

Workshop on “Nuclear fuel modelling to support safety and performance enhancement of water-cooled reactors”

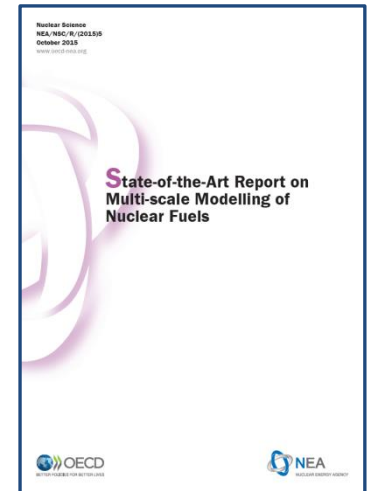
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M. Petit (IRSN, WGFS Ch.), T. Besmann (USC, WPMM Ch.)

NEA Secretariat: S. Massara (NSC), M. Kissane (CSNI)

7-9 March 2017, OECD Conference Center, Paris

Background

- In the last decade, increased accent on the development of multi-physics & multi-scale simulations, with associated challenges for V&V
- Largely recognized need of nuclear utilities to restore the overall competitiveness of nuclear energy, also through an improvement of nuclear fuel performance, but in a more stringent regulatory framework after the Fukushima Daiichi accident
- At the NEA, a variety of activities dealing with “nuclear fuels” within Nuclear Science Committee and Committee on the Safety of Nuclear Installations (CSNI) – *see next slide*
- Nevertheless, a common steering of these activities is lacking, and strengthened/improved coordination is recognised as beneficial by member countries



WPMR report on Multiscale Modelling of Nuclear Fuels (2015)

Materials Database

NSC

Advanced Materials Research

EG on Reactor
Fuel Performance
(EGRFP)

International Fuel
Performance Experiments
Database (IFPE)

Project on
Thermodynamics of Advanced
Fuels International Database
(TAF-ID)

EG on Accident Tolerant
Fuels for LWRs (EGATFL)

EG on Innovative
Fuels (EGIF)

EG on Innovative
Structural Materials
(EGISM)

Task Force on 'Unit
mechanisms of gaseous FPs
release'

EG on Multiscale Modelling
of Fuels (EGM2F)

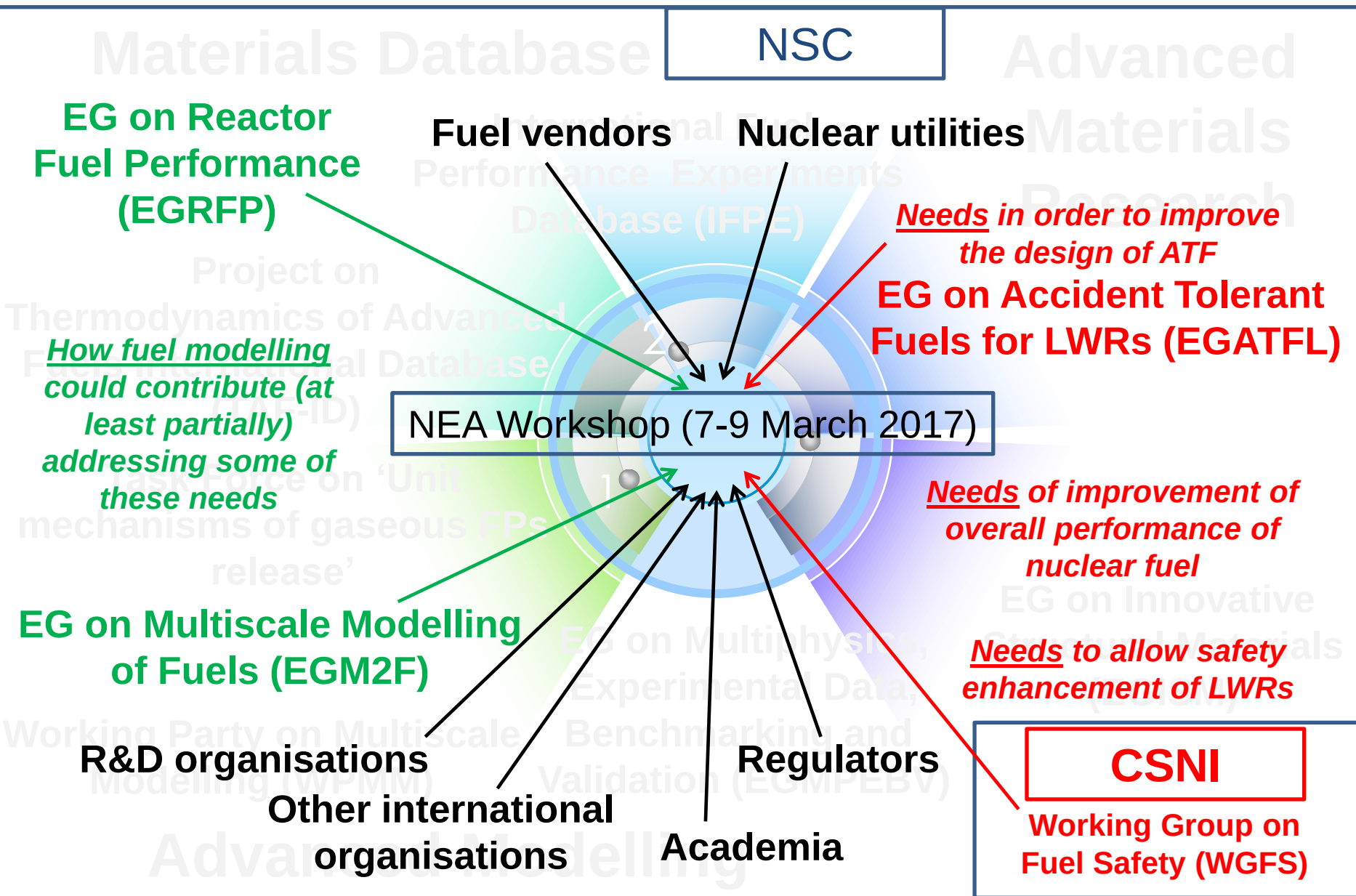
Working Party on Multiscale
Modelling (WPMM)

