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WORKING MATERIAL

Forty-Second Meeting of the

Technical Working Group on Fast Reactors (TWG-FR)

Indira Gandhi Centre for Atomic Research (IGCAR)

Kalpakkam, Tamil Nadu, India

25 – 29 May 2009

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**Forty-Second Meeting of the
Technical Working Group on Fast Reactors (TWG-FR)**

**Indira Gandhi Centre for Atomic Research (IGCAR)
Kalpakkam, Tamil Nadu, India
25 – 29 May 2009**

MEETING REPORT

1. Introduction

The 42nd Annual Meeting of the Technical Working Group on Fast Reactors (TWG-FR) was held from 25 – 29 May 2009 in Kalpakkam, India, hosted by the Indira Gandhi Centre for Atomic Research (IGCAR).

The meeting was attended by the TWG-FR Members and Advisers from the following Member States (MS): Belgium (observer), France, Germany, India, Italy, Japan, the Republic of Korea, the Russian Federation, and Switzerland. Apologies for not being able to participate were received from Belarus, Brazil, Kazakhstan, the United Kingdom, the United States of America, the European Commission, ISTC, and OECD/NEA.

The objectives of the meeting were to:

- Exchange information on the national programmes on Fast Reactors (FR) and Accelerator Driven Systems (ADS)
- Review the progress since the 41st TWG-FR Annual Meeting, including the status of the actions
- Consider topical technical meetings meeting arrangements for 2009, 2010, 2011 and beyond
- Review the IAEA's ongoing information exchange and coordinated research activities in the technical fields relevant to the TWG-FR (FRs and ADS), as well as coordination of the TWG-FR's activities with other organizations and international initiatives
- Discuss future joint activities in view of IAEA's Programme and Budget Cycles beyond 2010–2011.

The inaugural session was held jointly with the participants of two IAEA consultants' meetings (on two IAEA technical publications titled "Status and trends of uranium-plutonium oxide, carbide, nitride and metallic fuels for sodium cooled fast reactors – fabrication, properties and irradiation behaviour", and "Back-end of the fast reactor fuel cycle: status and perspectives"), which were held in parallel at IGCAR. All delegates were welcomed by Mr S.C. Chetal, IGCAR Acting Director. Opening remarks were given by Mr A. Stanculescu, TWG-FR Scientific Secretary and by Mr H.P. Nawada, on behalf of Mr C. Ganguly, Scientific Secretary of the two consultants' meetings. After the self-introduction by the participants, the chairmen for the meetings were selected: Mr P. Chellapandi (TWG-FR chairman 2009 – 2010), Mr. H.S. Kamath, and Mr P.R. Vasudeva Rao for the two consultants' meetings.

After the inaugural session, Mr P. Chellapandi, as chairman of the TWG-FR starting with the 42nd till the 43rd Annual Meeting, expressed his expectation that the rich tradition of the TWG-FR (in terms of in-depth information exchange on the progress in the areas of fast reactors and ADS and on the technological approaches followed by the Member States, as well as of collaborative R&D) should be continued to the benefit all the Member States.

2. National Presentations

There were 12 presentations made by the representatives of 9 Member States in addition to the presentation on TWG-FR activities during May 2008 – April 2009 made by Scientific Secretary, IAEA, the presentation on the “societal aspects” made by Mr M. Suehiro, and the presentation on the IAEA database THERPRO made by the TWG-FR Scientific Secretary. The presentations are attached, and a brief outline of each of the presentations is given below. Lively discussions took place on the various specific topics addressed in the national presentations. The discussions contributed to the clarification of the points of view of the represented Member States with regard to the status and prospects of fast reactor research and technology development, fast reactor concepts under consideration, and the progress and status of works related to ADS activities.

