12th GIF-IAEA Interface Meeting
Vienna, 26-27 March 2018

IAEA General Information on NE Activities Related to Innovative Nuclear Systems

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- 3 Divisions
- 10 Sections
NPTDS currently has activities on all 6 reactor technologies selected by GIF.
Coordinated Research and Main Activities Relevant to GIF
Coordinated Research (1/2)

Ongoing CRPs:

- **SCWR**
  - Understanding and Prediction of Thermal-Hydraulics Phenomena Relevant to SCWRs

- **HTGR**
  - Modular High Temperature Gas-cooled Reactor Safety Design
  - HTGRs applications for energy neutral sustainable comprehensive extraction and mineral products development (with NEFW-NFCM)
  - HTGR Reactor Physics, Thermal-Hydraulics and Depletion Uncertainty Analysis

- **FR**
  - NAPRO – Na Properties and Safe Operations of Exp. Facilities
  - PSFR Source Term – Radioactive Release Under Severe Accident Conditions

Recently Concluded CRPs:

- **FR**
  - EBR-II Shutdown Heat Removal Tests (Published)

Details on the CRPs will be provided in separate presentations
Coordinated Research (2/2)

New CRPs:

• **FR**
  – CEFR Physics Start-Up Experiments (19 proposals received):
    • Most recent data on Sodium-cooled Fast Reactor
    • Neutronics Codes Benchmarking
  – FFTF ULOF Test:
    • Coupled neutronics, thermal hydraulics, material behavior and system codes
    • Essential benchmark for safety analysis (validation of models and assessment of simulation codes)

• **SMR**
    • A Joint CRP between Department of NE and Department of Nuclear Safety & Security
    • Key objective: address aspects of emergency preparedness & response (EPR) specific for SMR deployment, particularly the size of EPZ

• **Non Electrical Applications**

*Details on the CRPs will be provided in separate presentations*
FR flagship Activity

FR17 in Yekaterinburg, 26-29 June 2018

600+ Participants
29 Countries
6 Intl. Organizations
488 Contributions
  4 Opening
  11 Keynotes
  11 Panels
  12 YGE
  243 Orals
  206 Posters

Panel on GIF SDC/SDG
Panel on FR of SMR type

FR17 Proceedings are under review
(approved by DCT)
Main Activities (FRs)

• Technical Working Group on Fast Reactors
  – 50th TWG-FR Meeting in Vienna, May 2017
  – 51st TWG-FR Meeting in Hefei, China, 21-25 May 2018

• GIF-IAEA Workshops on Safety of SFR/LMFR
  – 7th GIF-IAEA Workshop on LMFR Safety: 27-29 March 2018
    • Continuous in-depth discussions on the development of SFR SDC/SDG

• LMFNS Experimental Facilities Database:
  – Includes an overview as well as detailed information on 150 experimental facilities under design, construction or operation

• Training Courses and Workshops
  – Next Workshop: 20 – 24 August 2018, Trieste, Italy (Open for Applications)

Details on the activities will be provided in separate presentation
Main Activities (HTGRs)

- Nuclear Graphite Knowledge Base related activities:
  - Taxonomy developed for the IAEA Nuclear Graphite Knowledge Base (to be incorporated into SharePoint site)
  - Progress to be made on the transfer of the knowledge base and software related to the closed HTGRs program of the Research Centre Juelich to the IAEA (with NKM) and support from South Africa
  - TM on the Status of the IAEA Nuclear Graphite Knowledge Base (15-16 Nov 2018)

- TM on Knowledge Preservation for Gas Cooled Reactor Technology and Experimental Facilities (12-14 Nov 2018)

- TM on Research and Technology Needs to Enable Increased Operating and Accident Temperatures for High Temperature Reactors (to update latest developments and review the TECDOC under development)

- Joint IAEA-GIF Technical Meeting on Safety of High Temperature Gas Cooled Reactors (Nov 2018)

Details on the activities will be provided in separate presentation
Main Activities (MSRs)

