PROGRAMME

Workshop on Extended Storage and Transportation

Spent Fuel & Radioactive Waste
from Current and Future Reactor Technologies

5-8 December 2023
Camden, NJ, USA

General information

Workshop overview

The NEA Radioactive Waste Management Committee created, in 2021, the Ad-hoc Group on the Extended Storage and Transportation (AhGEST) which worked on these two topics and presented its conclusions and recommendations to the RWMC in March 2022. The AhGEST recommended to the RWMC to organise a broad discussion on sustainability of extended storage and transport with involvement of the NEA STCs, international organisations, and other stakeholders.

Extended storage refers to situations where longer storage periods than generally considered today are required, for example when the disposal solutions are not available in the near future. These longer storage periods require for further understanding of potential changes to the SpF/RW characteristics over times. In order to understand the behavior of the Spent Fuel/Radioactive Waste, a monitoring and inspection programme might provide useful information to help identify potential challenges and options to address them before a safety problem arises (such as repackaging).

The NEA and NRCan (Canada) organised the international workshop on the implementation of radioactive waste management strategies for small modular reactors (SMRs)/Advanced Reactor technologies held on 7-10 November 2022 in Ottawa, Canada. The workshop was intended to better understand how radioactive waste management be considered as part of a comprehensive preparation for these reactors' deployment from the design stage. As well as understand the unique features of SMR waste and identify key concepts associated with the disposal of SMR waste. A number of topics was raised from this workshop that would be further elaborated in this workshop.

Key workshop themes

The workshop will bring experts in various fields together to explore topics focusing on the following elements:

- Experiences in developing radioactive waste extended storage and transporation programmes, focusing on the establishment of: national frameworks and subsequent policy developments, regulatory frameworks, technical requirements, , cost estimation and financing, characterisation for the various waste streams, knowledge management and stakeholder engagement.
- Lessons learnt from participating countries, including on: technical elements, government policy and role, public engagement and the decision-making process.

Workshop objectives

- Enable an overview over current approaches and plans connected to the extended storage and transportation of spent fuel, SMRs and advanced reactor fuel and radioactive waste (SF/RW)
- Identify technical issues related to SF from new, advanced types of reactors and other RW;
- Link technical, regulatory and policy aspects of the extended spent fuel storage, transportation as well as advance reactor spent fuel management.
- Identify challenges crossing discipline borders and concepts/tools to address these overarching systematic challenges.

DAY-1 – 5 December 2023

Session 1: Workshop opening

08:30 – 09:20	**Introductory remarks** *Rebecca TADESSE, Head of Radioactive Waste Management & Decommissioning Division, NEA* *James MCKINNEY, Workshop Chair and Chief Strategist, Integrated Waste Management, NDA, UK* *Daniel MONEGHAN, EPRI, USA* *Amparo GONZALEZ ESPARTERO, Team Leader, Spent Fuel Management, IAEA (~5')* *Rick SPRINGMAN, HOLTEC International, USA* *Keynote Speaker- Paul MURRAY, Deputy Assistant Secretary for Spent Fuel and Waste Disposition, US Department of Energy*

Session 2: Extended Storage of LWR Spent Fuel & Radioactive Waste

2.1 Extended Storage challenges

09:20 – 09:25	*Introductory Remarks*
09:25 – 09:45	**2.1.1 Presentation on Aging Management and Criticality for Extended Wet Storage Including ATF/HE/HBU** *Hatice Akkurt, EPRI*
09:45 – 10:05	**2.1.2 Presentation on Wet Storage infrastructure ageing management programmes** *Anders SJÖLAND, SKB*
10:05 – 10:25	**2.1.3 Presentation on (Re-)Licensing of Wet Storage for extended periods** *Stefan ANTON, HOLTEC*
10:25 – 10:45	*Break*
10:45 – 11:25	**2.1.4 Presentation on (Re-)Licensing of Dry Storage for extended periods** *David PICKETT, Center for Nuclear Waste Regulatory Analyses* *Southwest Research Institute* *Maik STUKE, BGZ*
11:25 – 11:45	**2.1.5 Presentation on Spent Fuel behaviour/properties evolution in Dry storage conditions** *Elmar SCHWEITZER, Framatome*
11:45 – 12:05	**2.1.6 Presentation – on Casks/containers/vaults** *Roger MAGGI & Prakash NARAYANAN (ORANO, USA)*

