# Department of Aerospace and Mechanical Engineering

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# The Consortium for Advanced Simulation of Advanced Light Water Reactors - A US DOE Energy Innovation Hub

**Tuesday, February 18, 2014, 3:30P.M.**

**Lower Level Auditorium, Geddes Hall**

Refreshments served at 3:00 p.m. in the Geddes Hall Coffee House

The Consortium for Advanced Simulation of Light Water Reactors (CASL) is the first U.S. Department of Energy (DOE) Energy Innovation Hub, established in July 2010 for the modeling and simulation (M&S) of nuclear reactors. CASL applies existing M&S capabilities and develops advanced capabilities to create a usable environment for the high fidelity predictive simulation of light water reactors (LWRs). This environment, designated the Virtual Environment for Reactor Applications, integrates components based on science-based models, state-of-the-art numerical methods, modern computational science and engineering practices, and rigorous verification and validation against data from operating pressurized water reactors (PWRs), single-effect experiments, and integral tests. The CASL M&S technology is being designed for efficient execution on today's leadership-class computers, advanced architecture platforms now under development, and design engineering workstation clusters. CASL vision's is to predict, with confidence, the performance of nuclear reactors through comprehensive, science-based modeling and simulation technology that is deployed and applied broadly throughout the nuclear energy industry to enhance safety, reliability, and economics. To achieve this vision, CASL's mission is to provide coupled, high fidelity, usable capabilities needed to address light water reactor operational and safety performance-defining phenomena associated with nuclear fuel and the reactor vessel and internals. CASL is focused on a set of specific Challenge Problems (CPs) that encompass the key phenomena currently limiting the performance of PWRs, with the recognition that much of the capability developed will be broadly applicable to other types of reactors. CASL defines a Challenge Problem as one whose solution is (1) important to the nuclear industry and (2) amenable to or enabled by M&S.

After giving a brief overview of CASL's goals and strategies, I will dive into the current computer and computational science technologies and methodologies embodied within CASL's Virtual Environment for Reactor Applications (VERA). VERA is not a single simulation tool but rather a collection of capabilities for scalable simulation of nuclear reactor core behavior - it is a flexible toolkit of components that can be exercised in various combinations for different Challenge Problems and for varying fidelity requirements or computational resources. M&S challenges for the VERA toolkit – some overcome and some not – will also be highlighted with illustrative examples.

**Dr. Douglas B. Kothe**
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*If you are interested in meeting individually with Dr. Kothe, please contact Linda at 631-5431.*