2.1 *Belgium*

Mr. Didier De Bruyn presented the ongoing activities in Belgium in the field of ADS. The flexible Neutron Irradiation Testing Facility, MYRRHA in its XT-ADS version and the facility “Generator of Uninterrupted Intense NEutron at the lead VENUS REactor” (GUINEVERE) have all made progress in the last 12 months in the area of design, coupling experiments and R&D studies. Several Euratom FP7 projects have been started in the domains of MYRRHA design (CDT project), materials, thermal hydraulics etc. The Belgian government has expressed its interest in the realization of MYRRHA, and a project review/evaluation report is being prepared by international experts under the OECD/NEA umbrella.

2.2 *France*

Mr. Pascal Anzieu presented the status of the French fast reactor program. He highlighted the progress achieved in the last 12 months. During 2008 and 2009, the Phénix operation availability factors were 69% and 95% respectively. The Phénix end-of-life test program in the areas of neutronics, thermal hydraulics, and negative reactivity transients were briefly presented, along with the decommissioning program. Two types of fast reactor concepts, SFR (sodium cooled) and GFR (gas cooled) are being pursued by France. Innovation efforts are focussed on the following areas: core design, materials, safety, energy conversion systems, general layout, in-service inspection and repair (ISIR), and components development. For the SFR, design studies for the 300 - 600 MWe prototype reactor ASTRID are ongoing. For the GFR, conceptual design studies for a 50-80 MWth experimental prototype reactor called ALLEGRO are ongoing within the framework of Euratom projects. The R&D studies for the GFR concept are focusing on the development of plate or pin type fuel elements clad with composite SiC ceramics.

2.3 *Germany*

Mr. Joachim Knebel presented an overview of Germany’s nuclear energy activities. The share of nuclear energy portion in the electricity supply is 23.3%. The German NPPs will continue to be operated for at least another 15 years. The decision on a final repository is still to be made. FZK and FZJ contribute to the foundation of the European Technological Platform on radioactive waste disposal. The German R&D activities are addressing the major challenges for the next 10 years in the areas of safety and waste disposal, including the Partitioning and Transmutation option. Research and technology development in the area of innovative reactor systems are being pursued within the framework of PhD and Master Theses Programmes at Universities. The facilities available in KIT (joint organization of FZK and the Karlsruhe

Technical University) were briefly presented. The nuclear education programme for engineers and scientists provided by experts of KIT and AREVA were highlighted.

2.4 India

Mr. P. Chellpandi presented the overall Indian nuclear power scenario, and in particular the status of fast reactor development in India. The total installed capacity at the end of March 2009 was approximately 148 GWe. The energy generated during April 2008 to March 2009 was 718 BU. Sixteen thermal reactors are in operation, with 52% overall capacity factor achieved during the year 2008-09. Six nuclear power plants are under construction, including the Prototype Fast Breeder Reactor (PFBR). The operating experience of the Fast Breeder Test Reactor (FBTR) was presented. For the 500 MWe PFBR, the balance of design and R&D activities was completed. The status of the PFBR project was presented. Many activities were completed towards the construction of PFBR, design review of handling and transport structures, provision of guidelines for the assembly and erection of components, etc. Current on-going activities towards future SFRs and a few interesting results were presented. The main future SFRs R&D activities are in the field of reactor physics, component development, thermal hydraulics, structural mechanics, materials and metallurgy, safety, fuel chemistry and reprocessing.

Mr. P.K. Nema presented the status of Indian activities in the domain of ADS. These activities have been progressing since 2003 in a coordinated project on reactor physics, spallation target, and high-power proton accelerator system development. In the ADS concepts studies, nuclear reactions in spallation target reactions were coupled with sub-critical core neutronics at various proton beam energies. The thermal hydraulics studies in the spallation target module with beam window and lead-bismuth eutectic circulation were studied. A few concepts for baseline design of a thermal reactor core changed to sub-critical ADS configuration were evolved. Preparations are going on for conducting experimental reactor physics studies with a 14 MeV neutron generator coupled with a metallic natural uranium fuelled, light water moderated core. Also, stand alone facilities of a 20MeV proton Linac and a lead-bismuth eutectic experimental loop are being set up within the framework of a technology development programme.

