

NSC/WPRS Activities on Reactor Fuel Performance (EGRFP) and IFPE database

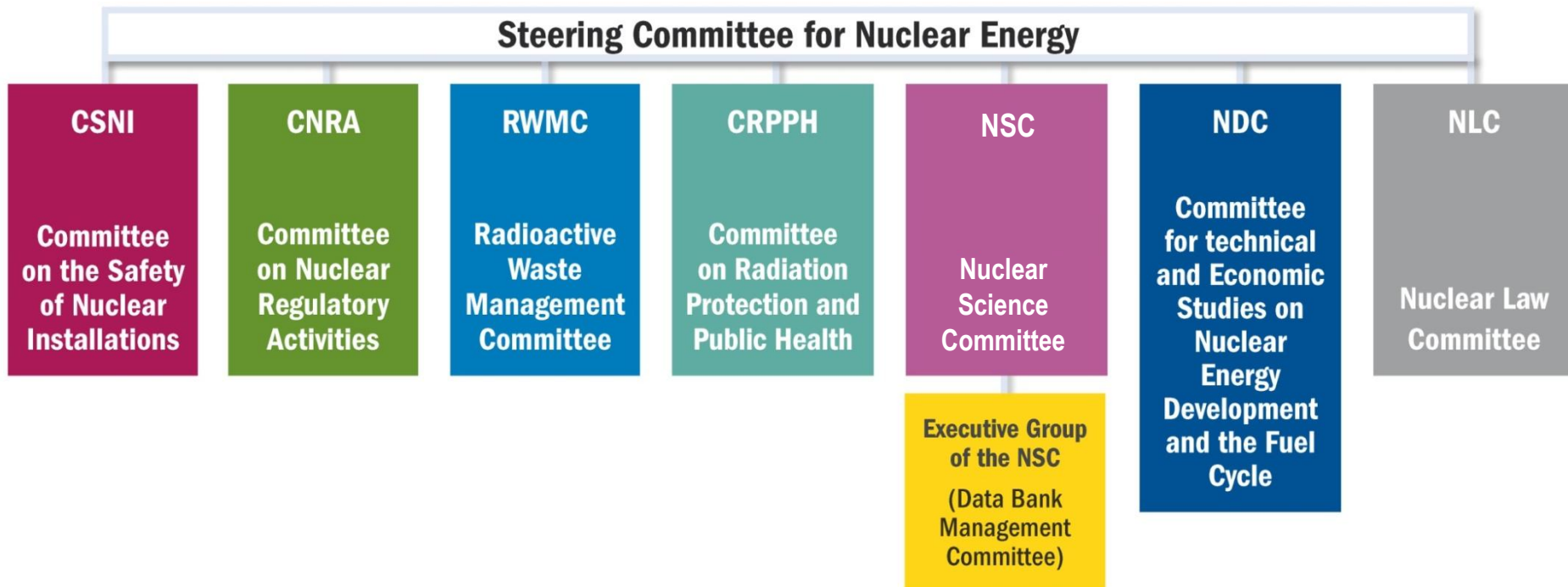
Akifumi YAMAJI

OECD/NEA Data Bank

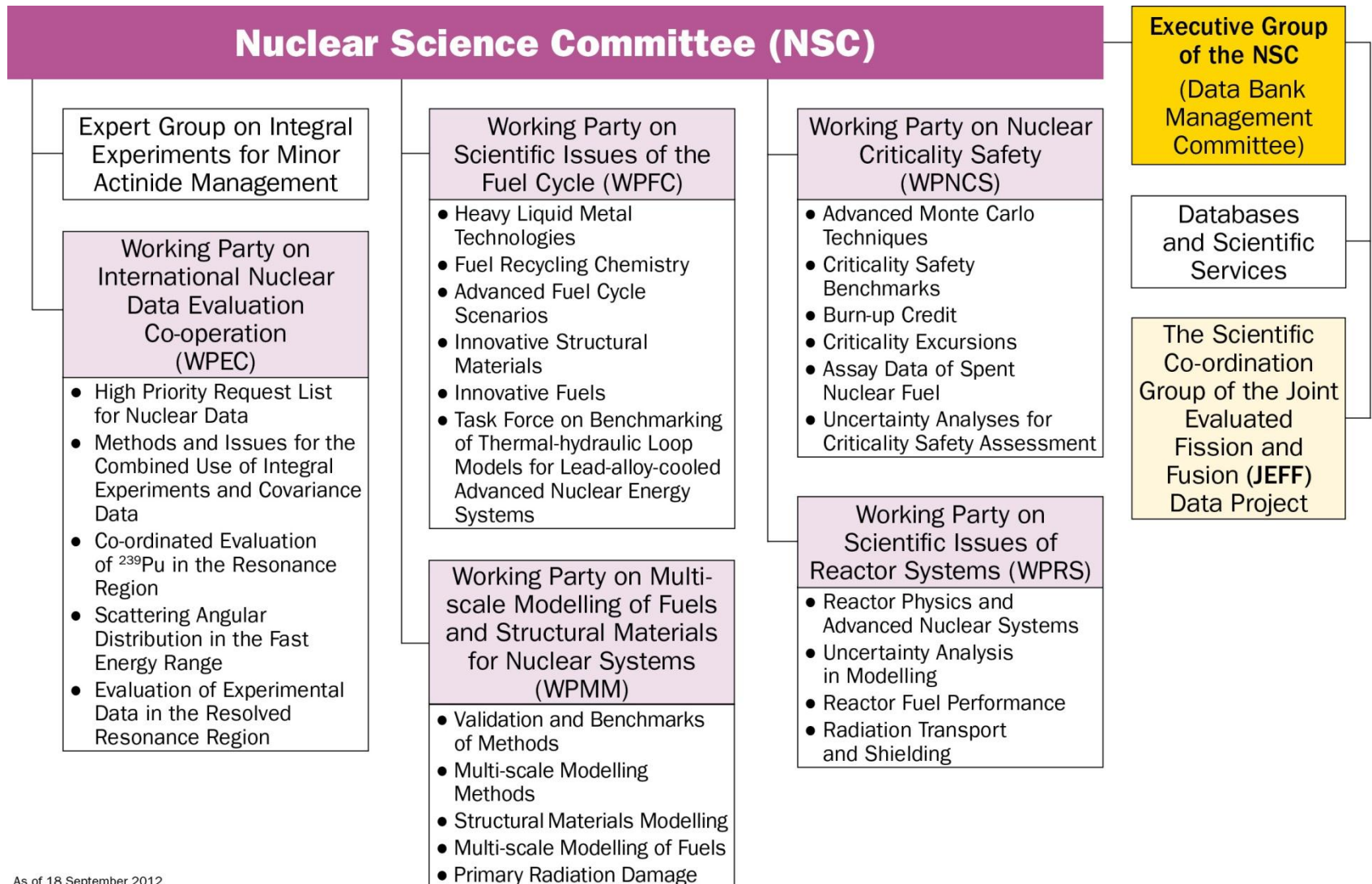
Presentation to Start-up Meeting of the Expert Group on
Accident Tolerant Fuels for Light Water Reactors

