June 2018

Bonneville Power Administration and the Lower Snake River Dams: The Folly of Conventional Wisdom

> *An organization of our size and scope has to be really good at asset management… the best. (We) need to make good capital allocation decisions. And be willing to ask hard questions about certain assets and asking 'are these economically viable?'* [1]
>
> – Elliott Mainzer, Administrator, Bonneville Power Administration March 14, 2018

On February 6, 2018, Steve Kern advised the Northwest Power and Conservation Council (NWPCC) that Bonneville Power Administration (BPA) is approaching a financial cliff. Kern is the General Manager of the Cowlitz Public Utility District, one of BPA's 135 utility district customers. The following month BPA Administrator Elliot Mainzer told the NWPCC "I'm not in a panic mode, but I am in a very, very significant sense of urgency mode. I feel that even though we've got 10 years left on our power sales contracts, that the time for action, and I think real action, is now."

According to BPA's own information, over the past eight years the federal agency has:

- raised electricity rates for its preference customers by 30%;
- blown through $900 million of financial reserves to avoid even greater rate increases;
- expanded its debt/asset ratio to 99%, with cash-on-hand to cover fewer than 60 days of operations;
- suffered a significant decline in revenues from the sale of surplus power.

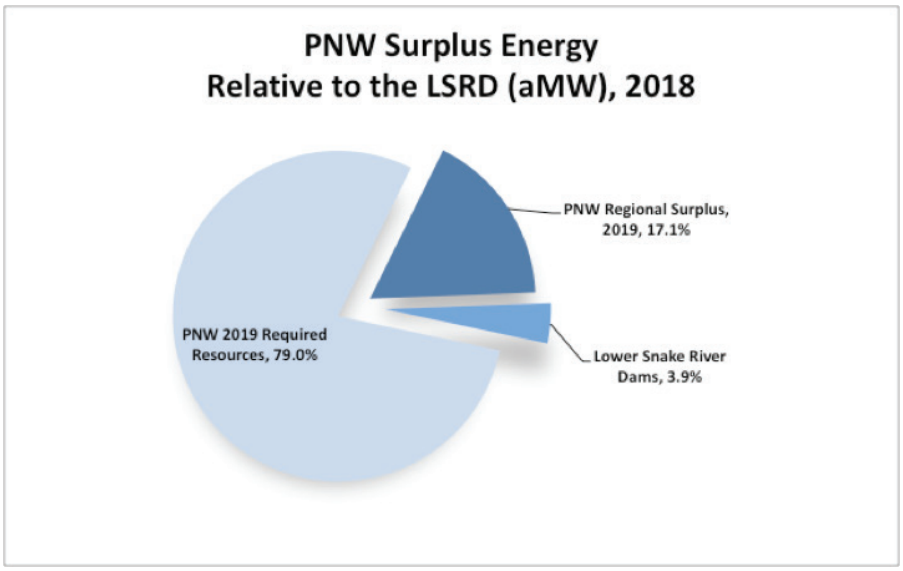
The textbook solution for a business dealing with a financial downturn is to identify and eliminate high-cost/low-value assets. BPA's *2018-2023 Strategic Plan* hints at one set of such assets — the Lower Snake River Dams (LSRDs) — but BPA has chosen to await the results of a federal court-ordered Environmental Impact Study due in 2021 to determine the LSRDs' fate.

Time is running out for BPA. Its survival and ability to meet the "vast public responsibilities" to which it swears allegiance require immediate action. Now consider the following facts.

The LSRDs produce approximately 4% of the Pacific Northwest's electricity, a region with a 17% energy surplus.

