

Atomic Age Revisited

Nuclear power generation experiences a renaissance as carbon-free alternative

By Mike Federman

Nuclear power has reappeared on the energy horizon as an alternative to fossil fuels that can limit carbon emissions while addressing baseload expansion.

Electricity generation and production efficiency reached all-time highs at U.S. nuclear plants in 2007, according to the Nuclear Energy Institute (NEI), the policy organization of the nuclear energy industry.

Cost of production at the nation's 104 nuclear plants was at a record low, with an average cost in 2007 of 1.68 cents per kilowatt-hour, NEI statistics show.

"The public is saying, 'We're comfortable with nuclear power,'" says NEI spokesman Felix Killar. "This is not new technology anymore, and people are not as scared of technology as they once were."

Killar predicts construction of four to eight new nuclear plants in the United States could begin as early as 2010, with power generation available by 2015.

Nearly all U.S. nuclear plants are expected to apply for renewed

licenses, which will keep them operating into the middle of the 21st century, according to the U.S. Department of Energy.

The Tennessee Valley Authority last June brought back online its 1,120-megawatt (MW) reactor near Athens, Alabama, after mothballing the facility in 1985 for safety reasons.

It is the first "new" commercial reactor to start power generation in the United States since 1996.

A small reactor has been proposed to serve the city of Galena, Alaska. The "nuclear battery" would consist of a 10 MW Toshiba reactor that uses liquid sodium as a coolant instead of water.

The Western Divide

Despite being an integral part of energy production in the East and Midwest, only three of the 10 Western states have commercial nuclear plants.

The three-reactor plant in the Arizona desert near Wintersburg and the two-reactor plants along the California Coast near San Luis Obispo and San Onofre are operated by large investor-owned

utilities, which also have majority ownership of the power generated at the plants.

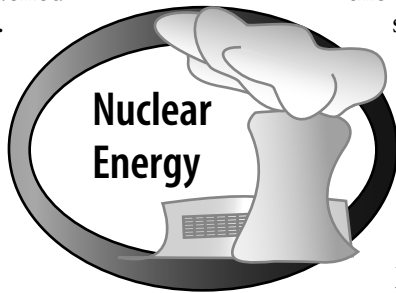
The Columbia Generating Station, a boiling water reactor on the Hanford nuclear reservation near Richland, Washington, produces electricity that is sold at cost to the Bonneville Power Administration (BPA).

The 1,150 MW Columbia reactor produces about 10 percent of BPA's load. As the only large, nonhydroelectric plant in BPA's energy mix, Columbia is a crucial component of the region's firm power during low-water years and dam drawdowns.

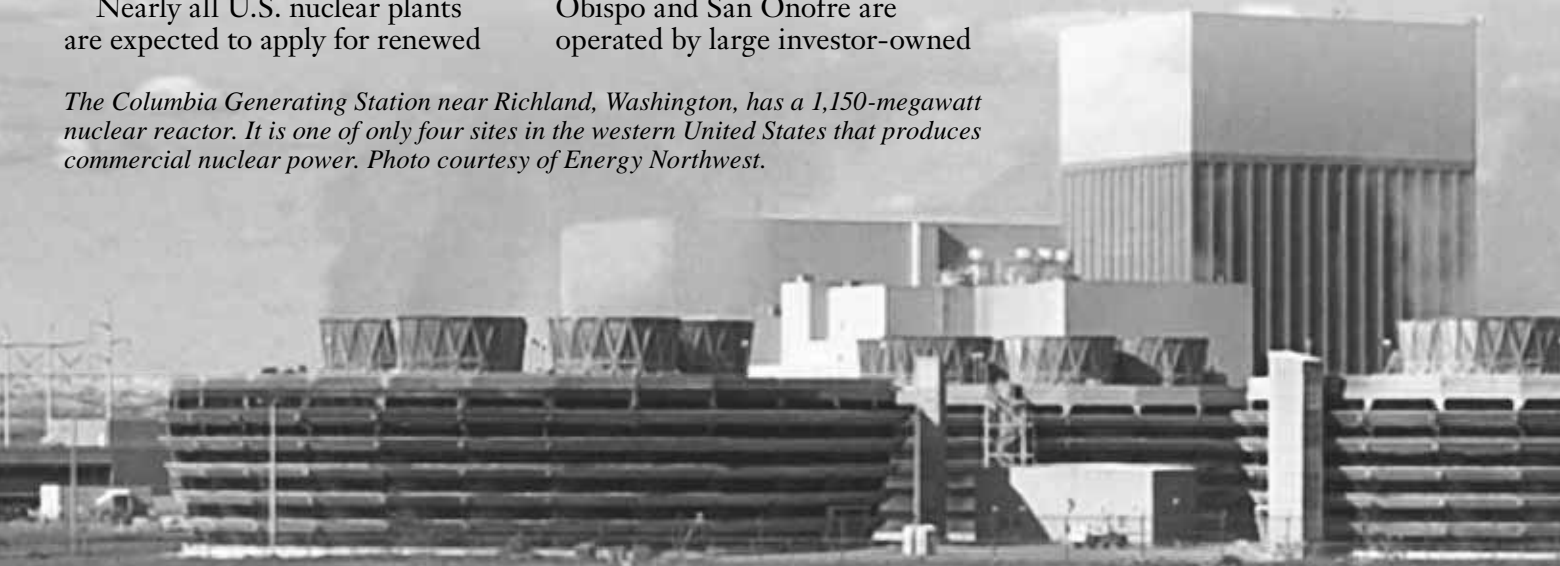
Columbia is owned and operated by Energy Northwest, a joint operating agency made up of 17 public utility districts and three municipal utilities in the state of Washington.