28-29, April 2014, OECD/NEA

NEA Committees



As of 18 September 2012



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 239Pu in the Resonance

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

Working Party on Scientific Issues of Reactor Systems (WPRS)

- Reactor Physics and Advanced Nuclear Systems
- Uncertainty Analysis in Modelling
- Reactor Fuel Performance
- Radiation Transport and Shielding

Working Party on Multi-scale Modelling of Fuels and Structural Materials for Nuclear Systems (WPMM)

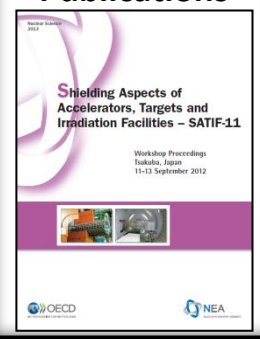
- Validation and Benchmarks of Methods
- Multi-scale Modelling Methods
- Structural Materials Modelling
- Multi-scale Modelling of Fuels
- Primary Radiation Damage

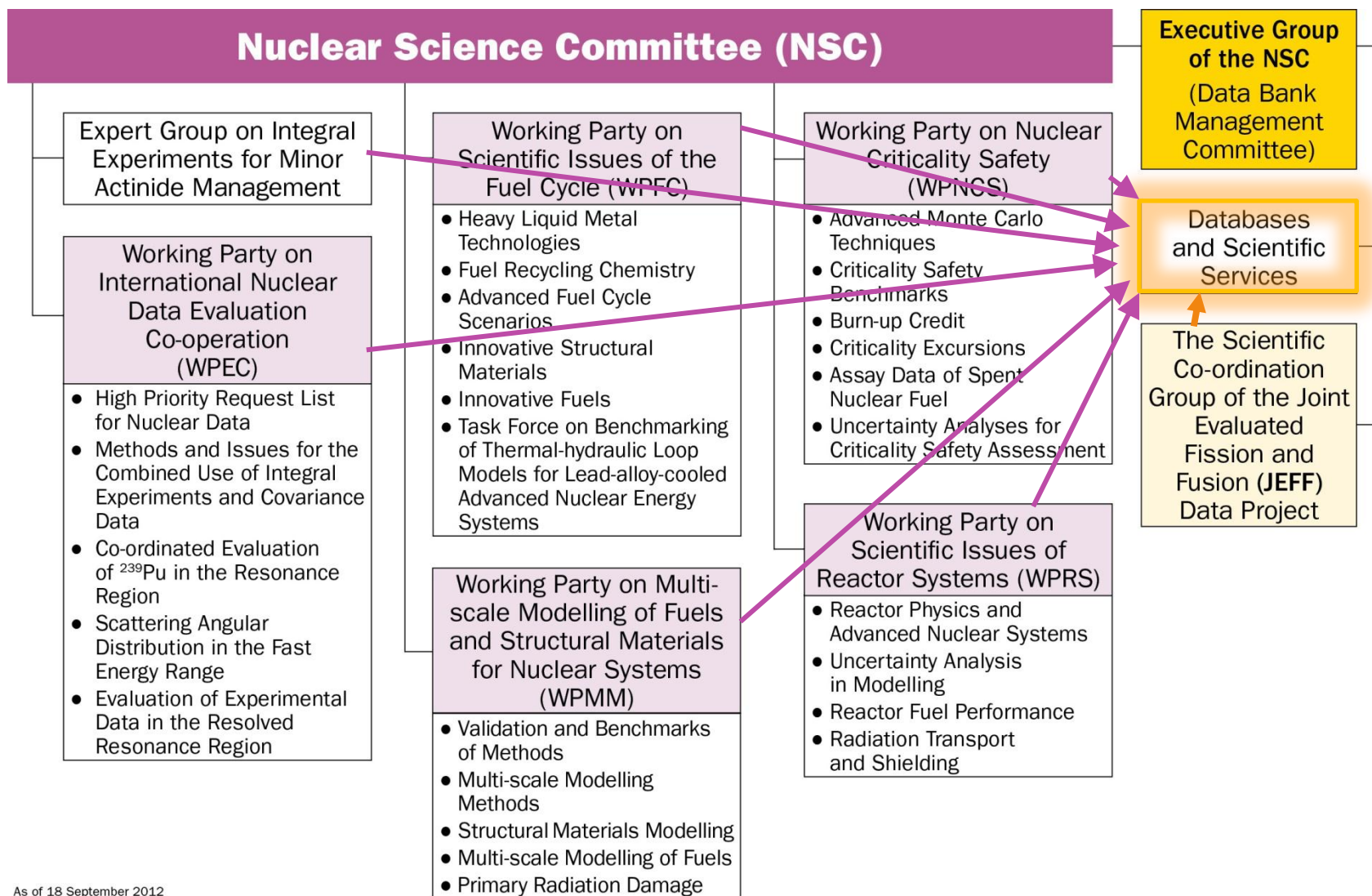
Executive Group of the NSC
(Data Bank Management Committee)