12:05 – 12:25	**2.1.7 Presentation on Dry Storage infrastructure ageing management programmes: Programme Establishment | Monitoring & Inspection** *Kalyan K. NIYOGI, HOLTEC*
12:25 – 14:00	*Lunch Break*
	2.2. National contexts for regulatory requirements on extended storage
14:00 – 14:05	*Introductory Remarks*
14:05 – 14:25	**2.2.1 Presentation from US-NRC** *Shana HELTON, U.S NRC*
14:25 – 14:45	**2.2.2 Presentation from KR-KINS** *Daesik YOOK, KINS-KOREA*
14:45 – 15:05	**2.2.3 Presentation from DE-BGZ** *Dr. Oliver WALLENFANG, BGZ*
15:05 – 15:25	*Break*
	2.3 Legacy spent fuel, radioactive waste & lessons-learnt from past experience with extended storage
15:25 – 15:30	*Introductory Remarks*
15:30 - 15:50	**2.3.1 Presentation on Legacy spent fuel, radioactive waste & lessons-learnt from past experience with extended storage** *Shawn ROBARTS (NWS, UK)*
15:50 – 16:10	**2.3.2 Presentation on Legacy spent fuel, radioactive waste & lessons-learnt from past experience with extended storage** *Johan HEDLUND, SKB*
	2.4 Future fuels and anticipated needs for extended storage
16:10 – 16:15	*Introductory Remarks*
16:15 – 16:55	**2.4.1 Presentation on Forecast Spent Fuel and Waste inventory with regards to anticipated constrains/needs** *Brett VAN DEN ACKER (USNC – TRISO)* *Eric WILLIAMS (TERRAPOWER – CHLORIDE)*
16:55 – 17:05	**Closing Remarks of DAY-1**

DAY-2 – 6 December 2023

Session 3: Storage of SMRs and Advanced Reactors (ARs) spent fuel & radioactive waste

08:30-08:35	**Introduction of the Sessions of the Day** *introducing the Panel discussions*
08:35-08:55	**3.1 Key note presentation** *David HAMBLEY, Fellow UK NNL*
08:55-09:15	**3.2 EPRI and Vanderbilt Research Projects** - TRA on approaches for MSR Waste Management - R&D needs for Chloride MSR Waste Management *Steven KRAHN, Vanderbilt University*
09:15 – 09:35	**3.3 Presentation on Storage of Dry TRISO Fuel in Germany** *Linus BETTERMANN, GNS*
09:35 – 09:55	**3.4 Presentation on U.S. Perspective: Back-End Management of Advanced Reactors (BEMAR)** *Jorge NARVAEZ, U.S. DOE*
09:55 – 10:15	*Break*
10:15 – 10:55	**3.5 Panel discussion (1) on potential areas to consider for storage of SMRs and ARs Spent Fuel and Radioactive Waste** • **Are current storage strategies applicable to SMRs and ARs Spent Fuel and Radioactive Waste ?** • **Are disposal requirements taken into account in Storage strategies of SMRs and ARs Spent Fuel and Radioactive Waste ?** *Stefan ANTON (HOLTEC)* *Sven BADER (ORANO)* *Brady HANSON and Ed MATTEO, DOE Spent Fuel and Waste Science and Technology Program* *Brett Van Der AKKER, USNC* *Megan HARKEMA, Vanderbilt University* *Jorge NARVAEZ, U.S. DOE*
10:55 – 11:45	**Q&A with audience**
11:45 – 11:50	**Wrap up of Panel Discussion**
11:50 – 13:30	*Lunch Break*

13:30 – 14:10	**3.6. Panel discussion (2) on potential areas to consider for storage of SMRs and ARs Spent Fuel and Radioactive Waste** • **Do existing regulatory frameworks consider storage & transporation of SMRs and ARs Spent fuel / Radioactive Waste ?** • **What are the potential impact of these new SF in the current operations, transportation and cask designs ?** ○ **Codes Validation and Verification** ○ **Regulations** *Rick SPRINGMAN (HOLTEC)* *Prakash NARYANAN (ORANO)* *Laura McMANNIMAN (EPRI)* *Gordon PETERSEN (INL)* *Rod McCULLUM, NEI* *Jay KRAEMER, Fried Frank*
14:10 - 14:50	**Q&A Session**
14:50 – 14:55	**Wrap up of Panel Discussion**

