

OECD NEA Nuclear Science Committee (NSC)

WORKSHOP “ENHANCING EXPERIMENTAL SUPPORT FOR ADVANCEMENTS IN NUCLEAR FUELS AND MATERIALS”

8-10 January 2018
OECD Conference Center
2, rue André Pascal Paris, France

GUIDANCE FOR SPEAKERS

This paper presents the objectives and proposes some examples of topics for discussion **for each Workshop session** with the purpose to guide you through the preparation of your presentation.

You are kindly asked to prepare a **20-minute** presentation. Please provide your presentations by **December 23**, uploading them via the workshop registration box (www.oecd-nea.org/science/workshops/advnucfuel2018/) or by email (tatiana.ivanova@oecd.org).

General Workshop Objectives

- Propose mechanisms for interaction between the different parties involved in developing and deploying fuels/materials.
- Identify the role of NEA and potential collaborations that could strengthen the validation and qualification processes.

Session 1: Industry Experience and Perspectives in Fuel and Materials Evolution

- **Session Objectives**

Utilities

- Provide expectations of evolution/innovation in fuels and materials.
- Describe challenges and constraints faced during operation; provide perspectives on areas of potential improvement by evolution/innovation.
- Delineate successful outcomes in both the short term and long term, for example; long-term operation, increased number of hours station blackout before core damage; improved flexibility for maintenance schedules; higher burnup to reduce waste load; lessened probability of fuel failure at steady state; possibility to uprate.

Fuel Vendors

- Provide the technology readiness level of innovations in nuclear fuels/materials to address the challenges faced by industry.
- Summarize the process from development to deployment for evolutionary fuel/material technologies.
- Provide perspectives on potential areas where improvements in design simulation tools and experimental data would help accelerate the design process.
- Highlight ongoing R&D, including experimental programmes to support fuel/material qualification.
- Identify any perceived gaps in the qualification process and experimental work that could be improved via collaboration with other vendors, regulators, experimental facilities and academia.

- **Example topics for presentations and discussion (non-exhaustive list):**
 1. Prioritisation of needs and potential benefits in economics and safety.
 2. Readiness level of different domains for innovation: design of fuels/materials, optimisation of fabrication processes, exploitation regimes and of regulation.
 3. Potential areas of improvement for interaction between industry and vendors during the development process.
 4. Anticipated (and realistic) improvements of experimental equipment, techniques, data analysis methods etc.
 5. Improvements of credibility and acceptance of the fuel qualification process; specific needs for R&D and experimentation.
 6. Requirements for experimental data in the qualification process.
 7. Collaboration and communication (including with regulators) on both an international and national levels.
 8. Issues of dissemination and/or utilisation of proprietary data.

Session 2: Advances in Nuclear Science: Promising Fuel Technologies, Modelling and Validation Methods, and Associated Experimental Challenges

- **Session objectives**
 - Provide the status/capabilities of state-of-the-art simulations intended to support fuel/material development and deployment; draw attention to improvements available in the near term, and their potential to strengthen safety cases.
 - Provide feedback on the interconnection between modern simulations and data produced in modern experiments and contrast this to legacy experiments, noting problems/barriers in using either data for validation.
 - Discuss the role of simulations in experimental design and illustrate how experiments could produce targeted information, so called “smart” experiments, thereby better focusing on validation.
 - Note potential gains from the application of modern data science for experimental data interpretation.
- **Example topics for presentations and discussion (non-exhaustive list)**
 1. The barriers to acceptance of novel simulation tools.
 2. “Smart” experimentation: support from science and benefit for science.
 3. Experimental support for calibration and validation of simulations.
 4. New quality of instruments and measurements – characterisation of samples before experiments and online control of irradiation and sample evolution.
 5. Potential to improve the material fabrication process from improved understanding of materials.
 6. Impact of improved simulation of the entire life cycle of the fuel.
 7. Advanced data mining techniques.
 8. Interactions between the modelling community and ongoing experimental programmes.

Session 3: Technical Support Organisations' Perspectives for Operation of Current and Innovative Fuel and Materials

- **Session Objectives**

- Provide an overview of the process for qualification/licensing of evolutionary/innovative fuels and materials, including interactions with licensees, research organisations and experimentalists.
- Identify areas where the process could be improved or expedited, with either improved modelling and simulation or experimental data.
- Identify potential areas where international consensus could benefit the qualification process.

- **Example topics for presentations and discussion (non-exhaustive list)**

1. Areas where R&D can improve the safety assessment process.
2. Specific needs for R&D and experimentation.
3. Ongoing and planned experimental programmes.
4. Role of simulation in fuel/material licensing process.
5. TSO's needs for accessing the experimental data used in the qualification process.
6. Impact of different safety case approaches.

Session 4: Experimental Infrastructure: Perspectives in Advanced Instrumentation and Experimental Techniques to Support Fuel Development

- **Session Objectives**

- Indicate state-of-the-art capabilities in experimental infrastructure, both for irradiation and post irradiation analysis (spectrometry and microscopy). Identify major developments that have taken place; highlight longstanding gaps recently, or soon to be, filled by new infrastructure.
- Discuss existing processes for experimental design. Describe the relationships and collaborations with other experimental facilities, academia and industry.
- Consider the role of NEA and potential collaborations that could strengthen experimental support for the validation/qualification processes.

- **Example topics for presentations and discussion (non-exhaustive list)**

1. Unique measurement capabilities available at the facility.
2. Examples of ongoing and planned experimental campaigns.
3. “Smart” experimentation: support from science and benefit for science, improvement of facility performance and resolution.
4. Optimisation: needs/databases/exchange of available materials/instruments/test devices.
5. Maximising the knowledge via efficient analysis of data generated during the experimental campaigns.
6. Expectations and requirements of the new facilities coming online.
7. Experience with administration of user facilities and programmes.
8. Issues: waste management, transportation of irradiated and nuclear materials.