

Overview of IAEA Activities on Advanced Nuclear Fuel Cycles

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IAEA's Organization

Department of Nuclear Energy

NE

NS

NA

TC

SG

MT

Division of Nuclear Fuel Cycle and Waste Technology (NEFW)

RRS

WTS

NFCMS

DERS

UPC Team

NFE Team

SFM Team

- **Project 1.2.3.001 Spent fuel storage:** To support MSs in understanding and addressing the challenges of an effective and safe storage of their SNF (through wet and dry technologies), including anticipating those generated by SMRs
- **Project 1.2.3.002 Spent fuel recycling:** To facilitate discussion and information sharing among interested MSs on recent and future developments in nuclear fuel recycling processes and technologies for current and next generations of nuclear power reactors (e.g., LWRs, FRs, SMRs)
- **Project 1.2.3.003 Radioactive materials transportation:** To support MSs in understanding and addressing the challenges and issues related to the safe transportation of all kinds of radioactive and nuclear materials used or generated through nuclear fuel cycle activities, including SNF from current fleet of LWRs, Advanced Reactors and all different SMRs technologies





IAEA

Technical Working Group on Nuclear Fuel Cycle Options and Spent Fuel Management (TWG-NFCO)

20 Member States (Belgium, Canada, China, Finland, France, Hungary, India, Japan, RoK, Mexico, Netherlands, Romania, Russia, Spain, Sweden, Slovakia, UK, UAE, Ukraine, USA).

Three International Organizations (EC, OECD/NEA and WNA)

TWG-NFCO focuses on nuclear fuel cycle options with an emphasis on:

- **Spent fuel management** (storage, recycling and transportation)
- **Innovative fuel cycles** (multirecycling, minor actinides management and P&T of long-lived fission products)
- **Nuclear materials management**

TWG-NFCO Meeting, 1-3 April 2025

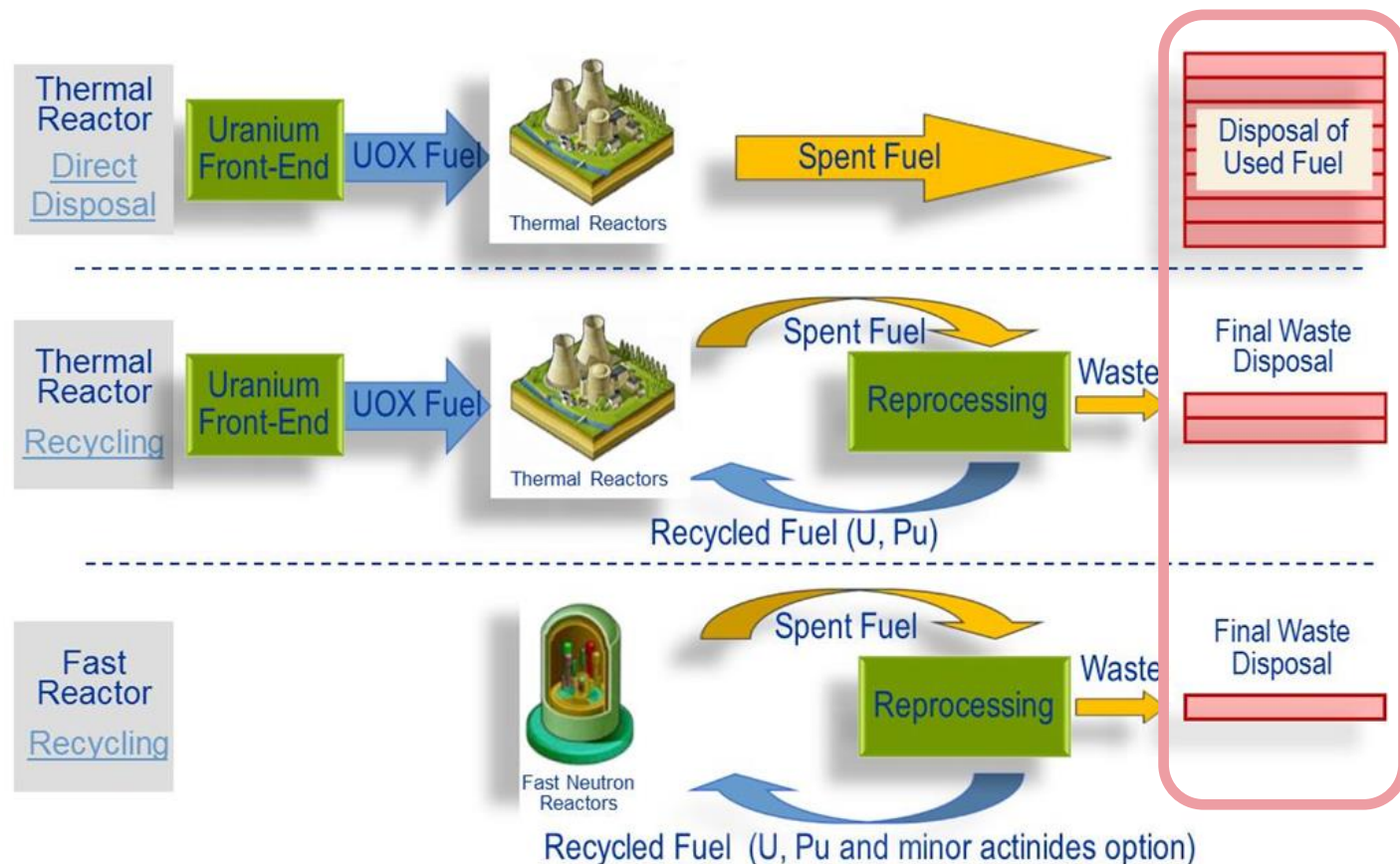




IAEA

Nuclear Fuel Cycle Options

- For Nuclear power to be sustainable, the nuclear fuel cycle must remain **economically viable and competitive** through the optimization of the use of fissile materials in reactor cores or the **recycling of valuable materials**
- This results in different fuel **cycle options**, some already implemented and others may be deployed in the future
- Potential future synergies between LWR-SMRs and AMRs will bring new spectrum of Nuclear Fuel Cycle Options

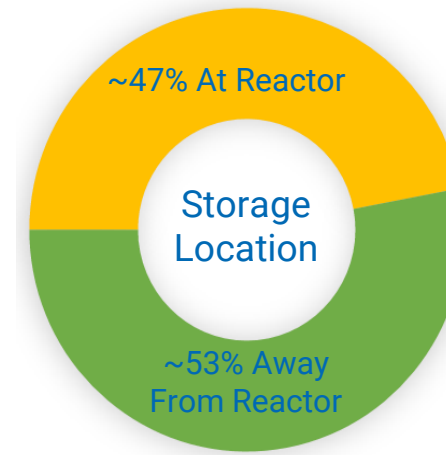
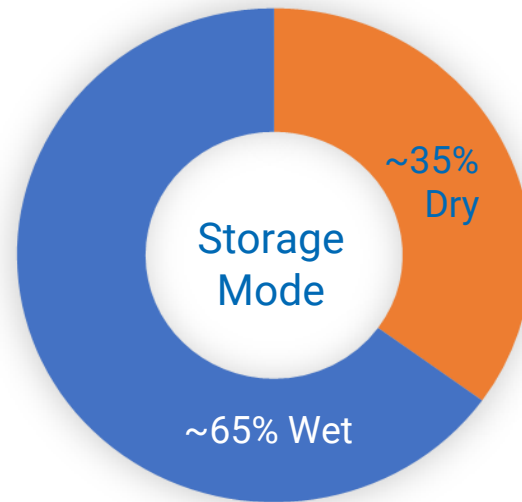
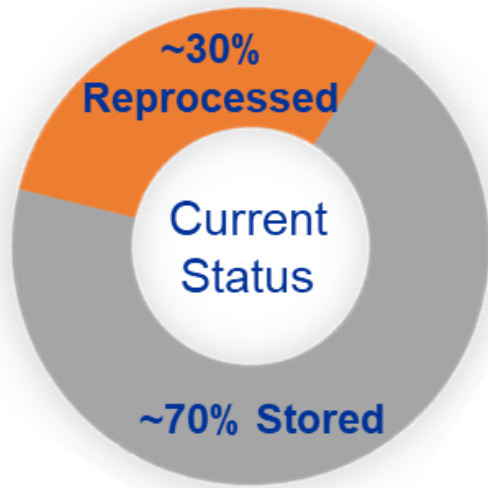


Each Type of Reactor has an Associated Nuclear Fuel Cycle

Spent Fuel Management: Status and Trends

~ 416 NPPs* in 31 countries discharging ~ 10 000 tHM per year

Global Inventory by the end 2024, ~ **430 000 tHM**



(* August 2025, see PRIS database: <https://pris.iaea.org/pris/>)

- Global Inventory of spent fuel at the end 2023: ~ **430 ktHM**, among which ~ **301 ktHM are in Storage**
 - 47% at Reactor, 53% Away from Reactor (**33% Wet Storage / 67% Dry Storage**)
- Selection of storage technology depends on many factors: Fuel, Economics, Stakeholders' preference

Spent Fuel Management Strategies Worldwide

Today mainly countries with large nuclear power programmes recycle spent fuel: France, the Russian Federation, Japan, India and China.



Some countries have not yet made a final decision.

Most spent fuel is in interim storage.



