

CFD4NRS-3

Experimental Validation and Application of CFD and CMFD Codes to Nuclear Reactor Safety Issues

OECD/NEA & IAEA Workshop
Hosted by

United States Nuclear Regulatory Commission
Washington D.C., USA

14–16 September 2010

Third Announcement and Final Call-for-Papers

Abstract Deadline Extended: January 15, 2010

Scope

Following the two CFD4NRS workshops held in Garching, Germany, (Sept. 2006) and Grenoble, France, (September 2008), this workshop is intended to extend the forum created for numerical analysts and experimentalists to exchange information in the field of Nuclear Reactor Safety (NRS)-related activities relevant to computational fluid dynamics (CFD) validation. The workshop will include single-phase and multiphase CFD applications as well as new experimental techniques, including the following:

- Single-phase and two-phase CFD simulations with an emphasis on validation are welcome in areas such as boiling flows, free-surface flows, direct contact condensation, and turbulent mixing. These should relate to NRS-relevant issues such as pressurized thermal shock, critical heat flux, pool heat exchangers, boron dilution, hydrogen distribution, thermal striping. The use of systematic error quantification and Best Practice Guidelines (BPGs) is encouraged.
- Experiments providing data suitable for CFD validation—specifically in the area of NRS—should include local measurement devices such as multisensor optical or electrical probes, laser-doppler velocimetry, hot-film/wire anemometry, particle image velocimetry, laser-induced fluorescence, and other innovative techniques. Papers should include a discussion of measurement uncertainties.

Background

Over the last decade, three-dimensional CFD codes have been increasingly used to predict steady-state and transient flows in nuclear reactors. The reason for the increased use of multidimensional CFD methods is the increased availability of capable computer systems and the ongoing drive to improve and reduce uncertainty in our predictions of important phenomena such as pressurized thermal shock, boron mixing, and thermal striping.

CFD codes contain empirical models for simulating turbulence, heat transfer, multiphase flows, and chemical reactions. Such models should be validated before they can be used with sufficient confidence in NRS applications. The necessary validation is performed by comparing model results against trustworthy data. A reliable model assessment requires CFD simulations with control of numerical errors to avoid erroneous conclusions being drawn concerning model performance.

These issues have prompted an Organization for Economic Cooperation and Development/ Nuclear Energy Agency (OECD/NEA) initiative to form writing groups of experts with the specific task of assessing the maturity of CFD codes for NRS applications and to establish a database and best-practice guidelines for their validation and use. The Workshop supports these activities.

Keynote Speakers

In addition to the technical program, internationally known experts will present a few keynote lectures on the following themes:

- Current safety issues affecting operating nuclear plants, plant extension options, and future reactors.
- Overview of error control philosophy in CFD simulations.
- Novel experimental measuring techniques that can provide data for CFD validation.
- Approaches to international benchmarking activities.

Also, the results of the OECD/NEA-sponsored CFD benchmark exercise involving thermal fatigue in a T-junction will be presented through poster sessions and a lecture where all submitted results will be compared to the experimental data.

Organizing Committee

Ghani Zigh, U.S. Nuclear Regulatory Commission (NRC), USA, General Chair
Dominique Bestion, Commissariat à l’Energie Atomique, France, Co-Chair
Brian L. Smith, Paul Scherrer Institute, Switzerland, Co-Chair
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Dirk Lucas, Forschungszentrum Rossendorf, Germany
Tadashi Morii, Japan Nuclear Energy Safety Organization, Japan
Fabio Moretti, University of Pisa, Italy
Tadashi Watanabe, Japan Atomic Energy Research Institute, Japan

Dates & Deadlines

January 15, 2010	Extended abstracts
February 12, 2010	Invitation to write a full paper
April 23, 2010	Receipt of full paper
May 28, 2010	Decision on acceptance, reviewers' comments
June 25, 2010	Final paper

Instructions to Authors

Extended abstracts (500-600 words, no figures) before **January 15, 2010** via email to the NEA/NSD Secretariat (JongChull.Jo@oecd.org), with a copy to the General Chairman (Ghani.Zigh@nrc.gov) and the Co-Chair (Christopher.Boyd@nrc.gov). The preferred format is MS Word following the guidelines below:

TITLE OF PAPER (Centred, Times New Roman, Caps, 11pt, Bold)
(*single line space*)

I1. Author1, I2. Author2 (Centred, Times New Roman, 11pt, Bold)
(*single line space*)

Affiliation (Centred, Times New Roman, 11pt, Italics)
(*single line space*)
(*single line space*)

Extended Abstract (Left Justified, Times New Roman, 11pt, Bold)
(*single line space*)

Text of extended abstract (Usual A4 Margins, Left and Right Justified, Times New Roman, 11pt). The abstract should contain a clear description of the work to be presented, including background details, purpose, approach used, novelty, and a summary of new results obtained. The number of words should be in the range 500–600, and no figures should be included. Equations should only be included if absolutely necessary and should be limited to no more than one or two; each equation should be written on a separate line.

Recommendations

Papers that present new experimental and new measurement techniques should state how these techniques will be applied to enhance CFD validation, and should discuss the domain of application and experimental uncertainty.

Papers that present validation experiments and simulations of validation experiments with single-phase or two-phase CFD tools should address the experimental uncertainties and should discuss the adequacy of the measurements for a proper validation of CFD tools. Identification of the requirements for such “CFD grade experiments” is welcome.

The papers that present CFD code applications should try to justify all the choices made on the physical models, nodalization, and numerical options. Authors are encouraged to apply Best Practice Guidelines to the degree possible.