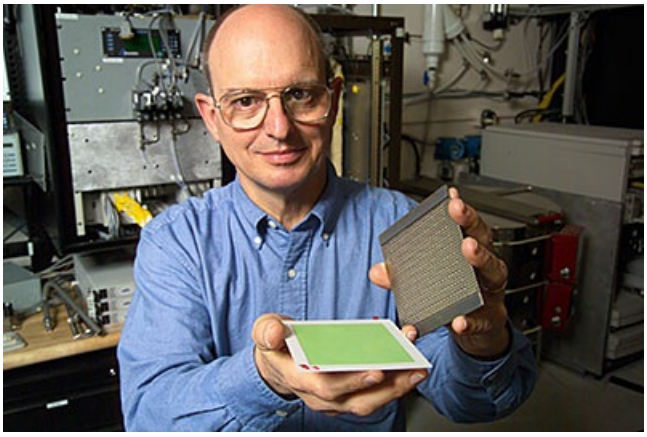

Idaho National Laboratory Fellow Steve Herring is retiring from INL this month after a storied career studying an extensive variety of energy and nuclear topics.

Idaho Engineer is an Energy Renaissance Man

By Casey O'Donnell, *INL Nuclear Science & Technology Intern*

Steve Herring, Idaho National Laboratory Fellow and deputy division director of Nuclear Systems Design and Analysis, has led a wide-ranging career. From superconducting magnets to high-temperature hydrogen production, and from submerged nuclear reactors to liquefied-natural-gas (LNG) vehicles, Herring has studied an extensive variety of energy and nuclear topics.

In short, Herring's career has been anything but boring.

Herring got his start in engineering as a 13-year-old, building a linear induction electric motor while in the hospital recovering from an appendectomy. Drawing on his dual degrees in electrical and mechanical engineering from Iowa State (1971), Herring served as an SP4 (specialist fourth class) in the U.S. Army Electronics Command Laboratories at Fort Monmouth, New Jersey (1971-74). After discharge, he studied at the Eidgenössische Technische Hochschule (Swiss Federal Institute of Technology) in Zürich, Switzerland, on a Rotary Foundation Fellowship. While there, Herring studied nuclear engineering for a year, taking courses taught only in German. Upon returning to the U.S., he earned his doctorate in nuclear engineering from the Massachusetts Institute of Technology and began working at INL in 1979.

Energy topics Herring has studied throughout his career span fission, fusion, liquefied natural gas transportation and hydrogen production.

Herring's first position at INL was part of the Fusion Safety Program, which conducted research into possible safety issues of nuclear fusion reactors. (All commercial nuclear reactors in the world today are fission reactors, splitting heavy nuclei. Fusion derives its energy from combining light nuclei, in a process similar to that in the sun and stars.) In 1987, he served as a visiting scientist in the Kernfoschungszentrum Karlsruhe, the premier nuclear research center in Germany, where he studied accidents in superconducting magnets.

The work with superconducting magnets, cooled by liquid helium at 4 K (-452 °F), led to research from 1996-99 on the safety of transporting and using liquefied natural gas as a fuel for trucks and buses (at a balmy -258 °F).

Turning increasingly to fission research in the early '90s, Herring investigated high-burnup fuels for light water reactors and the use of thorium-uranium mixtures for reduced plutonium production and for actinide transmutation — converting long-lived isotopes into energy and much shorter-lived fission products.

Other research led to a patent in 1993 for the design of a submerged nuclear reactor, to be located 20 to 50 kilometers offshore and 50 to 200 meters beneath the surface. The Submerged Power Station would be manufactured, refueled and decommissioned in a central facility and transported to the generating site for a 3- to 5-year operating cycle. The subsea location would have enhanced cooling, seismic, tsunami and hurricane advantages.

What may be the highlight of Herring's research is his work on the High Temperature Steam Electrolysis hydrogen production project from 2004 to 2010. This project centered on the use of a new prototype of reactor being vigorously researched at INL — the Very High Temperature Reactor — to produce hydrogen.

A Very High Temperature Reactor would operate at temperatures much higher than the light water reactors currently found in the commercial nuclear energy industry. These high temperatures (850 to 950 ˚C) can be used not only to produce electricity, but also to drive certain industrial processes, such as high-temperature steam electrolysis, the splitting of a water molecule into hydrogen and oxygen. In the future "hydrogen economy" envisioned by energy researchers, the hydrogen from electrolysis could be used as a vehicle fuel. In the nearer term, it could be used as a feedstock for the production of synthetic diesel, gasoline and jet fuel. For present-day purposes, the produced hydrogen can be used to upgrade heavy crude oil, producing conventional transportation

As an INL Laboratory Fellow, Herring works with an elite group of scientists to consider lab goals and identify the most pressing issues in the nuclear field.

fuels.

From 2011 to 2012, Herring served as a liaison for INL at the Department of Energy's Office of Nuclear Energy in Washington, D.C. In addition to his current job title, Herring also is chairman of Laboratory Fellows. The designation of INL Laboratory Fellow, the lab's top scientific achievement, recognizes an individual's outstanding contributions to the scientific and engineering community. As chairman, Herring is responsible for peer reviews, mentoring of younger researchers, advising and selection of award recipients. Most importantly, along with the other Lab Fellows, he considers the long-term goals of INL.

When identifying these lab goals, the Lab Fellows look for the most pressing issues in the nuclear field. "The problems we look at are issues that aren't going to go away suddenly," Herring explained. "They're long term."

For example, a primary INL goal is to find ways to increase the resilience of nuclear plants in response to natural disasters. In line with this goal, Herring is part of an international committee at the Nuclear Energy Agency which is investigating the responses of various infrastructures to Hurricane Sandy, the 1998 Quebec ice storm, the 2003 drought in France and the 2011 floods on the Missouri River. By examining this data, researchers can determine ways to improve structural robustness in the face of natural disasters. The committee's study is applicable not only to nuclear plants, but to all kinds of power plants and to city structures.

Reflecting on his time at INL, Herring touched on the unique nature of life in Idaho Falls.

"This is a small town in the corner of Idaho, and it's not a very populated area," he said. "However, as the home of INL, Idaho Falls attracts interesting people from all over the world. That's one reason that I've really enjoyed my career here and hope to keep in contact after retiring September 30."

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Feature Archive