Over the past 17 years, the four LSRDs produced on average 943 annual Megawatts (aMW) of power. For comparison purposes, total Pacific Northwest (PNW) power production in 2016 was 26,400 aMWs. PNW load growth for the next twenty years will be met entirely by increased energy efficiency.[2]

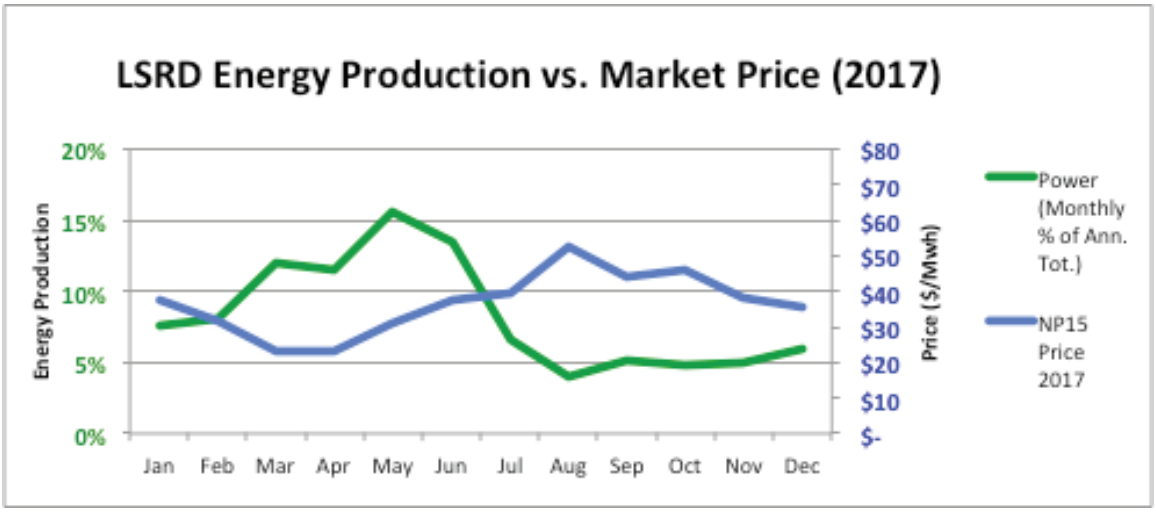
[1] Elliot Mainzer in presentation to NWPCC on March 14, 2018.
[2] Northwest Power and Conservation Council (NWPCC), Seventh Power Plan.



Source: BPA White Book, 2017, OY 2019, Tables 3.1 and 3.7.

Over 50% of the Lower Snake River Dams' hydropower is produced during the four months of the year with the least demand and lowest prices for electricity.

The LSRDs produce more than half their power during the spring run-off months of March, April, May and June, the time of year when demand for power is typically at its lowest level. During spring runoff the Pacific Northwest is awash in surplus energy, with energy supply from hydropower alone often twice BPA's total load demand.



Sources: LSRD power from Army Corps of Engineers (ACOE). Market prices from OASIS (NP15), Graph by Rocky Mountain Econometrics (RME). See footnote #3.

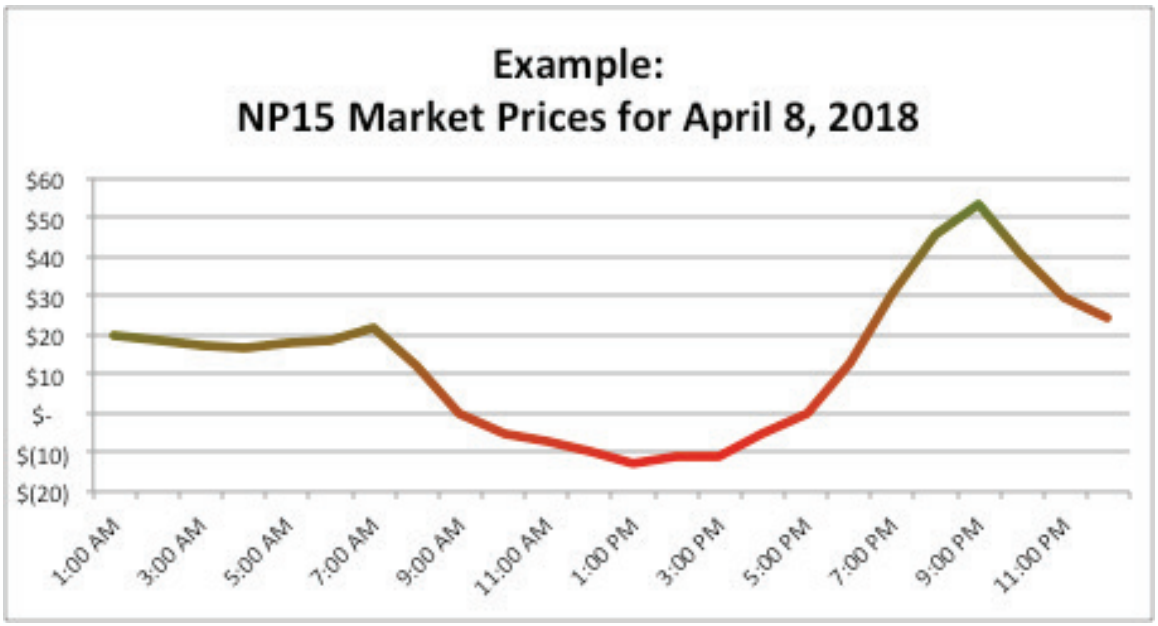
Surplus hydropower cannot be stored and is frequently dumped on the market, sometimes at negative pricing.

