

Projects would invest billions on Lake Roosevelt for needed renewable-energy storage, but hurdles are high

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GRAND COULEE, Wash. – Darwin Fales stood on the North Dam of Banks Lake on a recent morning and looked down through the town of Grand Coulee toward the water of Lake Roosevelt shimmering in the distance.

“We’ve got two of the largest reservoirs in the state of Washington, if not the whole Northwest, right here,” Fales said. “It’s the perfect setting for hydrogeneration.”

Just 2 miles away from where Fales stood looms the 550-foot-high, milelong Grand Coulee Dam, the nation’s flagship hydropower facility since its completion during the Great Depression.

While the famous dam is the centerpiece of the area’s complex hydropower puzzle, it’s not the only one.

Every year, the Grand Coulee Dam’s [John W. Keys III pumping plant](#) lifts about 3 million acre-feet of water 300 feet up from Lake Roosevelt and then releases it through power-generating turbines and down a concrete Feeder Canal that empties into Banks Lake, Fales said.

The water contained in that 27-mile-long reservoir doesn’t stay long, though. It flows out of Banks Lake, through hundreds of miles of canals and ditches, and [irrigates some 700,000 acres](#) of farms and orchards in Central Washington. En route, that water gets a second use, passing through a system of turbines and powerplants that produce energy for Columbia Basin Hydropower, where Fales works as secretary-manager.

While that network of hydropower production already forms the core of Washington’s hydroelectric generating capacity, which exceeds that of any other state, Fales is now leading one of two major expansion efforts.

If all goes according to plan, operators from Columbia Basin Hydropower will flip the switch in 2027 on the \$1.5-billion Banks Lake Pumped Storage Project, a subterranean system of pipes, pumps and turbines that would use wind and solar energy to move water up from Lake Roosevelt to Banks Lake, then release that water whenever needed to generate energy at an underground powerplant.

Four years later, in 2031, Daybreak Power aims to unveil a similar pumped-storage hydropower project about 35 miles upriver from the Halverson Canyon dam.

The project would employ 3,500 to build a new dam, fill the canyon with water and create another system for cycling Lake Roosevelt water to create on-demand, carbon-free power. That project would cost about \$5 billion.

Those projects haven't evaded criticism.

Republican state Sen. Mark Schoesler argues the projects would raise rates for utility customers by "producing electricity twice," once with solar or wind and again with water.

The tribes whose reservations border Lake Roosevelt, and whose regulatory authority extends into it, have raised concerns about the environmental impact of such projects.

Electric City Mayor Diane Kohout has asked questions about how the projects would affect recreation on Banks Lake.

But the projects have major appeal as the dire consequences of burning fossil fuels become increasingly clear and as governments ramp up efforts to eliminate fossil-fuel emissions.

With [Washington](#) electric utilities required to switch completely to clean, renewable power by 2045, the clock on building out clean-power infrastructure is ticking. And many experts and observers argue more pumped-storage hydropower will be necessary to meet that mandate.

While energy from the sun and wind are key to that transition, those sources are contingent on uncontrollable factors like the time of day and the weather.

[Pumped-storage hydropower](#), on the other hand, offers a seemingly endless and on-demand source of power generation that doesn't produce any carbon. It also provides one of the [potential mechanisms](#) – among them, batteries – for storing other, less-predictable forms of renewable energy.

A [2019 report from the U.S. Department of Energy](#) found that pumped-storage hydropower offers one of the lowest-cost, efficient and "mature" options to store power.

Jim Day, CEO and co-founder of Daybreak Power, said the case for pumped-storage is clear.

"Without lots and lots and lots of storage, the clean energy transition cannot happen," Day said. "We're going to remain reliant on gas-fueled power plants and coal power plants if we don't get in a ton of storage at a price that people can afford. The clean energy transition is going to come to a screeching halt. It cannot happen without large-scale storage, and everyone in the energy industry knows that."

