

Small Reactors . . . *Big Problems*

Nuclear power development has stalled in the US, but not because the nuclear industry and the Department of Energy haven't been willing to throw buckets of taxpayer money at it. One effort focuses on small modular reactors (SMRs). SMRs will not be built without ongoing taxpayer-funded subsidies.

Today, the largest commercial US nuclear reactors have a capacity of about 1,300 megawatts (MW). SMRs might have a capacity of as little as 45 MW per reactor unit; several could be grouped together at a single site. The DOE has conducted some SMR research for a number of years, and it is now trying to foster commercial deployment. The first step has been to provide one-to-one cost sharing grants to help companies get their designs licensed by the Nuclear Regulatory Commission (NRC). The four most likely recipients in the first round of competition were Holtec, but its design is still in the very early stages; Westinghouse, which has decided to focus on business with greater economic potential, admitting "there are no customers" for SMRs; Generation mPower; and NuScale.

Generation mPower, which is led by Babcock and Wilcox and includes Bechtel and the Tennessee Valley Authority, won the first round of funding, worth as much as \$226 million through 2017. The DOE said it chose mPower because it "was the most capable applicant."

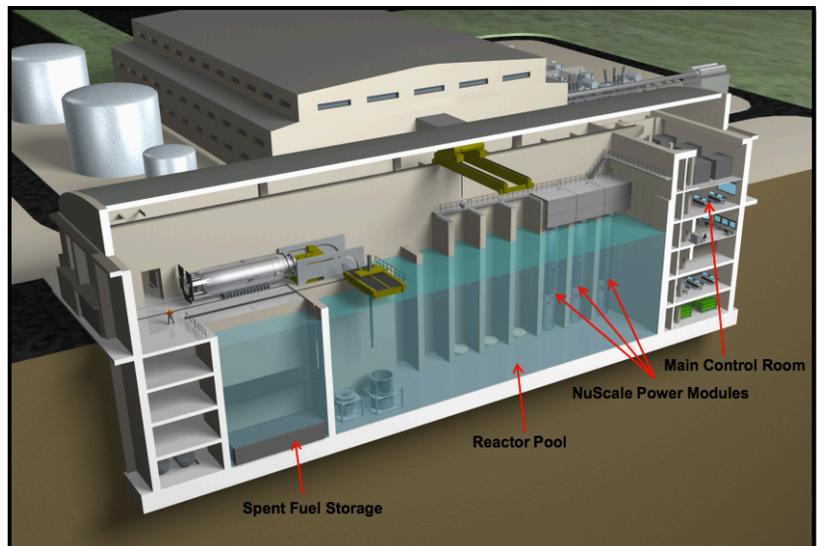
Since that vote of confidence, Babcock and Wilcox has tried, unsuccessfully, to shed its majority share of the project. Like Westinghouse before it, Babcock and Wilcox has announced it will put almost no more money in the SMR effort.

An Idaho Connection

In December 2013, NuScale Power won the second grant. Under the grant's cost-sharing provisions and subject to annual Congressional appropriations, NuScale could receive \$217 million through May 2019.

NuScale was spun out of Oregon State University in 2007 after the DOE paid for its original reactor development. Then, about three years ago, NuScale nearly sank into bankruptcy and sold a substantial stake to Fluor Corporation in October 2011. In August 2013 Rolls Royce joined the venture, and Enercon took an equity position in the company earlier this year.

Unlike mPower's grant agreement, which included efforts to obtain a construction and operating license from the NRC, NuScale's grant only covers design certification. So even under the best-case scenario, NuScale will be back for a lot more taxpayer money long before any reactor is a reality. The DOE asked Congress for \$97 million for the whole SMR program for 2015. When budget decisions are finally made after the elections, most of that could go to NuScale.



NuScale's small modular reactor would cover about 500 acres. Surrounded by water, spent fuel and up to 12 reactor units would extend many stories underground.

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NuScale spokespeople have made much of the possibility that their reactor might be built in Idaho. But the DOE will only spend \$1.25 million on the program in Idaho in 2014 and the Idaho National Laboratory's share of next year's \$97 million is zero.

In 2010, NuScale estimated the overnight capital cost for its 12-module, 540 MW plant would be about \$4,000 per kilowatt. By March 2014, the World Nuclear Association pegged the overnight cost at \$5,000 per kilowatt. Those are very pricey prices, and they're going in the wrong direction. In contrast, and depending on such things as location and technologies, the estimated installed cost per kilowatt of wind is less than \$2,500, while natural gas is about \$1,100 and energy efficiency \$1,000 to \$2,000. Peter Bradford, a former NRC commissioner, estimates SMR costs would need to drop 20 to 25 percent for the power to be competitive. He concludes, "The fundamental problem here is that there is no foreseeable market."

There are other financial concerns as well. Industry developers hope SMRs can replace the economies of scale with the economies of replication. But the senior SMR project manager for TVA has already acknowledged industry has to have purchase orders before it can get financing before it can build the production lines that attract...orders.

Furthermore, a recent DOE official's statement indicates the agency thinks most of the SMR market will be in China. But China's explicit nuclear strategy is to purchase a few foreign units and then reverse engineer them: "Made in China."

It's More than Money

Although the current SMR proposals are all light-water reactors, a familiar technology, the designs pose new concerns. That's often been the case in the nuclear age. Decades of research and development have been devoted to trying to overcome the fundamental safety, environmental, and economic problems that arise when we split atoms. New concerns are only now coming to light as SMR developers try to get their designs certified by the NRC. Here are a few: Some proposed measures might shortchange safety and security. For instance, containment domes could be thinner. Some developers, including NuScale, seem to think SMRs would affect a dramatically smaller area if an accident occurred and want to size their emergency planning zones accordingly.

Furthermore, many tests and inspections of today's reactors occur when the reactor is down for refueling. SMRs might not refuel as frequently. NuScale's schedule might double the time between tests and inspections. Because of the longer time fuel might be in reactors, the fuel would be "high-burnup," which presents storage and disposal challenges. Reactor size itself would also have an impact on inspections. Some pipes might be too small for the kind of thorough examination needed.

NuScale's design is an underground installation, which would raise new seismic and soil structure issues. The fact that its buried reactor units would be submerged in water raises materials issues as well. Every single component would have to withstand a fairly challenging environment.

It's not at all certain that a small modular reactor will ever be built in the United States, let alone in Idaho. But the Snake River Alliance will keep a sharp eye on the program to protect taxpayer money and our land, water, and people from further nuclear harm.