

Working Party on Scientific Issues of the Nuclear Fuel Cycle (WPFC)

Expert Group on Innovative Fuels (EGIF)

Chair: Nathalie Chauvin (France)

NEA Scientific Secretary: Stéphanie Cornet

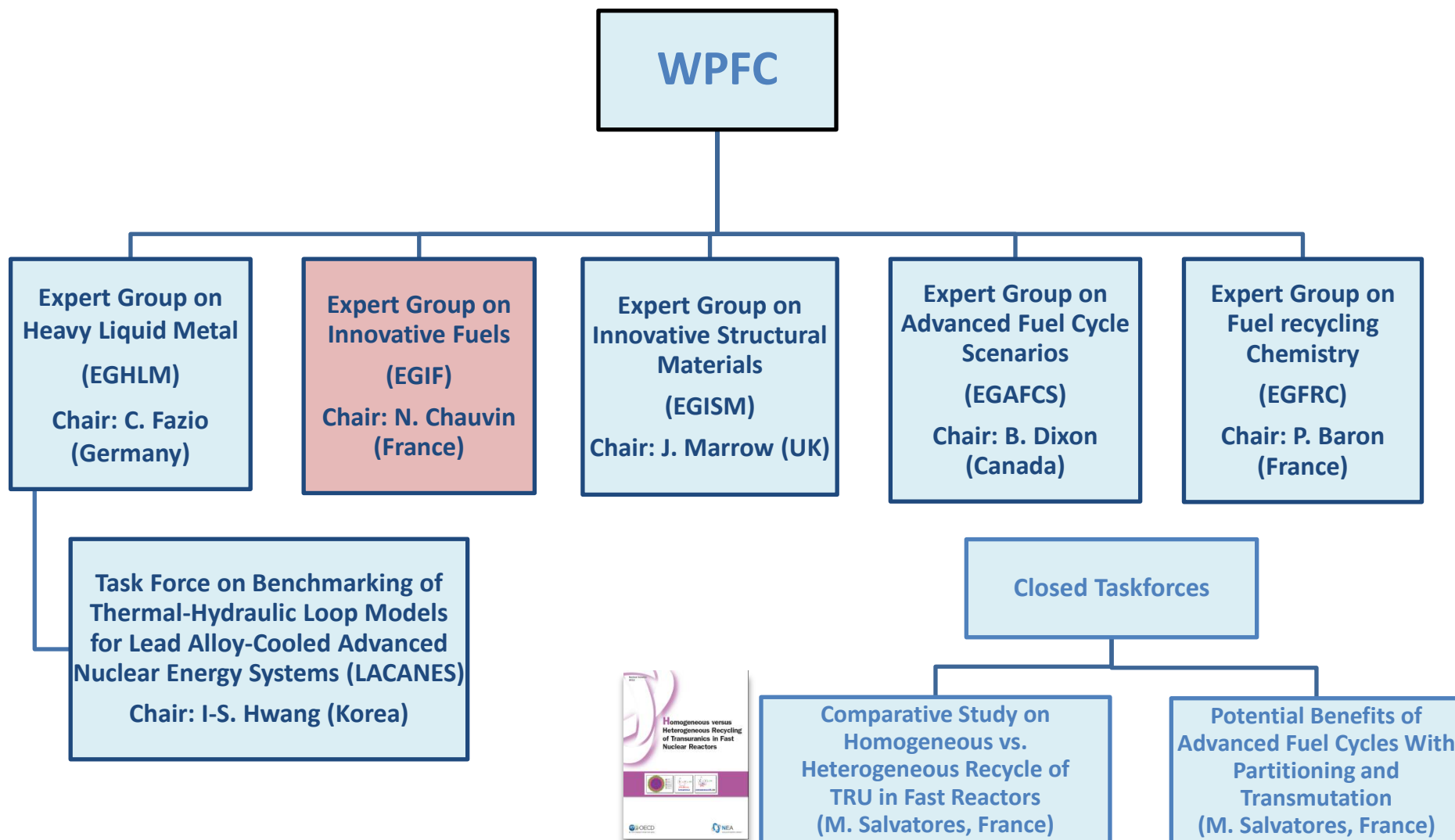
WPFC objectives

- Created in June 2004- current mandate until June 2017
- Chair: Nathalie Chauvin (France).

