CASL Program Highlights
January 2015

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U.S. DEPARTMENT OF ENERGY | Nuclear Energy
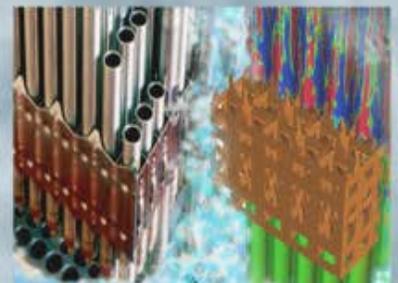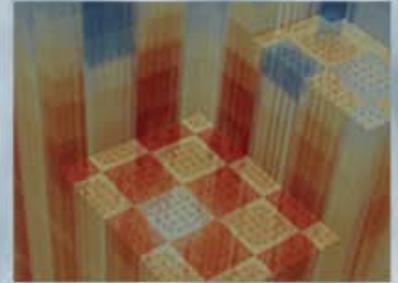
Computational Science Efforts Advance Fuel Performance Simulation

MOOSE/Bison-CASL capability more adept at simulating the important fuel pellet-cladding contact phenomena

- A new mechanical contact system in MOOSE has resulted in **significantly better solution convergence** for Bison-CASL

- Size of models that can be run with this system had previously been **limited due to excessive memory usage**

- Until recently, the set of nodes that can interact during contact (or "patch") was set at the beginning of analysis and held fixed; large patch sizes were required for large problems

- New capability implemented to permit periodic updating of the patch, resulting in **much smaller patches and hence much less memory usage**

- To demonstrate this capability, a full-length 2D fuel rod model was run with both a fixed and dynamically updated patch

- A time history of memory usage (right) demonstrates a **roughly 50% memory reduction**
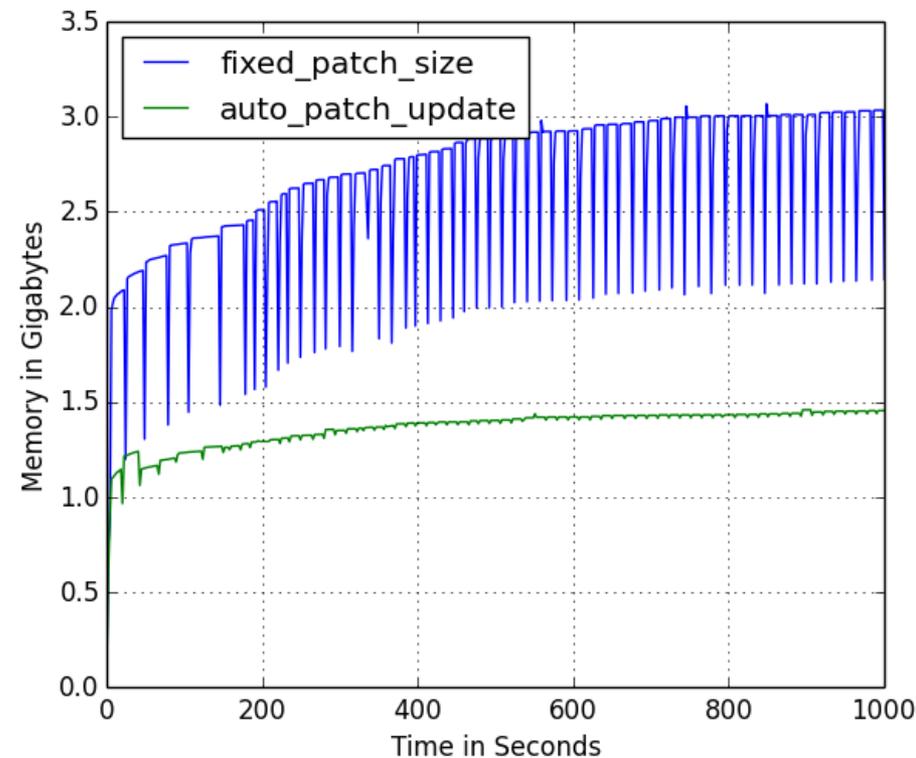

Comparison of memory usage on a full length 2D fuel rod model, with a fixed contact node locator patch with a size of 40 nodes, and the automatic patch strategy with a 3-node patch

CASL-U-2015-0233-000

Energy Department Announces Five Year Renewal of Funding for First Energy Innovation Hub

Consortium for Advanced Simulation of Light Water Reactors (CASL) to Receive up to $121.5 Million Over Five Years

