OECD Nuclear Energy Agency Workshop

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

7-9 March 2017

OECD Conference Centre, 2 rue André Pascal, Paris, room CC10

Final programme

7 March 2017 (9.00-18.00)

8.00-9.00 Arrival formalities: security clearance, collection of badges, etc.

9.00-9.15 **NEA Welcome**
D. Iracane (NEA, Deputy Director-General and Chief Nuclear Officer)

9.15-9.30 **Welcome from the Workshop Co-Chairs: review of the programme, objectives**
K. Pasamehmetoglu (INL), M. Petit (IRSN), T. Besmann (USC)

9.30-9.45 Introduction of attendees

9.45-12.35 **Session 1: Recent developments and future challenges for nuclear fuel**
Co-Chairs: K. Pasamehmetoglu (INL), M. Petit (IRSN), T. Besmann (USC)

9.45-10.10 **Recent developments in advanced modelling applied to nuclear fuel**
C. Stanek (LANL), M. Freyss (CEA)

10.10-10.35 **Utility perspective on needs related to nuclear-fuel operation**
N. Waeckel (EDF), J. Zhang (Tractebel-Engie), K. Yueh (EPRI)

10.35 – 10.50 *Coffee break*

10.50-11.50 **Fuel-vendor perspectives on current trends and future needs for improvements**
Four talks 15' each:

- N. Murakami (MNF, Japan), Expectations from progress in fuel modelling in order to optimise fuel design and safety analysis
- P. Mailhe (AREVA, France), Current and upcoming issues for fuel modelling
- S. Middleburgh (Westinghouse, Sweden), Modelling accident tolerant fuel concepts: gaining a mechanistic understanding to aid licensing
- J.S. Yoo (KEPCO-NF, Korea), Current issues and future needs for fuel modelling in LWRs

11.50-12.05 **Safety and regulatory aspects related to nuclear fuel and activities within CSNI Working Group on Fuel Safety**
M. Petit (IRSN), T. Fuketa (NRA)

12.05-12.20 **Link with NEA Innovation 2050 initiative**
M. Deffrennes (NEA)

12.20-12.35 **IAEA activities on fuel performance**
M. Veshchunov (IAEA)

12.35 – 13.45 *Lunch break*

13.45-18.00 **Session 2: Nuclear-fuel modelling in support of performance and safety improvements under off-normal conditions**
Co-Chairs: A. Alvestav (SSM) and B. Wirth (ORNL/UT)

13.45-14.00 **Introduction and objective of the session**
A. Alvestav (SSM) and B. Wirth (ORNL/UT)

14.00-16.30 **Keynote presentations:**

- G. Guillard (IRSN, France), Computational analysis of multi-rod ballooning and fuel relocation during LOCA using the multi-physics DRACCAR code
- M. Amaya (JAEA, Japan), Key issues in fuel safety studies on the modelling of fission-gas behaviour inside fuel pellet under normal and off-normal conditions
- H.C. Kim (KAERI, Korea), Development status of the fuel module for simulation of LOCA and RIA in KAERI
- V. Ozrin (IBRAE, Russia), Modelling of irradiated oxide-fuel behaviour and fission-product releases under transient and severe-accident conditions by the fuel performance and safety code SFPR
- K. Govers (SCK-CEN, Belgium), Granular simulation of fuel relocation and dispersal in LOCA conditions

16.30 – 16.45 *Coffee break*

16.45-18.00 **Panel discussion moderated by session Co-Chairs**

T. Forgeron (CEA, France)
T. Valentine (ORNL, US)
N. Waeckel (EDF, France)
K. Yueh (EPRI, US)

18.00 *Adjourn for the day*

8 March 2017 (9.00-17.45)

9.00-10.00 **Session 2 wrap-up**
Co-Chairs: A. Alvestav (SSM) and B. Wirth (ORNL/UT)

10.00-10.30 Discussion

10.30 **Closure of session 2**

10.30 – 10.45 *Coffee break*

10.45-17.45 **Session 3: Nuclear-fuel modelling in support of performance and safety improvements during normal operating conditions**
Co-Chairs: M. Moatti (EDF) and G. Rossiter (NNL)

10.45-11.00 **Introduction and objective of the session**
M. Moatti (EDF) and G. Rossiter (NNL)

11.00-16.15 **Keynote presentations:**

- C. Durand (EDF, France), Fuel assembly bowing during normal operation
- G. Khvostov (PSI, Switzerland), On effects of high-temperature fuel restructuring during the steady-state irradiation in the context of the selected fuel design criteria
- B. D. Wirth (ORNL/UT, USA), Multiscale modelling of fission-gas bubble evolution in UO_2 under nominal operating conditions

12.30 – 13.45 *Lunch break*

- L. Aagesen (INL, USA), Modelling Fission Gas Bubble Swelling in Silicide Fuel using Marmot
- P. van Uffelen (EC-JRC), Current meso-scale modelling developments for TRANSURANUS
- G. Pastore (INL, USA), Recent Developments in Modelling Fission Gas Behaviour for BISON
- J. Julien (CEA, France), ALCYONE calculations of GONCOR experiment for the kinetics of gaseous swelling during a power transient
- P. Demianov (JSC Bochvar Institute, Russia), A model of irradiation-induced densification of oxide nuclear fuel

16.15 – 16.30 *Coffee break*

16.30-17.45 **Panel discussion moderated by session Co-Chairs**

F. Nagase (JAEA, Japan)
C. Stanek (LANL, US)
M. Veshchunov (IAEA)
J. Zhang (Tractebel-ENGIE, Belgium)

17.45 *Adjourn for the day*

18.00-19.30 **Cocktail, Roger Ockrent room**

9 March 2017 (9.00-12.30)

9.00-10.00 **Session 3 wrap-up**
Co-Chairs: M. Moatti (EDF) and G. Rossiter (NNL)

10.00 **Closure of session 3**

10.00-12.15 **Session 4: Workshop wrap-up**
Co-Chairs: K. Pasamehmetoglu (INL), M. Petit (IRSN), T. Besmann (USC)

10.00-12.15 **Discussion animated by workshop Co-Chairs and NEA Secretariat**

- Recommendations on key items identified during the workshop
- Key cross-cutting issues between safety and economic performance
- New requirements for experimental validation

11.00 – 11.15 *Coffee break*

- Existing frameworks for collaborative activities (NEA, IAEA) and possible new activities or means for cooperation
- Other issues (regulatory, IP, …)

12.15-12.30 **Conclusion of the workshop**
Workshop Co-Chairs, NEA

12.30 *Workshop adjournment*