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ERIC WESOFF: MAY 25, 2010

NuScale Progresses with Small Modular Nuclear Reactors

Regulatory advances and public perception are just as important as nuclear engineering.

Corvallis, Oregon -- Some investors and entrepreneurs are braver than others. It's one thing to create the best iPhone app that mimics flatulence -- but to fund and join a large energy startup takes a certain level of testicular fortitude. Building a new automobile or solar factory or fuel cell is expensive and difficult and stands only a small chance of survival.

And if that startup happens to be developing a new take on light water reactors (that's nuclear reactors, son), well, that's a different animal altogether.

Although there are a few nuclear technology startups (Kurion, TerraPower, Hyperion, General Fusion, Tri-Alpha), the company with the clearest near-term chances of success seems to be Oregon's NuScale. This is not to diminish the work being done at the other firms. It's simply that NuScale's market-entrance strategy seems to better take into account the intricacies and glacial time-scale of Nuclear Regulatory Commission (NRC) approval.

Investor Maurice Gunderson of CMEA has labelled the small modular reactors (SMRs) designed by NuScale as one of the "game-changing" technologies in energy (along with utility-scale energy storage and fusion). CMEA is an investor in NuScale, along with Vulcan Capital and MKG, the Michael Kenwood Group.

We have reported on NuScale and SMRs numerous times, and we've covered the strong case that SMRs, small modular reactors, have made in their own favor.

Under the SMR concept, reactors can be built in factories and shipped to the site instead of being expensively and riskily built on-site. Rather than engineer and build reactors capable of producing over one gigawatt of electric power, SMRs can produce 10 megawatts to 350 megawatts of electricity (or heat). SMRs operate in similar fashion to conventional reactors or fossil fuel plants; nuclear fuel builds heat, which creates steam, which in turn is used to spin a turbine.

It is anticipated that SMRs will cost about the same to construct per kilowatt as large nuclear plants and will produce electricity at the same cost as a conventional nuclear plant (in the 6 to 8 cent/kWh range). SMRs are not new. The U.S. Army has built and operated small nuclear power plants in the past and the military uses small reactors to power naval vessels. But the incremental construction scheme of SMRs can change the financial and safety picture.

The sheer enormity of the undertaking and the level of commitment of this project were driven home at a NuScale-sponsored event I attended on the Oregon State University campus earlier this month. Remember that this is a startup project, not a multinational; most startups don't have to consider purchasing 8,490 tons of rebar or nuclear source term security issues.

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More than 85 people from all layers of the nuclear ecosystem gathered to check in on NuScale's progress to date. One of the factors contributing to NuScale's progress and credibility is their access to a small-scale (electrically powered) nuclear integral test facility at OSU in which the technology can be run through its paces. One can essentially put a hole in pipe in a nuclear system and safely simulate failure behavior.

Dr. Jose Reyes, the CTO at NuScale, has experience at the NRC, and that knowledge is absolutely crucial in bringing this regulation-intense project to reality. Dr. Paul Lorenzini, the CEO at NuScale Power, is both a lawyer and a nuclear engineer, relevant skills for this prodigious effort.

One of the distinctions of the NuScale design is that it employs passive cooling, making the design safer and less complex with no pumps and no back-up pumps. The technology used by NuScale is proven, and in many cases, borrows from existing LWR designs. This is crucial as it allows the NRC to stay well within their comfort zone.

That's allowed NuScale to make real progress on the regulatory and political side, where, in the words of Reyes, the CTO, "We've seen huge changes in the acceptance of small reactors," and, in the words of the CEO, "in how much of a recognition of the role small reactors can play there is." On a related note, the Obama administration continued to support nuclear technology with a $2 billion conditional loan guarantee from the DOE last week to help finance AREVA' s Eagle Rock Enrichment Facility near Idaho Falls, Idaho.

Reyes described the unit as a "stainless steel thermos, under water, underground." The firm has addressed safety issues throughout the design process: "Seismic isolators give remarkable seismic robustness," according to the CTO, and it is "walk-away safe" because of the water cooling design.

It is arguable that regulatory and political advances are as important as technical innovation in a project of this nature."You don't have to be a rocket scientist" to understand the value of SMRs, according to Lorenzini. He claims that the economics are validated along with the "incremental build-out option." Lorenzini stated, "The DNA in nuclear is economies of scale, but we asked 'how can we build a small plant to capture the economies of small?'" NuScale uses factory manufacturing, passive design and the ability to deliver the unit via barge, rail or truck.

NuScale has leveraged an existing supply chain with proven industry leaders like EPC firm Kiewit. The speaker from Kiewit said that they see "SMR construction looking more like conventional power plants." "What has held it back is that nobody believed you could reach the price point," said Lorenzini.

On the subject of price, Jay Surina, the CFO of NuScale Power, estimated the cost at under $4000 per kilowatt at the 540 megawatt level -- a number that rivals or beats the price of existing "cathedral-style" nuclear plants.

According to the firm, a 540-megawatt power plant constructed from 12 of NuScale's 45 megawatt reactors could produce power for 6 to 9 cents a kilowatt-hour on average over the plant's lifetime, said Bruce Landrey, NuScale's VP of business development.

NuScale hopes to submit design certification documents to the Nuclear Regulatory Commission in Q1 2012, and it will take about three years for the agency to complete its review. According to NuScale, approximately 95 percent of the regulatory basis for the NRC design review of a multi-module NuScale plant already exists. Using standard and proven computer codes, controls, components, control rod drives and enrichment levels, and fuel assembly design makes the approval process easier for the NRC and faster for all concerned. According to Lorenzini, there is a huge market for reactors in the 300-megawatt to 500-megawatt range.

About 20 percent of U.S. electricity comes from nuclear sources. Other nations like China, India and France will rely on nuclear for baseload power to an even greater degree going forward. We can't just wish it away.

Nuclear remains a financial and safety challenge and nuclear's detractors make good arguments -- everyone from Amory Lovins and his Rocky Mountain Institute to NIRS, the Nuclear Information and Resource Service, are able to point out the cost overruns and safety concerns. More valid objections here. I could go on.

Perhaps NuScale and SMRs can help the industry address some of nuclear's historic financial and marketing impediments.