Brazzaville pumped hydro storage

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Pumped storage hydropower (PSH) is a type of hydroelectric energy storage is a configuration of two water reservoirs at different elevations that can generate power as water moves down from one to the other (discharge), passing through a turbine. The system also requires power as it pumps water back into the upper reservoir (recharge). PSH acts similarly to a giant battery, because it can store power and then release it when needed. The Department of Energy"s "Pumped Storage Hydropower" video explains how pumped storage works.

The first known use cases of PSH were found in Italy and Switzerland in the 1890s, and PSH was first used in the United States in 1930. Now, PSH facilities can be found all around the world! According to the2023 edition of the Hydropower Market Report, PSH currently accounts for 96% of all utility-scale energy storage in the United States. America currently has 43 PSH plants and has the potential to add enough new PSH plants to more than double its current PSH capacity.

PSH can be characterized as open-loop or closed-loop. Open-loop PSH has an ongoing hydrologic connection to a natural body of water. With closed-loop PSH, reservoirs are not connected to an outside body of water.

Open-loop pumped storage hydropower systems connect a reservoir to a naturally flowing water feature via a tunnel, using a turbine/pump and generator/motor to move water and create electricity.

Closed-loop pumped storage hydropower systems connect two reservoirs without flowing water features via a tunnel, using a turbine/pump and generator/motor to move water and create electricity.

The Water Power Technologies Office (WPTO) invests in innovative PSH technologies and research to understand and determine the value of the potential benefits of existing and prospective advanced PSH facilities. Through the HydroWIRES Initiative, WPTO is currently working on projects designed to evaluate and expand hydropower and PSH"s contribution to grid resilience and reliability.

To cut U.S. greenhouse gas emissions in half within a decade, the Biden administration"s goal, the U.S. is going to need a lot more solar and wind power generation, and lots of cheap energy storage.

Wind and solar power vary over the course of a day, so energy storage is essential to provide a continuous flow of electricity. But today"s batteries are typically quite small and store enough energy for only a few hours of electricity. To rely more on wind and solar power, the U.S. will need more overnight and longer-term storage as well.

It"s called pumped hydro energy storage. It involves pumping water uphill from one reservoir to another at a higher elevation for storage, then, when power is needed, releasing the water to flow downhill through

turbines, generating electricity on its way to the lower reservoir.

Pumped hydro storage is often overlooked in the U.S. because of concern about hydropower"s impact on rivers. But what many people don"t realize is that most of the best hydro storage sites aren"t on rivers at all.

We created a world atlas of potential sites for closed-looped pumped hydro - systems that don"t include a river - and found 35,000 paired sites in the U.S. with good potential. While many of these sites, which we located by satellite, are in rugged terrain and may be unsuitable for geological, hydrological, economic, environmental or social reasons, we estimate that only a few hundred sites are needed to support a 100% renewable U.S. electricity system.

There are several techniques that grid managers can use to keep that balance with variable sources like wind and solar. These include sharing power across large regions via interstate high-voltage transmission lines, managing demand - and using energy storage.

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