BPA sells power to Public Utility Districts and Direct Service Industry customers, called "preference customers," at a set rate under long-term contract. Power not needed to meet the load demands of these preference customers is "surplus power," which is sold on the open market at prices that vary hour-by-hour and day-by-day.

Water that does not pass through turbines, and therefore generates no electricity, is called "spill." Spilled water can become supersaturated with dissolved gases, which can cause gas bubble disease in juvenile salmon and steelhead. The unfortunate side effect for BPA of avoiding dissolved gas saturation, particularly during spring runoff, is the frequent generation of far more energy than BPA's contracted preference customers can absorb.

Under these circumstances, BPA employs its Over Supply Management (OSM) protocol and shuts down other sources of power such as wind farms. BPA is required to reimburse the owners of these sources for their lost revenues. The remaining surplus is sold on the open market, often for amounts far below the cost of production.

As demonstrated in the graph below, some surplus energy is sold for $0 or even at *negative pricing*. BPA actually *pays* power wholesalers, principally in California, to take the surplus power.

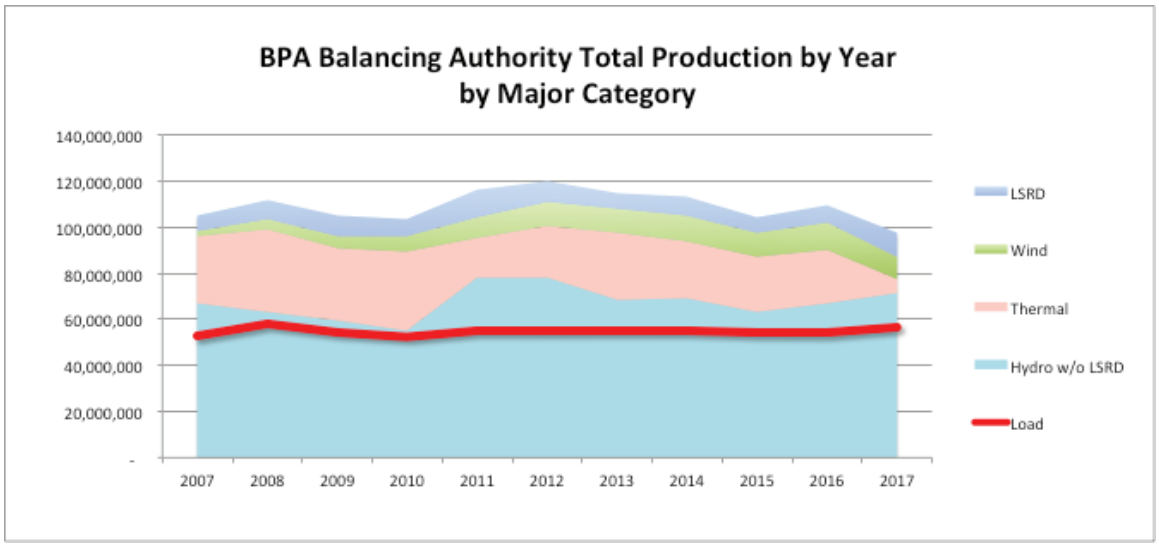


Source: California Independent System Operator (CAISO), Open Access Information System (OASIS), Northern California Trading Hub (NP15), Day Ahead Market (DAM).[3]