"And if the clean energy transition does not happen, what's the risk? What's the result?" he continued. "We fry the planet. We continue pouring greenhouse gases into the atmosphere. The temperature keeps going up and up and up. I feel very passionate about that. My reading

of this, we have to tackle this clean energy transition. And this is my way of trying to make it happen. And I'm extremely worried that we're not going to put in enough storage and we won't be able to deploy wind and solar at the levels we're going to need to."

Supply and demand

Pumped-storage hydropower isn't a new or especially complicated technology.

"It's not like a gizmo," Day said. "There have been pumped storage facilities for more than a century."

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First constructed in Europe in the late 19th century, pumped-storage hydropower requires only a few elements: a pair of reservoirs at different elevations, a pumping system to move water to the higher water body and turbines to create power when that water is released back into the lower reservoir.

As of 2019, pumped-storage hydropower accounted for 93% of grid storage in the U.S. and more than 99% of electrical energy storage, according to the Department of Energy's 2021 Hydropower Market Report.

While that may sound like a lot, projections indicate the existing pumped-storage infrastructure won't be nearly enough to store the excess power produced by the expanding network of solar panels and wind farms, especially as people turn increasingly away from gasoline and toward electricity to charge their cars.

"The increasing demand for electricity storage from renewables and the electrification of the transportation sector is likely to grow the total amount of electricity storage capacity by five times the current capacity and as much as ten times by 2050," says National Hydropower Association's [2021 Pumped Storage Report](#).

Forty-three pumped-storage hydropower facilities are in operation in the U.S., providing 22,878 megawatts of storage capacity.

While there has been a flurry of interest in building more facilities, with 67 new projects pursued across the country, according to the NHA, the hurdles such projects must clear are high.

For one thing, developers have to navigate a layered regulatory process.

The Federal Energy Regulatory Commission is charged with licensing hydroelectric projects, while a range of other federal, state and tribal entities can oversee.

When permitting timelines are combined with construction timelines, new pumped-storage facilities typically take seven to 10 years to complete.

As a result, “few investors are willing to finance such long-lead projects,” according to the NHA report.

Even when investors step in, the path to completion is fraught with obstacles.

The Washington State Department of Ecology [recently declined to issue a water quality permit](#) for a proposed pumped-storage facility in Klickitat County being pursued by Portland-based [Rye Development](#). That project has also faced opposition from the Confederated Tribes and Bands of the Yakama Nation and from a range of environmental groups.

In an email, Erik Steimle, a Rye vice president, wrote that Ecology’s decision was “expected” and that a “water quality certificate will be issued later in the permitting process” for the [Goldendale Energy Storage Project](#).

Steimle also expressed optimism that the approval process with the state and federal governments could be completed soon.

“The Goldendale project is about half way through both the state and federal permitting processes,” he wrote, adding Rye expects the process to be completed in early 2023.

The paths forward for the Lake Roosevelt projects are at least as complicated, at least for now.

Banks Lake

Officials at Columbia Basin Hydropower have been pursuing the idea of pumped-storage at Banks Lake for about a decade, Fales said.

In that time, the small utility has “started putting some things in place,” he said, enlisting an engineering firm to begin designing the project, tapping a financial firm to identify potential investors and hiring a lobbyist in Washington, D.C.

So far, Columbia Basin Hydropower, which the three Columbia Basin Irrigation Districts own, has spent between \$4.5 million and \$5 million laying the groundwork for the project, which would have a 500-megawatt generating capacity and would produce 760,000 megawatt hours annually.

The facility’s design, Fales said, is “only about 3% to 5% complete.” But despite being “very preliminary,” Fales said the general concept has begun to come together.

“Right where we’re standing here would be a concrete inlet,” he said from his spot on Banks Lake’s North Dam.

When operators are ready to generate hydropower, that inlet would open, letting water flow into pipes that would about run 300 feet underground, first to a subterranean powerhouse located near Crescent Bay, then to an outlet that would release the water into Lake Roosevelt just upriver from the Grand Coulee Dam. Pumps would then move water back up to Banks Lake through the same pipes.

“So you wouldn’t see hardly anything,” Fales explained.

He argued the amount of water sucked out of Lake Roosevelt would be negligible.

Already, he said, about 3 million acre-feet of water, or 4% or 5% of the flow at Grand Coulee, is pumped into Banks Lake every year.