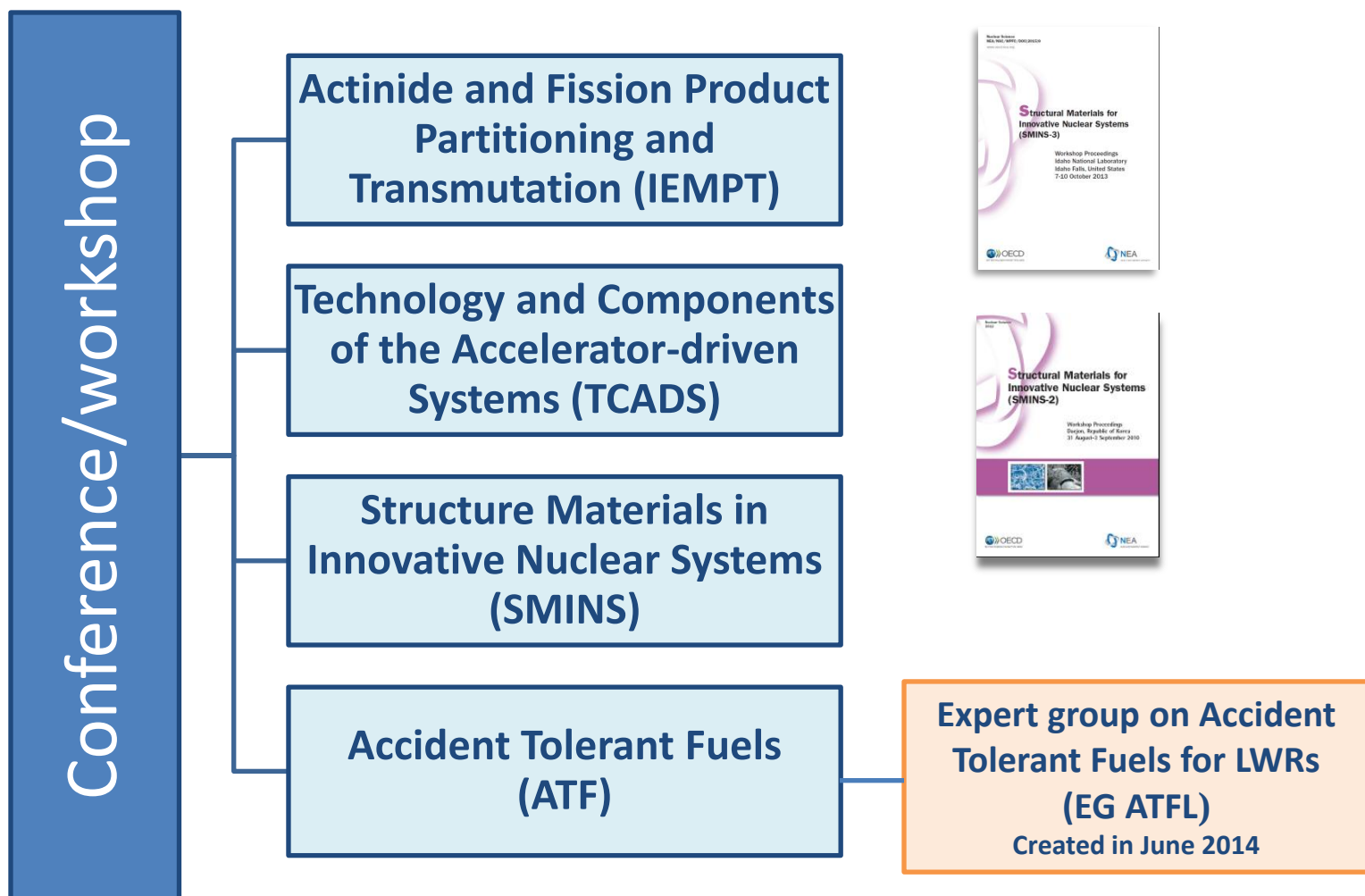
The WPFC covers:

