

ENERGY TRANSITIONS

The new weapon in the war over dam removal: Economics

Jeremy P. Jacobs, E&E News reporter • Published: Wednesday, October 23, 2019



The fish wars of the Pacific Northwest have raged for decades over Lower Granite Dam and three other dams on the Lower Snake River in eastern Washington. Jeremy P. Jacobs/E&E News
LOWER GRANITE DAM, Wash. — The decadeslong Pacific Northwest salmon war may be nearing the end.

But it's economics, not fish, that could be the demise of four dams at the center of the fight.

The dams on the Lower Snake River — besieged by conservationists and biologists for killing fish — are now battered by falling prices for renewable energy, skyrocketing replacement costs for aging turbines and a growing tab for environmental mitigation.

"The jig is up," said Daniel Malarkey, a senior fellow at the Sightline Institute, a regional think tank focused on energy, economic and environmental policy. "We had this super-cheap power relative to other resources, and we've piled a bunch of extra costs on it."

The Lower Snake River dams account for 5% to 13% of the Bonneville Power Administration's power generation. But due to river flow conditions and endangered species requirements for fish, they produce far less than their capacity — and they are most productive at exactly the wrong time.

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When power demand is high, supply from the eastern Washington dams is low. When demand is low, the dams produce too much electricity when combined with BPA's other generation.

In fact, the Lower Snake River dams produce less power than BPA sends out of its service area in the region.

There are other factors, as well, including BPA's financial health. The federal power agency is \$15 billion in debt, and its electricity rates have climbed 30% since 2008 as the wholesale market has fallen due to growing supplies of wind, solar and natural gas ([Greenwire](#), Sept. 3).

Hydropower is no longer the Northwest's cheapest energy, and if BPA wants to get its books in order, critics say, it should start by removing expensive and possibly money-losing assets like the four Lower Snake River dams from its books.

"They could reduce their surplus and get out from some of those recovery costs by actually recovering the fish," said Jim Norton of the Idaho Conservation League and Columbia Rediviva project.

BPA and federal dam managers are under court order to consider breaching the four dams. In 2016, a federal judge in Oregon struck down their fish management regime — the fifth time it's been ruled illegal — and ordered BPA and federal agencies to conduct a new environmental assessment that examines breaching.

Bonneville Administrator Elliot Mainzer trod carefully when asked about the Lower Snake River dams in an interview with E&E News.

Mainzer said the dams allow the utility to nimbly respond to demand at peak times, such as the morning, when electricity customers are getting ready for work, or the evening, when they get home.

"They are not a huge producer of megawatt-hours of energy, but they are a critical piece of the 'dispatchable' capacity and flexibility of the system," Mainzer said. "They are a fast and responsive part of our grid."

BPA says the dams are like the volume knob on a stereo: easy to turn up or down in response to demand. It also contends that their electricity will become more valuable as Washington state, and potentially others, shift to carbon-free power.

But the agency points to fact sheets and operations documents to support the dams that critics say are misleading. Perhaps more revealingly, BPA confirmed that it hasn't put major repairs or upgrades to most of the dams' turbines in its budgets for the next two decades, when they will all be at or beyond their engineered life spans.

To many in the region, a new question about the dams has emerged: Is it financially irresponsible not to breach them?

A recent economic analysis by ECONorthwest, an economic consulting firm, concluded that the benefits of breaching the dams outweighed the costs by somewhere between \$5.4 billion and \$12.4 billion.

"They are just nursing along a system that can't keep up anymore," Malarkey said.

By the numbers



Ice Harbor Dam is the last dam on the Lower Snake River before it merges with the Columbia River. U.S. Army Corps of Engineers

The four dams on the Lower Snake River were part of the New Deal-era effort to bring cheap power to the rural Pacific Northwest.

They were among the last in the system; Ice Harbor was completed in 1961, Lower Monumental in 1969, Little Goose in 1970 and Lower Granite in 1975.

These are not massive impoundments like Grand Coulee Dam, one of America's greatest engineering feats.

At about 100 feet tall, the Lower Snake River dams are run-of-the-river dams. One of their main functions is navigation. The dams and their locks tame river conditions, making barge traffic possible, primarily for farmers.

Each dam has a powerhouse set off to the side of the lock. And each has three to six turbines.

