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Nuclear energy in the Northwest: today and tomorrow
Columbia Generating Station — a 1,170-megawatt nuclear power plant located near Richland, Wash. — has been attracting attention lately for its record-breaking performance.

Owned and operated by Energy Northwest, a joint action agency with 27 publicly owned member utilities, Columbia is boosting power production while reducing costs. Among its achievements:

- **Output:** Produced more electricity — nearly 9.8 million megawatt-hours — in fiscal year 2014 than any previous year in its 30-year history.
- **Operation:** Set a new record in 2015 for longest continuous operational run: 683 days.
- **Cost-effectiveness:** The cost of Columbia’s operations, maintenance, and fuel has decreased 4.4 percent annually over the last eight years.
- **Safety:** The plant has operated for more than 1,000 days with no employee or contractor lost-time accidents.

But just a few years ago, Columbia was attracting attention for another reason. In 2009, it had a series of scrams (unplanned plant shutdowns) that landed the plant on the Nuclear Regulatory Commission’s radar screen. That meant Columbia required heightened monitoring by the independent regulatory agency.

What led to the turnaround from poor performer to top performer? The answer: 1,100 employees focused on a dedicated performance improvement plan. Of course, organizations need leaders, and a virtual wholesale change in senior leadership is arguably where the transformation started.

When Mark Reddemann joined Energy Northwest as CEO in 2010, he set a goal of performance excellence. To help realize that goal, he brought in Brad Sawatzke, now the agency’s chief operating officer and chief nuclear officer. In turn, Sawatzke created a core management team led by Grover Hettel, vice president for operations, and Alex Javorik, vice president for engineering. Brent Ridge was
pulled from the mid-management ranks to serve as chief financial and risk officer and soon after received added duty as vice president for corporate services. Rounding out the new team was Bob Dutton, a seasoned industry attorney, coaxed from AREVA to serve as the agency’s general counsel and chief ethics officer.

But a nuclear plant is a complex machine that cannot be run from the top down. “It’s our people who are the key to Columbia’s success today,” said Reddemann. “We presented a proven industry method for changing work behaviors and achieving results. The EN team did the rest.”

That method has been phased in over the past four years, creating the building blocks that have resulted in higher performance.

“It’s important to recognize that not everything can be fixed immediately,” Sawatzke explained. “So we prioritized what we would go after based on identified gaps to excellence.”

The phased approach allowed Columbia to become a top industry performer in equipment reliability, an early focus area, which helped with predictability.

That early focus paid off with a record generation year in 2012, again in 2013, and again in 2014, exemplifying the strengthening performance of the nuclear industry as a whole. Reddemann said those records were only made possible by employees embracing a performance improvement program known as the Excellence Model.

Individual behaviors developed through this model helped teams led by Hettel and Javorik return the nuclear plant to 100-percent power recently following a challenging restart after the plant’s spring refueling outage.

Plant leaders understand that power equals value. As part of its drive toward performance excellence, Energy Northwest is focused on providing greater value to ratepayers. All the electricity generated by Columbia is sold at cost to the Bonneville Power Administration (BPA), a federal agency that markets electricity from 31 federal hydropower projects in the Columbia River Basin. Higher output from Columbia, said Reddemann, plays a significant role in reducing costs.

**Columbia’s benefit to the region**

In 2012, BPA and Energy Northwest examined the value of the Columbia Generating Station to the Pacific Northwest region. They found that the plant would save energy consumers more than $2.5 billion if it continued to operate, compared with its short-term or permanent closure and replacement by a natural gas combined cycle plant. The study timeframe covers 2012 through the expiration of Columbia’s operating license in 2043.

To validate the findings, Energy Northwest commissioned a study by IHS Cambridge Energy Research Associates (IHS CERA). The consulting firm concluded that Columbia Generating Station was the best value for ratepayers when compared with all practical alternatives.

IHS CERA pointed to other benefits, too. Columbia’s capacity was sufficient to meet demand, and its capacity reserve ensured reliability. The plant also is an emission-free source of electricity and adds “important diversity” to the Northwest’s generating portfolio.

When the Public Power Council, which represents the interests of publicly owned utilities in the Northwest, reviewed the IHS CERA study, it concluded that Columbia’s continued operation “is economically advisable for the region.”

Ridge estimates that EN’s cost-cutting efforts will save ratepayers approximately $125 million during the fiscal 2016 rate period. Contributing to these savings is a low-cost, below-market nuclear fuel purchase, which will provide fuel for Columbia through 2028.

