Westinghouse has a more than 70-year history with nuclear energy, and we intend to support our customers for at least 150 years or more

**Interview mit Dr. Rita Baranwal,
Senior Vice President, Energy Systems, Westinghouse Electric Company**

Dr. Rita Baranwal

As Senior Vice President, Energy Systems, Dr. Rita Baranwal leads AP300™ Small Modular Reactor (SMR) deployment. She has 25 years of nuclear industry experience and has held this role since May 2023. Before, Dr. Baranwal was Chief Technology Officer and Senior Vice President of Digital and Innovation at Westinghouse.

Previously, Dr. Baranwal served as Chief Nuclear Officer and Vice President of Nuclear at the Electric Power Research Institute (EPRI). She had responsibility for the research and development (R&D) activities conducted by EPRI, providing support to more than 80 percent of the world's existing and advanced commercial nuclear fleet.

Before joining EPRI, Baranwal served as Assistant Secretary for the Office of Nuclear Energy in the U.S. Department of Energy (DOE) in a U.S. President-appointed and Senate-confirmed role. She led efforts to promote R&D on existing and advanced nuclear technologies that sustain the U.S. fleet of nuclear reactors and enable the deployment of advanced nuclear energy systems.

Prior to the DOE, Dr. Baranwal directed the Gateway for Accelerated Innovation in Nuclear (GAIN) initiative at Idaho National Laboratory. Under her leadership, GAIN positively impacted over 120 organizations.

Before joining the Idaho National Laboratory, Dr. Baranwal served as Director of Technology Development & Application at Westinghouse. Her previous positions at Westinghouse included director of Core Engineering and manager of Materials and Fuel Rod Design. Prior to joining Westinghouse, she was a manager in Materials Technology at Bechtel Bettis, Inc. where she led and conducted R&D in advanced nuclear fuel materials for U.S. Naval Reactors.

Dr. Baranwal is a Fellow of the American Nuclear Society (ANS). She serves on Advisory Boards for the US Nuclear Industry Council (US NIC) and the Nuclear Engineering departments of the University of Michigan and North Carolina State University. he also serves as a Commissioner on the Council on Strategic Risks (CSR) High Level Commission on Nuclear Energy and Climate Security, the Atlantic Council's Nuclear Energy and National Security Coalition, and the Board of Scholars at American Council for Capital Formation (and is the first non-economist selected to serve on this Board).

Dr. Baranwal has a bachelor's degree from Massachusetts Institute of Technology in materials science and engineering and a master's degree and Ph.D. in the same discipline from the University of Michigan.

Westinghouse presented its contender for the SMR-market, the AP300 past May, relatively late after several years of intensive discussion on SMRs and sometimes overdrawn expectations. What were the reasons for entering this prospective market now?

Westinghouse has been looking at small modular reactors for at least a decade, even pursuing an integral reactor for a time. But what really inspired the team was the success of the AP1000 reactor, five of which are operating in China and the U.S. with a sixth reactor set to come on line in the U.S. later this year or early next year. The performance of these reactors has been stellar. So, we began exploring whether we could leverage that experience in a small modular reactor. We spoke with customers and potential customers about what they would need in an SMR resource for their systems. What we heard told us that we were on the right track with a smaller but nearly identical version of the AP1000 technology. Since we launched in May 2023, we've had interest from Finland, Slovakia, Ukraine and many others. It's been a very exciting year for us.

The AP300 is based on the AP1000 which brings advantages such as a basic safety concept already approved by important international regulators and a readily available supply chain. On the other hand, it might make industrial, serialized production more difficult. Can the AP300 design overcome the economically unfavorable size effect by efficiency gains in manufacturing, construction and financing?

The cost-of-power per MW for an SMR will likely be higher than that of a large reactor because, as you say, there are obviously big differences in the amount of electricity generated between the two.

When we designed the AP300 SMR, we looked at what were the main cost drivers of a nuclear power plant and used innovation as a tool to add benefits and reduce costs. One reason we diverged from an integral reactor is the limited power offering, where one would need multiple reactors to reach the same power output of one AP300 SMR. For an Nth-of-a-kind AP300 we are targeting a billion US dollars apiece and a 36-month construction period.

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The AP300 SMR can utilize the same mature supply chain as the AP1000, which also uses modular construction elements, and the proprietary lessons-learned from deploying so many AP1000 reactors, six in operation or nearing operation and six more currently under construction. That will serve to reduce risks and keep costs down.

But another thing to keep in mind is the value that the AP300, and the AP1000, for that matter, can provide. Besides reliable, clean electricity generation, both can provide district heating for communities and process heat for industry, hydrogen generation and water desalination. For these reasons we've expanded the traditional customer base for a nuclear reactor because of that flexibility a GEN III+ reactor delivers.

What is the primary market for the AP300: smaller countries with smaller grids that can't accommodate or finance a big NPPs, industry that seeks an independent source for electricity and heat or the traditional large utility market in competition with large LWR?

