IAEA programmatic activities on Fuel Cycle and Wastes Technologies

Three sections:

1. NFCMS – Nuclear Fuel Cycle and Materials Section
2. WTS – Waste Technology Section
3. RRS – Research Reactors Section
1) Nuclear Fuel Cycle and Materials

Spent Nuclear Fuel (SNF) Management

- Information sharing on:
  - Safety of SNF (long term) storage, deterioration and ageing of both SF and storage systems, mitigation measurements, high burn-up and short cooled fast reactor SNF
  - Lessons learned in back-end of Nuclear Fuel Cycle and SF management
  - SNF recycling to increase fuel cycle sustainability and/or reduce repository footprint

- Coordination of research activities (CRPs) in Member States

- Publication of documents

- Organization of Technical Meetings, Workshops and Conferences
1) Spent Nuclear Fuel Management

Coordinated Research Projects (*Already Closed*)

- More than 30 years of accumulated experience showed that interim SF storage is safe in both wet and dry conditions
  - **BEFAST CRP series**: BEhaviour of spent Fuel Assemblies in STorage
  - **SPAR CRP series**: Spent Fuel Performance Assessment and Research
    SPAR I (1997-2001); SPAR II (2002-2008); SPAR III (2010-2014)

- Technical Document gathering relevant results and information obtained under preparation

**Main Conclusions**

- BEFAST and SPAR CRPs have demonstrated that international cooperation can successfully be accomplished, providing major benefits to MSs
- SF storage is approaching a **mature technology** in the back end of the FC

**CRP SPAR IV** is pending for approval by the Committee for Coordinated Research Activities (CCRA)
1) Spent Nuclear Fuel Management

Coordinated Research Projects *(Active)*

- Demonstrating Performance of Spent Fuel and Related Storage System Components during Very Long Term Storage *(Demo)*

  - PUI funded CRP on specific research needs to demonstrate long-term performance of SF from LWR for extended dry storage period
  - Demonstration tests in USA (for more than 15 years) and Japan
1) Spent Nuclear Fuel Management

Coordinated Research Projects (*New and Planned*)

- **Management of Severely Damaged Spent Fuel and Corium**
  - To expand the existing knowledge base and identify optimal approaches
  - CRP approved by the CCRA and open for proposals (research contracts/agreements)

- **Demonstrating Performance of Spent Fuel Storage (Demo-II)**
  - To follow up and assess results from demonstration projects in USA, Japan and RoK
  - CRP pending for approval by the CCRA

- **Ageing Management Programmes for SF Dry Storage Systems**
  - To develop the technical basis and methodology to provide guidance to MSs
  - CRP pending for approval by the CCRA
1) Spent Nuclear Fuel Management

Examples of Documents Published:

- Status of Developments in the Back End of the Fast Reactor Fuel Cycle
- Impact of High Burnup Uranium Oxide and Mixed Uranium–Plutonium Oxide Water Reactor Fuel on Spent Fuel Management
- Costing of Spent Nuclear Fuel Storage
- Management of Damaged Spent Nuclear Fuel
1) Spent Nuclear Fuel Management

Examples of Documents Published

- Nuclear Energy Supporting Documents (TECDOCs)
1) Spent Nuclear Fuel Management

- Documents under preparation
  - Potential Interface Issues in Spent Fuel Management
  - Spent Fuel Performance Assessment and Research (SPAR-III Final Report)
1) Spent Nuclear Fuel Management

**SFM-Net Development**

**ToRs Main Objectives (2013)**

- to foster safe, sustainable and efficient SF management practices across all MSs,
- addressing the management of SF after discharge, including handling, maintenance, storage, transport, reprocessing, SF data management, etc.