A pumped-storage facility would use about one-tenth of that amount, Fales said.

Even so, tribal officials have expressed concerns about what it would mean for the health of a stretch of the river already subjected to massive intervention for the sake of hydropower.

In February 2017, B.J. Kiefer, then-director of the Spokane Tribal Natural Resources Department, laid out a litany of concerns about the project in a letter to the Federal Energy Regulatory Commission.

Kiefer noted “the Tribe has regulatory authority over the waters of its Reservation, including portions of Lake Roosevelt that lie within its borders.”

“The Tribe has federally reserved water and fishing rights in the Spokane and Columbia Rivers,” Kiefer wrote, as well as “paramount use rights within 1/4 of Lake Roosevelt for fishing, hunting, and boating” and “ownership of the original beds and banks of the Spokane and Columbia Rivers that border its Reservation.”

But the Spokane Tribe’s authority to protect these resources, Kiefer wrote at the time, “appears to be/have been overlooked” in a study Columbia Basin Hydropower had submitted to FERC as part of the permitting process.

Among the considerations left out, Kiefer wrote, was the project’s potential effect on [work underway](#) to [re-establish salmon](#) and steelhead habitat [above the Grand Coulee Dam](#).

On behalf of the tribe, Kiefer asked that project planners study a number of specific effects that may result from the project, including the potential for increased water temperatures, the effect of altered flow on fish and the possible delivery of historical contamination from toxin deposits in Crescent Bay Lake.

Kiefer also asked that planners study the economic effect of the project, as it would use public infrastructure at Banks Lake to generate and store power.

And his letter requested that the Tribe be given a seat on the project's oversight group so that it could help "in the development of any criteria or standards that may impact our interest and resources."

Michael Marchand, then-chairman of the Confederated Tribes of the Colville Indian Reservation's Business Council, expressed similar concerns in his 2017 response to the project.

Marchand wrote that modeling didn't account for how altered flows to and from Banks Lake would "impact fish and the ecosystem"; that it doesn't "appear to anticipate a broader evaluation of impacts to place of traditional cultural and religious significance to Native Americans"; that the project's economic feasibility analysis relies on "unrealistic assumptions" about the future of power prices and capacity of the energy grid; and that the plan doesn't "appear to contain any information" about the geological impacts of the "significant subterranean tunneling" that the project would entail.

Proposed federal legislation from a pair of Washington lawmakers – Democratic Sen. Maria Cantwell and Republican Rep. Dan Newhouse – aims to answer some of those concerns by formalizing the tribes' ability to provide oversight on the project and by compensating them for any economic harm, while also helping move the project more easily through the regulatory process.

First proposed four years ago and passed twice by the Senate, that bill got a new life in April, when Cantwell and Newhouse introduced the [Pacific Northwest Pumped Storage Hydropower Development Act of 2021](#) .

At the time, Newhouse and Cantwell touted the bill in a news release as a means to "improve permitting for pumped storage hydroelectric projects, create jobs in Central Washington, and protect Tribal interests."

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And there’s a second Lake Roosevelt-related hydropower provision included in the package. It would provide \$100 million to upgrade the Keys plant’s ability to generate power when the usual flow of water up to Banks Lake is reversed. The plant has featured reversible pumps capable of producing power since 1973, but their capacity is limited.

More help for pumped-storage projects could also come from a much larger – and much debated – \$3.5 trillion reconciliation bill whose fate has been tied to that of the infrastructure package. It includes a 30% federal tax credit for energy storage.

While the fate of that legislation remains uncertain, Fales and Columbia Basin Hydropower aren’t waiting for Congress to act.

They submitted a preliminary lease of power application with the Bureau of Reclamation in January and have been “pursuing investors” to fund the \$25 million to \$50 million cost to get it to the point of being “all systems go,” Fales said.

The design process could take four years, he said, while the environmental review process is expected to last two years.

Fales said a crew of 2,000 or more workers could begin construction as soon as 2026, digging and blasting beneath the city of Grand Coulee. If that happens, operators could fire up the facility a year later.