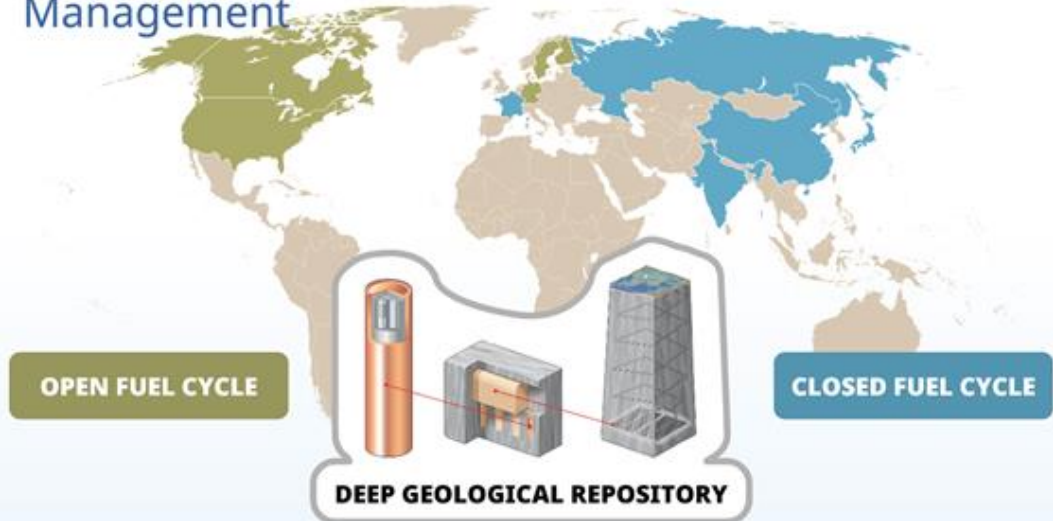
Several other countries have opted for direct disposal: Finland, Sweden, Canada, Germany



The Netherlands reprocess SNF from Borssele NPP abroad and stores High Level Waste at HABOG facility

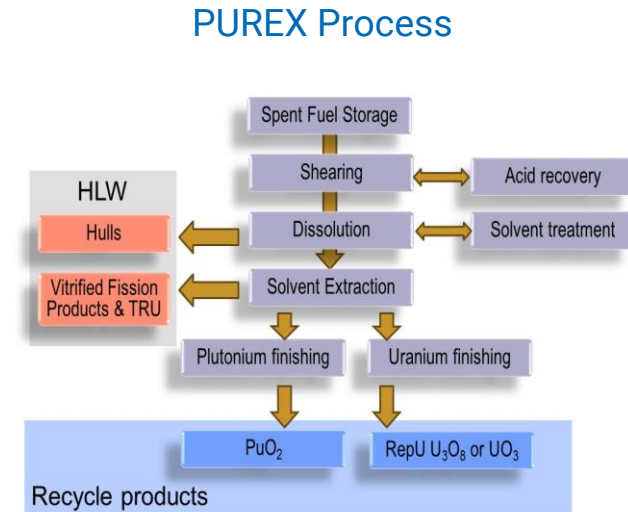


Strategic Options for Spent Nuclear Fuel Management



Spent Fuel Recycling through Reprocessing

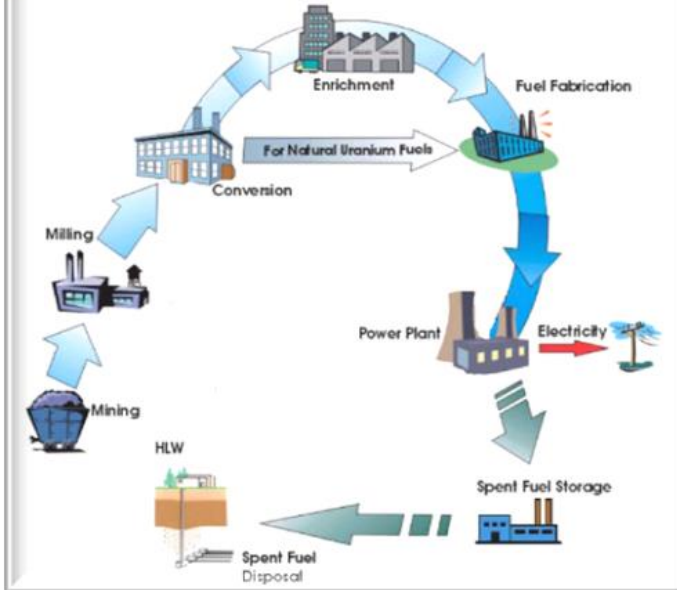
- Reuse of **Reprocessed Pu as MOX in Light Water Reactors**
 - More than **40 years** of experience worldwide (44 LWRs have used MOX fuel at industrial scale since 1986)
 - Loading cores partially with MOX (25-50%) and the remainder with UOX fuel
 - Recent reactor designs can accommodate 100% MOX cores
 - Demonstrating Multiple Recycling in LWRs contributes to transitioning to Fast Reactors
- Reuse of **Rep-Pu as MOX in Fast Reactors**: implemented in Russia in BN-800
- Reuse of **Rep-U as Enriched Reprocessed U (ERU)** in Thermal Reactors (PWRs, VVERs, RBMKs, AGRs, PHWRs)
 - More than **30 years** of experience worldwide (TRs can accommodate 100% Rep-U cores)



- Recycling Spent Fuel is a **mature technology** (Pu recycling in LWRs saves up to 25% of natural uranium resources)
- Reference options exist worldwide (PUREX)
- Reprocessing capacities exist in **France, Russia, India, Japan and China**

Towards Enhanced Nuclear Energy Sustainability through Fast Reactor Systems

LWR Open Fuel Cycle



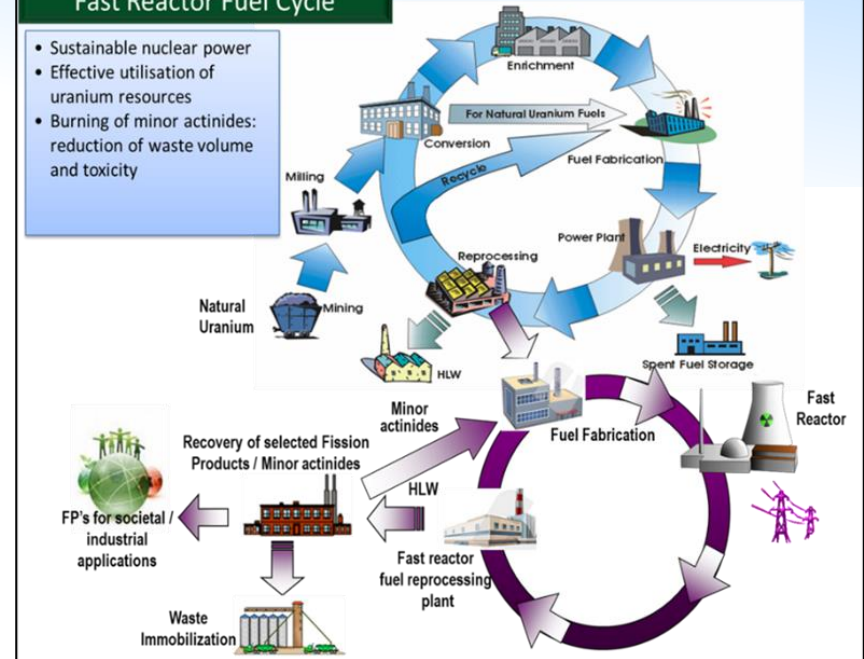
Environment-friendly innovative fuel cycles:

- Natural resources preservation
- Minimizing the burden of waste to be disposed of (reducing footprint of final repository)
- Economically viable fuel cycles through recycling valuable materials
- Enhance safety and security
- ...

Towards Fully Closed Cycle

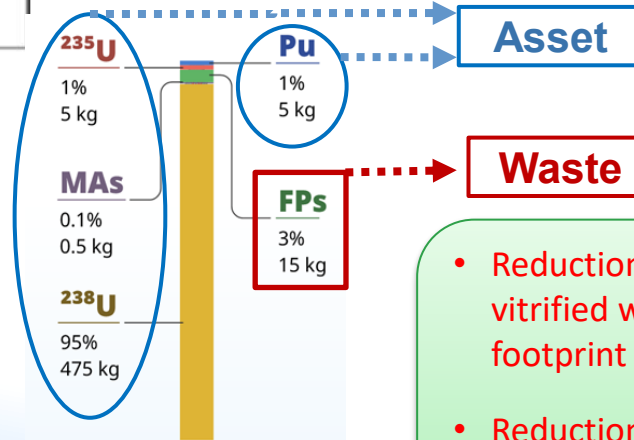
Fast Reactor Fuel Cycle

- Sustainable nuclear power
- Effective utilisation of uranium resources
- Burning of minor actinides: reduction of waste volume and toxicity



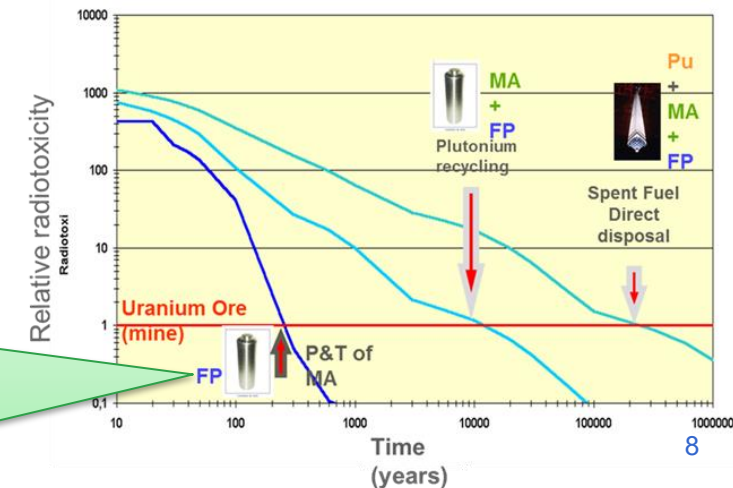
Multirecycling of valuable materials through innovative systems

- Breeding Pu
- Burning Pu
- Burning/Transmuting MAs



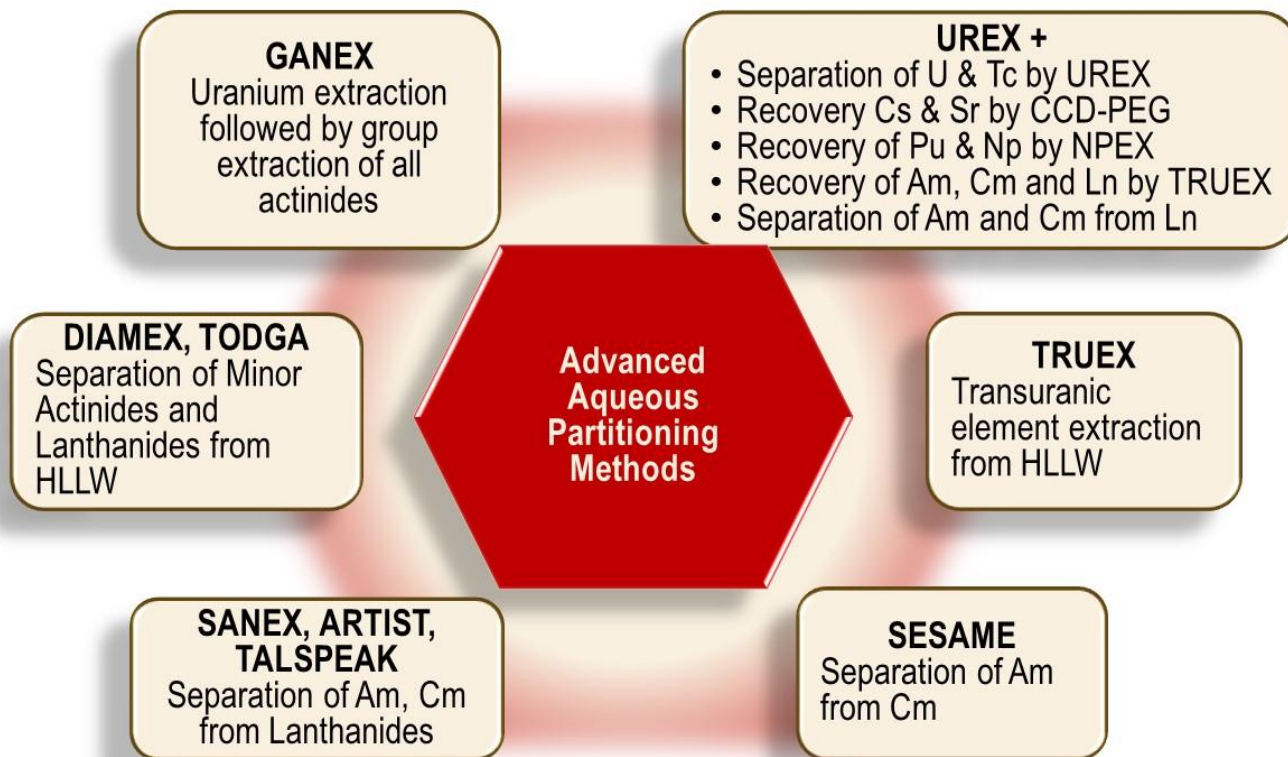
Spent Nuclear Fuel LWR
Fresh fuel 500 kg UO₂

