Overview of NEA related activities

EGATFL Meeting
23-25 September 2014, NEA HQ
Links with other NEA Nuclear Science activities

**Nuclear Science Committee (NSC)**

- **Expert Group on Integral Experiments for Minor Actinide Management**
- **Working Party on International Nuclear Data Evaluation Co-operation (WPEC)**
  - High Priority Request List for Nuclear Data
  - Methods and Issues for the Combined Use of Integral Experiments and Covariance Data
  - Co-ordinated Evaluation of $^{239}$Pu in the Resonance Region
  - Scattering Angular Distribution in the Fast Energy Range
  - Evaluation of Experimental Data in the Resolved Resonance Region
- **Working Party on Scientific Issues of the Fuel Cycle (WPFC)**
  - Heavy Liquid Metal Technologies
  - Fuel Recycling Chemistry
  - Advanced Fuel Cycle Scenarios
  - Innovative Structural Materials
  - Innovative Fuels
  - Task Force on Benchmarking of Thermal-hydraulic Loop Models for Lead-alloy-cooled Advanced Nuclear Energy Systems
- **Working Party on Nuclear Criticality Safety (WPNCS)**
  - Advanced Monte Carlo Techniques
  - Criticality Safety Benchmarks
  - Burn-up Credit
  - Criticality Excursions
  - Assay Data of Spent Nuclear Fuel
  - Uncertainty Analyses for Criticality Safety Assessment
  - Validation and Benchmarks of Methods
  - Multi-scale Modelling Methods
  - Structural Materials Modelling
  - Multi-scale Modelling of Fuels
  - Primary Radiation Damage
- **Working Party on Nuclear Data, Benchmarking and Validation for Coupled Multi-Physics Simulations**
  - Reactor Physics and Advanced Nuclear Systems
  - Uncertainty Analysis in Modelling
  - Reactor Fuel Performance
  - Radiation Transport and Shielding

**Executive Group of the NSC**
- (Data Bank Management Committee)

**Databases and Scientific Services**

**The Scientific Co-ordination Group of the Joint Evaluated Fission and Fusion (JEFF) Data Project**

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OECD-NEA activities related to EGATFL

- OECD-NEA Nuclear Science Committee (NSC):
  - Working Party on Reactor Systems (WPRS), for nominal and accidental behaviour, fuel modelling (EG on Reactor Fuel Performance, EGRFP);
  - New Expert Group on Multi-Physics, Experimental Data, Benchmark & Validation (EGMPEBV), for severe accident codes and validation issues

- OECD-NEA Committee on the Safety of Nuclear Installations (CSNI):
  - Working Group on Fuel Safety (WGFS);
  - Working Group on Analysis and Management of Accidents (WGAMA), for accidental scenarios modelling;
  - Benchmark Study of the Accident at the Fukushima Daiichi Nuclear Power Station (BSAF) Project, for the accidental sequences on Fukushima Units 1-3

- OECD-NEA Joint Project on Thermodynamics of Advanced Fuels – International Database (TAF-ID)
Joint Project on ‘Thermodynamics of Advanced Fuels – International Database (TAF-ID)’

- **Objective:** to make available a comprehensive, internationally recognised thermodynamic database (Gibbs energy, phase diagrams) on nuclear fuel materials for:
  - Fuel fabrication
  - Fuel behaviour under normal and off-normal operative conditions

- **Participants:** 9 Signatories from 6 member countries: Canada (AECL, RMCC, UOIT), France (CEA), Japan (JAEA, CRIEPI), Rep. of Korea (KAERI), The Netherlands (NRG), US DoE (ORNL, LLNL, INL), with the OECD-NEA acting as project coordinator

- **Budget:** 280 000 EUR for 3 years (2013-2015)

https://www.oecd-nea.org/science/taf-id/
New NSC Expert Group on Multi-Physics, Experimental Data, Benchmark & Validation (EGMPEBV),
Started 1 Sept. 2014

https://www.oecd-nea.org/science/egmpebv/
NSC Discussions on New Expert Group MPEBV

• Informal meetings with USDoE & USNRC July 2013
  – Focus was on validation for coupled multi-physics modelling methods

• Proposal to NSC Bureau December 2013
  – Bureau recommends establishment of new NSC Expert Group
  – Agreed to hold further discussions with linked NEA Technical Groups, ahead of consideration of formal mandate at June 2014 NSC meeting

• Informal discussions with EGUAM participants in February 2014
  – Agreed to arrange for further discussions with UAM-LWR participants (this workshop)

• NSC Approval for EGMPEBV June 2014 (see Mandate)
• Start-up Meeting 1-2 Sept. 2014 (NEA HQ)
• Recruitment of new NEA Staff member Oct. 2014.
New NEA Expert Group on Multi-Physics, Experimental Data, Benchmark, and Validation (EGMPEBV)

Phillip Finck

1 September 2014
Motivation

1. We are all developing “high fidelity” multi-physics codes
2. Validating these codes to their optimal level is critical to bring on their potential, but also extremely challenging:
   • Validation techniques; uncertainty quantification
   • Enhanced use of existing experiments
   • Definition of new experiments
3. On the experimental side:
   • Partial loss of knowledge (memory and competencies)
   • Loss of large-scale facilities
4. On the theoretical side:
   • We know how to validate single physics code
   • We have never fully validated a broad reactor multi-physics code (neutronics; TH; fuel performance; structural)
   • [Work underway, including at the NEA, demonstrates the complexity of the task]
Strategic Objectives

1. Continue collecting (international) relevant experimental data in a high-quality fashion:
   • Completeness
   • Relevancy
   • Documentation
   • Address new needs

2. Continue creating from these data high-quality benchmarks:
   • Documentation
   • Uncertainty

3. Collect lessons learned and provide guidance on V&V of complex multi-physics codes
Major Outcomes

1. Broaden current NEA activities to preserving and creating “certified” data to be used for validating multi-physics codes
2. Create consensus guidance on validation of multi-physics codes
3. Stimulate the creation of national “validation centers”
## Expert Group Objectives

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<tr>
<th>Activity</th>
<th>National Role</th>
<th>NEA Role</th>
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<tr>
<td><strong>Experimental Data</strong></td>
<td>Owns the data&lt;br&gt;Submits the data&lt;br&gt;Define applicability&lt;br&gt;Provides experts</td>
<td>Certifies the data&lt;br&gt;Data Repository&lt;br&gt;Define data gaps</td>
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<tr>
<td><strong>Benchmark Creation</strong></td>
<td>Proposes data&lt;br&gt;Executes creation&lt;br&gt;Provides experts</td>
<td>Directs benchmark creation&lt;br&gt;Certifies&lt;br&gt;Benchmark repository</td>
</tr>
<tr>
<td><strong>Validation Process</strong></td>
<td>Provides best practices&lt;br&gt;Provides experts</td>
<td>Creates guidelines&lt;br&gt;Provides support</td>
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Proposed Organization

EBV expert group of the NSC

- Close coordination with other NSC expert groups and CSNI
- Two task forces for the expert group
  - Data qualification and benchmark evaluation
  - Validation recommendations/guidance
- Data qualification and benchmark evaluation contributions through member countries
- Benchmark data and evaluations to be archived and maintained by the NSC
- Recommendations for identifying gaps in existing database by expert group participants
- Consensus validation guidance reported by the group
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