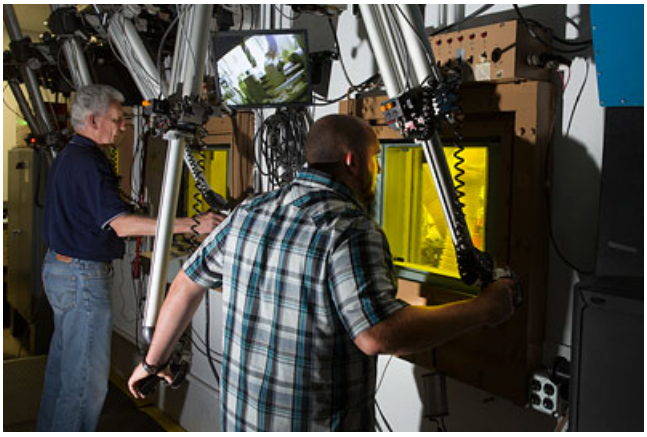

Westinghouse Electric Company's Materials Center of Excellence Laboratories (MCOE) Hot Cell Facility is now part of the Advanced Test Reactor National Scientific User Facility at INL. The ATR NSUF established an Industry Program to better serve research needs within the nuclear energy industry.

Industry Program forges new path forward

from the latest ATR NSUF Annual Report

To determine priorities that would benefit the nuclear energy industry, a federal research entity takes a deceptively simple approach: asking the industry what it wants.

The Advanced Test Reactor (ATR) National Scientific User Facility (NSUF) Industry Program, based at Idaho National Laboratory, works closely with nuclear power companies to help ensure those needs are met. The industry program is spearheading efforts that:

- Help industry to generate power as efficiently and safely as possible.
- Forge closer relationships between nuclear power companies and university researchers.
- Help to usher in a new generation of young nuclear engineers and scientists.

Joint projects help nuclear energy companies to maintain and sometimes even upgrade the fleet of reactors that produce roughly 20 percent of the nation's electricity. For university researchers, partnerships with industry provide relevance for their projects while energizing students about the real-world contributions they can make.

The new Irradiation-Assisted Stress Corrosion Cracking (IASCC) test rig at INL's Materials and Fuels Complex is a unique facility that can inspect highly radioactive materials.

"Everybody comes out ahead," said Dr. John Jackson, ATR NSUF Industry Program lead. "That includes the energy-consuming public, who ultimately reap the rewards through low-cost and safe power."

A major contributor to the Industry Program's success is the Electric Power Research Institute (EPRI). The nonprofit research and development organization's members represent about 90 percent of the electricity generated and delivered in the United States.

"We carry out research programs on a variety of issues related to nuclear power," said Raj Pathania, EPRI technical executive. "Our research results are used by the nuclear power industry to improve the safety, reliability and efficiency of their plants. Our results also are used by other stakeholders, including regulators and engineering code groups, to inform the development and implementation of technically sound standards and regulations. These activities not only benefit the power industry, but ultimately the public as well."

One of the first suggestions to the ATR NSUF Industry Program came from EPRI, Jackson said. EPRI proposed testing how a certain material, a so-called superalloy called Alloy X-750, performed in a reactor. Specifically, EPRI was interested in the growth of cracks in the material when exposed to the high-radiation environment of a reactor — a phenomenon known as irradiation-assisted stress corrosion cracking (IASCC).

For that initial project, ATR NSUF got the material from EPRI, machined it, and then irradiated it in the ATR at INL.

"This was the first civilian program that used the ATR center flux trap, where we have installed a controlled water chemistry loop," Jackson said. "Incidentally, the loop was another response to industry requests."

The project also led to development and installation of a new IASCC test rig at INL's Materials and Fuels Complex.

"There are only three or four other facilities in the world where you can do the sort of testing we can do with our IASCC test rig," Jackson said. "Ours is more heavily shielded and can handle higher levels of radioactivity…In addition to that, our systems are capable of testing full-size specimens."

Good relationships between industry and academic researchers are vital to advancing nuclear energy, according to Dr. John Jackson, ATR NSUF Industry Program lead.

That's important when testing certain classes of internal structural materials used in reactors. By measuring a full-size specimen, size-dependent uncertainty is eliminated. "It gives you a true, usable toughness number, and for engineering applications, you really need that."

The irradiated Alloy X-750 from the EPRI project is currently being tested using the INL IASCC test rigs, and the results will soon be evaluated. "This is an example of collaboration between the U.S. Department of Energy and industry, with DOE and ATR NSUF providing the irradiation facilities and irradiation exposures, and industry funding the testing," Pathania said, noting that the EPRI funding came from a project that has participation from the U.S. and international light water reactor industry.

Further experiments in the IASCC test rig will add to databases describing the effects of different irradiation doses on various structural materials.

"There's very little data in the world in terms of crack growth in these structural components under these kinds of controlled conditions," Jackson said. "The hope is to use the IASCC test rig, as well as our other state-of-the-art equipment, to begin to fill in some of these holes in the understanding of the behavior of irradiated materials, and highly irradiated materials in particular. This information is critical to the sustainably of the light water reactor fleet."

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Feature Archive