- Reduction of heat generation of vitrified waste → Reduction of the footprint of geological repositories
- Reduction of potential hazard of vitrified wastes → Control of risk for future generations

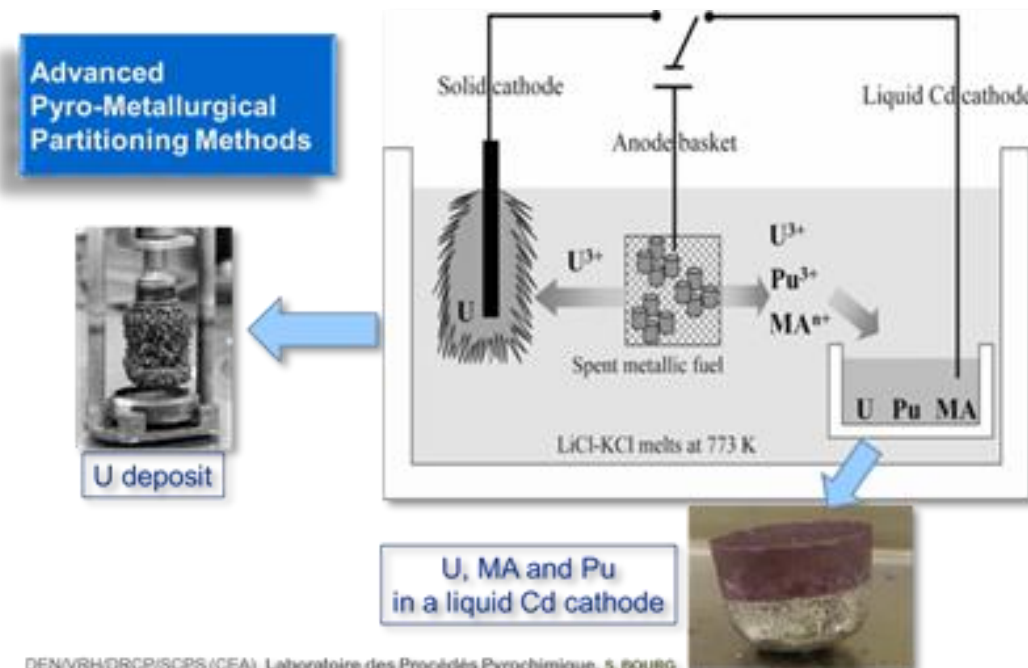


Advanced Partitioning Processes

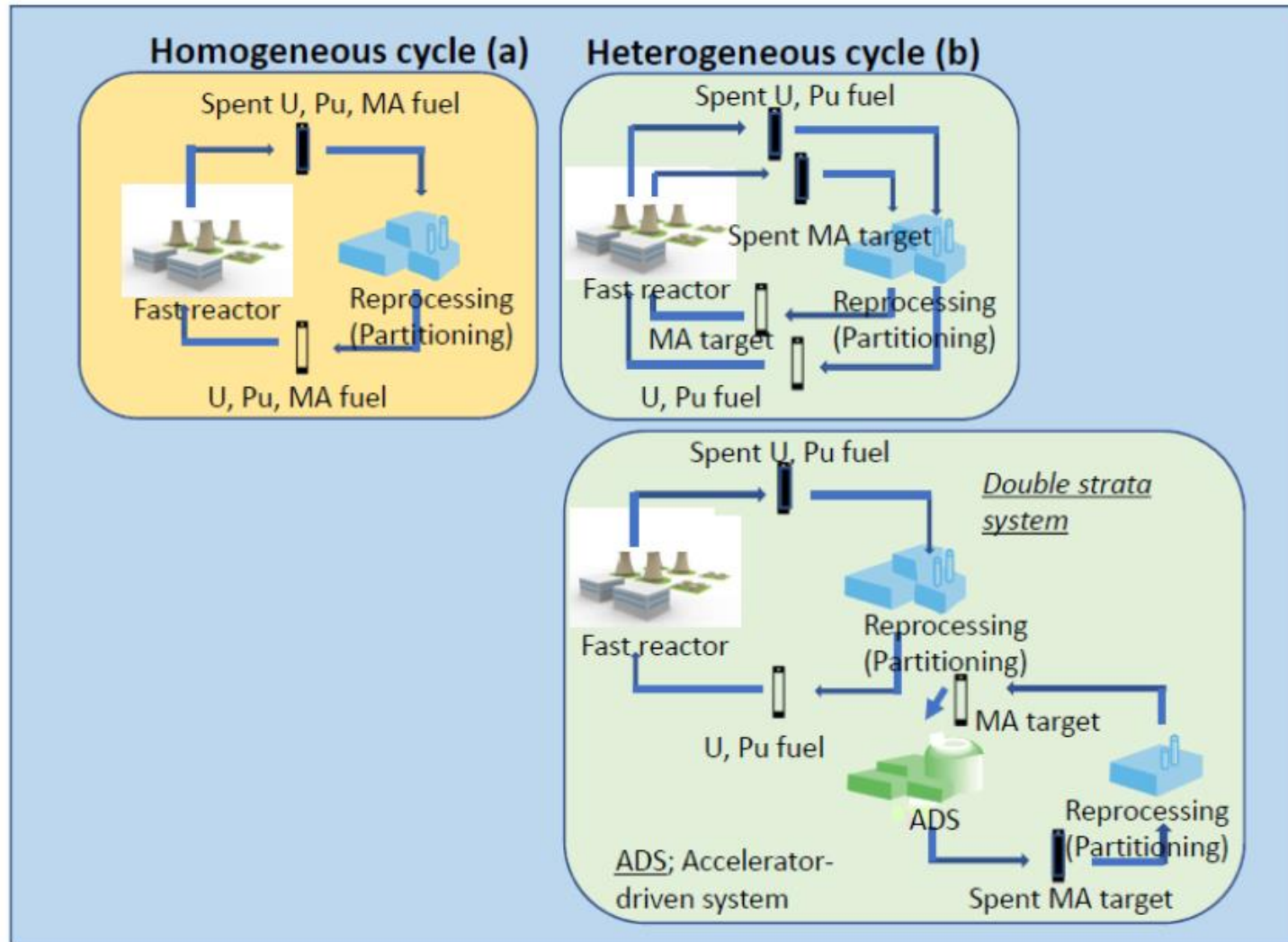
Hydro-Metallurgical Processes



Pyro-Metallurgical Processes

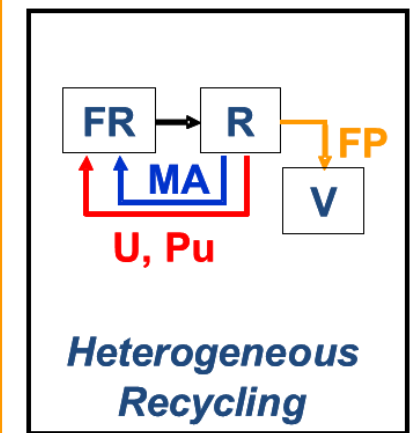
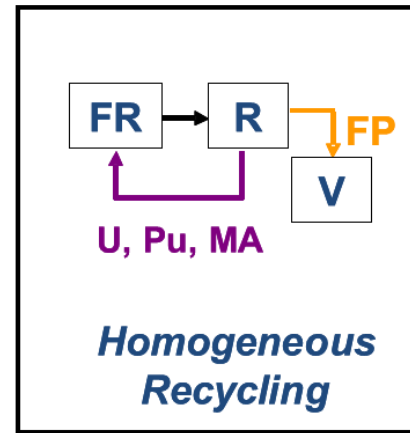


Fully Closed Fuel Cycle Options



FR: Fast Reactor
R: Recycle plant

V: Vitrification



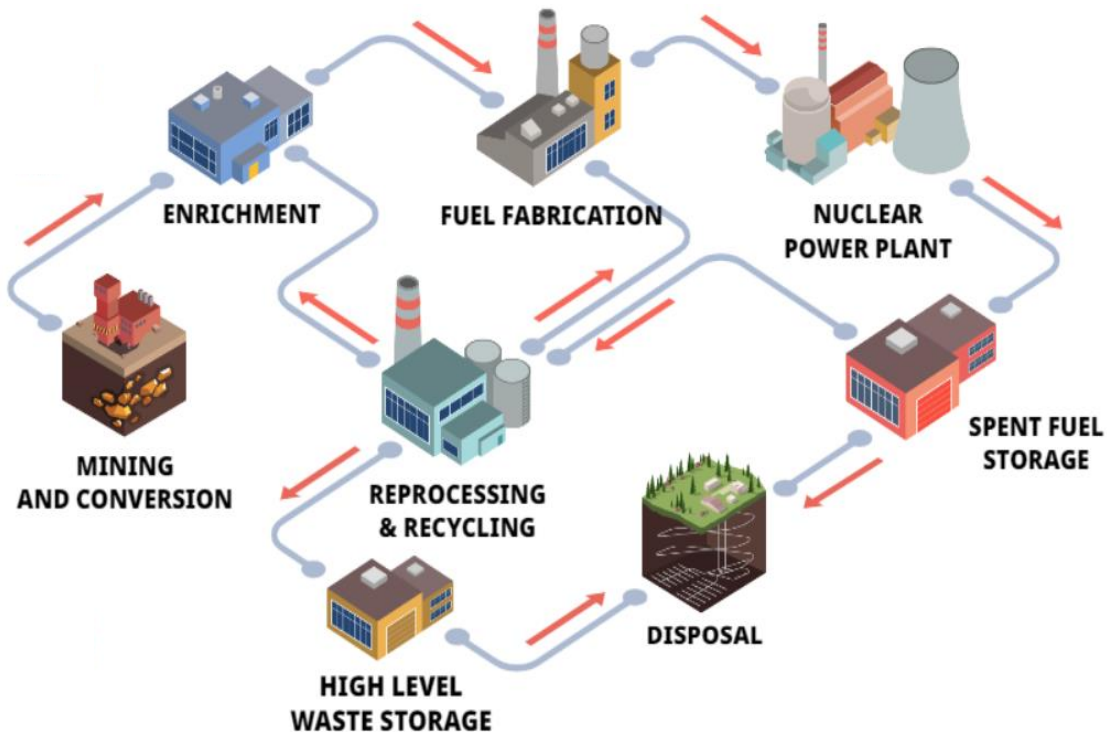
Separation Process
GANEX

Separation Processes
PUREX + SANEX

Hydro-Metallurgical Processes

Hydro and Pyro Processes still at a demonstration scale

Main Challenges for SNF Reprocessing and Recycling



Reprocessing and Recycling

- Reprocessing is specialized on current fuels and capacities are limited
- Ageing of available Rep&Rec facilities, specially in Europe
- Accelerate implementation at industrial scale of Multi-recycling in LWRs as transition to AMRs
- Demonstrate and scale up multi-recycling through Advanced Fuel Cycles for innovative reactors