Combined, the dams have a capacity of 3,000 megawatts.

But because of river conditions — maximum production is achieved only when flows are high — and projects aimed at offsetting damage to fish, the dams average about a third of that, 1,000 MW, enough to power 800,000 homes, according to BPA.

At most, they produce 12.6% of BPA's total generation. Notably, more than three-quarters of BPA's hydropower production comes from just six of its 31 dams, none of which are on the Lower Snake River.

Grand Coulee alone produces more than a quarter of the agency's hydropower, over double what the Lower Snake River dams produce on average.

BPA's system produces about twice as much power as customers in its service area need. It sells surplus electricity on the open wholesale market, and uses those revenues to help keep its primary rate low.

At least in theory, all of the power produced at the Lower Snake River dams could be considered surplus for its preference customers in the region. It's less than BPA sells on the open market at virtually any time.



Conservationists say four dams on the Lower Snake River are pivotal to the long-term survival of endangered salmon and steelhead. Claudine Hellmuth/E&E News

And that raises questions about how valuable that power actually is.

The four dams are most productive in the early spring, when snowmelt and river flows are high. But that's also when demand for BPA's power — and thus its value on the open market — is lowest.

In the fall and early winter, demand shoots up. But then the dams' production is at its lowest.

"They generate a third of nameplate capacity, and a third of that is generated when the power is least valuable," said Kevin Lewis of Idaho Rivers United, who closely follows the dams' production.

Fish protections are connected to the economics of the dams because mitigation adds significantly to the cost of generation at the four dams. BPA spends millions on tagging fish, barging them downriver and other mitigation per year because of the dams' impact.

BPA must recover those costs through the rate it charges its primary power customers, retail utilities in the Northwest.

That rate has risen to about \$36 per megawatt-hour, in part because of these issues. At the same time, the proliferation of solar, wind and natural gas generation has caused wholesale market prices to drop to around \$22.

Tony Jones, an economist with Rocky Mountain Econometrics, was hired by former Idaho Gov. Phil Batt (R) in the late 1990s to study the four dams. He estimates that they probably cost BPA as much as or more than the rate it charges its customers, and much more than it can get for the power on the open market.

"By definition, they are not moneymakers anymore," Jones said. "They haven't been since 2009."

Studies weigh other renewables



A study last year examined whether the power from the Lower Snake River dams could be replaced with renewables including wind and solar. Seagul/Pixabay

Malarkey, the consultant, joined the dam-removal crowd after he closely examined the electricity produced by the Lower Snake River dams.

A self-described climate hawk, his bias as he began studying the dams for ECONorthwest was toward keeping them. Why, he asked then, take 1,000 MW of relatively carbon-free power offline?

That changed quickly.

"The thing that shifted for me was these are 50-year-old facilities," he said. "It's like an old coal plant or an old gas plant. This thing is at the end of its useful life. Are we going to invest in it? On a cost basis, it's not obvious you should keep them going."

A key question for Malarkey was whether the power from the Lower Snake River dams could be replaced by other renewable sources.

BPA has said that it cannot.

"The four lower Snake River dams provide critical winter energy and capacity to serve regional loads," BPA said in a March 2016 fact sheet.

"This benefit cannot be replaced by other renewable sources such as solar and wind."

That point, however, was directly — and extensively — refuted in a report last year commissioned by the NW Energy Coalition, or NWEC.

The study, conducted by consulting firm Energy Strategies, examined a series of scenarios, including breaching with no replacement, natural gas, and renewables and demand response.

It found that solar, wind, demand-response and efficiency measures could replace the power generated by the dams — and at not a very high price, \$399 million to \$501 million per year.

That translates into \$1 to \$2 on a monthly residential electricity bill.



Daniel Malarkey. @djmalarkey/Twitter

But the report also found that "if costs for wind power, solar power and storage continue current declines, costs may be lower."

And they have.

The study addressed the concern that if the dams were taken offline, there would be instances when BPA could not meet its load requirements, instances, likely in the winter, when it couldn't provide enough power.

The NWEC report dispelled that, as well. It found that the renewables would make the grid more reliable than the dams.