- ✓ Existing and advanced nuclear fuel cycles
- ✓ Transition from thermal to fast nuclear cycles
- ✓ Heavy liquid metal coolant technology
- ✓ Partitioning and transmutation
- ✓ Fuel cycle physics, associated chemistry and flowsheets
- ✓ Development and performance of fuels and materials
- ✓ Accelerator driven systems

Structure of WPFC



Structure of WPFC: Conference/Workshop



Expert Group on Innovative Fuels (IF)

- Created in 2008
- Chair: N. Chauvin (France)

Objectives

Conduct joint and comparative studies to identify technical issues and support the development of innovative fuels (including innovative clad materials) that can be implemented in advanced nuclear fuel cycles

Scope

- ❖ Fuel types of interest contain minor actinides (MA).
- ❖ Technical issues associated with innovative fuel development are covered
 - ✓ fabrication techniques;
 - ✓ Irradiation performance of innovative fuels (including safety aspects);
 - ✓ Characterisation and post-irradiation examination methods;
 - ✓ Predictive models/codes for the innovative fuel fabrication and performance;
 - ✓ Phenomenological experiments in support of model development or validation.

State-of-the-art Report on Innovative Fuels

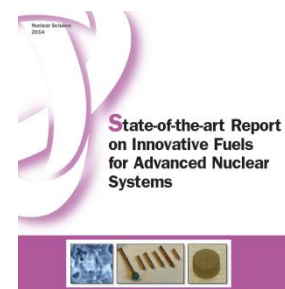
➡ Study of MA containing fuels for advanced nuclear systems:

- metal, oxide, nitrides, dispersion fuels and special mechanical fuel forms
- fabrication, characterisation, irradiation performance, design and safety criteria, TRL

Conclusions:

Transuranics bearing fuels are being developed at lab. scale and irradiation test have been limited to small samples. Most advanced are metal and oxide fuels

<https://www.oecd-nea.org/science/docs/2015/nsc-wpfc-doc2015-9.pdf>



Published in Dec. 2014

Benchmark Study on Fuel Performance Codes and Experiments

- ✓ Focus on experiments on MA bearing fuels with different chemical forms. (oxide, metal, IMF, spherepac, fuels for ADS)
 - ✓ Benchmark exercise with fuel performance codes
 - ✓ Synthesis of future R&D needs
 - ✓ Results gathered into a database
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- Irradiation of MA bearing fuel is rare compared to fuels for LWRs and only about 20 irradiation experiments have been performed so far.
 - The first stage of the benchmark will focus on MA oxide and metal fuels (low content: 5% or less)-data to be shared at the next meeting (Feb. 2015)
 - The second stage will focus on other types of fuels (IMF, spherepac, etc)

Benchmark Study on Fuel Performance Codes and Experiments

- Participating members states:
EC, France, Germany, Japan, Rep. Korea, US
 - Irradiations data from Phénix, JOYO, HANARO, ATR and EBR2
 - Codes: SIMMER, GERMINAL, TRANSURANUS, MBM
- First results to be shared at the next meeting in September 2015

Benchmark Study on Fuel Performance Codes and Experiments

- Two phases:
 - Phase 1: oxide and metal fuels with low content
 - Phase 2: Inert Matrix fuels, sphere pack, fuels for ADS with MAs
- Report on benchmark results
- Creation of a database for MA bearing fuels

Summary

- ❑ The current focus of the group is a code-to-experiment and code-to-code benchmark on MA bearing fuel performances
- ❑ The study has just started and data should be shared at the next meeting
- ❑ Creation of a new database on fuel performances for advanced systems
- ❑ EG works closely with WPRS/EGRFP and WPMM

Thank you for your attention