2.5 Italy

The status in Italy was presented by Mr. S. Monti. Italy is making concrete steps forward in order to reopen the nuclear energy option in the country. In particular, a new legislative framework is being implemented and important bilateral agreements with advanced nuclear countries have been recently signed. R&D activities are focused on four main areas: Cross cutting topics (modelling and simulation, safety, innovative materials), Gen III + evolutionary nuclear systems (IRIS), GEN IV nuclear systems (LFR, SFR and VHTR), and advanced fuel cycles including ADS. Ansaldo Nucleare, ENEA and CIRTEN are participating in the ESRF (European Sodium Fast Reactor) and in the ELSY (European Lead Cooled System) projects of the Euratom Framework Programmes.

2.6 Japan

Mr. Hitoshi Negishi presented the history and current status of fast reactor development in Japan. The development targets of the **Fast Reactor Cycle Technology Development** project (FaCT) are: safety and reliability, sustainability, economic competitiveness, and non-proliferation. The cost-reduction approaches (e.g. compact reactor vessel, shortened piping of

heat transfer system, two loop circuits, and innovative fuel handling system) adopted for the 1500 MWe JSFR were outlined. The conceptual design studies and the development of the innovative technologies are in progress. It is planned to realize a large-scale sodium test complex allowing the development and demonstration of the function of reactor components and cooling systems.

Mr. Shinji Yoshikawa presented the current status of the Monju fast reactor. The approval for detailed design and construction procedures for refuelling was granted in July 2008. Six newly fabricated fresh fuel subassemblies have reached the site. Exhaustive re-inspection of sodium detectors is underway after false alarms were activated due to their inappropriate installation. Repair work on a ventilation duct will soon be completed. Plant re-start is expected in 2009 on the premise of completion of the seismic safety re-evaluation.

2.7 *Republic of Korea*

The status of fast reactor technology development program in Korea was presented by Mr. Jinwook Chang. The on-site spent fuel storage limit will be reached in 2016, and a decision making process for spent fuel management is initiated. The long-term plans for SFR, pyro-processing, and metal fuel were presented. The developmental works including the construction of demonstration fast reactor are scheduled to be completed by 2025-2028. Details of a conceptual innovative SFR system were also presented. The R&D activities are focused on core design, heat transport systems, and mechanical structure systems. Specifically, planned R&D addresses a Passive Decay Heat Removal Circuit (PDRC) experiment, S-CO₂ Brayton cycle system, Na-CO₂ interaction test, and sodium technology. The Korean participation in various international programmes was presented.

2.8 *Russia*

Mr. Y. Ashurko delivered the national presentation for the Russian Federation. Russia is developing the “Federal Target Program (FTP) for nuclear power technology of a new generation for the period 2010-2020”. Within the framework of this program, fast reactor technologies based on sodium, lead, and lead-bismuth eutectic coolants (i.e. SFR, BREST, and SVBR, respectively) will be developed simultaneously, along with the respective fuel cycles. In 2008, the BN-600 load factor was 77.5%. The BN-600 design life time expires in April 2010. Works on its 15-year lifetime extension are being carried out. Operational highlights of BOR-60 and BR-10 were also presented. The construction of the 4th power unit of the Beloyarsk NPP with the BN-800 reactor is in progress. The design of the advanced large-size sodium cooled commercial fast reactor BN-K is ongoing. Activities aiming at the development of the 150 MWt sodium cooled research fast reactor MBIR have begun. MBIR will replace BOR-60. SVBR-100 and BREST-OD-300 activities are in progress. Some R&D works are also implemented in the ADS area.

