wind capacity into the electric grid from 15 states.

Among the new pumped-storage projects is Eagle Crest, a proposed facility east of Palm Springs, Calif., that would use abandoned mining pits as reservoirs to hold water pulled from arsenic-laced aquifers. It was licensed by federal regulators in 2014 and is currently seeking financing and customers.

Steve Lowe, president of Eagle Crest Energy Co., estimates he needs six years and $2 billion to get it built. He hopes it will serve as the battery pack for nearby wind turbines whose production peaks at night. NextEra Energy Inc. of Juno Beach, Fla., the biggest owner of renewable generation in the U.S., is a minority investor.

A new role for pumped storage is winning it new allies. The Natural Resources Defense Council was created in 1970 to fight a pumped-storage proposal in New York.

“Our views, over time, have become somewhat more nuanced,” says Ralph Cavanagh, co-director of NRDC’s energy program. “We still don’t want it at a place of breathtaking beauty like overlooking the Hudson River, but we’re open to it at other sites, particularly ones that are already degraded.”