Databases and Scientific Services

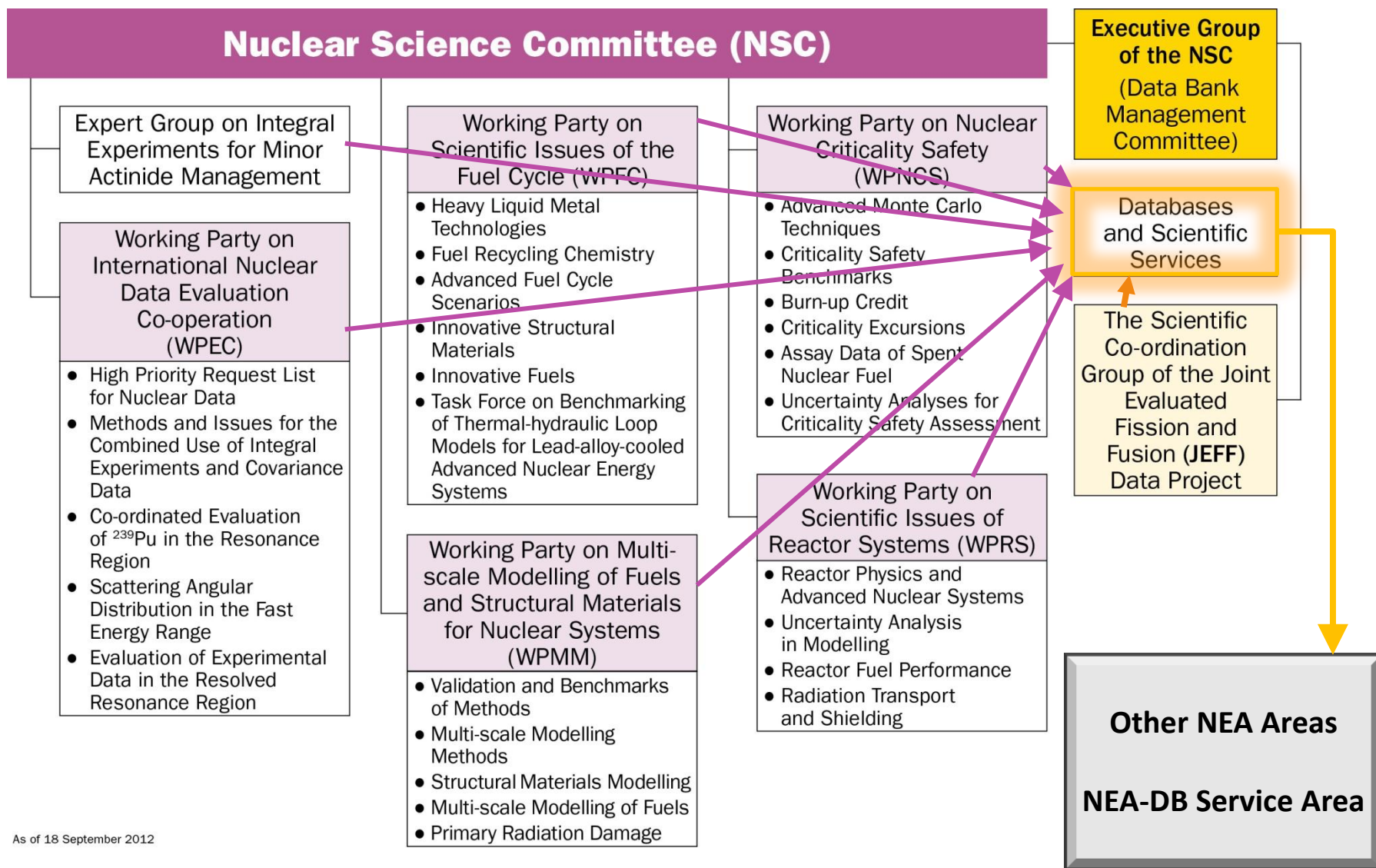
The Scientific Co-ordination Group of the Joint Evaluated Fission and Fusion (JEFF) Data Project