2.9 *Switzerland*

Ms. Aurélie Chenu made a presentation on the Swiss “Fast-spectrum Advanced Systems for power production and resource management (FAST)” project implemented by the Paul Scherrer Institute (PSI). The studies include fast reactor core physics (static and transient behaviour), reactor system behaviour, and safety analysis. The emphasis of the activities within the framework of FAST is on generic development and GEN-IV systems. The goal is to create a centre of competence in the following three main areas: neutronics, thermal hydraulics, and fuel behaviour. To achieve this goal, FAST is following a three-pronged approach, namely the establishment and use of a unique computational tool, the integration of

the activities into international programs, and the organization of an efficient team. FAST is considering all the three GEN-IV fast spectrum reactor systems, i.e. sodium, gas, and lead cooled fast reactors. Recent FAST achievements in the area of methods and code development have been: new cross section generation model, gas cooled fast reactor fuel model, and sodium boiling model. The results of the study were presented in detail.

2.10 IAEA

Mr A.Stanculescu gave the Scientific Secretary's report on the TWG-FR activities conducted during 2008-09. With particular attention given to CRPs and technical publications, he highlighted their status, main outcomes, and actions required to be taken for completion of ongoing activities. The activities proposed for the IAEA Programme and Budget Cycle 2010-2011 were presented. These are:

- Promoting Research and Development (CRPs on ADS Benchmarks, Monju upper plenum thermal hydraulics, Phénix end-of-life experiments, "Source Term for Radioactivity Release Under Fast Reactor CDA Situations", and in collaboration with INPRO a CRP on "Thermal Hydraulics, Code Benchmarking and Handling of Liquid Metal and Molten Salt Coolants at High and Very High Temperatures").
- Promoting Education and Training: Provide training and education on Fast Neutron Systems Physics, Technology, and Applications (Schools and Workshops in collaboration with ICTP, Trieste).
- Conducting Specialized Studies or Scientific Assessments (e.g. on innovative negative reactivity feedback design features of sodium cooled fast reactors; status of and innovative solutions for in-service inspection and repair of sodium cooled fast reactors; and on advanced sodium heated steam generators and sodium/gas heat exchangers for fast reactors).

The report was followed by a lively discussion on the driving force, what is needed to be done to promote fast reactors, and the role of the TWG-FR. The driving force is the sustainability requirement based on the aspects of natural resources, waste minimization and economical competitiveness. The fast reactor with closed fuel cycle is essential for increased sustainability. The TWG-FR members identified the future needs as follows:

- Concentration of IAEA fast reactor activities under the TWG-FR umbrella
- Member States commitment to and support for the TWG-FR
- Increased resources.

3. Preparation of the "ADS Status Report"

Almost all contributions to the report have been delivered. The detailed status of the report is as follows:

- Chapter 2 "Background": this chapter is already in good shape
- Chapter 4 "ADS Concepts" (coordinated by S. Monti): this chapter is in good shape too. The Section 4.1.7 on the Indian Demonstration ADS concept is currently being written under the coordination of P.K. Nema
- Chapter 6 "National Programmes" (coordinated by A. Stanculescu): here we miss several contributions that would really be welcome, specifically France, Italy, Korea. Also, we have to keep in mind that the existing contributions reflect the perspectives at the end of 2007; during the draft review stage, contributors are asked to update, if necessary.
- Chapter 7 "International Programmes" (coordinated by J. Knebel); to-date, this chapter contains only the IAEA section. For the EU programmes, some information should be available through recent presentations. For the Asian ADS network, a contribution would be welcome.

- The remaining generic chapters do not present major problems, because they are written by the editors; specifically, these are Chapter 1 (“Introduction”) and Chapter 3 “Physical Principles”, responsible A. Stanculescu), Chapter 8 “Road Ahead” and Chapter 9 “Conclusions” (responsible A. Stanculescu and D. De Bruyn)
- The large Chapter 5 devoted to R&D and coordinated by H. Oigawa (and later T. Sasa) is now in the hands of the editors for ensuring coherency in both contents and layout. Several missing items have been obtained [specifically, the French contribution for fuel (section 5.5)]; an appropriate contribution was identified for MEGAPIE (section 5.4.1) and needs to be integrated; a contribution for YALINA (section 5.9) is currently being written. The global picture seems already reasonably coherent and complete.