I would say all of the above. When we looked at the current SMR offers we found that 300-MWe was an ideal output that would meet the widest market demands.

Of course, the AP300 is a complement to the AP1000, so both can be deployed together or, if a grid can't support a gigawatt-scale reactor, then an AP300 is ideal. All the benefits still apply. But if a customer wants an AP1000 and an AP300, there are added benefits from an ongoing operations and maintenance viewpoint because we are using the exact same technology.

When do you expect design completion, the first regulatory approval and the AP300 FOAK-plant?

When we launched the AP300 SMR earlier this year we set out a schedule in which we would target design certification from the U.S. Nuclear Regulatory Commission in 2027, followed by long-lead procurement and site-specific approvals with construction beginning in 2030. Connection to the grid would follow several years after that.

We started our process with the NRC the week after launch by submitting our regulatory engagement plan. It is helpful to have the same licensing methodologies as the AP1000 – this is not new technology to the regulator.

As with other SMR-designs the AP300 will probably only be economically viable if there is standardization of regulation at least in an important part of potential markets which will limit overhead cost. Will the AP1000 design base be an advantage in this respect?

Economic viability for SMRs is key, as with any energy generation resource. Standardization of regulation is an important piece but not the only factor where economics is concerned. Utilizing the AP1000 reactor's licensing methodologies and bases will help regulators in licensing the AP300 SMR. The AP1000 reactor has regulatory approvals in the U.S., China and Great Britain plus more than 18 reactor years of safe operations.

Also pursuing a joint-review where appropriate is helpful. For instance, we are doing this with our eVinci microreactor with U.S. and Canadian regulators

In recent months discussions about energy security and independence dominated the European debate, the European nuclear sector having a particular issue with soviet era built NPPs in several countries. What is the contribution of Westinghouse to address this issue and support its eastern European customers?

Since the Russian aggression in Ukraine, and even before to a degree, we have seen countries strive to develop a more secure energy future. Nuclear energy plays a vital role in establishing energy independence.

Westinghouse is uniquely situated to assist countries around the world achieve this goal. Not only can we provide state-of-the-art advanced reactor

technology like the AP1000 and AP300, but we also provide world-class fuel for Russian-made VVER plants, the only Western option for countries that have these types of reactors. We have contracts in place with nearly all countries that have VVER-type reactors to supply their nuclear fuel, and in some cases already supply fuel, and this has been a tremendous benefit to them. For example, Westinghouse recently delivered VVER-440 fuel to the Rivne nuclear power plant in Ukraine. Westinghouse also provides ongoing plant services to extend the life of existing nuclear plants and decommissioning services when it's time to retire a plant.

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Westinghouse was successful in having been selected for the construction of Poland's first NPP in November 2022. How is the project proceeding and what are the upcoming steps?

The project is proceeding well and there is progress on all the many facets to deploying three nuclear plants. We recently signed an engineering services contract together with Bechtel as a consortium, with PEJ, our customer in Poland, and that will support work on finalizing a site-specific design for the three units, the turbine island and balance of plant, among other things necessary for licensing and operating the technology.

The next major contract for the project would be signed in the 2025 timeframe, for engineering, procurement and construction. Overall, there is a lot of activity and it's continuing to ramp up.

In Europe there has been a surge in interest for nuclear power and in the intention to go for nuclear new build in several countries. This is a huge opportunity for all market players, but at the same time a challenge when it comes to implementation. What is required from your point of view to address the supply chain and workforce issues that could impede ambitious new build programs in Europe?

Yes, with few exceptions the world is embracing nuclear energy because of the efforts to decarbonize while maintaining living standards through abundant electricity, as well as the energy security issue we've discussed.

We currently don't anticipate supply chain or workforce issues that would significantly affect the deployment of multiple, even many, reactors over the next decade. One of the issues we've had looking back over the last two or three decades in the U.S., at least, is that we haven't built enough new reactors to maintain these streams. Now we have both, a skilled workforce and a mature supply chain, we should put them to good use building more reactors in the U.S.

In many of the countries where Westinghouse is pursuing new build opportunities, there is a strong nuclear energy base, some existing reactors, a knowledgeable workforce and supply chains. We have signed dozens of MOUs with suppliers in these countries, we have ongoing internship programs for students who want to pursue careers in nuclear energy, developing that next generation of nuclear workers.

Nuclear plants are 60 to 80 year-plus relationships we are building with people and communities, and that means not only jobs for generations of people but a cleaner environment and energy security. Westinghouse has a more than 70-year history with nuclear energy, and we intend to support our customers for at least 150 years or more.

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Nicolas Wendler has been Head of Press and Politics at KernD since August 2013 (Nuclear Technology Germany e. V. / German Atomic Forum e. V.) and started his career in March 2010 as Policy officer. Previously he was an international consultant for the international relations of the Young Union (Junge Union) of Germany among other topics of energy, climate and economic policy for the organization. Since January 2022 he is also the editor in chief at atw. Wendler studied in Munich and Bordeaux political science and economics and (North) American cultural history.