Nuclear Science Publications

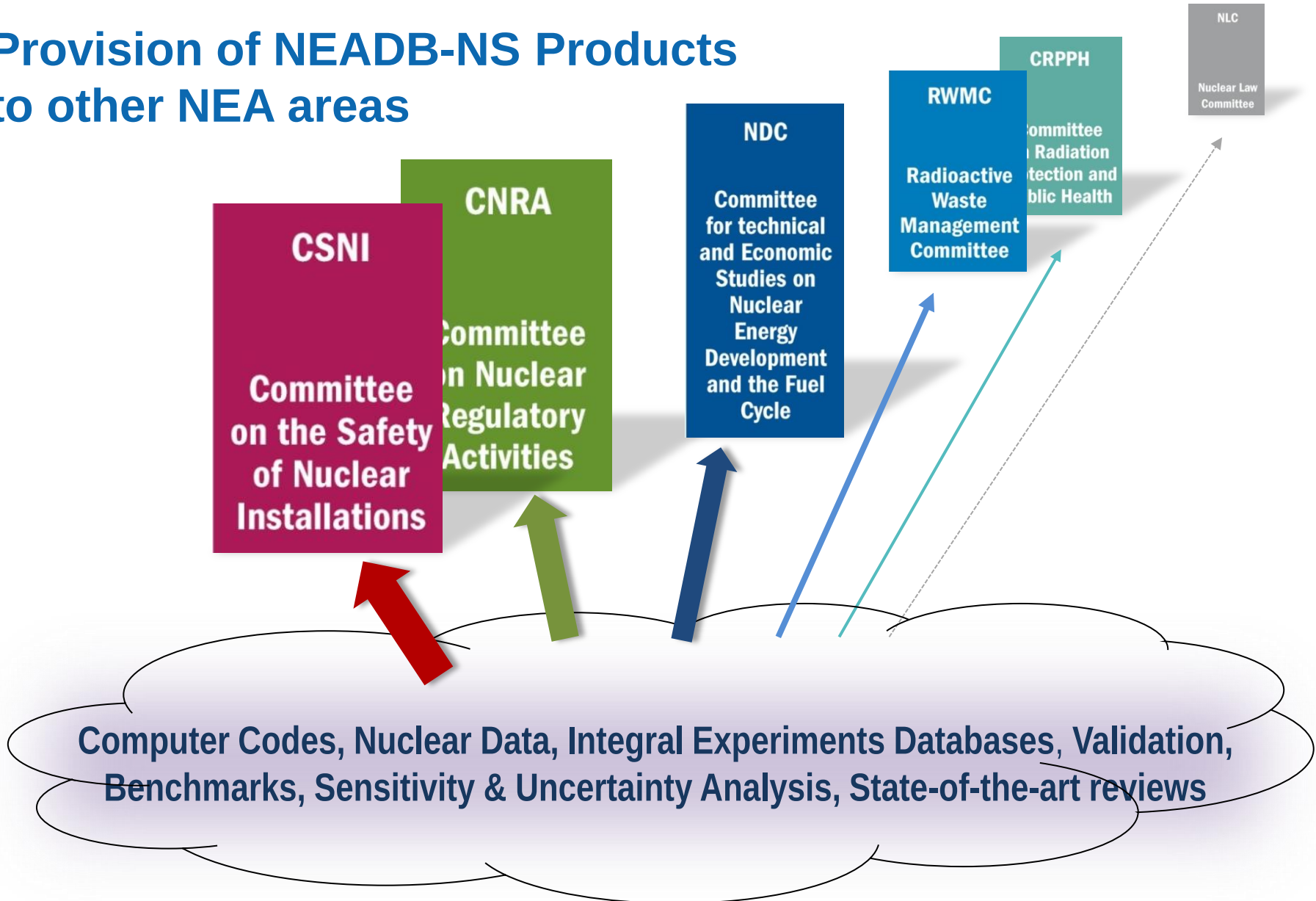


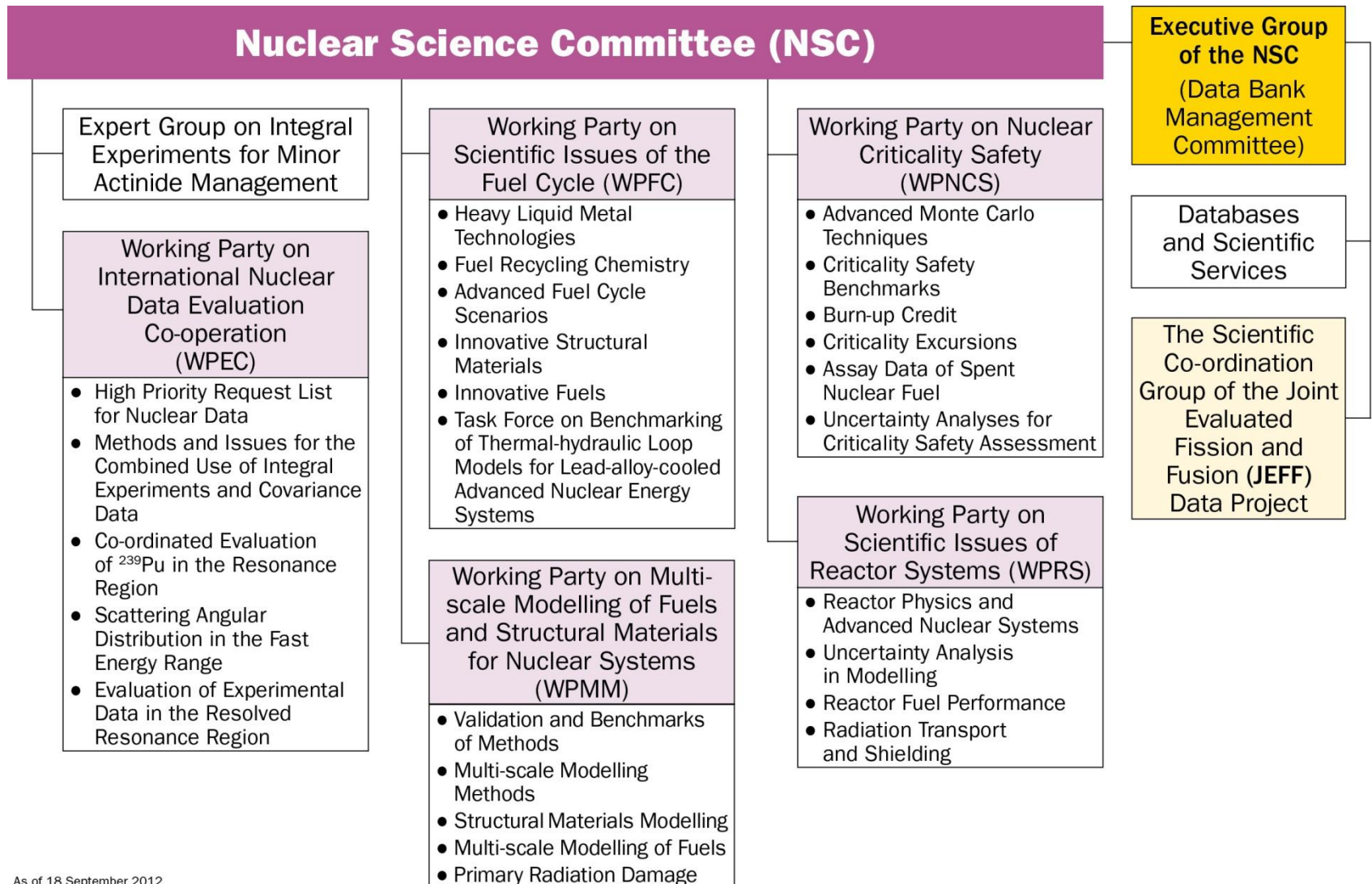


As of 18 September 2012

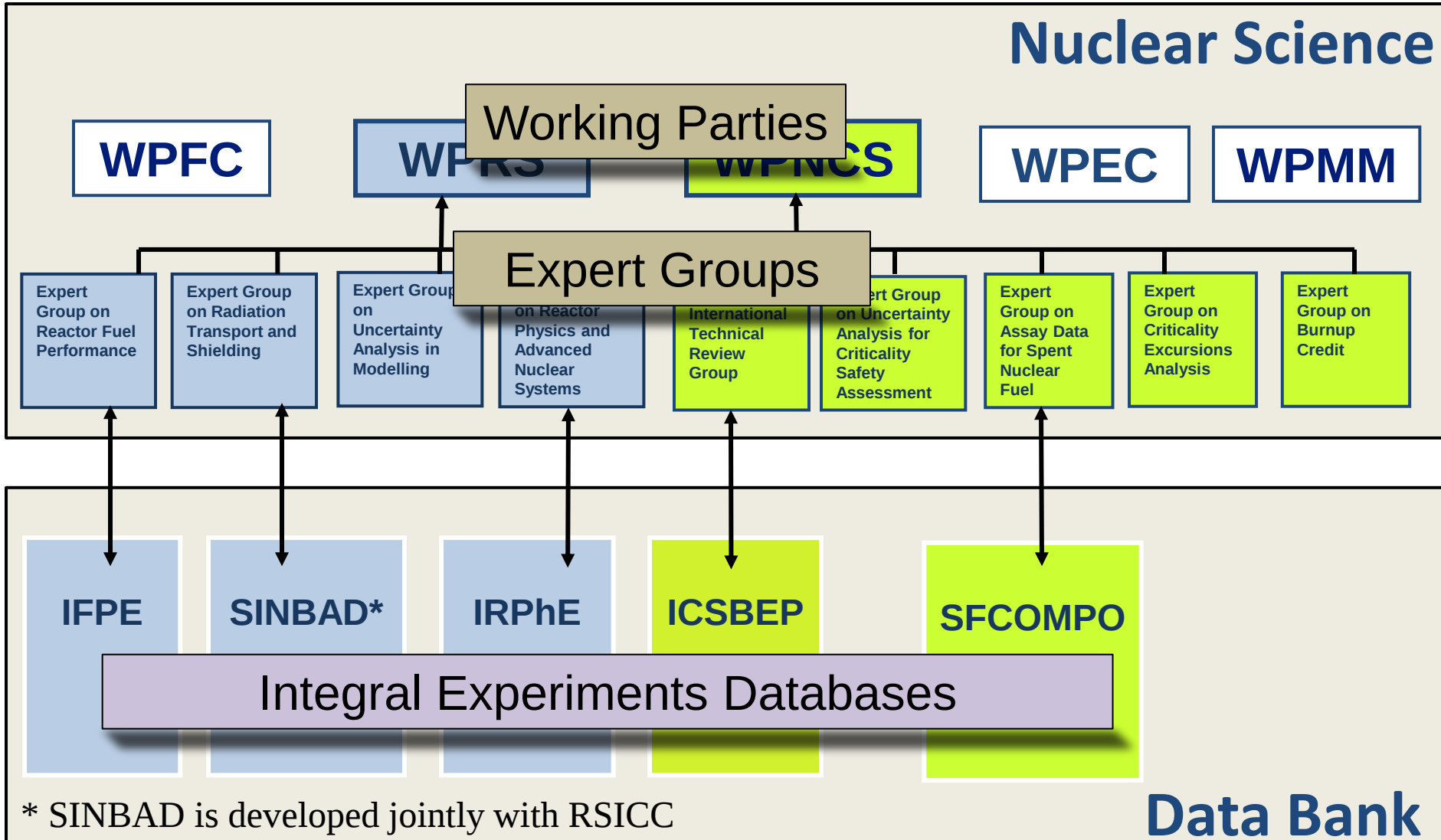


Provision of NEADB-NS Products to other NEA areas

