

PUMPED STORAGE: POWERING THE FUTURE

As the world pushes towards a net zero carbon green energy future, the need for bulk energy storage is becoming ever more apparent. Storage performs multiple functions in a grid that is dominated by variable output renewables like wind and solar, absorbing excess energy and releasing it when needed helps balance the grid. Although chemical battery technology has made great strides in recent years, it still falls far short of the world's oldest and still most successful form of energy storage – pumped storage hydropower.

According to the International Hydropower Association (IHA), some 85+% of the world's total energy storage capacity is met by pumped storage. The latest IHA figures also reveal that about 175 GW of pumped storage capacity is currently installed worldwide. About 10.5 GW of new capacity has recently been added to the global fleet. With its ability to flexibly deliver large quantities of power for extended periods and at short notice, pumped storage hydropower's unique capabilities make it the standout energy storage solution. The benefits pumped storage can bring has led to a substantial pipeline of 214 GW either in planning, permitting or already under construction. The IHA notes that the global pumped storage capacity over the next two decades is expected to double. Furthermore, while pumped

storage projects have traditionally been associated with particular geographical features such as linked reservoirs in mountainous regions only, alternative solutions are now being developed too. Under certain circumstances it is possible, for instance, to retrofit pumped storage capabilities at existing facilities such as conventional hydropower plants, irrigation dams, and even disused mines and quarries.

Although much of the new pumped storage capacity developed over recent years has been developed in China, both North and South America are also looking at embracing this approach. Pumped storage already accounts for more than 95% of all utility-scale electricity storage in the United States, for example, which

BENEFITS OF PUMPED STORAGE

- Best-proven, low-risk technology
- Balances volatile renewable energy generation with demand
- Manages grid bottlenecks
- Supports grid stability by virtue of a quick response to changing demand or sudden outages
- Contributes to grid stability by increasing grid inertia and providing black start capability
- Very long facility lifetime



3D rendering of a pump turbine unit including motor generator, pump turbine, and inlet valve.

has 43 plants and the potential to at least double this capacity.

Canada has only one operating 177 MW pumped storage facility. However, last year a report by WaterPower Canada on the technical and economic potential of pumped storage hydropower plants in Canada found that potentially over 8,000 GW at nearly 1,200 sites is feasible.

So far, South America has only succeeded in installing about 1 GW of pumped storage capacity with two plants of 750 MW and 224 MW in Argentina and just 20 MW in Brazil, constructed in 1939. Nonetheless, South and Central America have huge potential for pumped storage, some estimates put that at 7,000 to 8,000 GWh per million people each, and they are seen as among the most attractive markets for pumped storage for this reason.

As a leading hydropower technology company ANDRITZ has supplied or refurbished more than 460 pumped storage units over the last century with a combined capacity of almost 40,000 MW.

ANDRITZ has played a pivotal role in developing pumped storage plants across the Americas, showcasing our expertise and dedication to hydropower. Our work on

landmark projects like Northfield Mountain in the US, where we supplied four large reversible turbines capable of impressive water flow rates for a power output of 1,168 MW, and Muddy Run in the US, generating 1,070 MW from eight units, underscores our capacity to deliver high-capacity energy storage and generation solutions.

Beyond these significant projects, ANDRITZ continues to support the hydropower industry with a comprehensive portfolio of services and state-of-the-art equipment. Our local presence ensures ongoing support for projects, enhancing efficiency and sustainability in both existing and new hydropower plants. We are committed to advancing the hydropower sector as a key component of global renewable energy, working alongside developers, operators, and suppliers.

ANDRITZ stands ready to support both existing and new pumped storage projects to help the Americas meet all their bulk energy storage needs.

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"Pumped storage is more than just a back-up for intermittent renewable energy resources. It offers a wide spectrum of benefits and plays a vital role within local and regional water and energy programs."