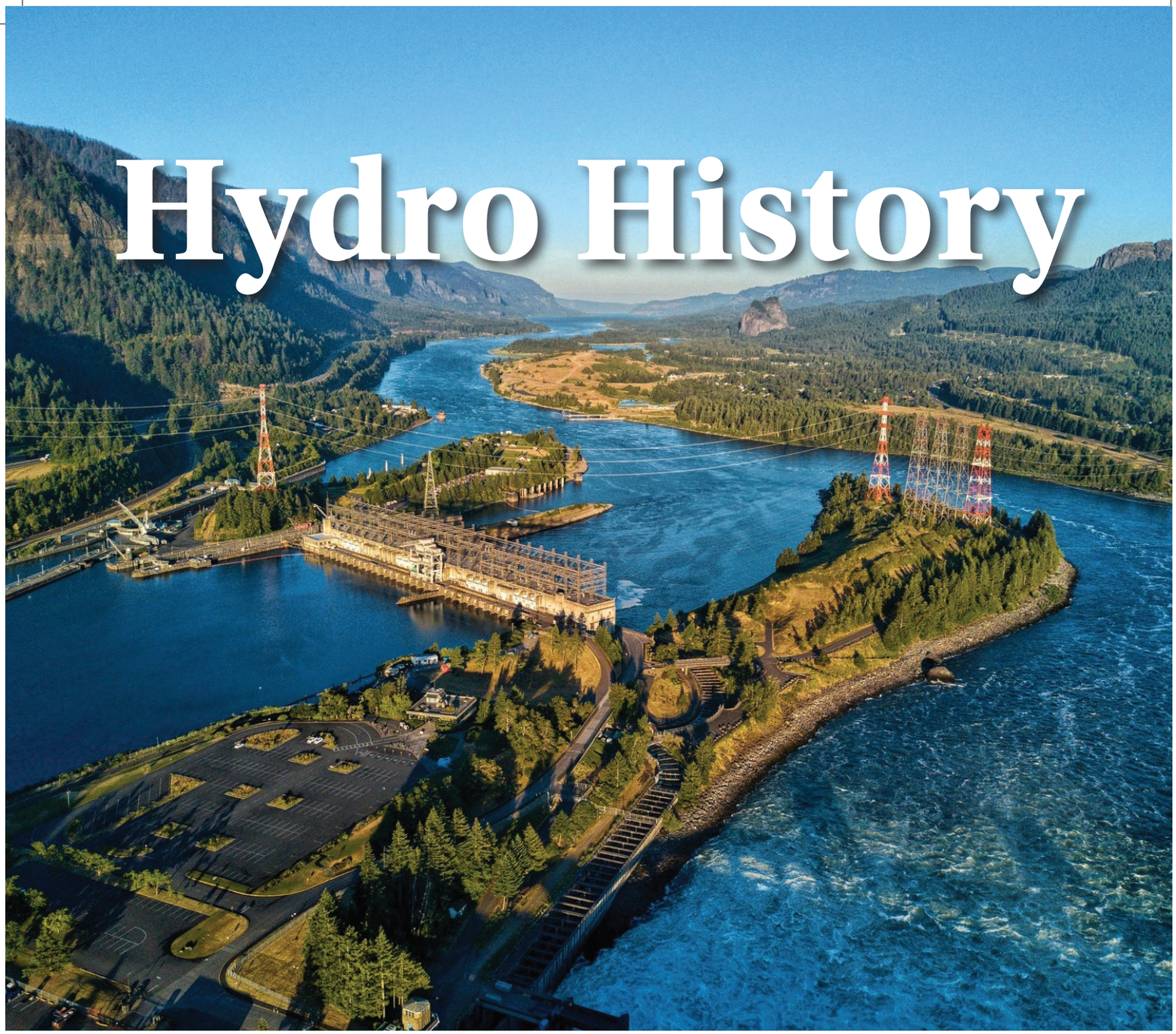
Hydro History



Bonneville Dam in Oregon is part of one of the world's largest hydropower systems. PHOTO COURTESY OF DEPARTMENT OF ENERGY

Hydropower tells a complicated tale of the nation's energy history

By Paul Wesslund

Electricity generated from hydropower tells an interesting story about today's energy trends that is deeper than just water flowing over the dam.