Integration of existing and new fuel cycles is key for sustainability

IAEA's Activities in Support of Spent Fuel Management

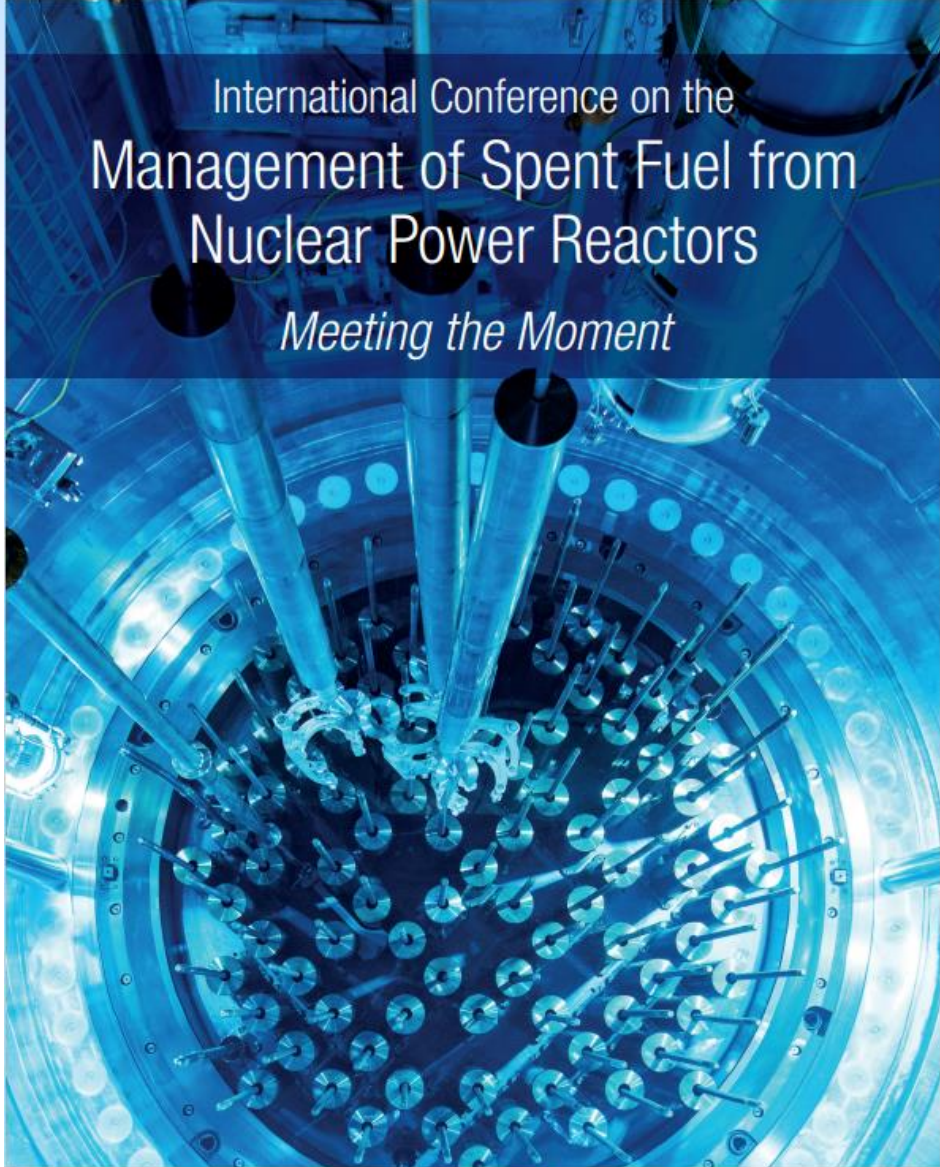
- **Publications**
- **Scientific/Technical Events**
- **Coordinated Research Projects**
- **e-Tools**

Scientific/Technical Events

- **Conference SFM'24, 10-14 June 2024**
 - In cooperation with NEA-OECD, WNA, EC, WNTI
 - 300 in person participants from 58 countries and 6 Int Org
 - 86 women and 214 men present
 - About 220 participants online
 - **Proceedings** in progress



International Conference on the
Management of Spent Fuel from
Nuclear Power Reactors
Meeting the Moment



Organized by the
 **IAEA**
International Atomic Energy Agency
Atoms for Peace and Development

10–14 June 2024
Vienna, Austria
#SFM24



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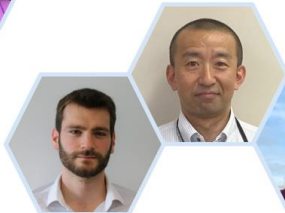
#SFM24 Panel Discussions

Panel on National Programmes (I)

Sama Bilbao Y Leon
World Nuclear Association (WNA)
Moderator



Takuji Fukuda
Nuclear Regulation Authority
Japan



Hong-June Park
Institute for Korea Spent
Nuclear Fuel
Korea



John Lubinski
Nuclear Regulatory
Commission (NRC)
United States of America



Thibault Manneville
French General Directorate
for Energy and Climate
France



Theo Klomberg
Ministry of Infrastructure
and Water Management
Netherlands



Tellervo Juurmaa
Nuclear Decommissioning Authority
United Kingdom



Panel on Stakeholders Involvement

Irena CHATZIS
IAEA
Moderator



Matti Kojo
Lappeenranta-Lahti University of
Technology (LUT)
Finland



Jan Boelen
Centrale Organisatie Voor
Radioactief Afval (COVRA)
Netherlands



Tim Vietor
Nationale Gesellschaft für die
Lagerung radioaktiver Abfälle (NAGRA)
Switzerland



Lisa Frizzell
Nuclear Waste Management
Organization (NWMO)
Canada



Rachel Zirovnik
Association Nationale des Comités et
Commissions Locales d'Information (ANCCLI)
France



María Pérez Fernández
Empresa Nacional de Residuos
Radiactivos, S.A. (ENRESA)
Spain



Panel on National Programmes (II)

Hans Wanner
Hans Wanner Consulting
Moderator



Umesh Dani
Bhabha Atomic Research Centre
(BARC)
India



Bartosz Sosnik
Polskie Elektroenergetyczne
Jądrowe
Poland



Nos Balint
Public Limited Company for
Radioactive Waste Management
(PURAM)
Hungary



Muhammad Shoaib
Pakistan Atomic Energy
Commission (PAEC)
Pakistan



Panel on Innovation and Integration

Laura McManniman
EPRI, USA
Moderator



Luis Iglesias Perez
Joint Research Centre -
European Commission (JRC-EC)



Edward Petit de Mange
OKLO
United States of America



Arthur Situm
University of Regina
Canada



Cecile Evans
World Nuclear Association
(WNA)



