

## **NE-20-23665, Coupled Neutronic and Thermal Hydraulic Analysis of a Natural Circulation Based Small Modular Reactor Using VERA-CS**

SMR, LLC is a wholly owned subsidiary of Holtec International (United States). SMR, LLC's mission includes establishing business alliances, securing regulatory acceptance, business, and project management of reactor projects, and promoting global acceptance of the SMR-160 small modular reactor design.

This collaborative activity will investigate transient behavior of SMR-160 design, while also providing steady-state, code-to-code comparisons and benchmarking for the core physics codes. For at-power operation, the primary flow through the core is driven only by natural circulation. Therefore, the nuclear and thermal-hydraulic parameters of the primary system are inherently coupled. As the SMR-160 design fully relies on natural convection for maintaining the coolant flow, eliminating the need for coolant pumps and external coolant loops inherent to conventional PWR designs, it raises operational challenges relating to neutronics of the core and on the core thermal-hydraulics. This provides an opportunity for the SMR-160 to utilize the capabilities of the Virtual Environment for Reactor Applications (VERA) code suite, which has a key advantage of coupling between its communicative counterparts providing a multi-physics simulation capability that captures feedback behavior in the reactor core.

SMR, LLC will analyze the SMR-160 steady-state reactor core and system behavior and response to anticipated transients and accident scenarios with Oak Ridge National Laboratory, who has demonstrated expertise with development of the VERA code suite and supports new emerging designs by applying VERA capabilities. Many aspects of the SMR-160 design will benefit from the coupled physics simulations with higher resolution results, which will help to better evaluate margins to safety limits.