

**CASL Industry Council Meeting**  
**March 26-27, 2013 – Cranberry Township, PA**  
**Minutes**

The sixth meeting of the Industry Council (IC) for the Consortium for Advanced Simulation of Light Water Reactors (CASL) was held on March 26-27, 2013 at Westinghouse in Cranberry Township, PA. The first day of the Industry Council was chaired by John Gaertner and the second day was chaired by Heather Feldman.

The meeting attendees and their affiliations are listed on [Attachment 1](#) to these minutes. Attendance was by invitation only. Representatives from 21 organizations were invited. Thirty-three people attended representing 17 organizations. Seven members of the CASL project team participated in the meeting – the program director, chief scientist, the quality manager, the project manager, the product applications coordinator, and four focus area leads/deputy leads. The DOE Director of Advanced Modeling and Simulation also participated during the second day.

The meeting followed the agenda included as [Attachment 2](#) to these minutes.

John Gaertner began the meeting with a warm welcome and announced that he will be retiring from EPRI at the end of March. Heather Feldman of EPRI will assume the role of CASL Industry Council Chairman. He noted that the relationship between the Industry Council and CASL is evolving from “review and comment” to “deploy and collaborate”. Following an overview of the agenda, action items were reviewed. The Industry Council website contains links to resources including minutes and presentations:

<http://www.casl.gov/IndustryCouncil.shtml>

The new members that joined the Industry Council include NPP owner/operators with analysis capability: Tyrone Stevens of Exelon, and SMR vendors: Dan Ingersoll of NuScale, Bill Arnold of mPower, and Michael Anness of Westinghouse. John’s presentation is included as [Attachment 3](#).

Doug Kothe, CASL Director, provided an overview of the CASL project including: Level 1 Milestones for the (first) 5 years, the program plan, program reviews, organizational structure, VERA deployment, Board of Directors engagement, NRC interactions, and DOE reportable milestones for Fiscal Year 2013. The Program Plan is reviewed annually and Doug plans to provide it to the Industry Council in the summer. Doug’s presentation is included as [Attachment 4](#).

Paul Turinsky, CASL Chief Scientist, provided an overview of the challenge problems. These are: Crud Induced Power Shift (CIPS), Crud Induced Localized Corrosion (CILC), Grid to Rod Fretting (GTRF), Pellet Cladding Interaction (PCI), Departure from Nucleate Boiling (DNB), Clad Integrity

during RIA and LOCA, Fuel Assembly Distortion (FAD), and Reactor Vessel & Internals Integrity. For each problem, he highlighted the problem statement, the need for advanced simulation as a resource to address the issue, the scope of the model needed and the VERA tools that would be used. Paul's presentation is included as [Attachment 5](#).

Rose Montgomery, CASL Product Applications Coordinator, and Jess Gehin, CASL Advanced Modeling Application (AMA) Lead, discussed product applications and VERA test stands. Rose discussed the two types of foundational products that are being developed by CASL: 1) Solutions Technology (know how) which could be communicated via publications in the public domain or via conversations with the CASL staff, and 2) ModSim Technology which is the external release of VERA. External releases of VERA are expected to occur annually and "snapshots" are internal releases that may occur about four times in a year. The target platforms for leadership class HPCs and industry class HPCs were discussed. Test stands can target the requirements for the industry class HPC which are on the order of 1,000 cores, 8 Tflops of computer speed, and 3 TB of RAM. VERA-CS is considered the foundational, coupled physics tool comprising models for neutronics, thermal-hydraulics, and fuel rod performance. The industry challenge problems are helping to drive the requirements in VERA. Rose concluded the presentation with the approaches for two of the challenge problems: CIPS/CILC and GTRF. Rose provided the Industry Council with the document "Product Description, Revision 1" and asked for comments. Jess then provided an overview of test stands. A test stand will serve as the mechanism by which an early adopter can gain access to VERA to enable industry users to become familiar with the product and to provide feedback to the CASL team. Test stand selection criteria have been developed and documented in CASL-U-2012-0146-000 which is available on the IC Website. The first test stands will be deployed to the industry partners: Westinghouse, EPRI, and TVA. External test stands are desired and it is envisioned that Industry Council members would deploy the external test stands. The Industry Council then discussed various thoughts and issues associated with test stands. Rose's and Jess' presentations are included as Attachments [6](#) and [7](#), respectively.

Randy Summers, CASL Virtual Reactor Integration (VRI) Deputy Lead, provided an overview of the VERA release schedule and showed the alignment of the schedule with the benchmark problems, a detailed look at the recently completed Plan of Record (PoR6), the scope of the March 2013 planned release of VERA 3.0, and the plans and milestones for the next Plan of Record (PoR7). Randy's presentation is included as [Attachment 8](#).