Paul Gauthé
HEXANA
France



Bruno Merk
University of Liverpool
United Kingdom



Scientific Conference Programme from 8:30h to 18:30h

Monday, 10 June		Tuesday, 11 June		Wednesday, 12 June		Thursday, 13 June		Friday, 14 June	
09:00-10:30 Opening Session <i>R. M. Gross, Director General International Atomic Energy Agency (IAEA)</i> <i>W. D. Magwood, Director General OECD Nuclear Energy Agency (OECD/NEA)</i> <i>S. Balaban y León, Director General World Nuclear Association (WNA)</i> <i>U. Engelbrecht, Director for Nuclear Safety and Security Joint Research Centre - European Commission (JRC-EC)</i> <i>P. Buchen, Managing Director of Shipping Nuclear Transport Solutions (HTS), Board Member World Nuclear Transport Institute (WNTI)</i> <i>J.A. Gago, Conference Chairman, Spain</i>		08:30-10:30 SB.2 ADV <i>IDW64 Challenges and Opportunities of Advanced Nuclear Reactors for the Back End of the Fuel Cycle, C. Evans, FRA</i> <i>IDW94 The WISARD Project - Starting with the End in Mind: Exploring How Innovative Nuclear Systems Require Innovative Waste Management Solutions, L. McMahon, USA</i> <i>IDW95 Potential Impacts of SMR Deployment on Multinational Cooperation at the Back End of the Fuel Cycle, J. Kingston-Miles, UK</i> <i>IDW119 Safeguards by Design: Supporting Sustainable Spent Fuel Management Strategies, J.J. Wynick, IAEA</i> <i>IDW93 HTGR Spent Fuel Management Strategy in the UK, L.E. Knaack, UK</i> <i>IDW123 Assessment of Performance and Spent Fuel Characteristics of a Generic 100-MWe-Class SFR-SMR, D.T. Wojaszcak, CAN</i>		08:30-10:30 SB.2 STO <i>IDW36 Progression and Challenges in Technically Underpinning the United Kingdom's Strategy for the Management of Spent AGR Oxide Fuel, R. Vesely, UK</i> <i>IDW156 Assessment of the Effects of Long-Term Wet Storage on Canadian Spent Nuclear Fuel, G. Ota-Sanchez, CAN</i> <i>IDW17 Observation on Slow Cooling Rate Effect of Unirradiated Zircaloy-4 Hydride Reorientation Under Dry Storage Conditions, D.H. Rock, ROK</i> <i>IDW57 Investigating Drying and Dry Storage Options for Stainless-Steel Clad Advanced Gas Reactor Spent Fuel, C. Gallagher, UK</i> <i>IDW90 Brittle Failure Limits of Spent Fuel Claddings Subjected to Long-Term Dry Interim Storage Conditions, U. Zerkow, GFR</i> <i>IDW134 Re-Examining Spent Fuel Cladding Integrity Limits, J. Faldowski, USA</i>		08:30-10:30 SB.2 DIS <i>IDW95 An Overview of the United Kingdom Strategy for Management of Spent Nuclear Fuel, Focusing on Metallic Uranic Fuels and Challenges Presented for Geological Disposal, M.J. Austin, UK</i> <i>IDW16 Design and Evaluation of a Korean-Style High-Efficiency Disposal System for Domestic Waste, K.-L. Lee, ROK</i> <i>IDW40 Exploring Encapsulation Envelopes for Disposal of Spent Nuclear Fuel, K.J. Robinson, UK</i> <i>IDW38 Predicting Decay Heat by Combining Fuel Parameters with Gamma and Neutron Data Using Machine Learning, V. Solanki, SWE</i> <i>IDW78 Developing Waste Acceptance Criteria for Advanced Reactor Waste Forms in the Universal Canister System, J. Skarve, USA</i> <i>IDW11 Effect of the Host Rock Thermal Properties on the Disposal Area Requirements for Spent Fuel and Vitrified High Level Waste in a Geological Repository, B. S. Acar, TUR</i>		08:30-10:10 SB.1 TRA <i>IDW114 Preparing Safe and Efficient Loading and Transport Operations of Spent Nuclear Fuel, Y. Solignac, FRA</i> <i>IDW20 Experience and Perspectives of SNF Transportation in Russia: Organization of Shipments, Safety Requirements and Justification, Emergency Response, New Tasks, V.N. Ershov, RUS</i> <i>IDW110 Spent Nuclear Fuel Management at KKM Nuclear Power Plant: Spent Nuclear Fuel Storage Away from the Plant, F. Holmgren, SWE</i> <i>IDW32 Transportation of Spent Nuclear Fuel Conducted in Poland - Lessons Learned, L. Bak, POL</i> <i>IDW141 Packaging Safety, Security, and Safeguards (SS) for Nuclear Fuel Cycle Materials in Storage, Transportation, and Disposal, Y. Liu, USA</i>	
10:30-11:00 Coffee/Tea Break		10:30-11:00 Coffee/Tea Break		10:30-11:00 Coffee/Tea Break		10:30-11:00 Coffee/Tea Break		10:10-10:35 Coffee/Tea Break	
11:00-13:15 P1 <i>T. Manville, French General Directorate for Energy and Climate, FRA</i> <i>T. Fukuda, Nuclear Regulation Authority, JPN</i> <i>R. Kumborg, Ministry of Infrastructure and Water Management, NET</i> <i>R. Soćka, Polskie Elektryczne Jądrowe, POL</i> <i>H.-J. Park, Institute for Korea Spent Nuclear Fuel, ROK</i> <i>T. Juvvusuu, Nuclear Decommissioning Authority, UK (IDW51)</i> <i>J. Lubinski, Nuclear Regulatory Commission, USA</i>		11:00-12:40 S2.1 STO <i>IDW76 Characterization of the Swiss SNF Radiocesium Inventory for DGR Planning, E. Vassopoulou, SWI</i> <i>IDW59 Computational Spent Fuel Characterization at VTT Finland, S. Hakkinen, FIN</i> <i>IDW127 EURAD - Spent Fuel Characterization - Report from a Recently Finished European Project, E. Vassopoulou, SWI</i> <i>IDW132 Overview of Decay Heat Measurements at Oak Ridge: Description of Decay Heat Measurements from 2003-2021 Under EPRI-SKB Collaboration, H. Akuru, USA</i> <i>IDW144 New Calorimeter Concept for the Measurement of Decay Heat from Spent Fuel Assemblies: A Goggin NPP Project, S. Curran, SWI</i>		11:00-12:40 S2.4 STO <i>IDW6 New Dual-Purpose Casks for Spent Fuel of Foreign WWER NPPs and High Level Waste from Spent Fuel Reprocessing, M.F. Adu, RUS</i> <i>IDW33 Modifications of the Interim Spent Fuel Dry Storage Facility for the Storage of Fresh Fuel, A. Smeyers, LIT</i> <i>IDW108 Performance Enhancement of the MICHOMS EDS Dry Storage System and the TM EAGLE Transportation Cask for Used Fuel Management, P. Maruyama, USA</i> <i>IDW77 Complementary Facility for Cask Recovery at EFSL, F. Lenojo, SPN</i> <i>IDW52 Spent Nuclear Fuel Management for Holtec International's SMR-300, R. Morin, SPA</i>		11:00-13:00 P4 <i>Panel on Innovation and Integration</i> <i>C. Evans, World Nuclear Association (WNA) (IDW53)</i> <i>I. Iglesias Páez, Joint Research Centre - European Commission (JRC-EC)</i> <i>F. Gauthé, HEXANA, FRA</i> <i>E. Petit de Mauge, OKLO, USA (IDW91)</i> <i>B. Merk, University of Liverpool, UK (IDW103)</i> <i>A. Sibani, University of Regina, CAN</i>		10:35-11:55 S3.2 TRA <i>IDW42 Demonstration of a Risk-Informed Approach for Regulatory Approval for Shipping a Microreactor Transportation Package, A.E. Adams, USA</i> <i>IDW41 Microreactor Transportation Emergency Planning Challenges, S.J. Mahoney, USA</i> <i>IDW148 Transportation and/or Interim Storage of SMR/AMR Spent Fuel: Solutions and Challenges, C. Kister, FRA</i> <i>IDW67 Development of a Functions and Requirements Document for a SNF Transportation Package Performance Demonstration, L. Hay, USA</i>	
13:15-14:45 Lunch Break		12:40-14:00 Lunch Break		12:40-14:00 Lunch Break		13:00-14:20 Lunch Break		12:00-13:00 Closing Session <i>J. A. Gago, Conference Chairman, Spain</i> <i>L. Evand, Deputy Director General and Head of the Department of Nuclear Safety and Security, IAEA</i> <i>M. Chudakov, Deputy Director General and Head of the Department of Nuclear Energy, IAEA</i>	
14:45-16:00 Panel on National Strategies for Spent Fuel Management (II) P2 <i>R. Kise, Public Limited Company for Radioactive Waste Management (PURAM), HUN</i> <i>U. Dax, Bhabha Atomic Research Centre (BARC), IND</i> <i>M. Shoaib, Pakistan Atomic Energy Commission (PAEC), PAK (IDW19)</i> <i>A.I. Chiverni, ROSATOM, RUS</i>		14:00-15:40 S2.3 STO <i>IDW72 Preparing for Extended Storage of SNF in Germany from the Point of View of the Licensing Authority, J. Palmes, GFR</i> <i>IDW57 Experience of Regulatory Oversight for the Construction, Commissioning and Operation of Spent Fuel Storage Facilities in Ukraine, A. Shepichuk, UKR</i> <i>IDW106 Regulatory Framework for Spent Fuel Management for China's Nuclear Power Programme, M. Asanovich, GHA</i> <i>IDW55 Environmental Justice and Public Engagement in the US Consent-Based Siting Process, M.Z. Bell, USA</i> <i>IDW130 Spent Fuel Management in the Slovak Republic, J. Vackar, SVK</i>		14:00-16:00 Panel on Navigating Stakeholders Engagement P3 <i>L. Frizzell, Nuclear Waste Management Organization (NWMO), CAN</i> <i>M. Kato, Lappeenranta-Lahti University of Technology (LUT), FIN (IDW79)</i> <i>R. Zhevnik, Association Nationale des Comités et Commissions Locales d'Information (ANCLC), FRA</i> <i>J. Boelen, Centrale Organisatie voor Radioactief Afval (COVRA), NET</i> <i>M. Pérez Fernández, Empresa Nacional de Residuos Radiactivos, S.A. (ENRESA), SPA</i> <i>T. Vektor, Nationale Gesellschaft für die Lagerung radioaktiver Abfälle (NAGRA), SWI</i>		14:20-15:40 S7.1 INT <i>IDW34 Addressing Nuclear Spent Fuel Management Challenges: A Key to Addressing Nigerian Skepticism Towards Nuclear Power Generation, J. Simon, NGR</i> <i>IDW73 An IRIS Augmented Expertise Tool Helping for Continuous Monitoring of the Consistency of the Fuel Cycle, F. Ledroit, FRA</i> <i>IDW151 Updated Status of Spent Fuel Removal at Fukushima Daiichi NPP, Y. Ishii, JPN</i> <i>IDW162 Findings from the RPV and PCV Internal Investigation for Fuel Debris Retrieval at the Fukushima Daiichi NPP, K. Sawada, JPN</i>		Track Titles 1. NAT - National Strategies for Spent Fuel Management 2. STO - Storage of SNF and Vitrified HLW and Subsequent Transportability 3. TRA - Transportation in the Back End of the Fuel Cycle 4. REC - Recycling of Spent Fuel 5. DIS - Disposal of SNF, HLW and Other Waste Forms in Deep Geological Repositories (DGR) 6. ADV - Impacts of Advanced Nuclear Energy Systems on the Back End of the Fuel Cycle 7. INT - Achieving Integrated Spent Fuel Management	
16:00-16:30 Break		15:40-16:00 Break		16:00-16:30 Break		15:40-16:10 Break		Panel titles P1 - Panel on National Strategies for Spent Fuel Management (I) P2 - Panel on National Strategies for Spent Fuel Management (II) P3 - Panel on Navigating Stakeholders Engagement: Sharing Insights and Lessons Learned in Spent Fuel Management Strategy Implementation in Member States P4 - Panel on Innovation and Integration: Approaches for Managing Spent Fuel from Advanced Reactors (e.g. SMRs, ...)	
16:30-18:30 SB.1 ADV <i>IDW26 Characterization of Spent Fuel for Selected Small Modular Reactors and Implications for the Back End Fuel Cycle, X. Wang, CAN</i> <i>IDW58 A Tool to Estimate Isotopic Evolution for Actinides Transmutation Dedicated to Fast Molten Salt Reactors: A Comparative Study of Existing In-core Key Parameters for the Preliminary Design of a Fast Molten Salt Reactor (F-MSR), P.-E. Duval, FRA</i> <i>IDW51 Assessing the Potential for Molten-Salt Reactor (MSR) Technology as EU's Sustainable Nuclear Energy Futures, L. Van den Oever, BEL</i> <i>IDW37 The French R&D Collaborative Project ISAC on Fast MSR Dedicated to Actinides Transmutation, M.-S. Chavaud, FRA</i> <i>IDW142 NRC Research Activities in Spent Fuel Storage and Management of Advanced Fuels for Advanced Reactors, T. Boyce, USA</i> <i>IDW21 The Implementation of SMR and the Back End Issue of the Fuel Cycle in Ukraine, B.P. Zhabenko, UKR</i>		16:00-17:20 S4.1 REC <i>IDW106 Solvent Extraction Experiments for Uranium, Plutonium, and Neptunium Co-Recovery with Dissolver Solutions Derived from Irradiated Nuclear Fuels, M. Nakahara, JPN</i> <i>IDW43 Recycling of PWR Spent Fuel in a Fast Reactor, C.-B. Lee, ROK</i> <i>IDW112 MOX and UOX Fuel Recycling in Pressurized Water Reactors, G. Vlast, FRA</i> <i>IDW7 Fundamental Approaches to HTGR SNF Reprocessing Technology Development, E.D. Almonova, RUS</i> <i>IDW9 Technological Approaches to Spent-Accident Tolerant Nuclear Fuel Processing, L.N. Podinovsk, RUS</i> <i>IDW5 Outlines for Building the Future of French Recycling Facilities, N. Vincenz, FRA</i> <i>IDW131 The ASOF Project - Advanced Separation for the Optimal Management of Spent Fuel, K. Lemmens, BEL</i> <i>IDW3 Sustainable Fuel Cycle as Basis for Successful Development of Nuclear Power Programmes for Embarking Countries, T.A. Aleksandrov, RUS</i>		16:30-18:30 SB.1 DIS <i>IDW120 CIGED, Readiness of the French DGR Project at the Construction Licence Examination Stage, M. Maertens, FRA</i> <i>IDW30 Recent Progress within the United Kingdom R&D Programme for the Geological Disposal of High Heat Generating Wastes, J.J. Dunsford, UK</i> <i>IDW124 Challenges in Collecting and Preserving Sufficient Spent Nuclear Fuel Information Before the Fuel is Placed in the Final Repository, F. Johansson, SWE</i> <i>IDW111 Cost Estimations for Disposal of Radioactive Waste in Switzerland: An Established Framework Takes the Next Step, O. Magno, SWI</i> <i>IDW71 Adaptation of Current Final Disposal Strategy and Methods in Finland for Spent Fuel from SMRs, P. Kato, FIN</i> <i>IDW53 Spent Nuclear Fuel and the ConfinAR Geo Project, L. Kozmik, ARG</i>		16:10-17:50 S7.2 INT <i>IDW45 About Spent Nuclear Fuel in Argentina: Should We Worry?, L. Góngora, ARG</i> <i>IDW55 The Value of an Integrated View on Spent Nuclear Fuel and Radioactive Waste Management Strategies Reducing Financial Risks to Stakeholders, L. Van der Duerpe, BEL</i> <i>IDW74 ROWO: A Holistic Approach to the Optimization of Deep Geological Disposal of High Level Waste, E. Vassopoulou, SWI</i> <i>IDW113 Advances in Developing a UWR Multirecycling System, C. Evans, FRA</i> <i>IDW116 Study of Scenarios for Spent Fuel Management in Mexico, J.L. François, MEX</i>			
18:30-20:00 Official Reception									

