21.6.2010
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Consultants' Meeting
"IAEA/GIF Workshop on Operational and Safety Aspects of Sodium Cooled Fast Reactors"

Terms of Reference

Date: 23 – 25 June2010
Venue: IAEA Headquarters, Vienna

Participants (preliminary)

China:	Ms Ren Lixia
France:	Mr Pascal Anzieu Mr J. Bouchard Mr Gian Luigi Fiorini Mr J-F. Sauvage
India:	Mr P. Chellapandi Mr S.C. Chetal Mr P. Mohanakrishnan Mr Baldev Raj
Japan:	Mr Shoji Kotake Mr Yasushi Okano Mr R. Nakai Mr Yutaka Sagayama Mr Masanori Tanihira
Republic of Korea	Mr Hahn Dohee Mr Jeong Hae Yong
Russian Federation:	Mr Yury Ashurko Mr V. Rachkov
USA:	Mr. Robert Boudreau Mr Thomas Kevern Mr Peter Lyons Mr Harold McFarlane Mr Tanju Sofu Mr Roald Wigeland
European Commission:	Mr Luca Ammirabile Mr Haileyesus Tsige-Tamirat
OECD/NEA:	Mr Makoto Takano
IAEA Scientific Secretaries:	Mr Randy Beatty, INPRO Mr Alexander Stanculescu, NPTDS

Background

Since the early 1950s, vigorous fast reactor R&D and technology development programs were pursued worldwide, leading to the construction and operation of experimental and prototype fast reactors: the USA were the first, with Clementine becoming critical in 1946, and the first nuclear electricity kilowatt-hours produced in December 1951 by a fast reactor, the

EBR-I in Idaho. The USA program continued with basic R&D and construction of fast reactors of increasing power (EBR-II, FERMI, and FFTF).

The USSR (BR-10, BOR-60), the UK (DFR), and France (RAPSODIE) also initiated fast reactor development programs and built their own experimental fast reactors. A few years later, Germany and Japan started their national fast reactor development programs and constructed experimental fast reactors (JOYO and KNK, respectively).

In the next years, the pace of fast reactor development picked up, and the programs were at their peaks by 1980. The experimental reactors were operating in many countries, providing the R&D tools (mainly as irradiation facilities) for the various commercial size prototype fast reactor development programs, e.g. Phénix, Superphénix in France, SNR-300 in Germany, Monju in Japan, PFR in the UK, CRBR in the USA, and BN-350, BN-600 in the USSR.

While interest in this technology was increasing in developing countries, the next 10 years saw a gradual decline in fast reactor activities in the West. By 1994, in the USA, the CRBR had been cancelled and FFTF and EBR-II had been shut down. In France, Superphénix was shut down at the end of 1998; SNR-300 in Germany was completed but not taken into operation, and KNK-II was permanently shut down in 1991. In the UK, PFR was shut down in 1994; and in Kazakhstan BN-350 in 1998.

Current renewed interest in nuclear energy is driven by the need to develop carbon free energy sources, demographics and development in emerging economies, as well as security of supply concerns. The pace at which the nuclear energy option is embraced seems to be accelerating worldwide, with the existing marked imbalances in energy availability causing more and more emerging economies to give it serious consideration.

For obvious sustainability reasons, spent fuel utilization and breeding are returning to centre stage, and with this the fast reactor as the necessary linchpin. As noted by many participants at the recent IAEA International Conference on “Fast Reactors and Related Fuel Cycles - Challenges and Opportunities (FR09)”, organized by the IAEA after a hiatus of 18 years, and hosted by the Japan Atomic Energy Agency (JAEA) in Kyoto from 7 – 11 December 2009, this rapidly evolving situation is likely to accelerate fast reactor development and deployment. FR09 laid out the path forward and showed that it is tied to clear objectives, leading to the commissioning of experimental fast reactors (CEFR in China in 2010), the restart of the industrial prototype Monju in Japan in 2010, the commissioning, at the time horizon 2011 – 2013, of power fast reactors in India and Russia (PFBR and BN-800, respectively), the planned construction of the French prototype fast reactor ASTRID, and further construction projects in India, Russia, Japan and the Republic of Korea. For these ambitious programs, international collaboration (as a means to pool resources, avoid duplication, and make best use of synergies) is a must, as are continuous efforts to harmonize concepts, in order to avoid duplications, and aim for complementarities.

It is generally accepted that economics, safety, and non-proliferation issues are the key areas to focus on for enhancing fast reactor technology acceptance in view of its depolyment.

The IAEA, through regular budget activities implemented within the framework of its Technical Working Group on Fast Reactors (TWG-FR), and related activities within the framework of the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO) is providing fora for exchange of non-commercial scientific and technical information, and for international cooperation on generic research and technology development topics related to fast reactors. The Generation IV Interanational Forum (GIF) is another interantional iniative that combines interested countries in the development of fast reactors.

Now 6-7 countries have definite plans to proceed with the construction of fast reactors. Their designs are based on the results of many years of R&D works, and operational and safety exprerience accumulated during operation of the experimental and power fast reactors.

Against this background, and with the objective of strengthening links between the IAEA/INPRO activities and GIF, it was decided to convene “Specialists’ Workshops” on

various topics related to sodium cooled fast reactors (SFRs). This Consultants' Meeting is planned as the first in a series of such "Specialists' Workshops".

Scope and Objectives of the Consultants' Meeting

The scope of the Consultants' Meeting covers the various national SFR operational and safety approaches.

The main objective of the Consultants' Meeting is to provide a forum for national experts to present the rationale introduced in the designs of the current and future fast reactors based on the operational and safety experience accumulated up to now. Since IAEA Member States with previous SFR experience and/or with current SFR development programs are following different paths for achieving similar operational and safety goals, the specialists participating in the Consultants' Meeting will present, on the one hand side, the national analytical, scientific and operational based rationales introduced in and safety criteria applied for the designs of SFR, and, on the other, the respective approaches for improvements.

The presentations are expected to be based on analyses, experiments, the licensing experience, as well as on safety-related operational and construction experiences. It is expected that the approaches for improvements will be outlined in a holistic manner.

The presentations are further expected to cover methods (codes and data) development, validation and qualification programs. In this context, the presentations are expected to address also the description of the experimental facilities (in operation and planned) related to SFR safety research and technology development, as well as the programs implemented and the results obtained at these facilities.

Outcome and Output of the Consultants' Meeting

It is expected that the Consultants' Meeting will lead to an improved understanding of SFR operational and safety issues. This, in turn, will result in fine tuning of national research and technology development programmes, thus improving the prospects of SFRs deployment, acceptable to both utilities and regulatory bodies.

The output of the Consultants' Meeting will be an IAEA Report summarizing areas of convergence and divergence with regard to SFR operational and safety issues, *viz*. safety criteria (i.e. goals and priorities based on insights, analyses, experimentation and licensing experience), design philosophy and technologies to meet those goals, and safety approaches as far as licensing efforts are concerned.

It is expected that the Consultants' Meeting will identify collaborative areas where IAEA Member States can work together with regard to modeling, experimentation, sharing of experimental facilities, codes and standards, etc.

The participants are also expected to recommend whether additional "Specialists' SFR Workshops" on related topics would be advisable prior to the next large IAEA International Fast Reactor Conference to be convened, presumably, in 2012 (FR12).

Preliminary Agenda Items

Day 1: National Presentations

Day 2: National Presentations

Day 3: Discussion and drafting of summary, conclusions, and action item list