"This study," NWEC Executive Director Nancy Hirsh said when the report was released, "shatters the myth that replacing the Lower Snake River dams and restoring our wild salmon would compromise the reliability of our power system and cause major increases in rates and greenhouse gas emissions."

Asked about the NWEC report, BPA said it stands behind its fact sheet.

What's the true cost of power production?



Moose Creek, on the right, merges with the Selway River in Idaho. Both are prime spawning habitat for salmon and steelhead, and are inland of the four Lower Snake River dams. Jeremy P. Jacobs/E&E News

Perhaps the most important figure in assessing the dams' worth remains a mystery.

When all expenses and costs are included, how much does it cost BPA to produce power at the four Lower Snake River dams?

If it is more than the rate BPA charges its primary customers to recover costs — about \$36 per megawatt-hour — then the dams are among BPA's higher-cost assets. In other words, it would be losing money on them.

BPA won't say.

Mainzer said the Lower Snake River impoundments are among the lowest-cost dams in the system. BPA says the dams produce at a cost of \$10 to \$14 per MWh.

But the utility acknowledged that its analysis doesn't include fish mitigation. Experts have estimated those costs are at least double the \$10 to \$14 figure, if not more.

Malarkey estimates it conservatively at \$22 to \$33 per MWh. Jones calculates it at above \$40, and may be closer to \$45.

Jones' estimate is closer to BPA's \$36 rate, and it's more than it can sell that power for on the open market, especially when demand is low. Wholesale market prices average around \$22 per MWh.

BPA doesn't have that analysis for the Lower Snake River dams. In fact, it doesn't break down a fully allocated cost to produce a megawatt-hour at any single dam, contending that they all work together as one system.

At least it doesn't release that breakdown publicly.

"Some aspects of the dams' operations are understandably hard to calculate. But calculating the fully loaded costs of operating generating assets now and in the future should be easy," Malarkey said. "Unfortunately, BPA makes it hard."

Linwood Laughy, a Harvard University-educated activist based in Moscow, Idaho, said this issue cuts to the core of whether the dams are needed. Given all the problems wrapped up in the dams — the impacts on fish, the costs of mitigation, the never-ending litigation — why is there such a commitment to them?

"Is it worth an extra \$15 per MWh?" he asked.

Attacking the Army Corps' math



The fish ladder and other facilities at Lower Granite Dam. Jeremy P. Jacobs/E&E News

Mainzer and BPA declined to answer some questions about the dams, such as how much it would cost to breach the dams or how much it thinks it would cost to replace their generation.

They noted that under court order, BPA is working on a new National Environmental Policy Act review of the system that must consider breaching those dams.

The first draft of the environmental impact statement should be released next February.

But critics of BPA are skeptical about what the EIS will say.

In the late 1990s, an Army Corps of Engineers career official, Jim Waddell, was transferred to the Army Corps' Walla Walla District, in eastern Washington.

The agency was in the midst of preparing what would become the 2002 EIS, the last one conducted for the dams.

Waddell became deputy district engineer. As he started reviewing the economic justifications for the dams, alarms began going off.

"I knew what it was," he said. "It was shit."

No matter what he asked, Waddell was told economics supported keeping the dams.

He reached another conclusion. He recommended breaching them.

The corps opted for another option: Keep the dams and invest more than \$1 billion in fish passage.

Waddell was investigated and suspended.

Years later, Waddell, after retiring, returned to those economic calculations.

In 2015 and 2016, he published a series of papers that he said "flipped" the Army Corps' cost-benefit analysis.

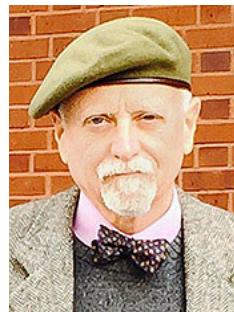
"It supported dam breaching, not keeping the dams," Waddell recalled.

In particular, he said the Army Corps vastly undervalued the costs of keeping the dams — billions of dollars in fish mitigation, as well as operations and maintenance costs. He said the Army Corps underestimated that cost by \$160.7 million per year, or 284%.

His conclusion: "The belief that we cannot afford to breach the Lower Snake River Dams is false. The opposite is true. Neither the American public, nor the U.S. Army Corps of Engineers, can afford to keep the four Lower Snake River dams in place."