Track titles

1. NAT - National Strategies for Spent Fuel Management

2. STO - Storage of SNF and Vitrified HLW and Subsequent Transportability

3. TRA - Transportation in the Back End of the Fuel Cycle

4. REC - Recycling of Spent Fuel

5. DIS - Disposal of SNF, HLW and Other Waste Forms in Deep Geological Repositories (DGR)

6. ADV - Impacts of Advanced Nuclear Energy Systems on the Back End of the Fuel Cycle

7. INT - Achieving Integrated Spent Fuel Management

Panel titles

P1 - Panel on National Strategies for Spent Fuel Management (I)

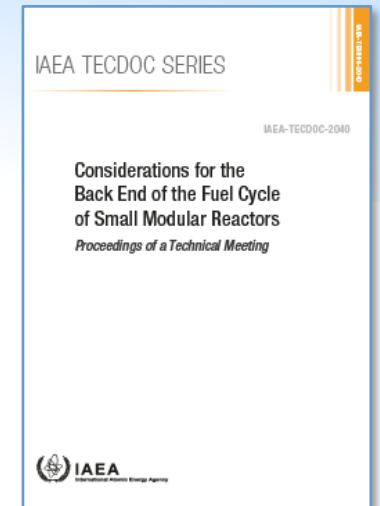
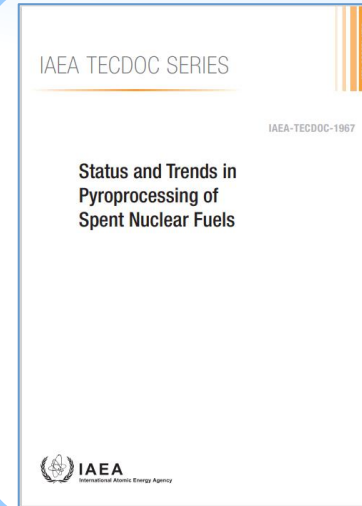
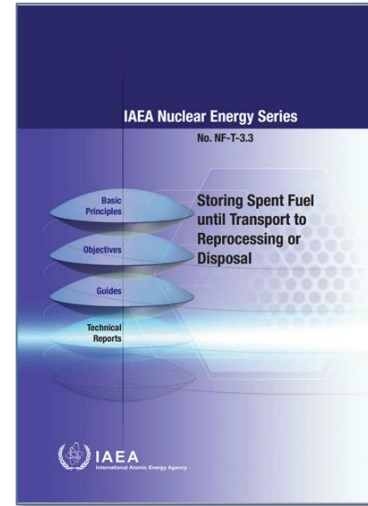
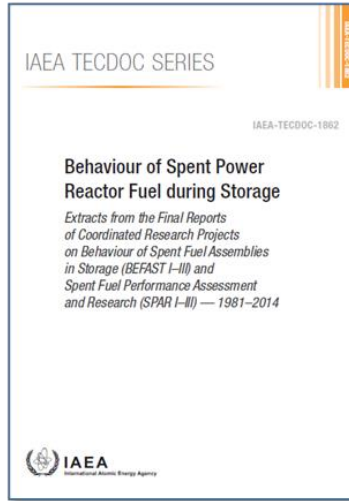
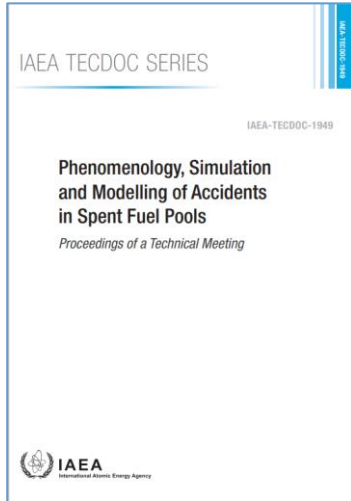
P2 - Panel on National Strategies for Spent Fuel Management (II)

P3 - Panel on Navigating Stakeholders Engagement: Sharing Insights and Lessons Learned in Spent Fuel Management Strategy Implementation in Member States

P4 - Panel on Innovation and Integration: Approaches for Managing Spent Fuel from Advanced Reactors (e.g. SMRs, ...)

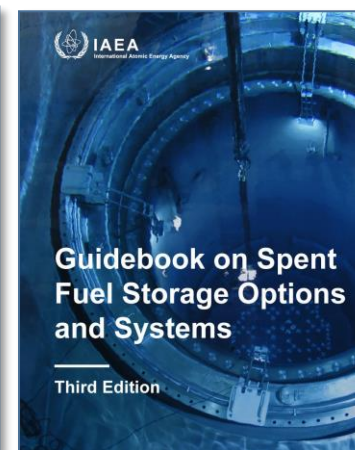
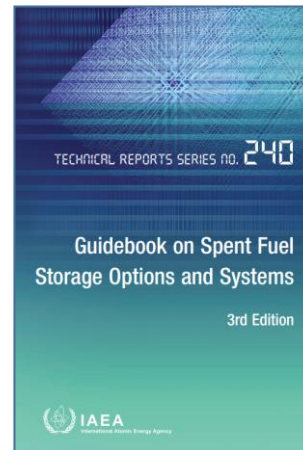
- 14 Sessions in 7 Tracks
- 77 contributed oral presentations
- 13 E-posters, 21 posters from 29 Member States and 2 international organizations

IAEA Publications on Spent Fuel Management

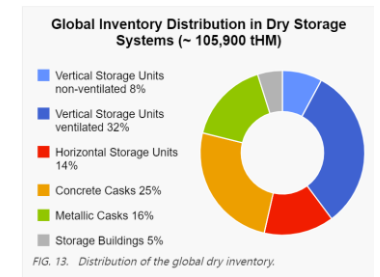
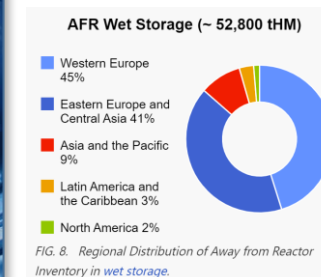


<https://www.iaea.org/publications>

- **TECDOCs**
- **NE Series publications**
- **Interactive Books** with pictograms, animations and downloadable pictures and charts

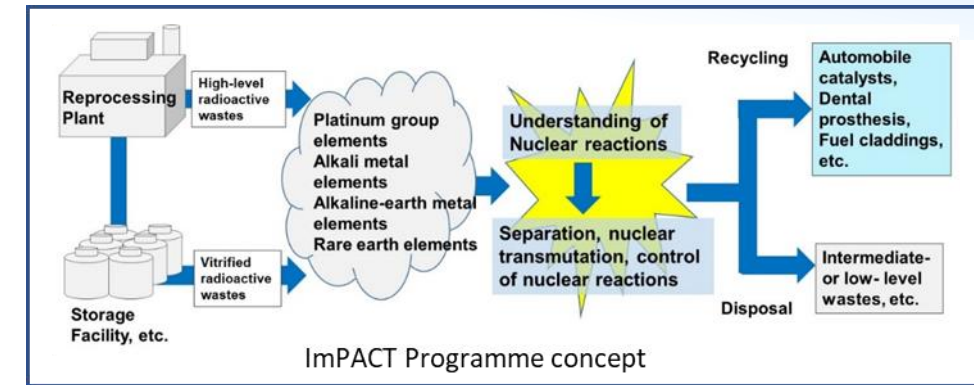
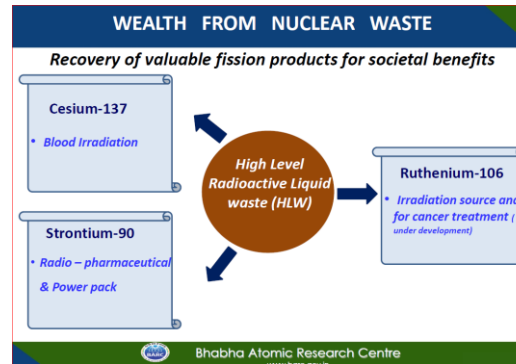
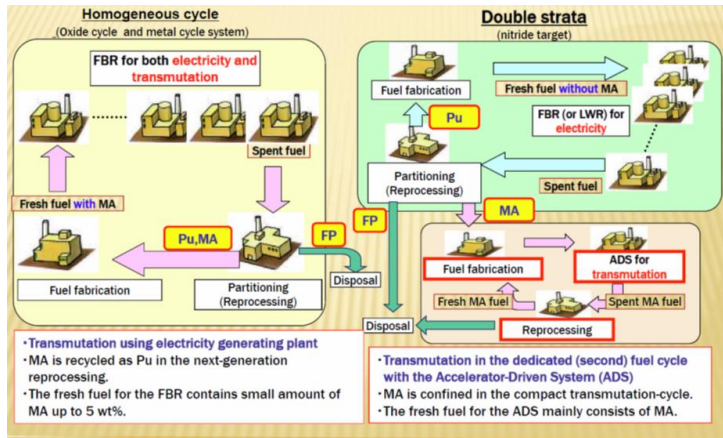