An additional factor benefitting ratepayers is the regional cooperation debt initiative with BPA (see page 29 for details). This debt refinancing arrangement, together with Columbia’s declining power costs, will result in more than $1.3 billion in BPA rate case savings between 2012 and 2021, according to Ridge.

Asked about nuclear energy’s role, Scott Corwin, PPC’s executive director, said that it accounts for nearly 4 percent of the region’s firm energy resources and roughly 13 percent of BPA’s firm resources. Columbia is also the third-largest generator in Washington, behind Grand Coulee and Chief Joseph dams; 92 Northwest utilities receive a percentage of its power.

“We’re fortunate to have large hydro resources as well as nuclear,” said Corwin. “Because more variable resources, such as wind and solar, are being added to the mix, it’s...
important to have baseload plants that can run day and night, regardless of the weather.”

The Columbia plant produces enough electricity to power a city the size of Seattle, said Corwin. “It’s a critical piece of the regional resource pie—now and into the future,” he added.

Maintaining power portfolio diversification is important for resiliency and affordability, especially in the baseload category, said Jackie Flowers, manager of Idaho Falls Power, a BPA customer and member of Utah Associated Municipal Power Systems (UAMPS). And, she added, it’s important for those baseload resources to be non-emitting; that’s a role nuclear energy can fill.

“Many publicly owned utilities, including our co-op, benefit from Columbia’s power,” said Ed Dowdy, a member of the Coos-Curry Electric Cooperative board. Coos-Curry receives Columbia’s electricity through its membership in the Pacific Northwest Generating Cooperative, a generation and transmission co-op.

Corwin agrees: “Nuclear is meeting baseload power needs for public utilities and cooperatives, and doing so in a reliable and emission-free way.”

**Nuclear’s value nationwide**

The Columbia Generating Station is one of 99 nuclear units operating around the country. With an installed capacity of 99,125 megawatts, they provide nearly 20 percent of the nation’s electrical energy through base load operation.

These plants are important to the U.S. economy, contributing $60 billion annually to gross domestic product, according to a recent study by The Brattle Group, an economic consulting firm. And the U.S. nuclear fleet prevents the emission of 573 million tons of carbon dioxide annually, the study found.

“The economic and environmental benefits of nuclear energy are often undervalued in national and state energy policy discussion,” said Mark Berkman, co-author of the report.

As the cost of building new large-scale plants rises, however, utilities — especially publicly owned utilities — are looking for less expensive baseload, carbon-free generating options.

One such option is the small modular reactor (SMR). These reactors, which are typically less than 300 megawatts
in capacity, can be built in sequence to meet demand. They rely on natural forces like gravity and convection to ensure adequate cooling without the need for electrical power. Most of the reactor components can be manufactured in a factory and assembled on site.

SMRs: wave of the future?

A few years ago, the Western Governors Association began exploring what its 19 member states could do to create an attractive environment for nuclear energy, specifically for SMRs.

The work of the WGA served as the foundation for the Western Initiative for Nuclear (WIN), created by NuScale Power in 2013 to advance SMR technology in the West. Energy Northwest is a participant in WIN.

“We’re following SMR technology. And given our 30 years of nuclear experience with Columbia, it’s a good fit,” said Jim Gaston, general manager of Energy Services & Development at Energy Northwest.

“It makes sense for us to be the operator of the first SMR,” said Reddemann. “We currently don’t have sufficient demand in Washington, but when that day comes to increase carbon-free generation, we’ll be ready with the culture and experience to meet the need.”

In 2014, the state of Washington awarded a grant to the Tri-City Development Council to study the Hanford Site, which surrounds Columbia, as a possible location for an SMR. The study concluded that siting an SMR at Hanford was technically feasible and could benefit from the existing infrastructure and local nuclear workforce.

“We would be interested in discussing the location of an SMR at that site,” said Gaston.

Earlier this year, Washington state adopted a budget that includes funding for a study to identify possible locations in the state for SMRs, as well as recommendations on how the siting and permitting process for SMRs could be streamlined.

The first SMR?

The country’s first SMR could very well be built in the West. UAMPS, another joint action agency, began looking at the technology as a carbon-emission regulation hedge for its 45 member utilities, said Doug Hunter, CEO and general manager.

The agency also needs to address its fuel mix, he said. Coal accounts for roughly 40 percent of UAMPS’ generation sold to its members. If power sales to California are included, the coal percentage is closer to 60 percent. Hunter said that the expiration of operating agreements with coal plant operators in 2022, the investment required to deal with regional haze issues, and proposed EPA emission regulations spell the retirement of coal-fired generation.