Zeses Karoutas, CASL AMA Deputy Lead, provided an overview of the scope and results of the IC Pilot Project – Post LOCA Flow of Fibrous Material. The outcomes of this project include: 1) insights into flow and thermal phenomena for this condition, 2) acknowledgement that the model could be used to guide upcoming testing that is being planned by the PWR Owner's Group, 3) insights into modeling for HYDRA development, and 4) acknowledgement that the simulation could be used for benchmarking of HYDRA. It was noted that the results of the simulation should be archived. Zeses' presentation is included as [Attachment 9](#).

Matt Sieger, CASL Quality Manager, provided an overview of VERA QA including documentation, validation, verification, and uncertainty quantification. The CASL quality program integrates the features of three major QA standards: DOE O 414.1D, ISO 9001-2008, and NQA-1-2008/2009 Part IV Subpart 4.2. The CASL program includes automated testing that can be done continuously (e.g. on code check-in) and for the nightly compile and for test cycles. Planned documentation includes: Theory Manual, User and Installation Manual, and Verification and Validation Manual. Verification and validation utilizes aspects of the following standards: National Research Council Committee on Mathematical Foundations of Verification & Validation and Uncertainty Quantification, and ASME V&V 20-2009. An internal survey of Component SQA and Verification Practices was conducted during the second quarter of FY13. An internal independent review of the CASL QAP by an NQA-1 qualified lead auditor was recently completed and an external audit is being planned. The milestones and associated schedule for the next Plan of Record (PoR7) were provided. Members of the Industry Council mentioned the possible need for a “Certificate of Conformance” to go along with the software transmittal. Matt’s presentation is included as [Attachment 10](#).

John Gaertner, CASL Industry Council Chairman, provided a strawman for the development of a value proposition for key CASL drivers. John indicated that the topic was brought up during the roundtable discussion at the September 2012 meeting of the CASL Industry Council and the idea was further validated by the CASL Board of Directors at the January 2013 meeting. The proposed process is to assess the value to the US Public of the CASL solutions (challenge problems) and include intermediate links (driving problems, intermediate customers, objective measures) in the assessment. A subcommittee of the CASL Industry Council will be formed to develop a value proposition. The subcommittee will be led by Heather Feldman, in-coming Industry Council Chairman. John’s presentation is included as [Attachment 11](#) and the strawman is included as [Attachment 12](#).

Paul Turinsky, CASL Chief Scientist, summarized possible future directions of CASL. Scope expansion could include: further analysis of the safety and lifetime extension Challenge Problems, extension to NSSS types other than currently operating PWRs (e.g BWRs), expansion beyond the reactor vessel to include the contents of the nuclear power plant, analysis of the lifecycle of current and advanced nuclear fuels, and severe accident analysis. Paul provided a list of possible new challenge problems. Paul indicated that he plans to ask the Industry Council to provide some feedback. Paul’s presentation is included as [Attachment 13](#).

Randy Summers, CASL VRI Deputy Lead, led a discussion about VERA’s modularity with commercial products. Workflow software was identified as the starting place to explore the modularity of VERA. Randy’s presentation is included as [Attachment 14](#).

The meeting was adjourned for the day.

The next morning Heather Feldman provided a summary and actions from Day 1 of the meeting.

The Industry Council formally recommended CD-adapco as a member.

Dan Stout presented TVA's Perspective on CASL. TVA's goal is to be a clean energy leader by 2020 and their plans are to increase nuclear, reduce coal, and increase pumped storage hydro capacity. New nuclear plants are under construction or planned at Watts Bar 2, Bellefonte, and Clinch River. TVA is looking to the future through evaluation of MOX fuel and SMRs. TVA's hopes and expectations for CASL are: to advance knowledge of nuclear concepts and performance, and to produce a rigorous, fully-coupled ModSim tool for all reactors that would become a design tool. The potential areas of focus include: power-limiting operating scenarios by looking at design basis accidents, ramp rates, departure from nucleate boiling, and beyond design basis accidents. Dan emphasized the importance of CASL to set understandable goals and then to achieve them. He also emphasized the need to plan deliberate outreach to key decision makers (e.g. presentations at utility conferences). Dan's presentation is included as [Attachment 15](#).

Alex Larzelere, DOE Director of Advanced Modeling and Simulation, congratulated John Gaertner on his retirement and thanked him for his many contributions including enabling successful industry engagement through the structure of the IC.

