International Conference on Fast Reactors and Related Fuel Cycles, Kyoto, Japan

OECD / Nuclear Energy Agency activities related to fast reactor development

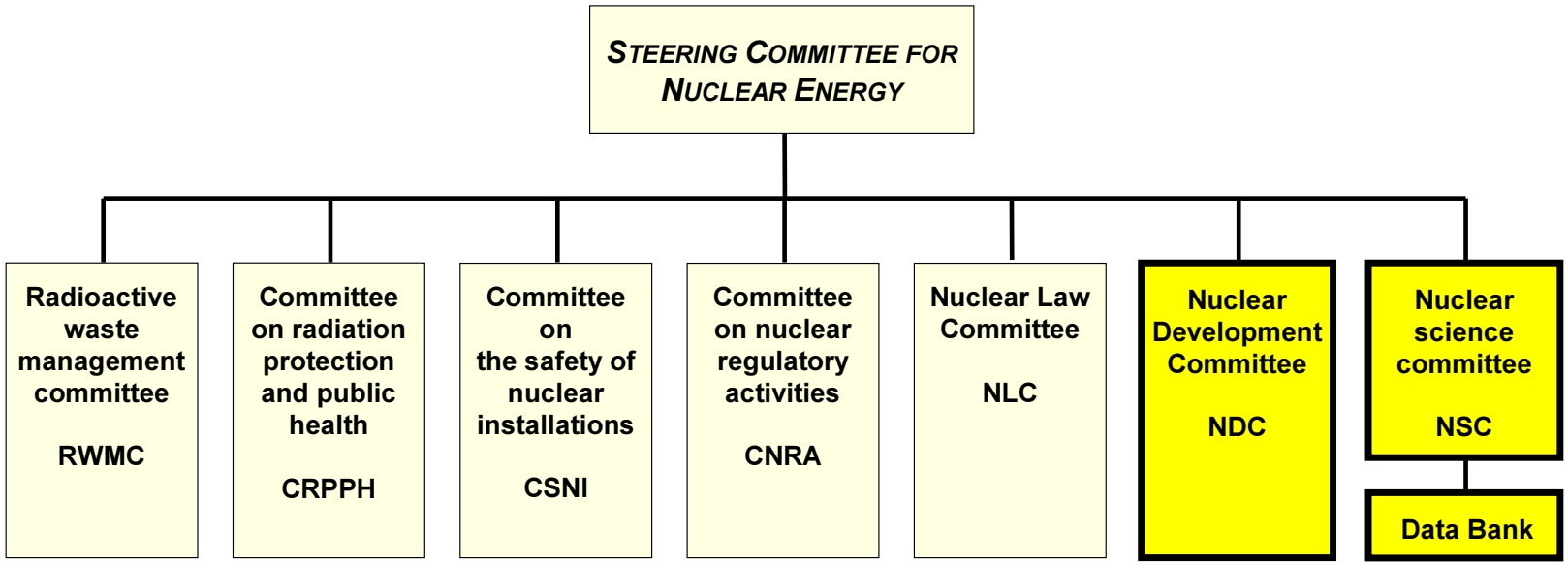
Th. Dujardin, C. Nordborg, Y-J Choi
OECD / Nuclear Energy Agency

OECD / Nuclear Energy Agency

- Assists its member countries to develop the scientific and technological bases required for the safe, environmentally friendly and economical use of nuclear energy
- Coordination of international projects, involving experts from member countries
- Headquarters in Paris, France; staff of about 75 - 90
- 28 member countries

