Fact Sheet

March 2010

# Power benefits of the lower Snake River dams

In the 1960s and early 1970s, the federal government built four large dams on the Snake River. This is the last set of major dams to have been built in the Federal Columbia River Power System. The FCRPS is the largest source of electricity in the Pacific Northwest and the largest source of renewable electricity in the nation.

The U.S. Army Corps of Engineers owns and operates the lower Snake River dams. All four of these dams are multiple-use facilities that provide navigation, hydropower, recreation, and fish and wildlife conservation benefits. These dams were not built to control floods.

Because of their location, size and ability to help meet peak power loads, these four dams do much more than generate energy. They are key to keeping the system reliable and helping to meet its multiple uses — including supporting wind energy.

## An important part of the Northwest's power supply

The useful output of a power station is measured in two ways — capacity and energy. The four lower Snake River dams are major power plants by either measure.

### Capacity to meet peak loads

Peak capacity typically refers to a power plant's value in meeting peak power loads. It is the largest amount of power a plant can generate operating at full capacity. Each of the four lower Snake River dams provides significantly more power capacity than a typical coal plant. The nameplate capacity of the four lower Snake River dams is as follows:

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| Ice Harbor Dam | 603 MW |
| Lower Monumental Dam | 810 MW |
| Little Goose Dam | 810 MW |
| Lower Granite Dam | 810 MW |
| **Total** | **3,033 MW**[1] |

**In comparison:**

| | |
|---|---|
| Boardman coal plant | 530 MW |

The four lower Snake River dams can operate above their rated capacity to produce up to 3,483 MW for several hours. In an extended cold-snap or other power emergency, such as another power plant shutting down unexpectedly, these four dams can produce in excess of 2,650 MW over a sustained period of 10 hours per day for five consecutive days.

According to the Northwest Power and Conservation Council, capacity is becoming increasingly important to the Pacific Northwest to meet peak loads in the summer as well as the winter.

Much of the year, BPA relies on the four lower Snake River dams specifically to help meet peak loads. This ability to produce power when the system needs it most is crucial to maintaining a reliable power supply.

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[1] For another reference point, the combined capacity of Pacificorp's seven dams on the Klamath River is 183 MW. (Source: Pacificorp relicensing application to Federal Energy Regulatory Commission.)

### Energy comparable to 27 years of conservation

Average energy is the annual output of a power plant divided by the 8,760 hours of the year. The four lower Snake River dams produce almost as much annual average megawatts as BPA's conservation programs have achieved in 27 years — at an investment of more than $2.3 billion:

| | |
|---|---|
| Four lower Snake River dams: | 1,022 aMW |
| BPA conservation programs (1982–2008) | 1,190 aMW |

Together, the four Snake River dams supply 12 percent of the average energy production of the entire FCRPS and 5 percent of the Pacific Northwest. This is enough energy to serve a city about the size of Seattle.

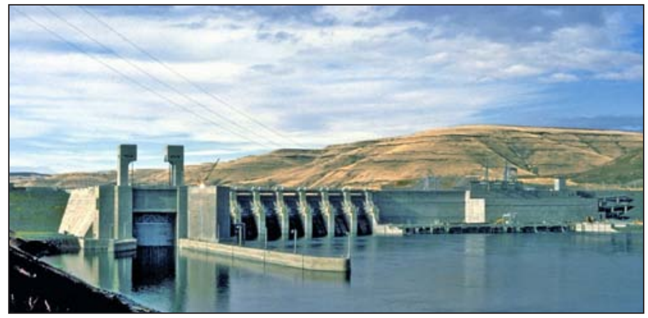
> *"Given the difficulty of reducing $CO_2$ emissions, discarding existing $CO_2$-free power sources has to be considered counterproductive."*
>
> — Northwest Power and Conservation Council

## Emission-free renewable energy

Hydropower is a renewable resource and produces virtually no greenhouse gas emissions.

Replacing the power from the four lower Snake River dams results in increased carbon emissions of 3.0 million tons year, according to the Council's Sixth Power Plan. This is an amount five times greater than the amount of carbon saved by renewable resource standards adopted by the states of Oregon, Washington and Montana combined.

*Lower Granite Dam — capacity 810 MW, energized 1975*



*Ice Harbor Dam — capacity 603 MW, energized 1961*

A 2007 Council study on the Northwest's carbon footprint concluded[2] that:

> *"Removal of the lower Snake River dams will not make additional $CO_2$-free energy resources available to meet future load growth or retire any existing coal plants. More than 1,000 MW of emission-free generation eventually will have to be replaced unless the supplies of renewables and conservation are considered unlimited. Given the difficulty of reducing $CO_2$ emissions, discarding existing $CO_2$-free power sources has to be considered counterproductive."*

## These dams keep the system in balance

While BPA markets power from 31 federal dams, only the 10 largest dams keep the federal power system operating reliably through Automatic Generation Control. Four of these 10 dams are lower Snake River projects.

Under AGC, when total generation in the power system differs from total load being consumed, automatic signals go to these few dams to increase or decrease generation. This maintains the constant balance of generation and loads necessary for power system reliability.