Heather Feldman presented EPRI's Perspective on CASL. The presentation was framed around the electricity landscape (renewables, storage, base load) which is an interactive, complex system. Results from EPRI's energy-economic model of the US, called PRISM, show the potential need for flexible operation of nuclear power plants as renewables are brought onto the grid. Power uprates, accident tolerant fuels, and extended operation (60 to 80 years) are also seen as important to the future of commercial nuclear power. Modeling and simulation tools such as those being developed in CASL are needed to inform the nuclear industry on how to navigate the challenges in this transforming electricity landscape. Possible initial efforts with the EPRI test stand are envisioned as: validation of Peregrine using EPRI data and using Peregrine to inform modifications to Falcon. The Industry Council expressed interest in future PRISM results if the model is changed to allow flexible operation of nuclear power plants. Heather supported this request. Heather's presentation is included as [Attachment 16](#).

The Round Robin allowed each IC member to summarize significant suggestions, concerns, or comments about the meeting agenda items. Comments are captured by the list below. Since the discussion was quite robust and free-form, it was not possible to attribute each comment to a specific IC member:

- Impressed with progress of CASL. Looking forward to moving from demonstration of proof-of-concept to demonstration of validated code.
- Interface with NRC is important.
- Test Stand
  - Need to address IP and export control issues with deployment of test stands and need to address concerns about reporting requirements when sensitive data are used in test stand applications.

- IP audit of VERA is desired.
- Need to be creative to get a win-win for external test stands.
- Insights on HPC – flops depend on computer architecture and on specific codes. Need to have teams ready to make software work on test stands. Lessons learned with test stand deployment should be documented and shared.
- Validation doesn't require release of proprietary data.
- Value Proposition
  - Value Assessment is critical.
  - Value Proposition is the delta improvement in value over what is now done. Will be customer specific.
  - Value proposition for regulatory issues is important, e.g., Fukushima response.
  - Duke Energy wants to collaborate and can help with value for CIPS.
  - Lower plenum flow reduction issues are cropping up.
  - Value of validation is critical. Show value to justify cost of validation.
  - PCI and CIPS are important and lead to conservative fuel designs. Solving these issues could help with power change restrictions. Dose reduction initiatives at plants could be easier to achieve if there were a reduced need to clean fuel.
- Topics for Future IC Meetings
  - More information on UQ in VERA is desired. Need more tangible UQ information. Uncertainty quantification will benefit risk reduction.
  - More talks from Focus Areas are desired.
  - Westinghouse volunteered to give a perspective presentation next meeting with test stand as the tentative topic.
- Extended Scope
  - Should address BWRs – their customers are already on the IC
  - Scott Thomas (Duke Energy) volunteered to actively participate with extended scope development
  - Interest in parameterization and optimization.
  - CASL tools could be used to inform designs on how to instrument plants (e.g. SMRs).

The following Action Items were identified as a result of this meeting:

1. Heather Feldman to provide Program Plan to Industry Council in June/July for with the intent for comments to be due by the September Industry Council Meeting.
2. Heather Feldman to provide the IC with a link to the CASL Project Summary document. Heather Feldman to add the Product Description Document to the IC website. Due by April 30, 2013.
3. Heather Feldman to provide access to full list of published works/solution technologies (via link to CASL website) on the IC website. Due by June 30, 2013.
4. Industry Council to provide Rose Montgomery with feedback on the Product Description Document. Due by next webcast (June timeframe).

5. IC Members to contact Heather Feldman if interested in obtaining a test stand (external test stands) and to provide proposals.
6. Matt Seiger to develop a survey on how IC members plan to use VERA in-house and on in-house requirements for safety and non-safety software codes. Heather Feldman to send out the survey by the next webcast (June timeframe) with the intent to review the results at the September Industry Council meeting.
7. Paul Turinsky will get a list of validation data needs from another group that he is working with. Heather Feldman will provide the list to the Industry Council and ask for comments on the prioritization. The list will be distributed to the IC prior to the next webcast (June timeframe).
8. Heather Feldman to lead the Industry Council subcommittee on the development of the Value Proposition to identify an example and provide the results at the September Industry Council Meeting. Bob Oelrich (Westinghouse), Bill Arnold (mPower), Rose Montgomery (TVA), and Scott Thomas (Duke Energy) have expressed interest in being on the subcommittee.
9. Heather Feldman to coordinate an effort to explore workflow software and VERA Modularity. Results of the effort will be reported at the September Industry Council meeting.
10. Tech Notes is the newsletter. Heather Feldman to distribute the latest issue to the IC by June 30, 2013.

The next in-person meeting will be on September 10-11, 2013 and a webcast is planned for June.

The meeting was adjourned at approximately 12:00 pm on March 27.

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By Heather Feldman, CASL Industry Council Chairman