In support of the President's call during his State of the Union Address to advance an all-of-the-above energy strategy, the U.S. Department of Energy announced on Jan 30, 2015 it would renew funding for CASL, an Energy Innovation Hub established in 2010 to develop advanced computing capabilities that serve as a virtual version of existing, operating nuclear reactors
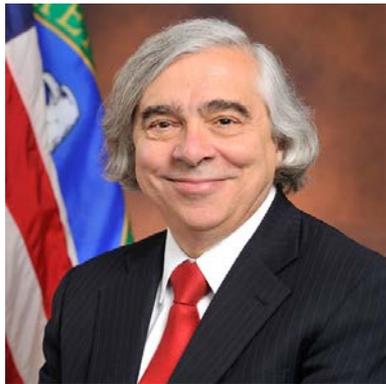
"As President Obama made clear during his State of the Union address, reducing carbon pollution and protecting the climate has to be a top priority. CASL's work to help further our understanding of nuclear reactors, improving safety while also making them more efficient, will help the transition to a low carbon economy."

- Energy Secretary Ernest Moniz

"The work being done at the Energy Innovation Hub at Oak Ridge National Laboratory is an important part of our country's ability to innovate and safely maintain our nuclear reactor fleet. I'm glad to see the Consortium for the Advanced Simulation of Light Water Reactors remains a priority as we rely on nuclear power to provide the clean, cheap, reliable energy we need to power our 21st-century."

**- Senator Lamar Alexander**

CASL-U-2015-0245-000

NCSU Researchers Receive IDC HPC Innovation Excellence Award

For Innovative Research Performed in the CASL Thermal Hydraulics Methods Focus Area (Lead: Igor Bolotnov, NCSU)

International Data Corporation (IDC) HPC Innovation Excellence Awards recognize noteworthy achievements by users of high performance computing technologies, thereby showcasing return on investment (ROI) and scientific success stories involving HPC. "IDC research has confirmed that HPC can greatly accelerate innovation and in many cases can generate ROI. The award program aims to collect a large set of success stories across many research disciplines, industries, and application areas," said Earl Joseph, Program Vice President for HPC at IDC. "The winners achieved clear success in applying HPC to improve business ROI, scientific advancement, and/or engineering successes. Many of the achievements will also directly benefit society."

Igor Bolotnov, NCSU

Researchers from NCSU conducted innovative research that will allow better prediction of thermal hydraulic behavior for current and future nuclear reactor designs. They analyzed the turbulence anisotropy in single-phase and two-phase bubbly channel flows based on DNS data. These novel simulations will help academia and later industry. Multiphase flow model development for computational fluid dynamics already benefits from high fidelity simulations presented in this work.
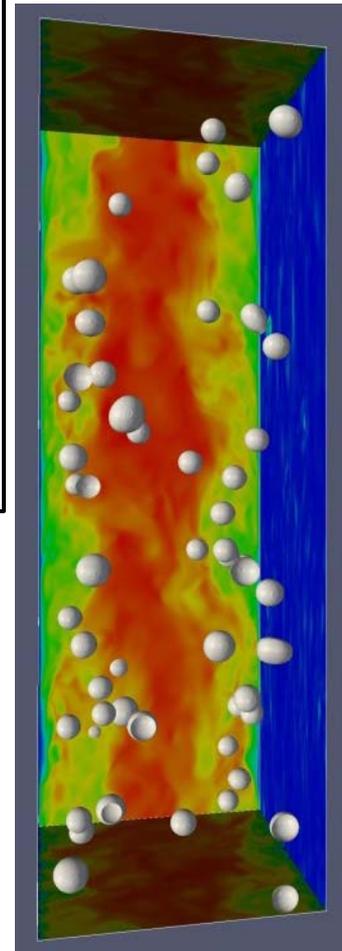
CASL Activities

CASL Collocation

- Simulation Data Issues
- CASL 2015: Celebrating the Past, Visualizing the Future
- Technology Control Plan for FY15
- Management/Ops Plan Review
- External Deployment Planning
- Technology Deployment & Outreach Post-CASL entity Planning
- Website Development Team
- EPRI Fuel Reliability Program presentation planning
- Licensing Strategy Update
- Thermal Hydraulics Methods CFD Update for DNB CP
- CIPS Update
- VERA Release Test Team
- L1 milestone status update – L1.CASL.P10.01
- Trac Alternatives
- Status on Preparations for the ANFM Workshop
- VERA Release Documentation Status
- Validation & Modeling Applications Kickoff

VOCC Tours

10 tours for January 2015

- Argonne National Laboratory
- TerraPower
- US China Civil Nuclear Energy
- Randy Stark, EPRI
- UTK User Experience Lab
- Paul Dixon, , LANL
- NRC
- BAE System Engineers
- General Atomics

Meetings

- NEKVaC Needs Workshop, Georgia Institute of Technology, Jan 15-16
- MPACT Code Camp, ORNL Jan 12-16

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