He has no illusions it will be easy, but Fales is optimistic that environmental concerns will be answered and that the project will become a productive and sustainable reality in the near future.

“You don’t wear out the water pushing it up and down the hill,” he said. “It’s non-consumptive. It’s a win-win.”

Halverson Canyon

Day, whose Daybreak Power is pursuing a bigger, costlier and more complex project at Halverson Canyon, said he is committed to completing his project.

“Pumped-storage hydropower is this technology that exists and it works and it’s cost effective and it does all the things we need to do,” he said. “And people have been overlooking it because it’s too hard to build.”

Day isn’t the most obvious candidate to bring such a massive hydropower project to Washington.

A former State Department employee who recently left the Washington, D.C. area for Luanda, Angola, where his wife works as a diplomat, Day identified the potential of the Halverson site after reading a report from the Bureau of Reclamation that was published in 2014 and updated last year.

That report evaluated 203 alternatives for pumped-storage on the bureau’s reservoirs.

Day said his company used that report to pursue several sites that were identified as “extremely cost-effective sites and configurations for massive pumped-storage projects, along with being pre-screened for regulatory viability, compatibility with existing (Bureau of Reclamation) operations and other factors that we believe make them extremely attractive.”

But that attractiveness doesn’t mean the process of bringing the Halverson project online will be easy for Daybreak, which has only two employees.

To bolster his firm’s capacity, Daybreak entered into an memorandum of understanding with Worley, a major Australia-based engineering company.

Daybreak filed a preliminary permit with the Federal Energy Regulatory Commission in January to study the construction of a 399-foot-high dam to create a 29,000-acre-foot reservoir in the canyon and to connect it to Lake Roosevelt with a 10,000-foot-long system for conveying water

That system would have a capacity of 2,650 megawatts of power and an estimated annual generation of nearly 9 million megawatt hours.

In response to his application, the Spokane and Colville tribes filed motions to intervene and expressed concerns about the project’s potential environmental impacts, similar to those raised over the Banks Lake project.

On June 27, the commission acknowledged those concerns, vowed to account for them as the process moves forward and granted Daybreak the permit, giving Day’s firm two years to “investigate the feasibility of the project.”

Day said he's convinced it will prove to be "operationally doable, technically doable. We think we can get the permits and water rights and site control and all the things that go into project development."

Even if that's the case, though, he said the success of the project hinges on whether Daybreak can reach a long-term off-take agreement with a purchaser of the power produced at Halverson Canyon.

The Bonneville Power Administration has not expressed an interest in the Halverson project.

Maryam Habibi, Bonneville Power's manager of media relations, noted the administration's only existing contract for a pumped-storage project is with the Keys pumping station.

"Our focus is on marketing the generation from the existing federal hydropower projects and the Columbia Generating Station," Habibi said.

But Day believes BPA's interest will grow.

"We think the pressure's going to build and build and build," Day said.

"Right now," he added, "this is the only technology that works. That's what we're banking on."

While he said it's "possible we could cobble together' agreements from different utilities," a firm two- or three-decade contract is key to raising the \$4.9 billion needed to build the facility.

"With that (contract) in hand, that's how you go to the banks and finance construction," he said.

Meanwhile, Day said he's "actively courting investors" who can help the project move through the design and permitting processes. And he said he's received "a ton of investor interest."

But the stakes, he argues, are more than financial.

Pumped-storage hydropower would serve as an "anchor" for the renewable energy grid that the state is requiring utilities to build by 2045.

One of those utilities, Spokane-based Avista, indicated it is interested in such projects as it works to make that transition.

"Avista evaluates all possible resource options to meet future customer energy and capacity needs, when it conducts its integrated resource planning (IRP)," Scott Kinney, Avista's director of energy supply, wrote in an email. "Previous IRPs have shown that pumped hydro may be an attractive resource option to serve our customers in the future."

“We are aware of several proposed pumped hydro projects in the Northwest and have talked to the developers to get a better understanding of the proposed projects size, schedules and costs,” Kinney continued. “Avista anticipates releasing a competitive request for proposals for new resources in the near future and pumped hydro could be selected in that process.”