Of the other dams on AGC, Grand Coulee Dam and Chief Joseph Dam are on the Columbia River above its confluence with the Snake River. The other four are on the lower river, below the Snake River confluence.

[2] Northwest Power and Conservation Council, "Carbon Dioxide Footprint of the Northwest Power System" (Nov. 2007), p. 11.

Streamflows in the Snake and upper Columbia River often differ. When one river's use is particularly constrained, the other may be used more to help meet the total fish, power, flood control and other needs. (During spring and summer, the AGC capability of the lower Snake River dams is limited by the requirements of fish operations at these dams.)

## Snake River dams contribute to transmission system reliability

The lower Snake River dams are integrated into the transmission grid by a long 500-kilovolt transmission line that runs from western Montana to eastern Washington. Other generators are also connected on this transmission path.

The lower Snake River dams provide necessary voltage regulation on this long transmission path, keeping the system reliable.

Similarly, because the Snake River dams lie east of the other federal generators, they provide a significant technical contribution to transmission grid reliability.

*Lower Monumental Dam — capacity 810 MW, energized 1969*

Absent generation at these projects, the carrying capability of certain major transmission lines would have to be reduced.

## Hydro's flexibility helps support wind power

Wind is booming in the BPA transmission grid. Today, the agency expects to see about 6,000 MW on line by 2013, which is expected to give BPA the highest ratio of wind power to load of any power system in the United States.

### Automatic Generation Control on federal dams


Automatic Generation Control allows federal hydro operators to use the lower Snake River dams to meet loads minute-to-minute while using the Columbia River dams to support wind power. There are 31 federal dams in the Columbia Basin; the 10 largest have AGC capability.

Because wind power is variable, it must be complemented with other generation that can be increased when wind unexpectedly dies down or decreased when the wind blows harder.

Hydropower is an exceptionally valuable source of this capability:

- Dam operators can start, stop, increase or decrease generation by hundreds of megawatts in seconds to minutes (if water is available).
- Natural gas-fired combustion turbines are next fastest in their ability to quickly increase or decrease output.

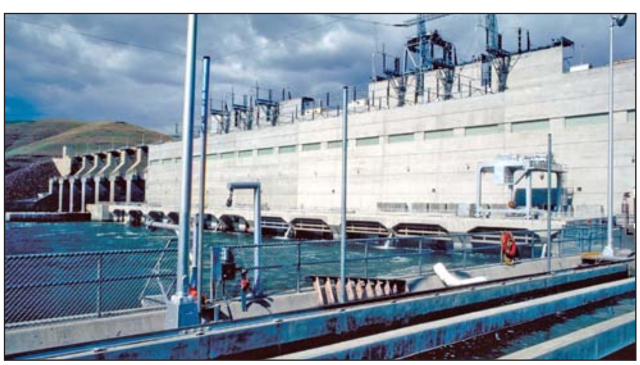
- Thermal plants such as nuclear and coal-fired generation take many minutes or hours to achieve similar ramps.

To maintain system reliability with more than 2,800 MW of wind power in its grid, BPA now adjusts hydro generation up or down by as much as hundreds of megawatts within individual hours to counterbalance unexpected increases or decreases in wind generation. BPA generally makes these within-hour adjustments at mainstem Columbia River dams while using the lower Snake River dams to help meet loads.

The four lower Snake River dams carry roughly one-quarter of BPA's operating reserves, capacity that utilities are required to have available to meet unexpected hourly changes in load. Without the flexibility and operating reserves that these dams supply, BPA would lose a substantial amount of its ability to deliver energy to the power system.

## Costs to replace the output of the lower Snake River dams

As described in the Council's Sixth Power Plan, the region can meet 85 percent of its expected load growth with cost-effective conservation (estimated at 5,900 aMW over 20 years). In addition, the Council's plan estimates the region can add 4,500 MW of new wind power. Some natural gas resources will be needed to meet remaining load growth and to provide capacity and flexibility for integrating wind generation and meeting peak loads.



*Little Goose Dam — capacity 810 MW, energized 1970*

Because the region is already planning to achieve all cost-effective conservation and renewables, the Council found that replacing the four Snake River dams would require "1,103 aMW of energy with 437 aMW coming from carbon producing resources, not including increased imports that would also most likely come from carbon producing resources."[3]

The Council's analysis also found that replacing the power from the four lower Snake River dams would cost an estimated $530 million annually, resulting in an increase in BPA's wholesale power rate of 24 percent to 29 percent.[4]

*Without the flexibility and operating reserves that these dams supply, BPA would lose a significant amount of its ability to deliver wind energy to the power system.*

Similarly, BPA's own analysis found that replacing the power from the four lower Snake River dams would cost the Northwest $444 million to $501 million (net of the dams' annual $38 million operation and maintenance costs), increasing BPA's wholesale power rates by roughly 25 percent.

## Conclusion

The four lower Snake River dams are important to the Northwest's power needs, provide important support for the transmission system and help keep our system low in carbon emissions.

3 Northwest Power and Conservation Council, "Sixth Northwest Power Plan" (Feb. 2010), Chapter 10.

4 Ibid.