Sodium Fast Reactors and the Versatile Test Reactor

Abstract: In September 2018, Congress approved an energy and water spending bill that included an increase in funding for the conceptual design of a Versatile Test Reactor. The primary mission of the VTR is to provide a fast spectrum neutron source to support fuels and materials testing for all advanced (non-light-water) reactors. Since the shutdown of sodium fast reactor Experimental Breeder Reactor No. 2 (EBR-II) in 1994, the U.S. has had no fast spectrum irradiation capabilities. The reactor type, core configuration, fuel specification, and physical configuration of the VTR will be based on the mature technology of sodium fast reactors in order to minimize program risk.

Dr. Fanning will present a brief overview of the history of fast reactors, why sodium is ideally suited as a coolant for fast spectrum reactors, and how coolant choice and core configuration can lead to unprecedented safety margins. These features will be incorporated into the VTR conceptual design. Pre-conceptual safety analysis will be presented to illustrate the inherent safety margins possible with SFRs.

Biography: Dr. Fanning received his Ph.D. in Nuclear Engineering and Engineering Physics from the University of Wisconsin and has worked at Argonne National Laboratory since 1994. He has made significant contributions in the areas of core design, fuel cycle analysis, waste form development, repository modeling, advanced systems modeling, and reactor safety. His primary research focus is on the development of codes and methods for fast reactor safety analysis. He currently manages the Safety and Engineering Analysis Group and oversees methods development and applications for a wide range of advanced reactor systems analysis activities. Dr. Fanning is the code manager for the SAS4A/SASSYS-1 safety analysis system and has extensive expertise in fast reactor design and safety. He was a member of the American Nuclear Society Special Committee on SMR Generic Licensing Issues and was nominated for the National Academy of Engineering’s 2010 Frontiers of Engineering. From 2014 to 2017 Dr. Fanning served as the U.S. representative for the Generation IV International Forum Sodium Fast Reactor Safety and Operations Project Management Board. Currently he serves as the U.S. representative for the Generation IV Expert Group.

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