Chapters 2, 4, 6, and 7 were distributed on a CD-ROM to the TWG-FR representatives. The editors are kindly requesting the TWG-FR representatives to comment/correct /add wherever appropriate. The draft will be finalized by D. De Bruyn and A. Stanculescu for publication before the end of the year.

4. TWG-FR Proposals for Future Activities (CRPs Topical Technical Meetings)

All TWG-FR members stressed the need to enhance the role of TWG-FR. A number of specific proposals and suggestions on how to achieve this goal were made. Finally, several topics for future activities were identified.

4.1 Enhancing the role of the TWG-FR

In view of enhancing the role of the TWG-FR, the TWG-FR members strongly recommend that:

- The TWG-FR should continue to (i) organise regular meetings to exchange information, (ii) carry out collaborative research projects of common interest to the TWG-FR Member States, (iii) be pro-active in the organization of large conferences on different aspects of fast reactor research and technology, and last but not least (iv) sustain the excellent platform for the fast reactor specialists to share the experience related to design, development, construction and operation of nuclear power plants with fast reactors.
- The TWG-FR increases the efforts to make more countries participate in its activities.
- The studies towards the development and realization of a sub-critical fast spectrum experimental reactor should be initiated within the framework of international collaboration.
- Efforts to secure training and education in the field of “Fast Neutron System Physics, Technology and Applications” are increased and respective Schools/Workshops be held on a regular basis.
- The TWG-FR emphasis in its activities benchmark studies on modelling and simulation of various phenomena related to fast reactors.
- The TWG-FR increases its efforts towards establishing a forum for broad exchanges on technical requirements for 4th generation fast reactor systems.
- Closer cooperation links be established with activities implemented within the framework of other international programmes (e.g. GIF, INPRO, OECD/NEA).
- A good interface between INPRO and TWG-FR should be established to avoid duplication of activities.
- To initiate and vigorously pursue the task of preparing IAEA Safety Guides on Fast Reactors (as in the case of Thermal Reactors).

4.2 *Topics for the TWG-FR activities (CRPs, topical technical meetings)*

The TWG-FR members agreed on the following general list of topics to be considered for the TWG-FR activities:

- Computer code validation (V&V) with the help of theoretical and experimental benchmarks, including severe accident analyses
- Operating experience feedback
- Lifetime extension aspects of sodium cooled fast reactors
- Instrumentation of primary system of sodium cooled fast reactors (temperature, flow measurement, drop-time measurement of shut-down systems, sodium boiling detection)
- Sodium leaks and fires
- Identification of gaps in sodium cooled fast reactors and need for experimental programme
- Preparation of safety guides on fast reactors starting with safety of nuclear power plant design (similar to NS-R-1 for thermal reactors)
- Lessons learned from operational experience (fast reactor knowledge preservation)
- Compilation of experimental facilities and their potentials, and stimulate member countries to make available their experimental data for benchmark exercises
- Use of sodium boiling experiments and numerical simulations
- Numerical simulation of available safety-related experimental data (e.g. CABRI, TREAT, etc.)
- Effectiveness of fast neutron ADS to incinerate higher actinides in the shortest time as complementary to plutonium utilization in critical FR, e.g. through an optimum support ratio of LWR + FR + ADS in a reactor (energy) park

4.3 *Proposals for CRPs, large international conferences, topical technical meetings, workshops, and seminars*

The TWG-FR members agreed on the following list of specific proposals for collaborative research (CRP) and information exchange activities (large conferences, topical technical meetings, workshops and seminars) to be implemented within the framework of the TWG-FR in the period 2010 – 2011 and beyond:

(I) Coordinated Research Projects (CRPs)

