

# CFD4NRS-4

## The Experimental Validation and Application of CFD and CMFD Codes in Nuclear Reactor Technology

OECD/NEA and IAEA Workshop

Hosted by  
Korea Atomic Energy Research Institute (KAERI)  
Daejeon, Korea (<http://thsr.kaeri.re.kr>)  
September 10 – 12, 2012

Third Announcement and Final Call for Papers

### Extended Deadline for Submission of Abstracts

Review of the abstracts received by the deadline date (December 16, 2011) has now begun. For those who were unable to meet the deadline, but still wish to submit an abstract for consideration, a deadline extension to **January 16, 2012** is hereby announced. Please note that the programme is nearly full, so only a limited number of late entries can be accepted.

### Scope

Following the CFD4NRS workshops held in Garching, Germany (Sept. 2006), Grenoble, France (Sept. 2008) and Washington D.C., USA (Sept. 2010), this Workshop is intended to extend the forum created for numerical analysts and experimentalists to exchange information in the application of Computational Fluid Dynamics (CFD) and Computational Multi-Fluid Dynamics (CMFD) to Nuclear Reactor Safety (NRS) issues. The workshop will include single-phase and multi-phase CFD applications, and will offer the opportunity for authors to present new experimental data for CFD validation. Emphasis will be in the following areas:

- Single-phase and multi-phase CFD simulations with a focus on validation will be welcome in areas such as: single-phase and multi-phase heat transfer, 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 in containments, thermal striping and fatigue, etc. The use of systematic error quantification and the application of Best Practice Guidelines (BPGs) are strongly encouraged.
- Experiments providing data suitable for CFD or CMFD validation are also welcome. These should include local measurements using multi-sensor probes, laser-based techniques (LDV, PIV or LIF), hot-film/wire anemometry, imaging, or other advanced measuring techniques. Papers should include a discussion of measurement uncertainties.

### Background

The last decade has seen an increasing use of three-dimensional CFD and CMFD codes in predicting single-phase and multi-phase flows under steady-state or transient conditions in nuclear reactors. The reason for this is that a number of important thermal-hydraulic phenomena cannot be predicted with the required accuracy and spatial resolution using traditional one-dimensional system analysis codes.

CFD codes contain empirical models for simulating turbulence, heat transfer, multi-phase interaction and chemical reactions. Such models must be validated before they can be used with confidence in nuclear reactor applications. The necessary validation can only be performed by comparing model predictions against trustworthy data. However, reliable model assessment requires CFD simulations to be undertaken with full control over numerical errors and input uncertainties to avoid erroneous conclusions being drawn.

These requirements have prompted an OECD/NEA initiative to form writing groups of experts with the specific task of assessing the maturity of CFD codes for NRS applications, to establish a database and BPGs for their validation, and to identify the extensions needed to perform trustworthy multi-phase simulations. The Workshop focuses specifically on these issues.

## **Keynote Speakers**

Each technical session will be preceded by a keynote lecture, given by an internationally recognised expert. In addition, an integral part of the workshop will be to report results of the OECD-KAERI International Benchmark on Turbulent Flow in a Rod Bundle with Grid Spacers. The first invited lecture will provide a synthesis of results from this exercise.

## **Poster Sessions**

- At the discretion of the reviewers, provision will be made for some papers to be presented as posters rather than orally. Full papers will still be expected, which will then be included in the official proceedings.
- Dedicated poster sessions will also be arranged for participants in the OECD-KAERI Benchmark to display their results. To avoid duplication, a written paper is not required in this case.

## **Use of CFD in Reactor Design**

Following an original IAEA initiative, it is apparent that the use of CFD in nuclear reactor design studies warrants increased exposure within the NRS community. Consequently, it is hoped to include a technical session devoted to the use of CFD in guiding nuclear reactor design thinking. Papers in this application area are welcome.

## **Organising Committee**

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Ghani Zigh, US NRC, USA

### **Local Organising Committee**

Hyuong-Gil Jun, KAERI, Korea  
In-Cheol Chu, KAERI, Korea

### **Dates & Deadlines**

January 16, 2012	Extended abstracts due
February 6, 2012 (latest)	Invitation to write a full paper
March 26, 2012	Receipt of draft of full paper
May 14, 2012	Decision on acceptance; reviewers' comments
June 11, 2012	Final paper due
June 30, 2012	Deadline for early registration

## Instructions to Authors

Authors are invited to submit **extended abstracts** (500-600 words, no figures) before **December 16, 2011** via email to the NEA Secretariat ([abdallah.amri@oecd.fr](mailto:abdallah.amri@oecd.fr)), with a copy to the General Chair ([chsong@kaeri.re.kr](mailto:chsong@kaeri.re.kr)). The preferred format is MS Word, following the guidelines below:

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

*(single line space)*

**Author-1, Author-2, ....** (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 there should be no figures. 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 which present new experimental data and novel measurement techniques should state what CFD model validation need is specifically being addressed by the technique, should quantify the domain of application, and include a measure of the experimental uncertainty.

Papers which present validation experiments and simulation of validation experiments with single-phase or multi-phase CFD tools should include 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” should be made.

The papers which present CFD code applications should try to justify all the choices made in regard to the physical models, nodalisation and numerical options. Authors are strongly encouraged to apply Best Practice Guidelines (BPGs) as far as possible.

As with previous workshops in the CFD4NRS series, acceptance or non-acceptance of papers will depend crucially on adherence to quality of content and presentation.

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