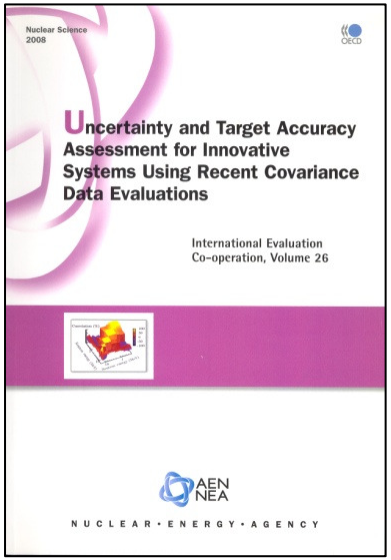
OECD / Nuclear Energy Agency

- No comprehensive programme on fast reactors
- But many different activities in support of fast reactor development



Scientific Issues

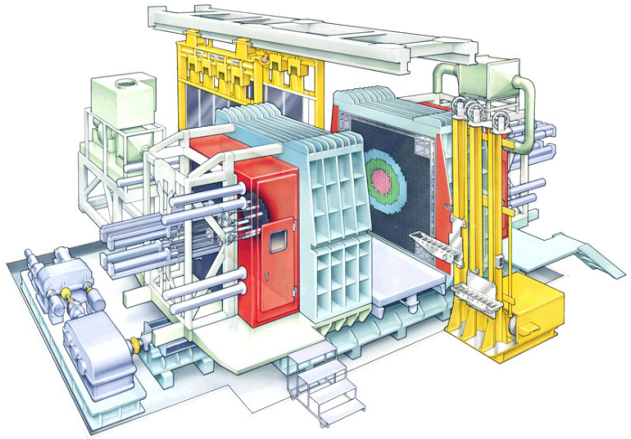
- **Nuclear data related activities**
  - **Nuclear data requirements are addressed by the NEA/NSC Working Party on Evaluation Cooperation (WPEC)**
  - **A study on a systematic approach to define data needs for advanced reactor systems completed**



  - **Follow-up activity on "*Methods for the combined use of integral experiments and covariance data*" (see paper by G. Palmiotti et.al at this conference)**

Scientific Issues

- **Nuclear Data related activities**
  - **The newly started NEA/NSC Expert Group on Integral Experiments for Minor Actinide Management will focus on:**



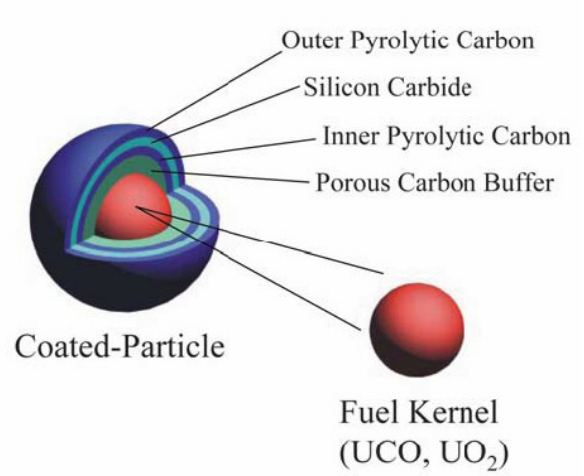
- ❖ reviewing existing data
- ❖ identifying additionally needed experimental work, based on work by WPEC
- ❖ proposing action programmes for international cooperation

Scientific Issues

- **Structural materials**
  - Particular importance for high temperature reactors
  - Two newly started NEA/NSC Expert Groups on:
    - innovative structural materials under extreme conditions, (high temperature and dose rate, corrosive chemical environment…)
    - structural materials modelling for developing integrated multiscale modelling frameworks of use in applications
  - NEA workshop on Structure Materials for Innovative Nuclear Systems (SMINS-2), 31 Aug. – 3 Sep. 2010, Daejeon, Korea

Scientific Issues

- **Fuels**
  - **The Expert Group on Innovative Fuels, mainly minor actinide bearing fuels, for use in advanced reactors, will review:**
    - **fabrication techniques**
    - **irradiation performance**
    - **characterisation and post-irradiation examination methods**
    - **predictive models/codes for fuel fabrication and performance**