While the agency keeps its members updated on the nuclear industry, it doesn't envision expanding nuclear capacity in the near future, says Energy Northwest spokesman Brad Peck.

"We don't think there is sufficient support statewide to approve a new plant in Washington," Peck says. "You would need a realization that the region needs extra power. That



The Columbia Generating Station near Richland, Washington, has a 1,150-megawatt nuclear reactor. It is one of only four sites in the western United States that produces commercial nuclear power. Photo courtesy of Energy Northwest.



Power Points

- The United States leads the world in nuclear power generation. It has 104 reactors at 66 sites in 31 states.
- France is the world leader in nuclear energy economy. Its 59 reactors produced 78 percent of its electricity in 2006. U.S. reactors produced 19 percent of its electricity in 2006.
- Illinois leads the United States with 11 reactors at six sites.

- Vermont has just one nuclear reactor, but generates the highest percentage of electricity through nuclear power of any state: 73.7 percent in 2007.
- The largest U.S. nuclear plant is Arizona's Palo Verde. Its three reactors have a combined capacity of 3,872 megawatts (MW). By comparison, Hoover Dam's capacity is 2,080 MW.

Sources: Nuclear Energy Institute, World Nuclear Association, Energy Information Administration

day is coming, but it's not here yet."

Washington voters determine whether new medium-to-large power plants are built. Before that can occur, Energy Northwest would have to address longtime skepticism from nuclear opponents.

The agency's former name was the Washington Public Power Supply System (WPPSS). Its vision in the 1960s and 1970s was to build five nuclear plants in Washington. Only one of those reactors was completed.

WPPSS could not cover escalating construction costs, which led to a bond default in 1982 and billions of dollars of debt.

Even if a power-generating entity had approval today to build a nuclear plant, it would be the mid-2020s before it would be brought online, Peck says, because large components needed for construction are limited worldwide and take years to acquire.

Despite those limitations, Peck calls nuclear energy "the most appropriate way" to expand capacity in the Northwest.

"The demand for power and economic growth go hand in hand," he says. "Unless you are planning to have an anemic economy, you have to figure that demand will continue to grow."

While energy conservation is a vital strategy to offset demand, it has limits of its own.

"A society cannot conserve itself into prosperity," Peck says. "Eventually, demand will outstrip conservation, and the price of energy will go way up."

Good, Bad and Ugly

The benefits of nuclear power are a driving force in its resurgence.

A large nuclear reactor produces more than 1,000 MW of electricity, enough to power a city the size of Seattle. No fossil-fuel alternative can match that kind of capacity.

A large wind turbine produces 1 to 2 MW of power. It takes a lot of wind turbines to equal the output of a single reactor. And unlike the intermittent generation of wind power, nuclear plants produce firm power regardless of the weather.

Nuclear energy leaves no carbon footprint. Its primary emission is water vapor in the form of steam.

Permanent storage of used nuclear fuel, however, is a deterrent to convincing proponents of "no nukes."

Yucca Mountain in Nevada has been designated as a permanent storage site, but scientific and political obstacles have slowed its launch. The first potential date of operation is still a decade away.

Peck says used nuclear fuel can be recycled. He cites the success of fuel-recycling programs in other countries, such as France.

"If you recycle, it dramatically reduces the need for a Yucca Mountain-type repository," Peck says. "The rest of the world has proved that you can recycle nuclear material safely."

The politics of nuclear safety always have been part of the debate.

Just as Washington voters have a say in power plant development, Oregon voters passed a measure in 1980 that bans new nuclear plant construction without voter approval. It also requires a federally licensed nuclear waste repository to be operational before new nuclear plants can be sited.

Cost is another limiting factor.

In January, MidAmerican Nuclear Energy Co. scuttled plans to build a large nuclear plant in Payette County, Idaho. The company said it did not make economic sense to pursue the project at this time.

A second proposed Idaho nuclear plant, at a site near Bruneau, met with strong public resistance and permitting problems. Site developer Alternate Energy Holdings Inc. announced in April it was relocating its proposed \$4.5 billion project north to a site in Elmore County.

Beyond politics and economics, there is fear of a nuclear accident. Three Mile Island and Chernobyl continue to haunt the public psyche.

Whether the nuclear renaissance will flourish remains to be seen.

John Keeley, an NEI spokesman, says Western states are waiting and watching to see how the first wave of new nuclear plant construction proceeds in other parts of the country.

"If the industry can pull this off—if it can get these plants online on time and at cost," Keeley says, "there will be a second, much larger wave of construction that the West will be looking to participate in." ■