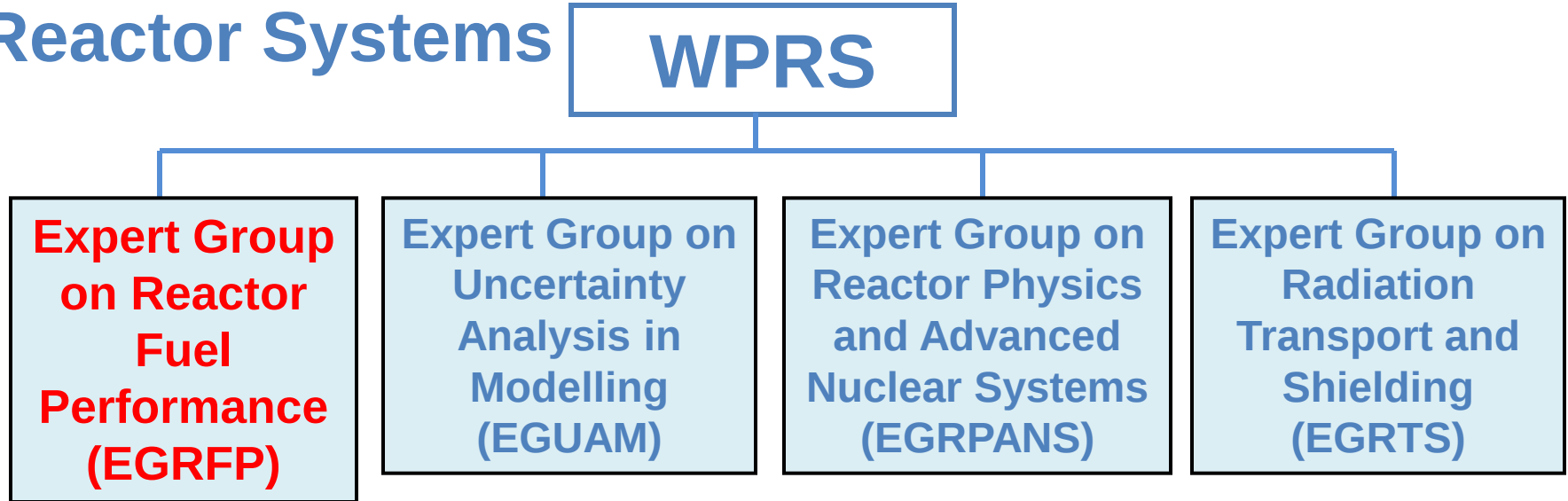




NEA Databases of Evaluated Integral Experiments



NSC Working Party on Scientific Issues of Reactor Systems



- Chair: K. Hesketh (NNL, UK)
- Secretariat: A. Yamaji (NEA)
- Scope
 - Reactor physics, radiation transport & dosimetry and fuel performance for present and future nuclear power systems.
 - Modelling of reactor systems and the uncertainties associated with such analyses.