- The **TWG-NFCO** provides advice and recommendations on technical aspects of SFM and NFC and supports programme implementation, reflecting a global network of excellence and expertise
  (Last meeting 22-24 April 2015)

- **Information systems: NFCIS**
1) Spent Nuclear Fuel Management


- **Advanced Recycle Technologies**
  - 18-20 November 2013, Vienna (Austria): Attended by 22 participants from 9 MSs
    - To review developments in advanced fuel cycles with emphasis on recycling
    - To identify multiple recycling issues and R&D needs

- **Lessons Learned in Spent Fuel Management**
  - 8-10 July 2014, Vienna (Austria): Attended by 36 participants from 16 MSs
    - Included the reporting of activities related to the management of damaged and severely damaged spent fuel

- **Challenges in Reprocessing of Fast Reactor Fuels**
  - 24-26 June 2015, Vienna (Austria)

- **Achieving Zero Fuel Failure Rates: Challenges and Perspectives**
  - 1-2 October 2015, Varna (Bulgaria)
1) Spent Nuclear Fuel Management

- Technical Meetings (2016-2017)
  - Technical Options for Management of RW and SF in Countries Developing New Nuclear Programmes
    - In cooperation with WTS
  - MSs approaches to societal confidence and political acceptance in the back end of the fuel cycle
  - Developing nuclear fuel cycles: Options for closing the back-end, impacts on the existing options, benefits/issues associated with transitioning to a new fuel cycle
  - Advanced fuel cycles for waste burden minimization
  - Deployment of mitigation technologies
1) Spent Nuclear Fuel Management

- Int. Conference on Fast Reactors and Related Fuel Cycles, 4-7 March 2013, Paris (France)  
  *In collaboration with NPTDS*

- **Main goals:**
  - To identify and discuss strategic and technical options
  - To promote development in a safe, proliferation resistant and economic way
  - To identify gaps and key issues in relation to industrial development
  - To engage young generation

- Attended by 700 experts from 27 countries and 4 International Organisations
- 208 oral and 140 poster presentations in 10 technical sessions
- Two panel discussions: safety design criteria and sustainability of advanced fuel cycle

- **Proceedings recently published**
  
1) Spent Nuclear Fuel Management

- Int. Conference on Management of Spent Fuel from Nuclear Power Reactors, 15-19 June 2015, Vienna (Austria)
  - **Main goal:** Highlighting the importance of an integrated long term approach to the management of SF from NPPs
  - **Seven topical sessions**
    - Spent fuel management strategies
    - Storage options in support of the integrated approach
    - Status and challenges in an integrated approach
    - Ageing management programmes
    - Impact of the front end of the nuclear fuel cycle on the back end
    - Research and development required to deliver an integrated approach
    - Safety aspects of spent fuel management
  - 220 Registered participants
  - 4 keynote talks, 7 invited speakers, 78 oral presentations and 31 posters
  - **President of the Conference:** Ms Fiona Rayment (Director of Fuel Cycle Solutions at the UK NNL)

IAEA
2) Waste Technologies

- WTS fosters technology transfer, promotes information exchange and cooperative research, as well as builds capacity in MSs by:
  - Assisting to develop consistent policies and related strategies
  - Assisting with the predisposal and disposal stages of waste management
  - Helping to manage disused sealed radioactive sources
  - Assisting with planning and implementing decommissioning strategies and projects
  - Supporting cleaning-up of legacy waste and environmental remediation actions of radiologically contaminated sites

- The WATEC provides advice and recommendations on technical aspects of RWM and D&ER
2) Waste Technologies

Main activities:

- **WTS Networks:**
  - International Decommissioning Network (IDN)
  - Network for Environmental Management and Remediation (ENVIRONET)
  - Underground Research Laboratories for Geological Disposal of HLW (URF)
  - Near-surface Disposal Network (DISPONET)
  - Waste Characterization Network (LABONET)
  - **CONNECT** – Connecting the Network of Networks for Enhanced Communications and Training in RWM, D&ER

- Publications
- Coordinated Research Projects
- TC Projects and direct assistance
- International Peer Reviews
- Other activities such as Status & Trends project, NEWMDB, PRIS Decommissioning module, etc.
2) Waste Technologies

- Web platform CONNECT:

