



Consortium for **A**dvanced **S**imulation of **L**ight Water Reactors

A DOE Energy Innovation Hub for Modeling and Simulation of Nuclear Reactors

CASL became a DOE Energy Innovation Hub on May 28, 2010, upon receiving a 5 year, \$122 million award. The CASL core partners include four DOE laboratories (Oak Ridge, Idaho, Los Alamos, and Sandia), three universities (Massachusetts Institute of Technology, North Carolina State, and Michigan), and three industry partners (Westinghouse, Tennessee Valley Authority [TVA], and Electric Power Research Institute). As laboratory leaders in science, nuclear energy, and national security; universities with preeminent nuclear engineering programs; and vendor, utility, and R&D industry representatives, CASL provides a remarkable set of assets.

Tackling Tough Industry Challenges that Matter

CASL's mission is to apply existing modeling and simulation capabilities and to develop advanced capabilities to address three critical areas of performance for nuclear power plants:

- Reducing capital and operating costs per unit energy by enabling power uprates and lifetime extension
- Reducing waste by enabling higher fuel burnups
- Advancing fuels and light water reactor (LWR) design while ensuring safety



Executing a Compelling and Urgent Plan

CASL's team will create a usable environment, designated the Virtual Environment for Reactor Analysis (VERA), for predictive simulation of LWRs. This environment will incorporate

- High-fidelity models for reactor core phenomena
- A modern software system
- Validation against Westinghouse-designed TVA reactors
- Predictive simulation of the core performance of pressurized water reactors
- Deployment through industry test stands

Fostering Innovation Where It Is Most Needed

VERA will incorporate prediction of coolant chemistry, fuel performance, neutronics, thermal hydraulics, and structural mechanics; solution algorithms, and numerical methods for high-performance computing (HPC) systems; quantified uncertainties for operational and safety margins; and HPC-based multiphysics tools embedded in engineering reactor design and analysis workflows.



Virtual One Roof

CASL is implementing a unique “physical and virtual one roof” approach. The collaboration facility, called the Virtual Office, Community, and Computing (VOCC), is located at ORNL. VOCC provides a state-of-the-art scientific collaboration space to support virtual cognitive convergence of the best scientists, engineers, and industrialists.

Innovation at the speed of Insight

Delivering Industry Solutions through Predictive Simulation

CASL's goals include providing new insight into challenges of improved reactor performance and output, delivering a technology step change to industry (VERA), imparting innovation and agility to the reactor design and analysis process, informing the design and licensing of new reactors, and implementing an agile and flexible structure for successful public-private partnerships.

Point of Contact: Doug Kothe • CASL Director • 865-241-9392 • kothe@ornl.gov • www.casl.gov