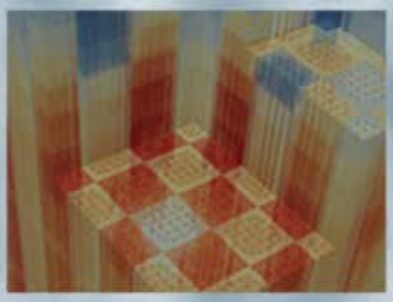
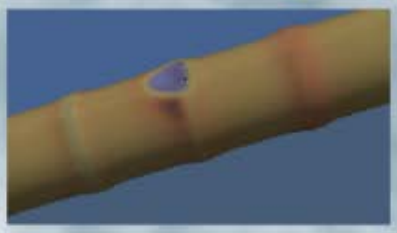
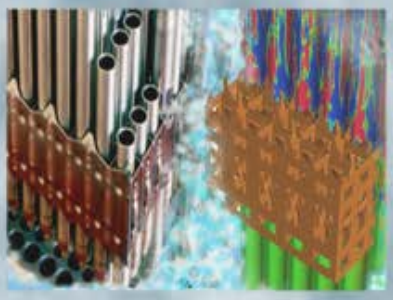
CASL
A DOE Energy Innovation Hub

CASL-U-2015-0234-000

CASL Program Highlights February 2015







Douglas Kothe
Oak Ridge National Laboratory

February 29, 2014

U.S. DEPARTMENT OF ENERGY | Nuclear Energy

CASL-U-2015-0234-000

CASL Demonstration of VERA Capabilities to simulate an iPWR SMR

Science

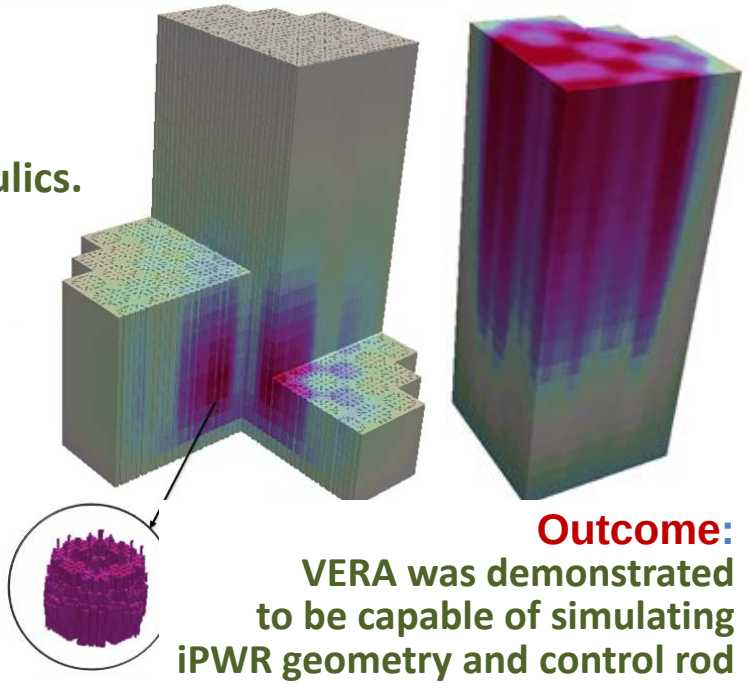
1. Pressurizer
2. Once-Through Steam Generator
3. Feedwater Inlet / Steam Outlet
4. Reactor Coolant Pumps
5. Electro- Hydraulic CRDMs
6. Upper Internals
7. Reactor Core

Illustration of the B&W mPower iPWR used as a basis for the model, courtesy of B&W.

Objective: Evaluate the Virtual Environment for Reactor Applications (VERA) ability to simulate an iPWR SMR.

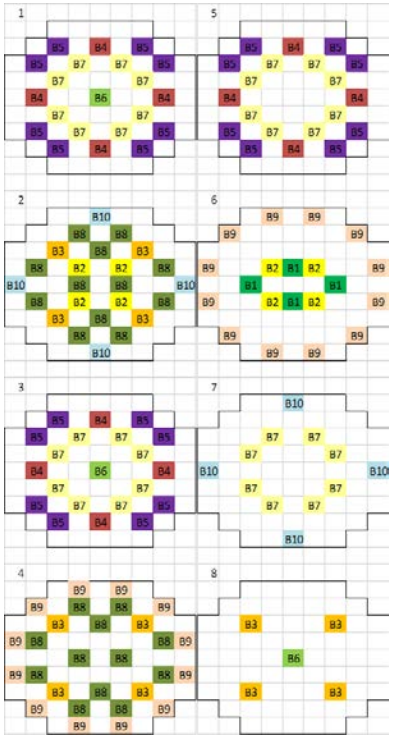
- ✓ Builds on work done in July 2014
- ✓ Incorporates control rod management similar to a typical BWR
- ✓ Utilizes coupled neutronics and subchannel thermal-hydraulics.