Session 4: Transport of Spent Fuel and Radioactive Wasste

4.1 Transportability after storage

14:55 – 15:00	*Introductory Remarks*
15:00 – 15:20	**4.1.2 *Presentation on Spent nuclear transportation after extended storage*** *Steven MAHERAS, PNNL*
15:20 – 15:35	*Break*

4.2 Repackaging after storage

15:35 – 15:40	*Introductory Remarks*
15:40 – 16:00	**4.2.1 Presentation on transport for Large-Scale Shipment of UNF in the U.S.** *Sven BADER (ORANO, USA)*
15:00 – 16:20	**4.2.2 Presentation on Factors influencing repackaging: Transport Regulations** *David PSTRAK, U.S NRC*
16:20 – 16:40	**4.2.3 Presentation on Factors influencing repackaging: Technical criteria** *Doug AMMERMAN (Sandia)*

Brady HANSON (PNNL)

16:40 – 17:05 **4.2.4 Presentation on Factors influencing repackaging: Disposal Requirements**

Doug AMMERMAN and Ed MATTEO (Sandia)

17:00 – 17:05 Closing Remarks

DAY-3 – 7 December 2023

	4.3 Transport of Spent Fuel and Waste of SMRs and Advanced Reactors
09:30 – 09:35	*Introductory Remarks*
9:35 – 9:55	**4.3.1. Presentation on Package Design and Licensing** *Stefan ANTON, HOLTEC*
9:55 – 10:15	**4.3.2 Presentation on streamlining regulatory guidance for integrating transportation experience of new Spent fuel and Waste Streams** *Nicholas GUIBERT, ORANO*
10:15 – 10:35	*Break*
	4.4 International perspectives on transport of spent nuclear fuel and radioactive waste
10:35 – 10:40	*Introductory Remarks*
10:40 – 11:00	**4.4.1 Presentation on Air, Land, Maritime international legal framework** *Khalil BUKHARI, NTS*
11:00 – 11:20	**4.4.2 Presentation on lessons learned from France on efficient transport system** *Sven BADER (ORANO, USA)*
11:20 – 11:40	**4.4.3 Presentation on overview of transport system of spent fuel in Sweden (sea, road), and associated challenges/lessons-learnt** *Johan HEDLUND, SKB*
11:40 – 12:00	**4.4.4 Transport of Spent Nuclear Fuel: the Current Situation in Belgium and the Approach of the Belgian Competent Authority** *Thomas BANDE, FANC*
12:00 – 13:30	*Lunch*

Session 5 : Factors & tools for holistic decision-making

	5.1 Stakeholder Engagement
13:30 – 13:35	*Introductory Remarks*
13:35 – 13:55	**5.1.1. Presentation on US perspective on consent-based siting process** *Erica Bickford, U.S DOE*
13:55 – 14:15	**5.1.2. Presentation on Social Licensing** *Jan BOELEN – COVRA*
	Economical assessment for extended storage
14:15 – 14:20	*Introductory Remarks*
14:20 – 14:40	**5.2.1 Presentation on Economical assessment from SF generation to disposal** *Luc Van Den DURPEL, NUCLEAR 21*
14:40 – 15:00	**5.2.2 Presentation on Economical assessment for extended storage** *Bálint Nős, PURAM*
15:00 – 15:20	*Break*
	Knowledge Management for extended period of storage
15:20 – 15:25	*Introductory Remarks*
15:25 – 15:45	**5.3.1 Presentation on Memory and data & information preservation & awareness** *Ulrich NOSECK (GRS, Germany)*
15:45 – 16:05	**5.3.2 Presentation on Memory and data & information preservation & awareness** *Russel Chris CAMPHOUSE (Sandia)*
16:05 – 16:25	**5.3.3 Presentation Importance of spent fuel characteristics data management in wet storage conditions from a TSO perspective** *Daesik YOOK, KINS*
16:25 – 17:00	**Workshop Closing Remarks**

DAY-4 – 8 December 2023

SITE VISIT

HOLTEC Spent fuel Casks Manufacturing Plant