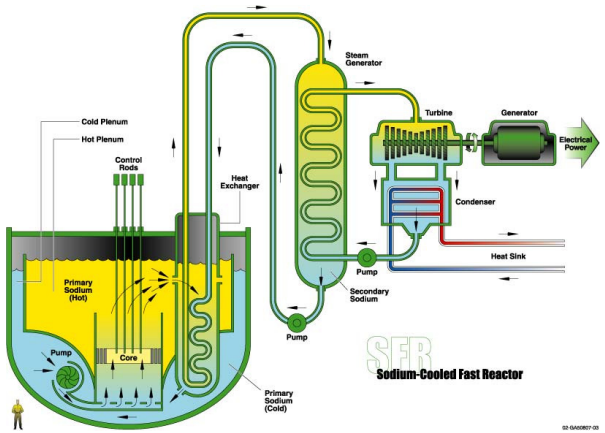


Scientific Issues

- **Fuels**
  - **The Expert Group on Advantages and Drawbacks of Homogeneous versus Heterogeneous Recycle of Minor Actinides in Fast Reactors is:**
    - **reviewing specific scenarios for implementation, potential non-proliferation issues, strategies for Cm management…**
    - **pointing out the potential impact, both on the reactor core and on the power plant**
    - **reviewing limitations on minor actinides content, residence time, remote fabrication implications…**

Scientific Issues

- **Reactors**
  - **New NEA/NSC activity on Sodium Fast Reactor core feed-back and transient response**

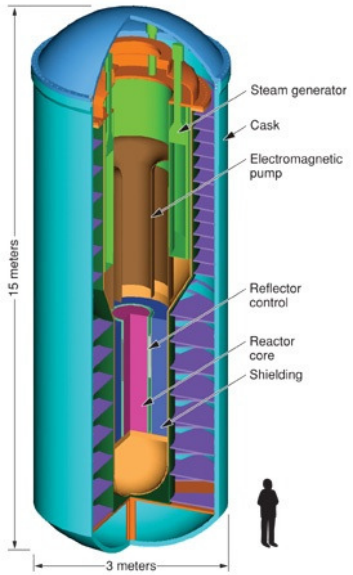


  - **The group will:**
    - **perform a safety parametric study (keff, power and flux distributions, void effect, Doppler, etc.) based on two different core sizes, each one with three fuel types: oxide, carbide and metal**
    - **make recommendations for improved safety and for future work on severe accidents and minor actinides management**

Scientific Issues

Reactors

- NEA is also coordinating the following activities related to Lead-Alloy Cooled reactors:



- a benchmark study for both natural circulation and steady-state forced convection using data from the HELIOS loop at Seoul, Korea
- updating the 2007 handbook on Lead-bismuth Eutectic Alloy and Lead Properties, Materials Compatibility, Thermal-hydraulics and Technologies

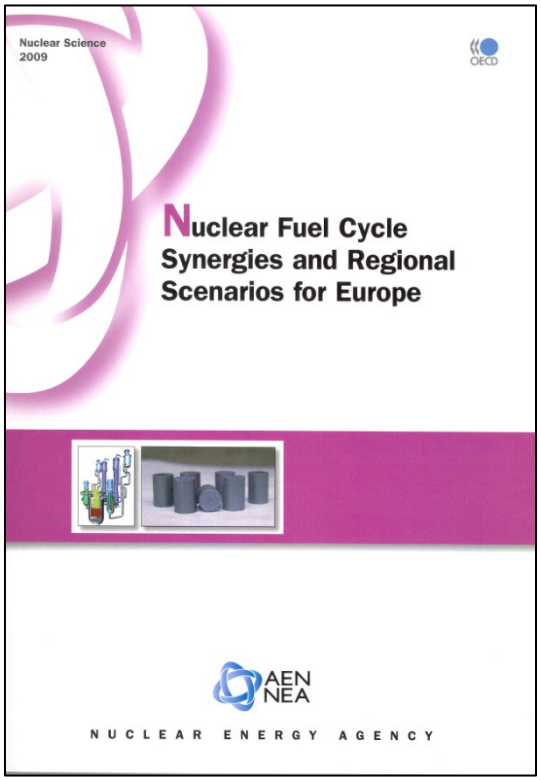
Scientific Issues

- **Partitioning and Transmutation**
  - **NEA biennial Information Exchange Meetings on P&T**
    - **next meeting on 1-5 November 2010, in San Francisco, USA**