IFPE History and Overview

- IFPE: International Fuel Performance Experiment database
- IAEA/FUMEX Programmes (1993-2012)
- OECD/NEA Taskforce setup 1993
- OECD/NEA Report, *prepared by J. A. Turnbull* (1995)
- Creation of IFPE with data from Halden + Studsvik and Risø (1995)
 - The public domain database
 - Thermal reactor fuel performance, principally for $Zry + UO_2$
 - Addition of advanced products with fuel and clad variants is not ruled out
 - Today, about 1452 rods/samples from various sources encompassing BWR, CAGR, PHWR, PWR, and VVER

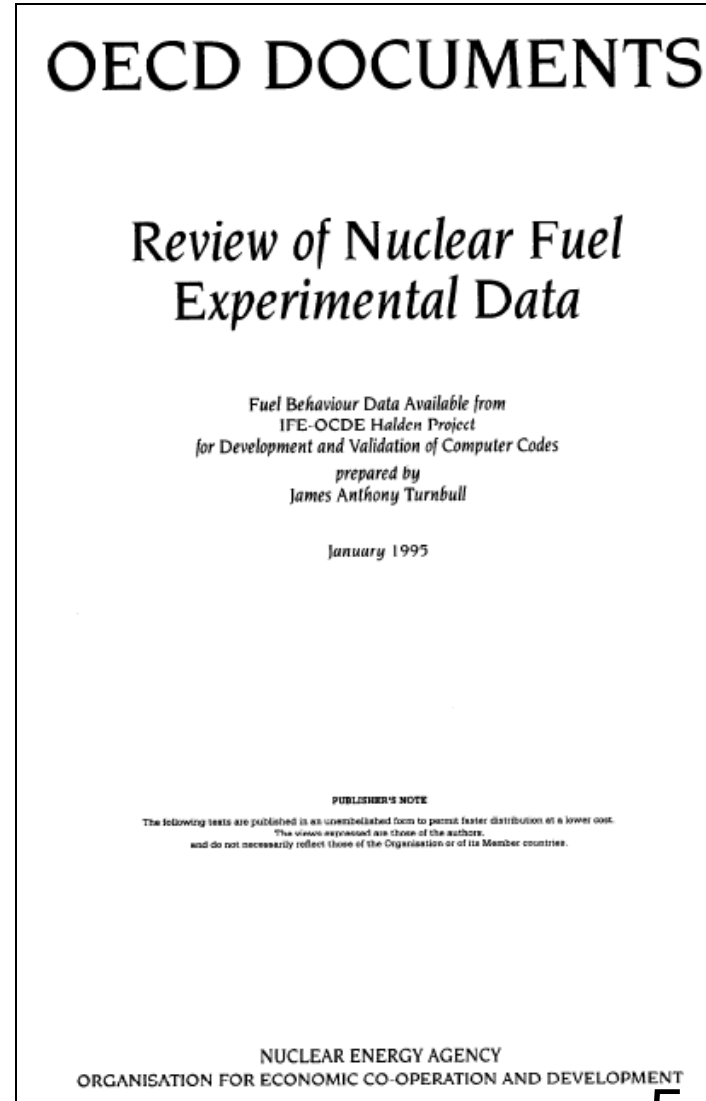
IFPE webpage <http://www.oecd-neo.org/science/wprs/fuel/ifpelst.html>

The Turnbull Report (1995)

Need for data in the following topic areas considered:

- *Radial Flux Depression*
- ***Thermal Performance***
- *Fuel Densification and Swelling*
- *UO₂ Grain Growth*
- ***Fission Product Release***
- *Clad Properties*
- ***Pellet Clad Mechanical Interaction (PCMI)***
- ***Integral Behaviour***
- *High Burnup Effects*

➡ Creation of **IFPE database**



Expert Group on Reactor Fuel Performance (EGRFP)

- Created in 2011 under the guidance of WPRS
- Chair: G. Rossiter (NNL, UK)

Objectives

- To provide expert advice on the development needs (data and methods, validation experiments, scenario studies) for **existing and future fuel designs**
- To provide specific technical information regarding:
 - National / international programmes, experimental capabilities
 - The provision of experimental data for model development and validation from the **IFPE Database**
 - Methods for code verification

