

NRC INTERNATIONAL TRIP REPORT

Subject

Attendance of Organization for Economic Cooperation and Development (OECD) / Committee on the Safety of Nuclear Installations (CSNI) sponsored Special Computational Fluid Dynamics (CFD) Group.

Dates of Travel, Countries and Organizations Visited

I departed for Paris France on Saturday May 8, and returned to the U.S. on Thursday May 13, 2010. In the First day, May 10, the meeting was held at the Nuclear Energy Agency (NEA) Headquarters, Issy-les-Moulineaux, France. Subsequently, meetings were held at OECD Headquarters, Paris France, May 10-12.

Author, Title, and Agency Affiliation

Ghani Zigh, Senior Level Advisor, DSA/RES

Sensitivity

Not applicable

Background/Purpose

In May 2002, an "Exploratory Meeting of Experts to Define an Action Plan on the Application of Computational Fluid Dynamics (CFD) Codes to Nuclear Reactor Safety Problems" was held at Aix-en-Provence, France. The outcome was a recommendation that three writing groups be created to provide recommendations on:

1. Writing Group 1 (WG1): Guidelines for Use of CFD in Nuclear reactor safety Application. The work was concluded in December 2006.
2. Writing Group 2 (WG2): Assessment of CFD Codes for Nuclear reactor safety Problems. The work was concluded in December 2007.
3. Writing Group 3 (WG3): Extension of CFD Codes to two-Phase Flow safety Problems. The work will be concluded in June 2009.

The Writing group activities is now concluded. As follow-up activities, a special CFD group was created, consisting of the chairmen of WG1/WG2/WG3 to report back to CSNI Working Group on Analysis and management of Accidents (WGAMA). The main objective of this group was:

- Identify needs for future CFD work within WGAMA activities.
- Propose a work scope for WGAMA in the CFD area 2008 to 2010, and beyond if necessary.

Enclosure

Abstract: Summary of Pertinent Points/Issues

The proposal from the Special CFD group was to:

- Create, update and maintain a web-based centre of expertise on CFD for Nuclear Reactor Safety (NRS).
- Provide central organization for further workshops in CFD4NRS series, following those at GRS Garching, Germany in 2006 and CEA Grenoble, France 2008.
- Acts as a central organizing body for NRS benchmarking activities.

Three main topics were discussed in these meetings:

- Current and future of CFD WIKI pages from WG1, WG2 and WG3.
- Planning for the next CFD Workshop CFD4NRS-3, to be hosted by the US Nuclear Regulatory Commission (NRC) in September 2010.
- Synthesis and finalization of the first OECD/CSNI/CFD WG validation exercise (T-junction).

Discussion

In the first day of the meeting, detailed description of the items entered in the WIKI CFD Web pages were discussed. The entire content of the final report issued by WG2 is in the web. WG1 and WG3 final report will follow by the end of 2010. Additional Information about the past and future workshops and CFD benchmark exercise will be posted on the CFD Web. Arrangements are made to receive suggestions and remarks on the contents of the web page. In this meeting progress of the T-junction validation exercise was discussed. Report on the T-junction validation exercise will be submitted to WGAMA by the end of the year. Also, in this meeting, preparation for CFD4NRS-3 Workshop organized by the NRC in September 2010 was discussed.

In the second day of the meeting, the CSNI/CFD writing group members invited all CFD developers and users to discuss the CFD documents and web pages produced by the OECD/NEA CFD writing groups. The purpose of this meeting is to improve these living CFD documents and web pages as well as to propose new CFD V&V (verification & validation) tests and benchmarks, including the definition of new CFD-grade experiments.

In the third day of the meeting, the progress of the synthesis of the first CSNI/CFD WG benchmark exercise was discussed. The validation exercise consists of modeling hot and cold fluid in a T-junction configuration. Failure of structures due to high-cycle thermal fatigue occurred in several power plants around the world, for different reactor types. Many of these have been associated with mixing zones where hot and cold streams meet, and particularly near T-junction. An example is the failure event at the Civaux-1 PWR in France in May 1998.

The deadline to submit the results to this validation exercise was April 30, 2010. The participant will have the opportunity to present their calculation in the CFD4NRS-3 workshop in September 2010. Additionally in this meeting the experimental data for the T-junction benchmark test was released and presented by Vattenfall who performed this experiment.

Pending Actions/Planned Next Steps for NRC

The special CFD group will meet again in May 2011 to organize the forth CFD workshop (CFD4NRS-4) and the second CSNI/CFD writing groups validation exercise. Additionally, the CFD Wiki pages as well as the CFD writing groups three documents will be improved.

Points for Commission Consideration or Items of Interest

No commission action is required.

Attachments

The draft official summary of the WG1 and WG2 meetings are attached.

“On the Margins”

None