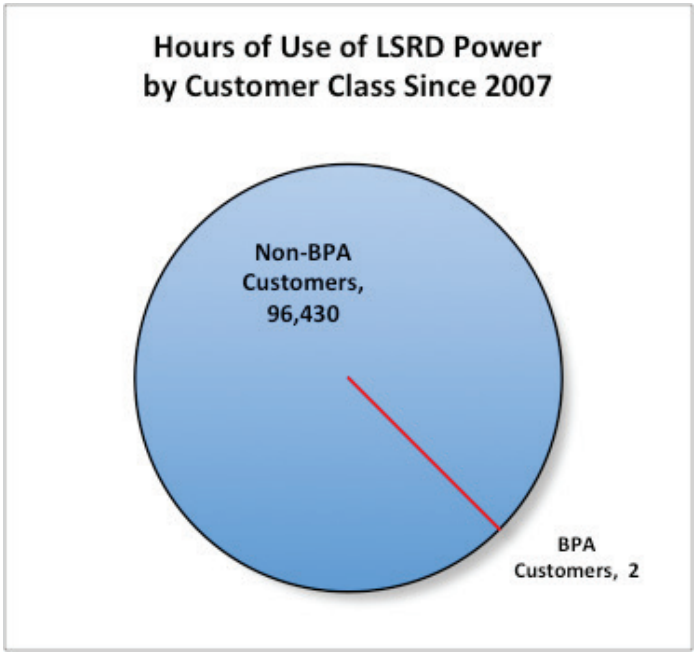
[3] CAISO-OASIS is the most transparent listing of open market energy trading west of the Mississippi. BPA normally trades at a hub called MID-C, a little farther north that does not publicly list its trading prices. MID-C is typically about $3/Mwh cheaper than NP15. To that end the prices shown in this chart are slightly higher than the prices BPA would see. Also, the prices shown here are for the day ahead market. These prices are "firm" for the following day and are typically a little higher than the Real Time Market (RTM), also known as the spot market.

All power produced by the LSRDs is *surplus* power.

BPA markets power from multiple sources, balancing system needs by drawing on hydropower, nuclear, wind, solar, and thermal (natural gas) energy sources. Since 2011, hydropower alone from twenty-seven of BPA's thirty-one dams—*excluding* the four LSRDs and all other sources of power—has produced more energy than the load demand of all of BPA's preference customers.



Source: ACOE; BPA Balancing Authority. Graph by RME.

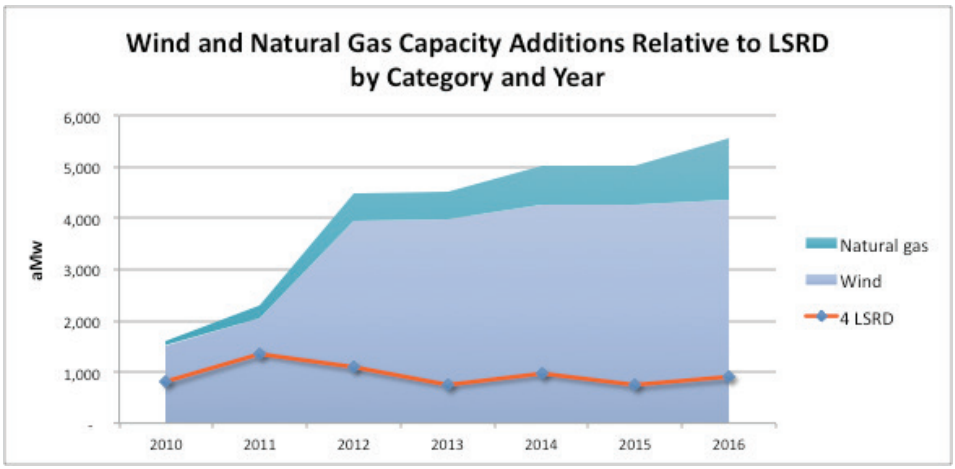


Source: ACOE; BPA Balancing Authority. Graph by RME.