EG on Multiphysics,
Experimental Data,
Benchmarking and
Validation (EGMPEBV)

Advanced Modelling

CSNI

Working Group on
Fuel Safety (WGFS)



OECD/NEA International Workshop

❑ Nuclear fuel modelling to support safety and performance enhancement of water-cooled reactors

❑ 7-9 March 2017, OECD HQ, Paris

❑ Objectives and scope

- To identify areas where **advanced rod-scale, mesoscale or microscale (or any multiscale integration of these) modelling of nuclear fuels is contributing or may contribute to significant progress on or insights into fuel safety and/or fuel performance** for water-cooled reactors. The focus will be on the design and operation of nuclear fuel, with consideration of nominal and off-nominal operating conditions including design-basis accidents.
- To identify gaps and possible experimental needs.
- To identify areas for enhanced international collaboration, and the NEA contribution.

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For each of these areas (safety, fuel performance) the workshop will aim at:

- **Promoting and facilitating discussions** between the communities of experts in different fuel areas (fuel modelling, fuel safety, fuel performance)
- **Identifying key items** which would strongly benefit from the application of advanced modelling techniques in a “reasonable” timeframe (5-10 years)
- **Strengthen the coordination** and **establish new synergies** between different Expert Groups, across (and outside) the NEA

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- **Major insights into needs of improved understanding of nuclear fuel safety, including:**
 - Nominal conditions including these phenomena:
 - Release of fission gases
 - Formation of high burn-up structures (rim and MOX clusters)
 - Fuel swelling and PCMI
 - The impact of existing dopants such as gadolinia
 - Analytical investigation of the margins associated with fuel-safety criteria including uncertainties
 - Off-normal conditions including (recovered) LOCA conditions and reactivity injection (excluding thermal-hydraulic aspects) including these phenomena:
 - All those above in normal conditions;
 - Fuel fragmentation in LOCA conditions.

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- **Major needs of fuel performance improvements for nuclear fuel, including:**
 - Reactor operation improvements (i.e., burn-up and cycle length increase, power uprates);
 - Reduction of uncertainties in the fuel design process and consequences on the decrease of conservatism during licensing;
 - Implications on the front and back-end of the fuel cycle.

OECD/NEA International Workshop

Workshop General co-Chairs

- K. Pasamehmetoglu (INL / Chair of EG on Accident Tolerant Fuels for LWRs)
- M. Petit (IRSN / Chair of CSNI Working Group on Fuel Safety)
- T. Besmann (University of South Carolina / Chair of Working Party on Multiscale Modelling of Fuels and Structural Materials)

Schedule

- **October 2016:** registration opens; a second announcement will be circulated providing registration details and the address of the workshop website.
- **30 January 2017:** deadline for registrations (however, please register early providing NEA with an idea of the number of participants).
- **7 March 2017:** workshop opens at OECD Conference Centre (Paris).

Contact (NEA Secretariat)

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https://www.oecd-nea.org/science/wpmm/workshop-fuel_mod/