  - **An on-going comparative analysis of studies performed in several international laboratories on the impact of advanced fuel cycles, including P&T, on geological repository performance**
    - **Expected recommendations on the appropriate criteria to evaluate the P&T impact, on the level of losses at fuel processing, etc.**

Strategic Issues

- **Transition scenarios from thermal to fast reactors**
  - **One technical report focussing on:**
    - **definition of key issues**
    - **assessment of technologies**
    - **national scenario assessments**
  - **Three benchmark exercises on:**
    - **scenario codes performances**
    - **regional European scenario**
    - **global transition scenario**



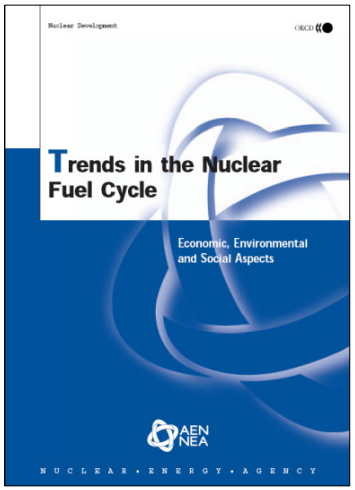
Strategic Issues

- **Transition scenarios from thermal to fast reactors**
  - **One strategic report focussing on topics of interest to policy makers:**
    - **highlights the need to evaluate the advantages and drawbacks of transition scenarios in a holistic approach, when considering short-term and long-term aspects, and assessing environmental and social criteria as well as economics**
    - **Implementation requires long-term commitments and comprehensive and consistent planning**
    - **stresses the potential role of international cooperation and multinational endeavours in facilitating the implementation of transition scenarios**

Strategic Issues

- **Trends in the Nuclear Fuel Cycle**
  - Update of a 2001 publication on the same subject
  - Investigating the trends in the latest progress and the future trajectories ranging from Gen II, III, III+ to IV and P&T, etc.
  - Covers
    - economics aspects
    - environmental aspects
    - social aspects

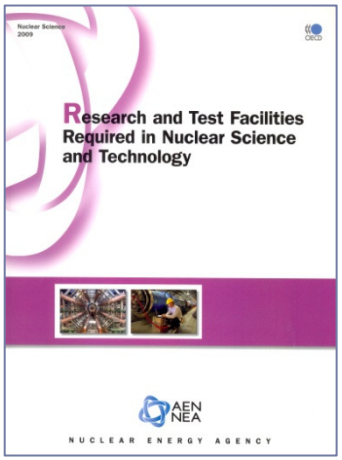
    the 3 pillars of sustainable development from an OECD perspective