- a. Completion of the CRP on “Analytical and Experimental Benchmark Analyses of Accelerator Driven Systems (ADS)” (last Research Coordination Meeting in 2010, final report in 2011)
- b. Implementation of the CRP on “Benchmark Analyses of Sodium Natural Convection in the Upper Plenum of the Monju Reactor Vessel” (Research Coordination Meetings in RCMs in 2010 and 2011, completion likely in 2012)
- c. Implementation of the CRP on “Control Rod Withdrawal and Sodium Natural Circulation Tests Performed During the Phénix End-of-Life Experiments” (Research Coordination Meetings in RCMs in 2010 and 2011, publication of final report in 2012)
- d. New CRP on “Source Term for Radioactivity Release Under fast Reactor CDA Situations” (kick-off likely in 2010, duration ~ 3 years)
- e. CRP on “Thermal Hydraulics, Code Benchmarking and Handling of Liquid Metal and Molten Salt Coolants at High and Very High Temperatures (in collaboration with the INPRO “COOL” collaborative project)
- f. CRP on “Optimum Plant Parameters with Metallic and MOX Fuelled Fast Breeder Reactors” (2012 and beyond)

(II) Information exchange

a. Large conferences, seminars, and workshops

- Institutionalize the 2009 IAEA international conference (hosted by JAEA) on “Fast Reactors and Related Fuel Cycles - Challenges and Opportunities (FR09)” as a recurrent event (every 2 – 3 years)
- Workshop on “Science and Technology of Sodium Fires”
- Seminar on “Lessons Learned from Monju Restart”, including lectures on the status of fast reactors and their experimental capabilities
- Workshop on “Advanced Core and Structural Materials for Future Fast Reactors”
- Seminar on “Fast Reactor Decommissioning Experiences and Guidelines for Future Reactor Design”

b. Topical Technical Meetings (TMs)

- IAEA Fast Reactor Knowledge Preservation (FRKP) initiative
- Identifying innovative fast neutron systems development gaps and technology challenges, and providing coordinated responses and solutions
- Fast reactor deployment issues (e.g. impact of institutional and regulatory issues, impact of industrial and manufacturing issues, societal issues and public acceptance of fast reactors, etc)
- Verification, validation and qualification (V&V&Q) methods
- TWG-FR annual meetings in 2010 and 2011
- Innovative negative reactivity feedback design features of sodium cooled fast reactors
- Status of, and innovative solutions for in-service inspection and repair of sodium cooled fast reactors
- Conceptualisation, development and experience of ultrasonic scanner for in-service inspection of reactor internals of liquid metal cooled fast reactors
- Advanced sodium heated steam generators and sodium/gas heat exchangers for fast reactors
- Seismic design of fast reactors

5. Conclusions and Recommendations

The 42nd Meeting of the TWG-FR reached the following conclusions/recommendations:

- It is recommended that IAEA concentrate all research and technical activities related to fast reactor developments under the TWG-FR umbrella
- To ensure a clear interface between TWG-FR and INPRO, and recognizing that INPRO concentrates on long-term objectives of fast reactor development (e.g. assessment of various energy options, systems and identification of collaborative projects and mechanisms to establish collaborations), it is recommended that the TWG-FR should, firstly, concentrate on the short-term and medium-term scientific and technical issues of fast reactor development, and, secondly, implement fast reactor collaborative research and technology development projects, as e.g. those identified by INPRO and other IAEA groups.
- It is recommended that the IAEA, with technical inputs from the TWG-FR, produce IAEA safety guides and standards relevant to fast reactors
- Regarding public acceptance, it is recommended to have a dedicated Panel Discussion session during the Tsuruga Session of the FR09 Conference in December 2009, inviting all conference participants, general public and media. To plan this Panel, a committee

consisting of members who are responsible for the Chapter 9.4 (on public acceptance) of the Fast Reactor Status Report should be established. This committee should support the organisation of the session, including recommending the panel members involving statesmen, safety authority and scientific and technical personnel working in nuclear and other fields in Japan and elsewhere.

- It is recommended to initiate a study (possibly coordinated with the INPRO-GAINS project) on overall scenarios in which Fast Reactors and ADS are put in perspective for more sustainable nuclear energy deployment. This study would benefit from the outcomes of the Euratom framework program project PATEROS.
- It is recommended to consider the extension of the THERPRO database to fast reactors, beginning with data relative to sodium cooled fast reactors, and extending subsequently to other fast reactor concepts.
- It is decided to finalize the Fast Reactor Status Report at a special drafting consultants' meeting to be convened in Vienna in July or August 2009.