EGRFP Key Activities

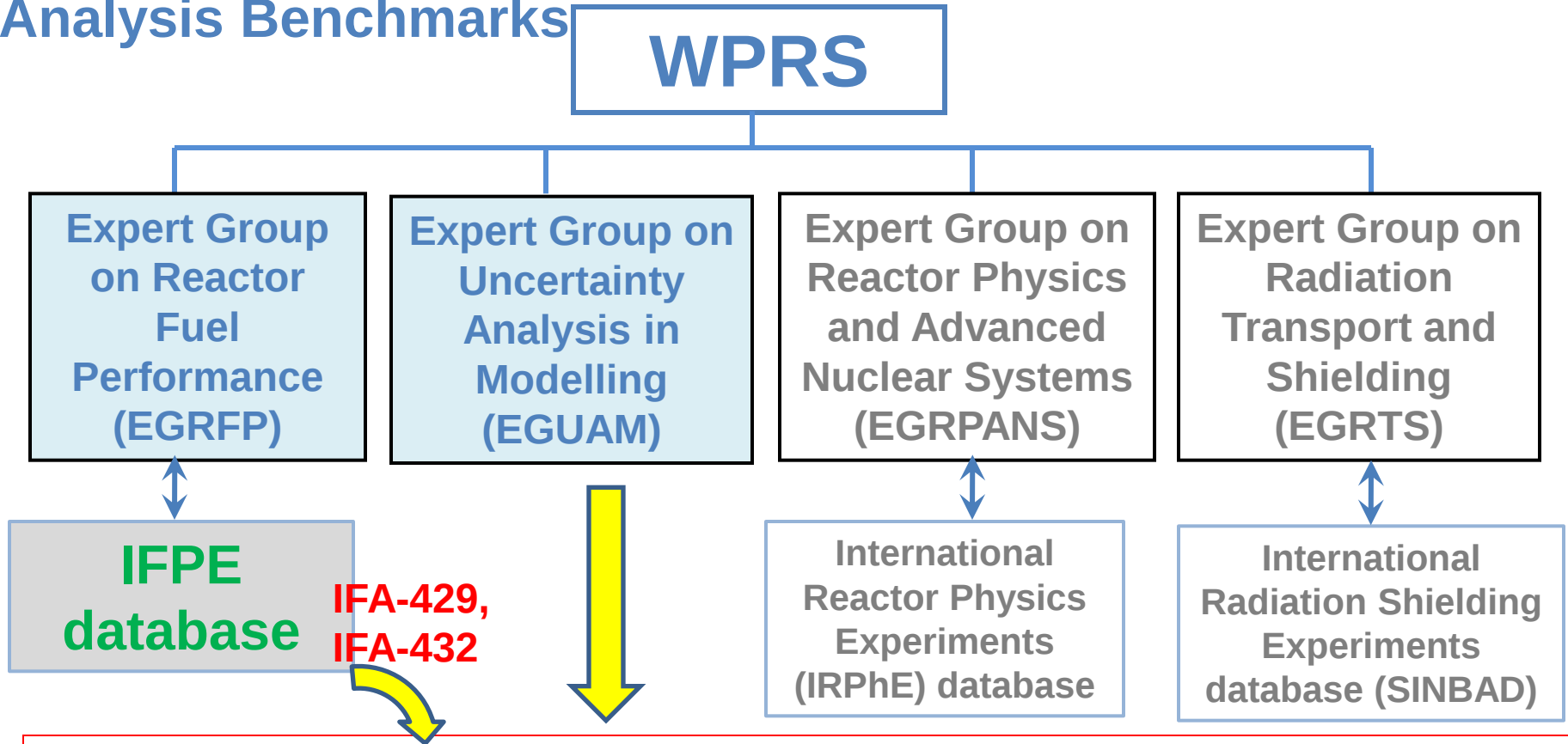
- Report on “Experimental Data Requirements for Fuel Performance Modelling” (2014/2015)
- **IFPE** database development
 - “Front-end” interface to be prepared to enhance accessibilities to the database
 - Keep coordination with **IAEA/FUMAC** → **New experimental data for IFPE**
- Benchmark on PCMI with Halden experimental data
 - Complementary to other benchmarks (e.g., **IAEA / FUMAC**, **OECD/NEA RIA Fuel Codes Benchmark**)

EGRFP: Meetings

- Third Expert Group meeting (Feb. 2013, NEA, Paris)
 - attended by 27 experts from 12 countries (Belgium, Czech Rep, Finland, France, Germany, Italy, Japan, Poland, Russia, Spain, UK, USA) and 3 international organisations (EC/ITU, IAEA, OECD/Halden).
- Next meeting: February 2015 at NEA in conjunction with WPRS meeting (date to be determined)

Contact: wprs@oecd-nea.org

Links: Use of IFPE database for LWR Uncertainty Analysis Benchmarks



- UAM-LWR Benchmark, Exercise II-1 – Fuel Modelling: Fuel thermal properties relevant to steady-state and transient performance of LWRs

EGRFP Links

- OECD/NEA/NSC
 - WPRS Expert Group on Uncertainty Analysis in Modelling ([EGUAM](#))
 - WPFC Expert Group on Innovative Fuels ([EGIF](#))
 - WPMM Expert Group on Multi-scale Modelling of Fuels ([M2F](#))
 - Expert Group on Accident Tolerant Fuel for LWRs ([EGATFL](#))
- OECD/NEA/CSNI
 - Working Group on Fuel Safety ([WGFS](#))
- OECD Halden Reactor Project ([HRP](#))
- IAEA
 - Technical Working Group on Fuel Performance and Technology ([TWG-FPT](#))
 - [FUMAC](#) (Fuel Modelling in Accident Conditions)
- World Nuclear Association (WNA) working group on Safety Criteria for New Fuel Technologies

Thank you for your attention.

Working Party on Scientific Issues of Reactor Systems
WPRS website:

<http://www.oecd-nea.org/science/wprs/index.html>