Maximum power peaking was observed at 150 effective full power days. Below left, core power distribution at 150 EFPD with inset showing locations with power peaking greater than 3.0; below right, coolant temperature distribution.



Below left: Normalized assembly average and (peak pin power) observed during the cycle modeled. Center: ten bank control rod scheme analyzed with bank insertion depth.

1.3469 (1.57281)	1.6767 (1.8178)	1.4706 (1.6877)	0.9617 (1.19726)	0.93924 (1.1604)
1.6767 (1.81773)	1.5816 (1.8150)	1.0615 (1.4632)	1.1343 (1.3078)	0.8786 (1.1442)
1.4705 (1.6877)	1.0615 (1.4632)	1.1375 (1.3520)	0.6860 (1.0282)	0.59224 (0.8879)
0.9615 (1.1972)	1.1342 (1.3077)	0.6859 (1.0282)	0.5050 (0.7672)	
0.9389 (1.1602)	0.8783 (1.1439)	0.5921 (0.8876)		



Move	EFPD	Bank	Steps
1	0	4	15
		5	15
		6	15
		7	15
2	150	2	20
		3	20
		8	0
		10	20
3	300	4	0
		5	0
		6	0
		7	0
4	450	3	0
		8	0
		9	0
5	600	4	30
		5	30
		7	50
6	750	1	60
		2	0
		9	0
7	900	7	50
		10	50
8	1050	3	50
		6	50
9	1200	ARO	228

Rods not shown are fully withdrawn

Outcome:

VERA was demonstrated to be capable of simulating iPWR geometry and control rod management for normal operating conditions.

Although the core cycle design and control rod management were determined to be unacceptable with respect to power peaking, the work did exercise VERA functionality that is necessary to iPWR SMR simulation.

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Independent review by Dudley Raine (B&W)

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Dr. Jess Gehin Named as CASL Direc
Effective April 1, 2015

CASL

- After a very successful Phase 1 and DOE approval of the CASL Phase 2 application Dr. Doug Kothe is returning to the Computing and Computational Sciences Directorate
- Gehin has been responsible for two CASL Focus Areas and delivery of key CASL accomplishments in the development and application of VERA
- Gehin's background well suited for Phase 2 applications of VERA research:
  - Ph.D. in Nuclear Engineering from MIT
  - Previous role as Reactor Technology R&D Integration in the Reactor and Nuclear Systems Division
  - Expertise is in nuclear reactor physics and reactor technology

Dr. James Duderstadt Chairs CASL Board of Director's Meeting

- CASL's BOD meeting held February 19, 2015 in Washington, DC chaired by new Board Chair Dr. James Duderstadt, President Emeritus, University of Michigan
- Key topics discussed included:
  - CASL Status and Phase 2 Approval
  - VERA IP and Licensing
  - DOE Annual Review Action Status
  - VERA Deployment Progress
- New board members in attendance:
  - Tom D'Agostino (at large member)
  - Randy Stark (EPRI)
  - Louis Martin-Vega (NCSU)

CASL Activities

CASL Collocation

- Collaboration Workshop
- Technology Transfer Workshop
- Physics Integration (PHI) VERA Infrastructure Standup Meeting
- CRUD Coordination
- Industry Council Webcast
- Website Development
- VERA Support Process
- PHI Review Meeting
- ANFM Session Slide Review
- TDO-VMA-PHI Deployment Update
- Student Workshop Discussion
- Streamlining Collocation Changes
- VMA Bi-Weekly Meeting

VOCC Tours

3 tours for February 2015

- DOE NE-5
- UTK-Nucelar Engineerg Students (2 tours)

Meetings

- DOE Industrial Consortia Initiative February Workshop, Washington, DC, February 2-5
- CASL Board of Directors , Washington, DC, February 19