Rensselaer Secures $1.5 Million From the National Nuclear Security Administration To Launch New Nuclear Safety Research Program and Lab

Institute To Celebrate Launch of New Program With Symposium on April 27

Nuclear criticality safety and reactor safety are at the heart of a new initiative led by researchers at Rensselaer Polytechnic Institute.

Yaron Danon

The five-year funding plan calls for $1.5 million to be invested at Rensselaer by the U.S. Department of Energy Nuclear Criticality Safety Program (NCSP), managed by the National Nuclear Security Administration (NNSA). The funds will support a new nuclear engineering research program and laboratory at Rensselaer, dedicated to the careful measurement and analysis of high-accuracy nuclear interaction data. This data is used by researchers and engineers around the globe in a wide variety of nuclear physics applications, including nuclear criticality safety of fissionable material processing, the design of new and safer nuclear reactors, and many other applications of interest to the NNSA and the broader international nuclear safety and nuclear reactor community.

Led by Yaron Danon, professor in the Department of Mechanical, Aerospace, and Nuclear Engineering at Rensselaer, the new program will study basic nuclear interactions that enable more accurate predictions of energy production and shielding effectiveness in a working nuclear reactor. Results of the study will also enable better prediction of heat production in emergency and emergency shutdown situations, such as the recent crisis at the Fukushima reactors in Japan.

The Institute will hold a symposium on nuclear data for criticality safety and reactor applications on April 27 to kick off the new research program.

“To store nuclear material safely, you absolutely need to know the probability that the neutrons will interact with materials they come into contact with. Will the neutrons be absorbed? Would they scatter? Or cause fission?” said Danon, who is director of the Gaerttner Linear Accelerator Laboratory (LINAC) at Rensselaer. “If you’re writing computer code or building a computer model to represent uranium being stored in a concrete structure, for example, these probabilities are critical. For many years, our team has built a reputation as one of the world’s premier nuclear data laboratories accurately measuring these probabilities.”

The goal of the new research program at Rensselaer is to provide high-accuracy nuclear data for the international nuclear community. In any nuclear technology application – including commercial power generation, naval propulsion, medical devices, and processing and storage of nuclear materials – neutron interactions are of paramount importance, Danon said. To design ways of storing nuclear fissile materials for these products, devices, and systems, engineers require the ability to accurately calculate and predict how the fissile material will behave.

To generate this nuclear data, Danon and his students use the Rensselaer LINAC facility to precisely measure how a wide range of metals, composites, and other materials interact with neutrons at the nuclear level. The collected measurements are expressed as a probability that the neutrons will interact with different materials called nuclear reaction cross sections. These probabilities, once measured and validated, are made public and used by engineers and scientists around the world as inputs in a wide range of engineering models and simulations.

“Highly accurate data about these basic interactions enable engineers to design better systems with the proper safety margins,” Danon said. “It all starts with good data.”

For more information on Danon’s research and nuclear engineering research at Rensselaer, visit:

- http://www.rpi.edu/~danony/Research.htm
- http://www.linac.rpi.edu/index.html
- http://www.rpi.edu/about/inside/issue/v4n13/nuclear.html
- http://www.eng.rpi.edu/soe/index.php/undergraduate-academics/programs-overview/24-nuclear-engineering

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