6 Miscellaneous

Considering the dates of ENC 2010 and PHYSOR 2010, the 43rd TWG-FR meeting is tentatively scheduled for 17 – 21 May 2010. A possible venue is Brussels (or Mol, Belgium), and the representative from Belgium will inquire with SCK•CEN about the possibility to host this meeting. In view of the CEFBR start-up, another possible venue would be Beijing; the TWG-FR Scientific Secretary will inquire with CIAE about this alternative.

IGCAR thanked the TWG-FR Scientific Secretary for accepting to organise the 42nd TWG-FR meeting at Kalpakkam, and also all the delegates from the TWG-FR Member States for accepting the invitation.

By the same token, all participants expressed their happiness and thanked for the excellent hospitality provided by IGCAR.

**Participants in the 42nd Annual Meeting of the TWG-FR, Indira Gandhi Centre for Atomic Research (IGCAR),
Kalpakkam, India, 25 – 29 May 2009**



**Meeting of the Technical Working Group on Fast Reactors, TWG-FR
25 to 29 May 2009, Kalpakkam, India
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Agenda for the

Forty-Second Meeting of the Technical Working Group on Fast Reactors (TWG-FR)

**Indira Gandhi Centre for Atomic Research (IGCAR)
Kalpakkam, Tamil Nadu, India, 25 – 29 May 2009**

Monday, 25 May 2009:

- 10:00 Joint opening of the 42nd TWG-FR Meeting and of the IAEA Consultancy Meeting)
Welcome by Mr Baldev Raj, Director of IGCAR
Opening remarks by Mr A. Stanculescu, TWG-FR Scientific Secretary
Opening remarks by Mr C. Ganguly, Scientific Secretary of the IAEA Consultancy Meeting)
Self-introduction by the participants
Selection of the TWG-FR and of the IAEA Consultancy Meeting
Chairpersons
Chairpersons' remarks
- 11:00 *Tea break*
- 11:20 Discussion and adoption of the agenda
- 11:30 Progress reports on national programmes on fast reactors and accelerator driven systems, and identification of areas and topics of interest for future cooperation within the TWG-FR framework [*Approximately 20 – 30 minutes presentation including discussion by each Member State representative, in country name alphabetical order. **The delegates are kindly requested to bring along their full paper progress reports (both as hardcopy and on electronic support) for publication in the meeting report***]
- 12:30 *Lunch*
- 13:30 Progress reports on national programmes ..., continued
- 18:00 *Adjourn*

Tuesday, 26 May 2009:

09:30 Progress reports on national programmes ..., continued

12:30 *Lunch*

13:30 Report of the TWG-FR Scientific Secretary (summary of TWG-FR activities, status of the actions)

Discussion of the TWG-FR Scientific Secretary's report

Status of recently completed / ongoing Coordinated Research Projects (CRPs)

- Studies of Innovative Reactor Technology Options for Effective Incineration of Radioactive Waste
- Analytical and Experimental Benchmark Analyses of Accelerator Driven Systems (ADS)
- Analyses of, and Lessons Learned from the Operational Experience with Fast Reactor Equipment and Systems (2006 – 2009)
- Benchmark Analyses of Sodium Natural Convection in the Upper Plenum of the Monju Reactor Vessel (2008 – 2011)
- Phénix End-of-Life Tests (2009 – 2012)

Status of the preparation of TWG-FR Status Reports

- Accelerator Driven Systems: Energy Generation and Transmutation of Nuclear Waste; Status Report
- Status of Liquid Metal Cooled Fast Reactor Technology
- Status Report on Lead and Lead-Bismuth Cooled Fast Reactors

17:30 *Adjourn*

Wednesday, 27 May 2009

09:30 Discussion of the TWG-FR activities planned within the framework of IAEA's Program and Budget 2008 – 2009