Strategic Issues

❑ Experimental facilities

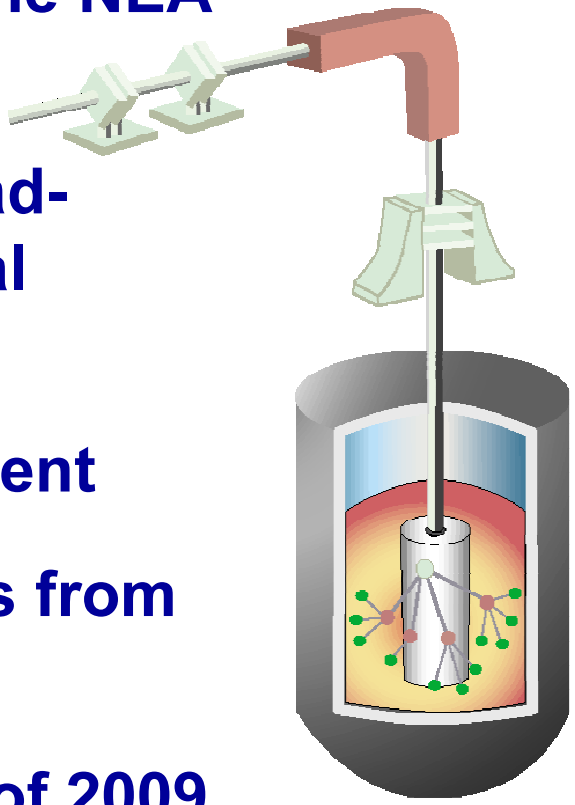
- One study on the strategy for an efficient utilisation of facilities and resources for meeting short and long term safety research priorities of fast (gas cooled reactors and sodium) reactors.



- Another review on the availability and need of research and test facilities in nuclear science and technology, including fast reactor development
- See separate presentation by Pierre D'Hondt at this conference

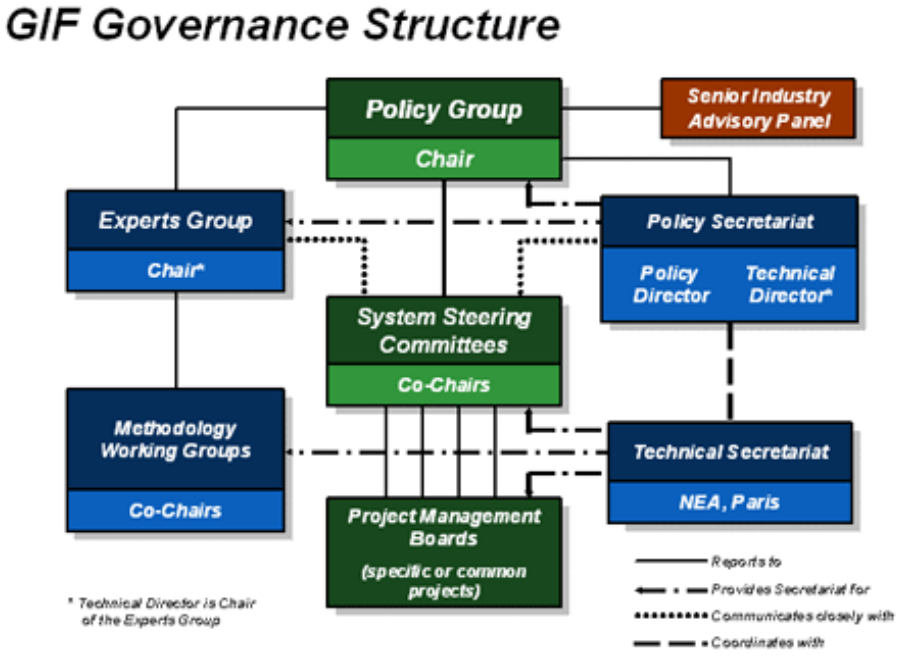
Evaluation of the MYRRHA Project

- International peer-reviews part of the NEA activities
- MYRRHA: an accelerator driven lead-bismuth eutectic cooled sub-critical reactor
- Request from the Belgian government
- Review team of 7 high-level experts from 7 different countries
- Report to be published by the end of 2009



Generation-IV International Forum

- **The NEA acts as the Technical Secretariat of the GIF, where 3 (4) of the 6 selected systems are fast reactors:**



- **Gas-Cooled Fast Reactor (GFR)**
- **Lead-Cooled Fast Reactor (LFR)**
- **Sodium-Cooled Fast Reactor (SFR)**
- **(Supercritical-Water-Cooled Reactor [SCWR])**

Thank you for your attention