INTERACTIVE
Available ON-LINE

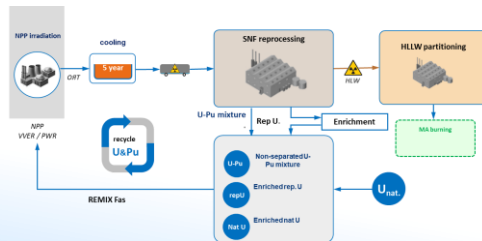


IAEA activities on Advanced Fuel Cycles

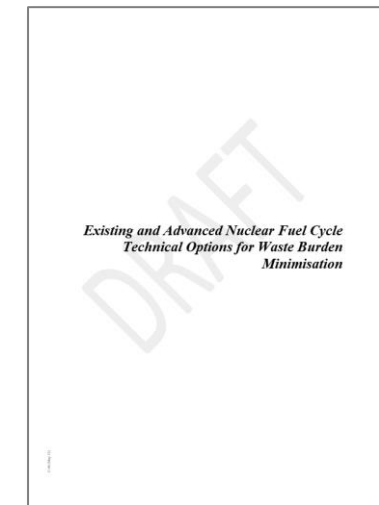
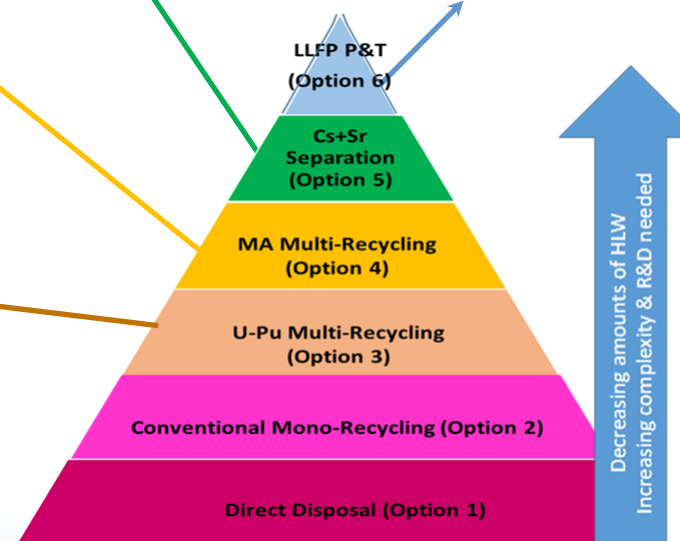
Nuclear Energy Series on “*Existing and Advanced Nuclear Fuel Cycle Technical Options for Waste Burden Minimization*”: To describe relevant information on Nuclear Fuel Cycle Options in terms of nuclear materials and wastes involved and nuclear fuel cycle facilities and infrastructures required



- LWRs multirecycling to enable transition to FRs
 - MIX and MOX-MR processes (France)
 - REMIX process (Russian Fed.)



- FRs multirecycling



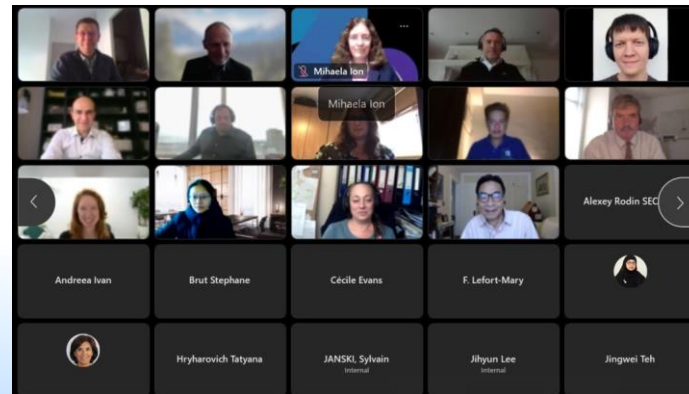
IAEA Technical Meeting (EVT2105850) on Backend of the Fuel Cycle Considerations for Small Modular Reactors, 20-23 September 2022



107 Participating Experts from
32 Member States

3 International Organizations

40 people in person and 67 on-line

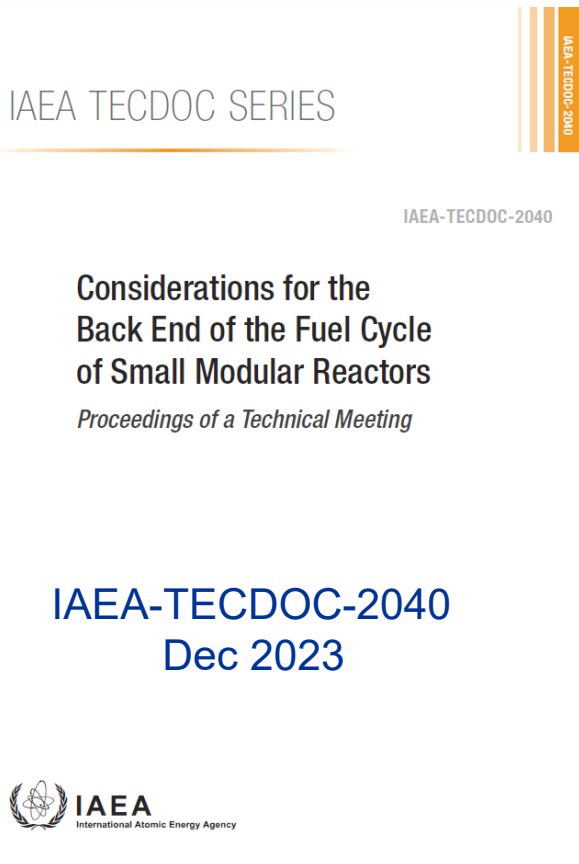


~ 40 Presentations and
Extended Abstracts

IAEA Technical Meeting on Backend of the Fuel Cycle Considerations for SMRs

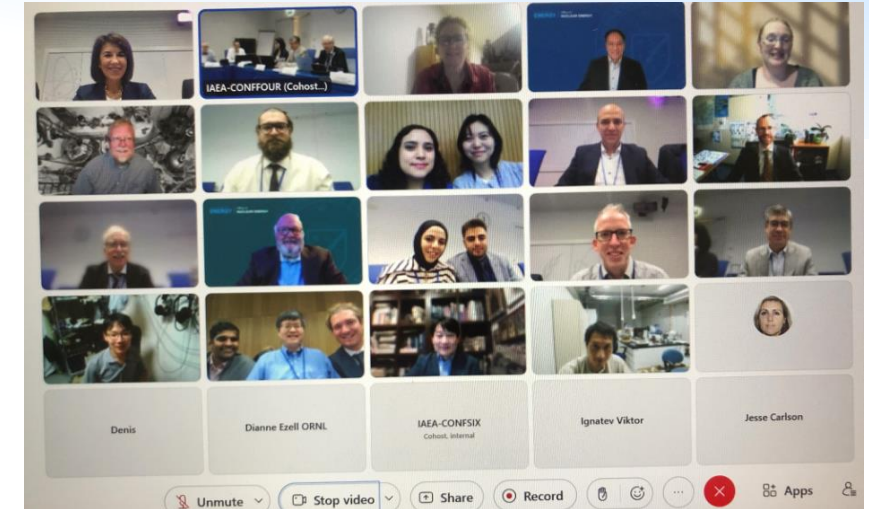
Summary of Presentations and Discussions during the Technical Sessions on

- IAEA Activities
 - SMR Developments and Associated Nuclear Fuel Cycle Options, Fuel Designs, Safety, Security, Safeguards, Economics, Transportation
- International Organization's Activities and Perspectives
 - EC/JRC, OECD/NEA and ERDO
- Member States' Activities and Perspectives
- Three Breakout Sessions (Storage, Reprocessing&Recycling, Transportation, Disposal)
 - LWR type
 - HTGR type
 - **AMRs (LMFRs and MSRs) type**
- General Discussion
- Conclusions and Future Areas of Work



International Workshop on the Chemistry of Fuel Cycles for Molten Salt Reactor Technologies, 2-6 Oct. 2023, in cooperation with the OECD/NEA

- Held in Vienna on 2-6 October 2023, co-organised by the NEA and the IAEA
- **44 participants** (28 onsite + 16 online) including **4 developers of MSRs** (Copenhagen Atomics, Seaborg Technologies, Naarea and Terrapower), **R&D organisations, regulators and industry experts** from **13 countries** and the EU
- Several **technical sessions** including technical presentations, “thoughts from the floor” sessions and panel discussions with all the presenters
- **Breakout sessions** for the participants to engage in further discussion and work together to identify gaps and needs: experimental underpinning; irradiations; monitoring and operation; irradiated fuel treatment (material and waste streams)



Publication gathering Main Findings, Topical Discussions, Break Out Sessions, Conclusions and Recommendations is under preparation