- Large International Conference on *Fast Reactors and Closed Fuel Cycle – Challenges and Opportunities*
- Large International Conference on *Materials Research and Utilization of Accelerators*
- Topical Technical Meeting (TM) on *Design Features of Advanced Sodium Cooled Fast Reactors with Emphasis on Economics*
- Topical Technical Meeting (TM) on *Fuel Handling Systems of Sodium Cooled Fast Reactors (unfunded)*
- Publication on *Public Acceptance of Fast Reactors (extra-budgetary)*
- IAEA/ICTP School on *Physics and Technology of Fast Reactor Systems*
- IAEA's Fast Reactor Knowledge Preservation Initiative

12:30 *Lunch*

13:30 Technical visits at IGCAR and PFBR (jointly with IAEA Consultancy Meeting)

17:30 *Adjourn*

Thursday, 28 May 2009

09:30 Discussion of the TWG-FR activities planned within the framework of IAEA's Program and Budget 2010 – 2011

- Topical Technical Meeting (TM) on *Negative Feedback Design Features of Sodium Cooled Fast Reactors* (2010 unfunded)
- Topical Technical Meeting (TM) on *In-service Inspection and Repair of Sodium Cooled Fast Reactors* (2011)
- Topical Technical Meeting (TM) on *Advanced Sodium Heated Steam Generators and Sodium/Gas Heat Exchangers for Fast Reactors* (2011)
- Enhance the THERPRO data base to include sodium cooled fast reactors materials

Discussion of future (beyond 2011) TWG-FR activities:

- Vision for the TWG-FR
- Proposals for new CRPs, TMs, symposia/seminars, identification of possible NE Series Documents on topics relevant to the TWG-FR work scope (*To ensure distribution among all participants, the delegates are kindly requested to inform the Scientific Secretary ahead of the meeting of intended proposals*)

Friday, 29 May 2009

09:30 Discussion of the conclusions and recommendations of the 42nd TWG-FR Meeting and drafting of the Meeting Report

Miscellaneous (date and venue of next TWG-FR Meeting, ...)

13:00 *Lunch*

14:00 Adjourn meeting

PRESENTATIONS:**BELGIUM**

On going activities in Belgium in the field of ADS: MYRRHA, XT-ADS, CDT and GUINEVERE

D. De Bruyn

FRANCE

Fast Reactor in France Status and Program

P. Anzieu, J. Rouault, L. Martin

INDIA

Status of fast reactor development in India: April 2008 – March 2009

P. Chellapandi

Indian ADS Programme: Status of Activities

P.K. Nema, P. Singh, P. Satyamurthy, S.B. Degweker, V.K. Handu

ITALY

Italian Progress Report on Nuclear Fission

S. Monti

JAPAN

A Current Status of Fast Reactor Development in Japan- JSFR (Japan Sodium-cooled Fast Reactor) design study and R&D progress

H. Negishi

Current Status of Monju

S. Yoshikawa

KOREA, REPUBLIC OF

Status of the Fast Reactor Technology Development Program in Korea

D. Hahn, J. Chang

RUSSIAN FEDERATION

Status and development of fast reactors in Russia

V.M. Poplavsky, Yu.M. Ashurko, N.N. Oshkanov, M.V. Bakanov

SWITZERLAND

FAST: Fast-spectrum Advanced Systems for Power Production and Resource Management

K. Mikityuk, S. Pelloni, J. Krepel, E. Marova, S. Pilarski, G. Girardin, A. Epiney, A. Chenu, K. Sun, P. Petkevich, R. Adams, C. Feliciani, C. Klauser

Modeling of Sodium Two-phase Flow

A. Chenu

IAEA

TWG-FR Activity Report for the Period May 2008 - April 2009

A. Stanculescu

The research for the better way of public acceptance related to the R&D of Fast Reactor

M. Suehiro

IAEA / THERPRO

A Compilation of Thermo-physical Properties of Nuclear Materials on Internet (THERmo-Physical Materials PROperties Database)

Kim, Y.s.