“We saw SMRs as one part of our Carbon-Free Power Project,” said Hunter. The other two parts are distributed generation and energy efficiency.

So UAMPS began exploring small modular reactors. “We liked the passive safety features, the small size, and the scalability,” said Hunter. After studying various SMR designs, the agency decided that the design being developed by NuScale Power would best fit its needs. “We talked with Energy Northwest about the project. Then, we reached out to NuScale,” explained Hunter.

In 2013, UAMPS announced a plan to build a NuScale SMR facility in Idaho, potentially on the site of the Department of Energy’s Idaho National Laboratory. The 600-megawatt plant (comprised of 12 50-megawatt power modules) would be owned by UAMPS and operated by Energy Northwest.

“Nuclear culture doesn’t change with platforms,” said Ridge. “We’re already proven experts in nuclear safety and environmental stewardship. Now we’re talking about an advanced, low-cost source of incremental electricity and I think public power needs to lead the way.”

NuScale plans to submit a design certification application to the NRC in late 2016, and UAMPS intends to submit an application for a combined construction and operating license in late 2017 or early 2018.

If all goes according to plan, the SMR could be on line in June 2024, said Hunter. One of the aims of the SMR project, he said, is to talk with other utilities about UAMPS’ experience. “I see a lot of promise for joint action with public power utilities,” he said.

UAMPS already has support from its own members, said Hunter. That includes Idaho Falls Power.

“We are an interested party, looking at this resource,” said Flowers. “Being first has its challenges. But because of the widespread interest in the project, we hope to see participation that will limit utilities’ risk exposure.”

Idaho Falls Power currently gets electricity from BPA, but Flowers says it is pushing the limit of that allocation. “So we’re looking at the UAMPS project as a possible next
addition to our portfolio,” she said. “As there’s more certainty on costs, we’ll work hard to analyze this resource.” Pricing, she added, will be crucial.

Flowers says the United States has the gold standard for nuclear safety and regulatory requirements, so “we want to move forward with SMRs on that basis.”

Hunter believes the UAMPS project is the best way to ensure stable, reliable, and well-priced power to member utilities for decades to come.

“Public power needs the benefits of nuclear,” said Mike McGough, chief commercial officer at NuScale Power. The scalability and lower cost of these reactors caters to public power participation, he added.

But it’s still the early days for SMRs, noted PPC’s Corwin. First, the pilot project has to get off the ground, and then utilities need to tap the operational experience. “As with any new technology, it’s important to bridge the cost gap,” he said. “In the Northwest, people will be looking at SMR development.”

Until an SMR proves itself, Columbia Generating Station will likely remain the Northwest’s only baseline comparison for nuclear power. At some point, however, the region will need more baseload generation. If Columbia’s reliability and cost of power are an indication of SMR potential, then nuclear will certainly be a major contributor to tomorrow’s diverse, carbon-free energy mix.

Alice Clamp has written articles on renewable energy, nuclear energy, grid reliability, emerging energy technologies, and many other energy-related topics for more than two decades. For more information about the Columbia Generating Station, please contact Energy Northwest’s John Dobken at (509) 377-8369.

Regional cooperation debt translates into savings

In partnership with Bonneville Power Administration (BPA), Energy Northwest has agreed to continue to refinance its nuclear debt. Under this regional cooperation debt plan, approved by Energy Northwest’s executive board, the debt for Energy Northwest’s Columbia Generating Station and two unbuilt nuclear power plants will be extended by 19 years.

The revenue from these lower debt service costs will be used to prepay BPA’s higher interest rate debt to the U.S. Treasury, essentially trading a more expensive regional debt burden for Energy Northwest’s less expensive debt. It should be noted that Columbia’s original debt would have been paid off in 2012 had these opportunities to benefit the region, which began in 2001, not materialized.

The most recent arrangement is expected to result in interest-rate savings of $2 billion, while restoring BPA’s Treasury borrowing authority by up to $1.9 billion.

“Energy Northwest is taking action with a broad view of its regional responsibilities and is willing, for the good of the region, to carry the regional cooperation debt on its books for a longer period than previously scheduled,” said Brent Ridge, vice president for corporate services and the agency’s chief financial and risk officer.

The partnership with Bonneville provides “remarkable debt management opportunities to lower the cost of power for the benefit of the region,” said Ridge.