**Background**
- IAEA currently does not have focused systematic activities on MSR technology

**GC60 resolution**
- "Encourages the Secretariat to explore, in consultation with interested MSs, the need for closer collaboration in technology development for advanced reactor lines by hosting a workshop with the aim of considering launching a new project on molten salt and molten salt cooled advanced reactors"

**Actions taken**
- Two consultancy meetings on Status of MSR Technology (18-20 November 2015; 25-27 September 2017)
- **Technical Meeting on the Status of Molten Salt Reactor Technology** (31 October – 3 November 2016)
  - 35 participants from 18 member states: Australia, Canada, China, Czech Republic, Denmark, France, India, Indonesia, Italy, Japan, The Netherlands, Russian Federation, Switzerland, Turkey, United Kingdom, USA, Venezuela, EU
- Support the development of a new chapter on MSRs in the IAEA Safeguards Physical Module Volume 6 Nuclear reactors (STR-314-06)
- **TECDOC: “Status of Molten Salt Reactor Technology” under development** (~150 pages; awaiting more contributions)

**Future actions**
Depends on stated MS interest and availability of RB / EB contributions
Main Activities (SMRs)

• Technical Working Group (TWG) for SMR (2018 – 2021)
  – Member States that have designated a member/representative: Argentina, Australia, China, France, Indonesia, India, Iran, Italy, Jordan, Republic of Korea, Pakistan, Russian Federation, and the United States, EC, OECD-NEA
  – Established to provide guidance to the IAEA on addressing challenges associated with the assessment of technology readiness and deployability of SMRs in Member States;
  – 1st TWG-SMR Meeting for SMR to be held on 23 - 26 April 2018 in Vienna

• New large regional TC project for Europe on SMR (2018-2019)
Main Activities: Non-electric Applications and Hybrid Systems

Technical Meetings

• TM on Nuclear-Renewable Hybrid Energy Systems for Decarbonized Energy Production and Cogeneration (October 22-25, 2018 – Vienna)
• TM on assessing the prospects for coupling non-electric applications to high temperature nuclear reactors, (November 19-21 Vienna)
• TM on the deployment of non-electric applications using nuclear energy for climate change mitigation (16-18 April 2018)

Studies

• Options to Enhance Energy Supply Security using Hybrid Energy Systems based on SMR
• Global Review of Integration of Renewable Generation in the Electricity Markets
Publications
Publications

FR

• FR17 Conference Proceedings: under review

• Analytical and Experimental Benchmark Analysis of ADS –
  ✓ In Publishing

• Catalogue of Experimental Facilities for Liquid Metal Cooled FNSs –
  ✓ In Publishing; Database is available online

• Benchmark Analyses of EBR-II Shutdown Heat Removal Tests
  ✓ Published

• NAPRO CRP
  • Handbook on Sodium Physical and Chemical Properties
    ✓ Under Review
  • Handbook on Thermal Hydraulics Correlations for Sodium-Cooled Reactors
    ✓ Final Draft
  • Design, Operation and Safety of Sodium Experimental Facilities
    ✓ Postponed

• Passive Shutdown Systems for Fast Neutron Reactors
  ✓ NES submitted for publication
Publications

HTGR

• TECDOC on Improving the Understanding of Irradiation-Creep Behaviour in Nuclear Graphite:
  ✓ Part 2: Recent Developments (Draft in 2018)

• TECDOC on Role of Nuclear-Grade Graphite in Controlling Oxidation in Modular High Temperature Gas-Cooled Reactors

NE-APP

• Industrial Applications of Nuclear Energy
  ✓ Published

• Opportunities for Cogeneration with Nuclear Energy
  ✓ Published

• Hydrogen Production Using Nuclear Energy
  – Published

• Generic Guidance on Nuclear Cogeneration
  ✓ Under review
Publications

SCWR

✓ Under advanced preparation

• Status of Fundamental R&D for SCWR
  – Under preparation

SMR

• Technology Roadmap for SMR Deployment
  ✓ Under final review

• Deployment Indicators for Small Modular Reactors
  ✓ Under final review

• New release of the Booklet “Advances in Small Modular Reactor Technology Developments”
  ✓ In 2018
Thank you!

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NPTDS and its Internal and External Networking