

First OECD/NEA EGMUP Task Force on Doppler Effective Fuel Temperature Workshop

**Bologna, Italy
May 24, 2023 (Track 1 Morning)**

Hosted by ENEA, Italy

Announcement and Proposed Program

Background and Purpose of 1st OECD/NEA EGMUP Task Force on Doppler Effective Fuel Temperature Meeting

The first OECD/NEA EGMUP Task Force on Doppler Effective Fuel Temperature Meeting will be held on May 24, 2023, in Bologna, Italy, and is a follow up to its kick-off meeting of the previous workshop hosted under the LWR-UAM Benchmark. This OECD/NEA EGMUP Task Force on Doppler Effective Fuel Temperature Meeting will have its dedicated session in the workshops and will be held in conjunction with other OECD/NEA Working Party on scientific issues and uncertainty of Reactor Systems (WPRS) meetings/workshops to facilitate co-ordination and sharing of work. Nine other meetings are being held in two parallel tracks at Bologna, Italy during the same week in order to combine efforts in common areas such as neutronics, thermal-hydraulics, and multi-physics modelling and uncertainty analysis and to make the participation more efficient. The meetings/workshops concerned are:

- May 22, 2023 (track 2 morning) – Ninth COBRA-TF (CTF) User’s Group (UG) Meeting (CTF-9) followed by a hands-on CTF training sessions which will be conducted on Monday afternoon, May 22, 2023 and Tuesday morning, May 23, 2023 (track 2);
- May 22, 2023 (track 1 afternoon) – First Burst-Fission-Gas Release Benchmark (BFGR-1) workshop;
- May 23, 2023 (track 1) - Sixteen OECD/NEA Light Water Reactor (LWR) Uncertainty Analysis in Modelling (UAM) Benchmark (LWR-UAM-16) workshop;
- May 23, 2023 (track 2) – OECD/NEA HTGR-TH Benchmark introductory presentation and discussions;
- May 22-23 (track 3), 2023 – OECD/NEA International School on Simulation of Nuclear Reactor Systems (SINUS);
- May 24, 2023 (track 1 morning) - OECD/NEA Task Force on Doppler Effective Fuel Temperature meeting;
- May 24, 2023 (track 2 morning) – Fourth OECD/NEA McMaster Core Thermal-Hydraulics (CTH) Benchmark (CTH-4) workshop;
- May 24, 2023 (track 1 afternoon) – OECD/NEA Task Force Artificial Intelligence & Machine Learning meeting;
- May 24, 2023 (track 2 afternoon – LFR neutronics) – May 25, 2023 (track 2 morning – LFR Thermal-hydraulics) – Second OECD/NEA Lead Fast Reactor (LFR) Benchmark (LFR-2) workshop;
- May 24, 2023 (track 1 afternoon) – May 25, 2023 (track 1 morning) - Eight OECD/NEA Time-Dependent Neutron Transport (C5G7-TD) Benchmark (C5G7-TD-8) workshop;
- May 25, 2023 (track 2 afternoon) – Second Liquid Metal Fast Reactor (LMFR) Thermal-Hydraulics (T/H) Benchmark workshop (LMFR T/H-2);
- May 25, 2023 (track 1 afternoon) – May 26, 2023 (track 1 morning) - Third meeting on OECD/NEA TVA Watts Bar 1 (WB1) Multi-Physics Multi-Cycle Depletion Benchmark (TVA-WB1-3) workshop.
- May 26, 2023 (track 2) - Eight OECD/NEA Sodium Fast Reactor (SFR) UAM Benchmark workshop and First Liquid Metal Fast Reactor (LMFR) Thermal-Hydraulics (T/H) Benchmark workshop (SFR-UAM-8);
- May 26, 2023 (track 1 afternoon) – Fifth benchmark meeting on Rostov-2 VVER-1000 multi-physics transient benchmark (Rostov2-5).

Multi-physics and multi-scale modeling has been a subject of strong research and development during the last decades leading to multi-physics coupling frameworks with impressive capabilities. However, these developments still rely on some strong multi-physics modeling assumptions that restrict their predictive capabilities and their application to uncertainty quantification studies. One of the most widely used modeling approximation in multi-physics calculations is the Doppler effective fuel temperature. Various effective temperature correlations have been developed throughout the years that aim to preserve the absorption rate in the fuel. These correlations can perform well under some conditions (e.g. steady state) but can also induce strong biases (e.g. Reactivity Initiated Accidents).

The objective of this Task Force is to study in detail the Doppler feedback to estimate the bias and uncertainty of such correlations and propose novel approaches that go beyond effective fuel temperatures. The Task Force should provide guidelines and recommendations for the Doppler feedback modeling to the Expert Group on Reactor Systems Multi-Physics (EGMUP). Three areas of research have been identified for the Task Force:

1. Evaluation of the impact of Doppler effective temperature approaches on multi-physics calculations.
2. Quantification of the bias and uncertainty of Doppler effective temperature approaches.
3. Development of novel Doppler feedback approaches that go beyond effective fuel temperatures.

The Task Force will advance and expand on these three broad areas and will incorporate the outcomes in three main deliverables:

1. Report on review of state-of-the-art on Doppler feedback effective temperature
2. Report on the novel Doppler feedback approach and uncertainty estimation;
3. Dataset for Doppler feedback studies and educational benchmark case in multi-physics handbook.

