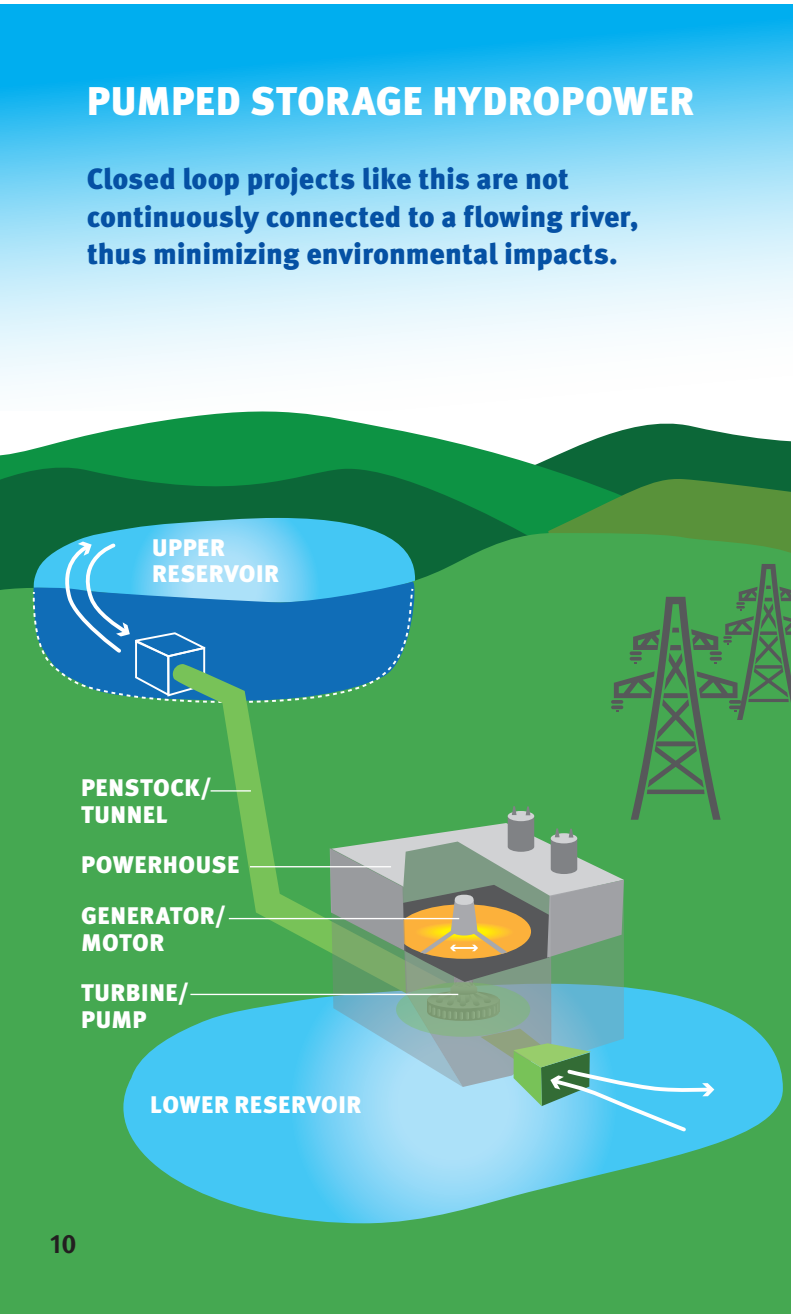
New and Emerging Hydropower and Battery Technologies

Supporting a 21st Century Carbon-Free Energy Stack

Engineers across the country are not just relying on current technologies and tools to meet power generation needs. Their problem solving is introducing new innovations and developing new technologies that create bridges to a carbon-free power generation future.



Pumped Storage Hydropower Projects

Pumped storage projects operate like conventional hydropower storage projects, but with a twist.

Water is pumped to an upper reservoir for storage. It's released downhill to turn turbines and generate electricity when demand is highest, also called peak periods, or when other weather dependent sources like wind and solar aren't available. Water is then pumped back to the upper reservoir when power generators normally run below capacity or sit idle.

You can think of pumped storage like a rechargeable battery. It provides energy on demand when needed, and then when energy is no longer needed or is exhausted, the battery can be charged up by another energy source.

Like conventional hydropower, this flexibility makes pumped storage an ideal partner for solar and wind power projects. "Closed loop" pumped storage projects have the added benefit of continuously recirculating water between the lower and upper reservoirs. By largely or completely decoupling operations from river flows, environmental impacts can be minimized.

Currently, the John W. Keys III Pump Generating Plant at Grand Coulee Dam is the Northwest's only pumped storage project. However, there are nine projects with a total capacity of over 4,600 megawatts of electricity being proposed. If all were built, they would provide enough power capacity to largely offset lost power from the retirement of coal projects.

Large pumped storage projects generally take over 10 years to move through the design, permitting and construction process, and cost between $1 to $3 billion to build. The two projects with initial permit approvals could go on-line before the end of this decade.

Battery Storage

Innovations in battery technology are an exciting part of a carbon-free energy future. Whether it's a solar panel on your home or larger utility scale wind and solar projects, battery storage keeps the power flowing when the wind isn't blowing or the sun shining. And like pumped storage projects, power can be stored for use when demand and cost is highest.

The good news is that over the past decade the cost of producing lithium-ion batteries has declined by 90 percent. Another 50 percent drop is considered possible by 2023.

As costs go down, utility-scale battery storage projects are growing quickly as well. Nationally, utility-scale battery storage has grown from 214 megawatts in 2014, to 899 megawatts in 2019, to potentially 2,500 megawatts in 2023. The average length of battery availability, however, is only four hours. This makes it most helpful for smoothing out solar and wind power availability to meet peak demand and short-term supply needs.

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