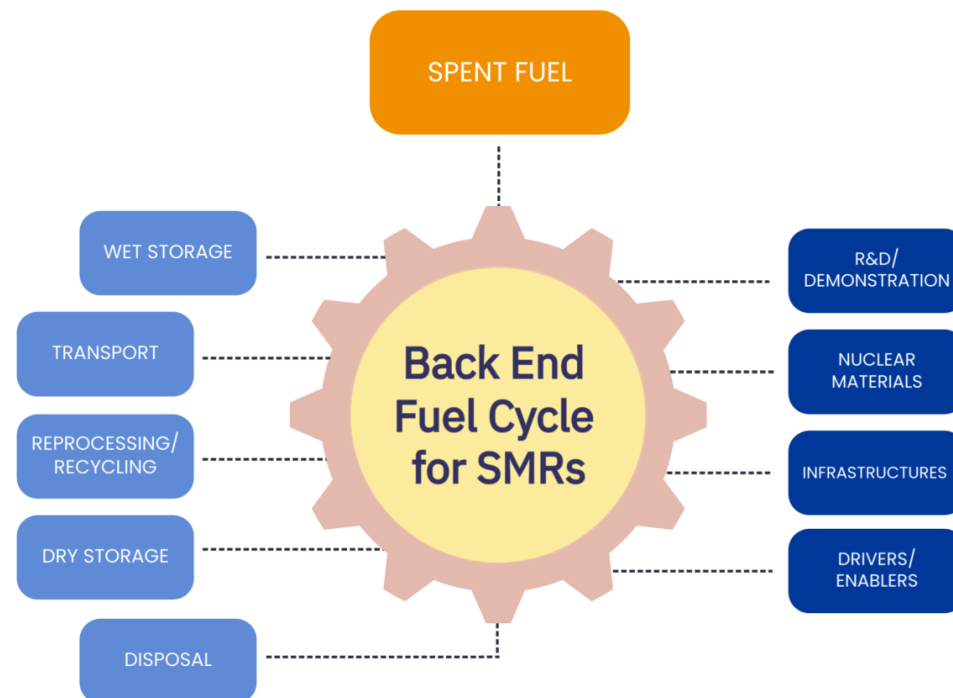
Coordinated Research Project on Challenges, Gaps and Opportunities for Managing Spent Fuel from SMRs

Understanding the implications of the management of new spent fuels is paramount to make informed decisions

MAIN OBJECTIVES:

- To identify viable nuclear fuel cycle options for the different SMR technologies
- To identify common technologies/similarities for various reactor types and/or significant differences
- To prepare a list of generic key parameters for countries to perform their analysis incorporating their specific context
- Development of **specific roadmaps** for managing spent fuel from the different SMR technologies, identifying what can be derived, optimized or adapted from existing practices, or what needs to be fully developed

SMR-COGS, CRP T13021





First Research Coordination Meeting of SMR-COGS CRP held on 11 to 15 November 2024 in Vienna

STATUS of the Coordinated Research Project SMR-COGS

- 14 Research Contracts from ARG, ARM, CPR, CZR, EGY, INS, LIT, MEX, POL, ROM(2), UKR(3)
- 18 Research Agreements from CAN(2), CPR, DEN, EGY, JOR, NOR, SIN, SPA, SWE, TUR, UK(2), USA(5)



Industry, Operators, Researchers, Regulators, etc.

Nuclear Energy Programmes: Embarking (Phase 1, 2 and 3), Expanding, Mature and Not Nuclear (DEN and NOR)

Observers: OECD/NEA, FIN, FRA, NET, RUS

45+ participants from 25 countries

Recent and Upcoming IAEA Events on Spent Fuel Management

1. Technical Meeting on Operating Experience and Lessons-learned on Managing Non-standard/Exotic Legacy Power and Research Reactor Spent Fuels, **18 – 21 February 2025, Vienna** (Material accessible at <https://conferences.iaea.org/event/399>)
2. Technical Meeting on Spent Fuel Behaviour and Performance of Storage Systems, **23-27 June 2025, Seoul, RoK**
3. Technical Meeting on the Management of Spent Fuel (Pebbles and Compacts) from High Temperature Reactors, **7 – 11 July 2025, Vienna** (Material accessible at <https://conferences.iaea.org/event/414>)
7. Technical Meeting on Proliferation Resistant Features of Fast Reactors and Advanced Fuel Cycles, **18 – 22 August 2025, Vienna**
8. [Workshop on Molten Salt Taxonomy \(In collaboration with the OECD/NEA and EC-JRC\)](#), **November 2025, Vienna**
9. [Technical Meeting on Status and Trends for SNF and RW Management](#), **28 – 31 October 2025, Vienna**
10. [Technical Meeting on Policies and Strategies for Managing Spent Fuel and Radioactive Waste](#), **1 – 5 December 2025, Vienna**

Joint IAEA-NEA-EC/JRC Workshop on the Taxonomy and Related Terminology of Fuel Cycles for Molten Salt Reactors

3 - 7 November 2025



Objectives

- To identify and establish a taxonomy for the fuel cycle options related to molten salt reactor technologies.
- To draft a suitable terminology for the different stages of the fuel cycles to facilitate communication on this complex topic.

Topics

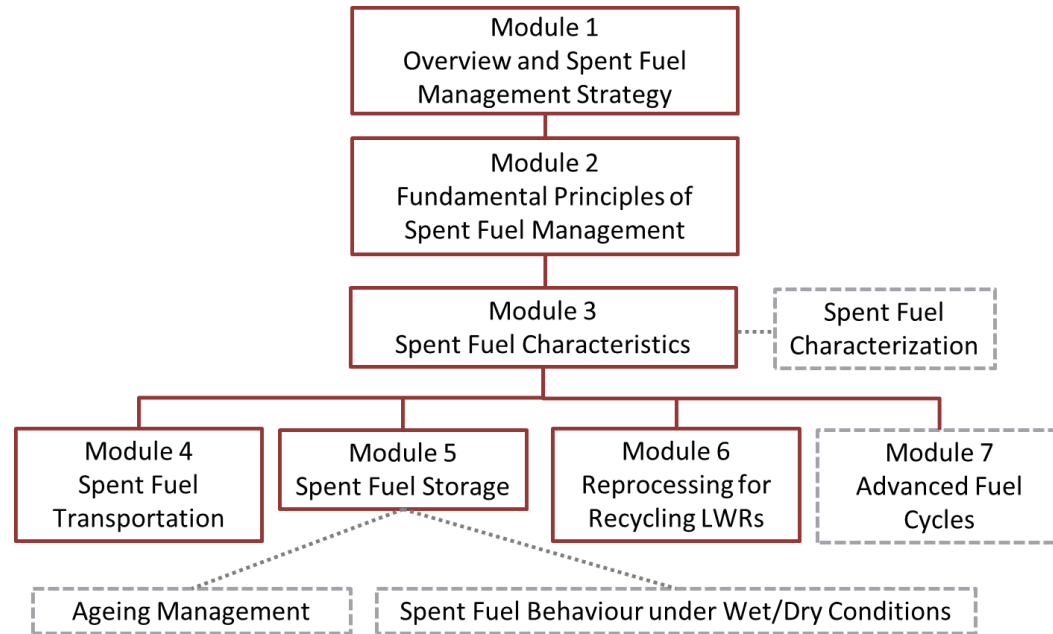
- **MSR Fuel Cycle Scenarios**
 - MSR fuel cycle scenario modelling: covering once-through to full recycling options
 - Flowsheet studies
 - Safeguards and MC&A considerations
- **MSR Fuel Cycle Technologies**
 - Clean-up and chemical control of fuel salt (with focus on fission products and contaminants removal)
 - Recycling of actinides
 - Influence of waste streams on fuel cycle options
 - Off-gassing techniques
 - Online, inline, offline, at-line, onsite, and offsite treatment options
 - How fuel cycle technologies affect the coupling of chemistry and physics
- **Impacts of the input streams on the fuel cycle**
 - Fuel source (e.g.: fresh fuel, recycled from spent fuel from other reactors)
 - Fuel and blanket salts
 - Fissile/fertile material (e.g.: U/Pu, Th/U, fuels with minor actinides)

International Conferences in 2026

- International Conference on Fast Reactors and Related Fuel Cycles (FR26) in Beijing (China) from **18 to 21 May 2026** (In collaboration with IAEA/NPTDS)
- International Conference on Fuel Supply Chain for Sustainable Nuclear Power Development in Vienna from **13 to 15 October 2026** (IAEA/NFCMS)
 - Topic 1. Industry Prospects and Challenges Facing Raising Fuel Supply Demand
 - Topic 2. Supply and demand of raw materials for nuclear fuel supply
 - Topic 3. Advanced nuclear fuels for innovative reactor technologies
 - Topic 4. Industrial and Innovative technologies for recycling nuclear materials

IAEA e-Learnings on Spent Fuel Management

6 Modules (11 Lectures) already available in



<https://www.iaea.org/services/education-and-training/online-learning>



Spent Fuel Management Network

SFM.Contact-Point@iaea.org



Welcome to the IAEA International Network on Spent Fuel Management - SFM Net

The spent fuel management (SFM) network is a forum for the sharing of practical experience and international developments on spent fuel management.

Its main objectives are to facilitate the efficient exchange of information, communication and cooperation amongst professionals working in the back end of the fuel cycle – from its removal from a reactor core to its final disposition (i.e. SNF wet and dry storage, transportation, handling and retrieval, reprocessing and recycling, economics of the back-end of nuclear fuel cycle, damaged SNF management, stakeholder involvement, communication issues, etc.)

The establishment of the SFM Net is aimed at fostering safe, sustainable and efficient spent nuclear fuel management practices across all IAEA Member States.

For further information or questions please contact SFM.Contact-Point@iaea.org.

Featured Publications

[SEE ALL](#)



Events 2025

- [Technical Meeting on Operating Experience and Lessons Learned on Managing Non-Standard Legacy Spent Fuels from Power and Research Reactor](#) (18 – 21 February 2025) [EV12304678](#)
- [Third Coordination Research Meeting on Spent Fuel Research and Assessment](#) (24 – 28 March 2025) [EV12404557](#)
- [23rd Meeting of the Technical Working Group on Nuclear Fuel Cycle Options and Spent Fuel Management](#) (01 – 04 April 2025) [EV12403034](#)
- [Technical Meeting on the Behaviour of Spent Fuel and Cladding During Storage and the Performance of Spent Fuel Storage Systems](#) (23 – 27 June 2025) [EV12406873](#)
- [Technical Meeting on the Management of Spent Fuel \(Pebble Beds and Prismatic\) from High Temperature Gas Cooled Reactors](#) (7 – 11 July 2025) [EV12404558](#)
- [Joint IAEA-NEA Workshop on the Taxonomy and Related Terminology of Fuel Cycles for Molten Salt Reactors](#) (29 September – 03 October 2025) [EV12404560](#)
- [Workshop on the Challenges in Managing Spent Evolutionary Advanced Technology Fuels](#) (10 – 14 November 2025) [EV12205116](#)
- [Technical Meeting on the Operation and Maintenance of Storage and Transportation Casks](#) (09 – 12 December 2025) [EV12404726](#)

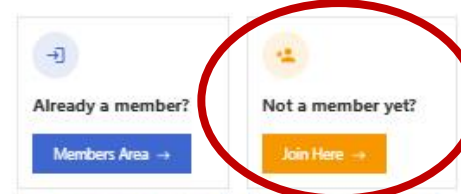
Latest News



NEW CRP: Challenges, Gaps and Opportunities for Managing Spent Fuel from Small Modular Reactors (T13021)



IAEA's Learning Management System!
With the addition of 3 new modules, the course on Spent Fuel Storage is available on IAEA's Learning Management System.



New infographics now available!





Thank You

A.Gonzalez-Espartero@iaea.org