This Task Force has been endorsed by the Organization for Economic Co-operation and Development Nuclear Energy Agency (OECD-NEA) and is coordinated by the EGMUP. The Task Force is of high relevance to other related WPRS activities such as the Expert Group on Physics of Reactor Systems (EGPRS), the LWR-UAM Benchmark and the Task Force on Artificial Intelligence and Machine Learning.

Scope and Technical Content of the Meeting

The topics to be addressed at the workshop include:

- Review and discussion on method and approaches to evaluate the impact of Doppler effective temperature approaches.
- Review and discussion of databases that will be used for estimating the bias and uncertainty of Doppler effective fuel temperature approaches,
- Review and discussion of novel approaches for modeling the Doppler feedback,
- Presentations on preliminary results for the proposed studies, novel approaches and databases.
- Presentation of current state of identified deliverables,
- Feedback and concerns of participants for the proposed scope of work,

- Discussion on potential interaction of this Task Force with other relevant activities such as LWR-UAM Phase II/III and the Task Force on Artificial Intelligence and Machine Learning, and
- Defining a work plan, schedule and goals for the next year of the Task Force.

The proposed meeting program is attached as Annex 1.

Organization of the Meeting

The meeting is organized around the previously identified areas of developments for the Task Force: (1) evaluation of the impact of Doppler feedback approaches on multi-physics calculations, (2) development of novel Doppler feedback approaches that go beyond effective temperatures, (3) development of databases for estimating the bias and uncertainty of Doppler effective temperature approaches. The participants are requested to present their expertise and experience in the Task Force related aspects such as modeling and simulation, uncertainty quantification and multi-physics applications.

Participation in the Meeting

Participation is restricted to individuals from OECD/NEA member country institutions.

Organization and Program Committee of the Meeting

An Organization and Program Committee has been nominated to make the necessary arrangements for the OECD/NEA EGMUP Task Force on Doppler Effective Fuel Temperature meeting and to draw up the final program, etc.

The members of the Program Committee are:

Gregory Delipei - *Principal Investigator and Chair*
North Carolina State University, USA

Alessandro Petruzzi - *Co-Chair*
 NINE, Italy

Giacomo Grasso – *Co-Chair, and Local Host*
 ENEA, Italy

Secretariat: **Oliver Buss**

OECD/Nuclear Energy Agency, France

Proposed Program of the Meeting

The proposed program was drawn up by the Program Committee and is enclosed as Annex 1.

Language of the Benchmark Workshop

The official language of the meeting is English.

Proceedings of the Meeting

A summary of the OECD/NEA EGMUP Task Force on Doppler Effective Fuel Temperature meeting will be published by the program committee after the meeting. The summary will be distributed free of charge to the participants in the meeting. The presentations will be available free of charge to the participants to download from participants' restricted area after the meeting.

Contacts and Registrations

The annual benchmark workshops/meetings of the [Working Party on Scientific Issues and Uncertainty Analysis of Reactor Systems \(WPRS\)](#) and OECD/NEA EGMUP Task Force on Doppler Effective Fuel Temperature Meeting will be hosted by ENEA in Bologna (Italy). The meetings will take place in two tracks in parallel during the week of 22 May to 26 May 2023 to exchange results and lessons learned for the different WPRS benchmark activities and to discuss future activities.

The link to registration page for the WPRS-related workshops/meetings, overall program, and local information for transportation and hotels is:

https://www.oecd-nea.org/jcms/pl_71612/wprs-benchmarks-workshop-2023

Workshop Location

The meeting place for all the meetings/workshops during the week of May 22 – 26, 2023, in three tracks is at the Zanol Hotel Europa, Bologna, Italy (in-person meeting). As mentioned above the local information for transportation and hotels is given at:

https://www.oecd-nea.org/jcms/pl_71612/wprs-benchmarks-workshop-2023

The program and schedule of the meetings is shown below:

	Track 1	Track 2	Track 3
Monday, May 22	Morning: MPCMIV Afternoon: Burst Fission Gas Release	Morning: CTF UG Afternoon: CTF Training	Morning: SINUS Afternoon: SINUS
Tuesday, May 23	Morning: LWR UAM Afternoon: LWR UAM	Morning: HTGR-TH Afternoon: HTGR-TH	Morning: SINUS Afternoon: CTF Training
Wednesday, May 24	Morning: Task Force on Doppler Effective Fuel Temperature Afternoon: Task Force on AI & ML	Morning: McMaster CTH Afternoon: LFR Neutronics	
Thursday, May 25	Morning: C5G7-TD Afternoon: TVA-WB1	Morning: LFR TH Afternoon: LMFR TH	
Friday, May 26	Morning: TVA-WB1 Afternoon: Rostov-2	Morning: SFR-UAM Afternoon: SFR-UAM	

**OECD/NEA EGMUP Task Force on Doppler Effective Fuel Temperature – First
Workshop (TF-DOP-1)**

Host Organization

Hosted by ENEA

Bologna, Italy

May 24, 2023

PROPOSED PROGRAM

TD01-07: Session code

Day 1: May 24, 2023

TD01. Introduction and opening remarks.

TD02. Overview of Task Force activities since last workshop.

TD03. Current status and review of Task Force deliverables.

TD04. Participants' presentations on Doppler feedback related studies and approaches for multi-physics calculations.

TD05. Discussion and review of participant's approaches and results.

TD06. Action items, schedule and goals for the next year of the Task Force.

TD07. Conclusions and closing remarks