It's a story about a renewable resource that once generated nearly a third of the nation's electricity, a share that has declined dramatically throughout the decades with the rise of nuclear power, natural gas, and wind and solar generation.

More recently, it's a story about how weather and climate can affect energy supplies, as an extended drought—especially in the southwestern United States—has reduced the amount of water available to generate power.

It's also a story about diversity in fuel sources. Although hydropower is less a part of our national energy picture than it was in 1950, when it produced 30% of the United States' electricity, it's still a useful part of today's energy mix. And in the Northwest, it's one of the most important parts of a strong regional economy.

Hydro-Based Regional Economies

Hydropower converts falling water into energy. That could come in the form of a water wheel turning in a flowing river at an old grain mill, or a giant dam built on the Columbia River for flood control and to channel the water through a large turbine that generates electricity.

In the 1930s, dams went up across the

Tennessee River Valley and in western states. Today, hydropower generates about 6% of the nation's electricity. That percentage hides its local importance. All but two states—Delaware and Mississippi—receive at least some of their electricity from hydropower.

The Bonneville Power Administration, which generates power for much of the West, generated 84% of its electricity in large hydroelectric facilities in 2020.

While flowing water might seem to be an endless energy source, hydropower has a complicated relationship with the environment.

Some question hydro's claims as a provider of clean energy because larger projects involve building a huge dam that floods a river valley to create a reservoir. But the Environmental Protection Agency classifies hydro as a renewable resource, and U.S. Department of Energy figures list hydroelectricity as the source of 31% of the nation's renewable electricity.

Recent weather patterns also seem to be redefining what renewable energy means. Nationwide, hydroelectric generation fell 9% during 2021 because of drought conditions. In the West, BPA generates power from water falling within the Columbia River Basin, which extends into Canada. In 2022, heavy summer water flow allowed BPA to generate more energy than expected, and it was sold across the grid to other regions.

14 Million
households can be powered by the Northwest's hydroelectric output.

90%
of the Northwest's renewable, carbon-free energy production is hydropower.

34 Thousand
megawatts is the max generating capacity of the Northwest's hydroelectric dams.

47%
of the Northwest's total energy production is hydropower.

16 Thousand
megawatts is the average combined generating output of the Northwest's hydroelectric dams.

0
carbon emissions are produced in the generation of hydroelectricity.

Cost-Effective, Renewable Energy

Hydro is one of the cheapest forms of energy, especially after the initial investment. Its operation does not produce greenhouse gases. Importantly, utility grid operators like its flexibility as a source of electricity. It can be turned on and off relatively easily, especially compared with sources such as coal, nuclear, solar and wind.

Those benefits have raised interest in hydro projects. Around $8 billion has been invested nationwide during the past 15 years to add enough capacity to power 1 million homes.

While many hydro dams have been around for a long time and are ready to be retired, new projects are planned, including modernizing older hydro facilities. The DOE reports proposed projects that could generate enough electricity to power yet another 1 million homes.

In addition to upgrading existing sites, DOE reports at least 200 dams that don't generate hydroelectricity could have generators added. Out of about 90,000 dams in the United States, only about 2,200 generate electric power.

Those efforts will get a boost from the federal infrastructure law passed in 2021. That measure includes more than $2 billion in hydropower incentives for river restoration and dam rehabilitation.

Hydropower doesn't always get the attention of flashier advancements such as wind and solar technologies. But it dates back more than 2,000 years, when the Greeks used it to turn wheels that ground wheat into flour.

Only the future will tell the role hydro will play in the American energy grids, but its time-tested techniques and green energy benefits promise it will still be providing some level of power 2,000 years from now. ■