From January 2007 through April 2018, a total of 96,430 hours, BPA required power from the LSRDs to meet preference customer load demand a total of 2 hours, both in 2009. Even then the dams were not needed to meet demand. Any of BPA's thermal plants could have been brought on line to fill the brief demand for additional power.

Those who argue that the power produced by the LSRDs could be replaced by alternative energy (wind and solar), at the same or slightly greater financial cost, assume (or falsely suggest) there is a need for replacement power. As the data show, no such need exists.

Alternative energy has already replaced the energy from the LSRDs six times over. BPA's abundance of *surplus* energy drives prices far below the cost of production. The last thing needed in BPA's portfolio is more energy that must be sold at a financial loss.



Source: Northwest Power and Conservation Council Power Supply https://www.nwcouncil.org/energy/powersupply/home/ and http://137.161.41.139/dd/common/dataquery/www/

Graph compiled by Rocky Mountain Econometrics

BPA faces major LSRD turbine rehabilitation costs exceeding a billion dollars.

In its 2014 report *Lower Snake River Programmatic Sediment Management Plan* the Corps of Engineers identified the life expectancy of the twenty-four turbines in the four LSRDs as 35-45 years. Two of six turbines in Ice Harbor Dam are currently being rehabbed. However, BPA's 2016-2030 Hydro Asset Strategy for Large Capital Forecast includes no major funding for the rehab of other LSRD turbines. By 2030, ten of these turbines will be older than sixty years, and the remaining twelve units 53-56 years of age.

At the $46 million per turbine rehab cost the Corps has budgeted for the fourteen turbines in McNary Dam, the cost of rehabbing twenty-two LSRD turbines after 2030 would exceed a billion dollars.

The Lower Snake River Dams produce some of the highest cost power in the BPA system.

BPA markets an approximate total of 82,000,000 Megawatt hours (MWh) of electricity each year from all its sources for about $3 billion. The non-profit federal agency is required by law to balance its revenues and expenditures. Thus BPA's price per MWh for its contracted customers is a sound estimate of BPA's costs. BPA's rate is presently $35.57 per MWh.

Over the past seventeen years the average annual production of all four LSRDs is 8,260,000 MWh per year. If BPA's average cost of production were applied to the LSRDs, total cost for Lower Snake River power would be $294M per year. However, one set of BPA expenses is disproportionately high for the LSRDs, that of Fish and Wildlife (F&W) mitigation.

BPA's direct expenses in BPA's current budget for F&W mitigation for damage caused by federally owned dams is $328 million.[4] Some would argue that the LSRDs are responsible for as much as 50% of those F&W expenses, or currently $164 million. A conservative estimate of $100M is a little over 30%. Based on this lower number, the added cost of power production at these four dams is $12.10/MWh, resulting in power costs of around $48 per MWh or about $396 million per year.

[4] These expenses do not include additional costs such as interest expenses on debt incurred on previous F&W projects or reimbursable costs paid to the Corps of Engineers for F&W projects.

In the last decade, surplus power prices have fallen dramatically and now average around $22/MWh. When LSRD power is sold by BPA on the surplus power market at the current average rate of $22/MWh, total revenue is $182M, a loss of over $200 million each year.

BPA's surplus energy prices are often even lower during the four-month spring run-off when the LSRDs produce the majority of their power. Thus BPA is selling $48 LSRD power for an average $22 or less. Where BPA once used surplus power sales to buy-down the rates its preference customers paid, the tables are now reversed. BPA Ratepayers are now subsidizing power shipped to California and other markets.