Waddell has also said BPA and the Army Corps are overstating how much breaching would cost. BPA has previously said it would run \$1.3 billion to \$2.6 billion.

Waddell puts it at \$440 million.



Jim Waddell. Dam Sense

'Abandoning their functionality'?



Little Goose Lock and Dam on the Lower Snake River in eastern Washington. U.S. Army Corps of Engineers

Looming over the dams is a big question: What if they break?

The four Lower Snake River dams cost about \$50 million per year for operations and maintenance. That doesn't include any major turbine updates. Those are "capital investments" and come out of another pot.

BPA mapped out its capital plan in a 2016 "Hydro Asset Strategy." The document lays out two capital investment schedules, one for \$200 million per year and another for \$300 million.

The agency is currently working under the \$200 million regime, but plans to get to the \$300 million figure around 2023.

Only one capital investment is planned for any of the Lower Snake River dams: about \$138 million for three turbines at Ice Harbor dam.

BPA's big producers, like the Grand Coulee and McNary dams, get the bulk of the capital investments — \$2 billion in total through 2035.

BPA confirmed that "only routine" maintenance is planned for the Lower Snake River dams over the next two decades.

Mainzer also said, "They are not consuming a disproportionate amount of our capital."

But to some, that suggests BPA isn't acknowledging the costs of eventual upgrades.

"The problem BPA has is they are trying to dig themselves out of a hole," said Lewis of Idaho Rivers United. "They know they have significant expenses coming down the pipe, and they are trying to push this stuff out as far as possible to make things look better now."

To others, it suggests BPA doesn't plan to refurbish those dams.

"Are you telling me that it's such a low priority you aren't going to fund it?" Waddell said. "If that's the case, you've made the case that they aren't worth keeping."

There's some indication that might be the case.

In response to questions, BPA directed E&E News to a June 2018 "Integrated Program Review" slideshow.

One slide showed that leveling the cost to generate a megawatt-hour of power at the Lower Snake River dams would average out to \$11.41 — a figure that does not include fish mitigation costs.

Another slide was more revealing. It suggested that in determining future investment and "risk management," criteria would include a "unit by unit analysis to drive decisions — replace vs. rehab vs. maintain vs. defer."

That suggests, Jones said, that the Lower Snake River dams wouldn't be worthy of capital investment.

"They essentially confirmed that they are doing to a large extent what they should be doing: abandoning the Lower Snake River dams," Jones said. "They aren't abandoning the structure, but they are abandoning their functionality."

Risk Management Strategy

• The Past

- Targeted specific classes of equipment
- System-wide analysis of individual components prioritized "low-hanging fruit" equipment with very high NPV,
- New O&M requirements were funded through budget increases when acceptable.

• The Future

- Targeting critical plants with greatest risk of lost generation
- Unit by unit analysis to drive decisions — replace vs. rehab vs. maintain vs. defer
- Constrained O&M funds — absorb growth through efficiencies and accept additional short-term risk

BONNEVILLE POWER ADMINISTRATION | IPR JUNE 2018

SLIDE 8

[+] BPA detailed part of its financial and risk management strategy in this June 2018 slide. It highlights a change from a "system-wide" to "unit by unit" analysis, as well as "constrained" operations and maintenance funds. Bonneville Power Administration

Company opted to breach its dams



Iron Gate Dam in Northern California is one of four on the Klamath River scheduled to be breached. Jeremy P. Jacobs/E&E News

Even if the economics don't support keeping the dams, is there precedent for breaching multiple power-producing dams in the West?

One need look 600 miles south in the forests of Northern California.

On the Klamath River, four dams that have devastated that river's salmon runs are in the process of being decommissioned and breached.

The dams' private owner, PacifiCorp, came to the conclusion that the dams weren't worth continued investment. They generated too little power. And the company didn't want to pay for new fish mitigation measures that would have been required in the dams' relicensing process ([Greenwire](#), March 13, 2017).

If the four Lower Snake River dams were privately owned instead of belonging to a sprawling federal bureaucracy rooted in the New Deal, their owners would likely reach the same conclusion, said Steven Hawley, an journalist who has written a book on the Lower Snake River dams.

"It would be better if the system was owned by a giant corporation because they would be more accountable," he said.

"It's a giant irony."

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