A password-protected, web-based, collaboration platform that provides a way for interconnecting IAEA networks.
2) Waste Technologies

- IAEA GC 2014 Scientific Forum (organized jointly by WTS/WES):

IAEA Scientific Forum Highlights Responsibility for Radioactive Waste
Establish Comprehensive Disposal Plans, Says Amano

Showing a stainless steel capsule used for conditioning disused sealed radioactive sources, which would have been used in medical, food, construction and other industries, IAEA Director General Amano emphasizes that radioactive waste is an issue for all States. (Photo: Ayhan Evrensel/IAEA)

A two-day Scientific Forum during the IAEA’s annual General Conference emphasized the need for a comprehensive, integrated, cradle-to-grave approach for management of radioactive waste.
2) Waste Technologies

- 10 publications issued in 2014 + 1Q 2015:

- 10+ are in various stages of preparation.

Constraints on multinational cooperation for disposal: under publication.
2) Waste Technologies

- Coordinated Research Projects:
  - RR spent nuclear fuel management (lead: RR Section) – first RCM in 2015
2) Waste Technologies

- **TC Projects and direct assistance:**
  - TC– WTS TOs are involved in about 40 national, 8 regional and 4 interregional projects
  - Up to ten workshops and other events organized yearly worldwide on variety of D&ER aspects
  - Projects – DACCORD, CIDER (joint IDN/ENVIRONET project), DRiMa and DAROD (jointly with WES) – TMs and CMs
  - Predisposal – launch of system to benchmark waste generation in operation of WWER NPPs, training events, workshops and TMs
  - Disposal – training events, workshops and TMs, support of BOSS concept development towards practical use, support of nuclear newcomers
  - DSRS Missions:
    - High activity DSRS: Lebanon, Honduras, Cameroon, Tunisia, Morocco
    - Conditioning: Bangladesh, Philippines, Chile, Sri Lanka, Peru, Paraguay, Malaysia

- **Contact Expert Group secretariat:**
  - Decision by CEG to cease activities in December 2014
  - Secretariat now completing summary of work completed since 1996
2) Waste Technologies

- Peer reviews:
  - International Peer Review of UK Magnox Decommissioning Programme (2008-2011) – final report handed over to Magnox representatives at the IAEA in February 2012
  - Korea: Geological disposal programme with emphasis on suitability for pyro processed waste (2012)
  - Russia: International Peer Review on the application of international safety standards to the liquid RWM practices in the Russian Federation (2013)
  - The Follow-up International Mission on remediation of large contaminated areas off-site the Fukushima Daiichi NPP (2013)
  - Mission to Malaysia on Lynas Project (NORM), 2014
  - International Peer reviews on Mid-and-long term Roadmap towards the decommissioning of Fukushima Daiichi NPP units 1-4 (two missions in 2013 + one in 2015)
ARTEMIS

✓ The Integrated Review Service on management of radioactive waste and spent fuel, control of discharges, decommissioning and remediation is a cross-cutting coordinated activity of NE and NS Departments

✓ Objective: to provide independent expert opinion and advice on:
  - radioactive waste and spent fuel management
  - assessment of radiological impacts to people and the environment
  - management of residues arising from uranium production
  - decommissioning and
  - remediation issues

✓ Based upon the IAEA safety standards and technical guidance, as well as international good practice

✓ Main associated procedures under preparation (NE and NS)
2) Waste Technologies

IAEA International Conference on Advancing the Global Implementation of Decommissioning and Environmental Remediation Programmes

- 23-27 May 2016, Madrid, Spain
- 10 years after the previous IAEA Decommissioning conference in Athens (December 2006)
- Focus on:
  - National policies and strategies to enable and enhance D&ER programmes;
  - Regulatory framework
  - Decision-making process: social and stakeholder involvement during D&ER lifecycle;
  - Technical aspects of D&ER
  - Project management, skills and supply chain considerations;
  - Optimization of waste and materials management
  - Support of international cooperation
- Close co-operation with NS & with OECD/NEA and EC
Thank you for your attention