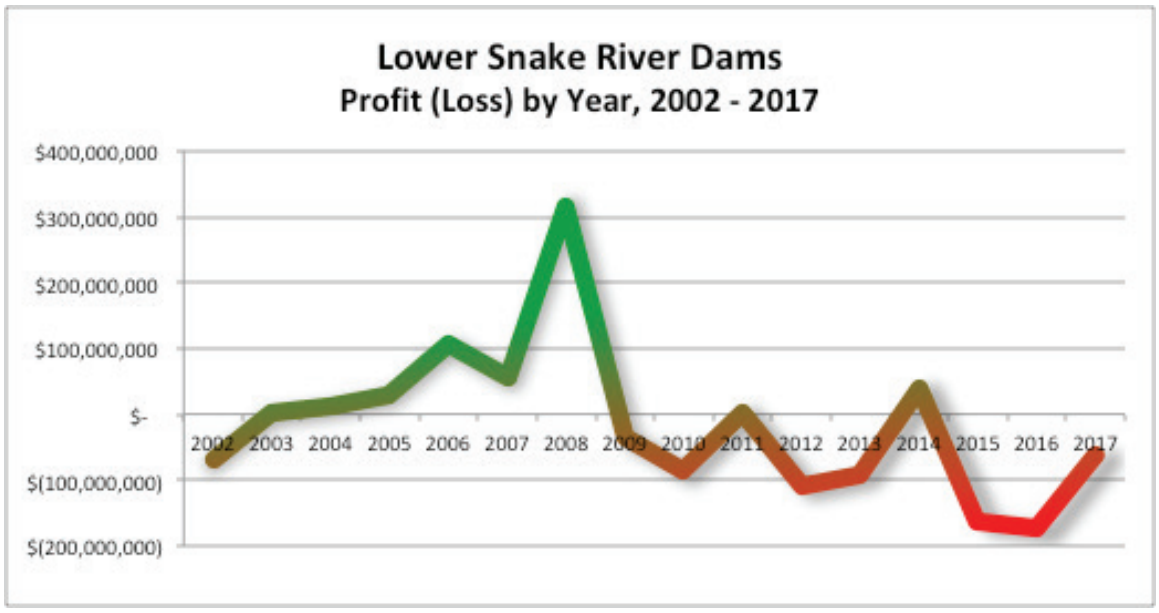
As is evident above, the LSRDs are high-cost/low-value and *unneeded* assets. Had these four dams disappeared in 2008, BPA could still have met its customers' full demand load every hour of the year and reduced its overall costs by at least $100 million per year. Today, conservation measures combined with recent thermal, wind and solar power additions to the system further increase the irrelevance of the LSRDs.

Note: As this report is being written, June 2018, the market price for surplus power continues to decline, a fact that does not bode well for BPA's future.

BPA, PUD customers, and ratepayers can no longer afford to keep the LSRDs.

As outlined in our earlier report, *Bonneville Power Administration: Threatened, Endangered, or on the Brink of Extinction*[5], BPA is facing a financial cliff.

Keeping spending at or below the rate of inflation and attempting to sell more surplus power into a saturated market with falling prices will not save BPA nor support its publicized claim of being "an engine of the Pacific Northwest's economic prosperity."



Source: Rocky Mountain Econometrics estimated profit (loss) of the LSRD based on 2017 BPA congressional budget and 2002-2017 OASIS (NP15) market prices.

[5] http://rmecon.com/examples/BonnevillePower%20May%202018.pdf

As LSRD turbines age beyond their life expectancies, maintenance costs will increase and production will decline. Legally required F&W costs continue to climb, and additional wind and solar energy constantly enter the market. If BPA is to survive, it must recognize that business-as-usual is no longer possible, including the agency's long-time support of the Lower Snake River Dams.[6]

In 2002, billboards and the sides of farmers' barns across eastern Washington's Palouse Prairie urged citizens to "Save Our Dams." A more appropriate message today would plead, "Save BPA —Remove the LSR Dams."

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• Jones is the owner of Rocky Mountain Econometrics (RME). He has served as an economist for the Idaho Public Utilities Commission and as advisor to Idaho governors Batt and Kempthorne on Lower Snake River dam issues.

• Laughy is a former Idaho outfitter, an author and environmental activist. In 2010 he co-founded Fighting Goliath, instrumental in stopping the conversion of the Clearwater/Lochsa Wild and Scenic River corridor into an industrialized megaload heavy-haul truck route.

[6] Note: This analysis is limited to the economics of the Lower Snake River Dams' hydropower production. The economic benefits of dam removal for sports angling and other outdoor recreation, tourism, and west coast commercial fishing are not addressed. Also not considered are U.S. treaty obligations or the improved odds of avoiding extinction of Snake River threatened and endangered salmon and steelhead or the southern resident orcas of the Salish Sea.