IAEA
International Atomic Energy Agency
Atoms for Peace and Development

Technical Meeting on Back End of the Fuel Cycle Considerations for Small Modular Reactors

IAEA Headquarters, Vienna, Austria
and virtual participation via Cisco Webex

20–23 September 2022

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Information Sheet

Introduction

There is an increasing interest in small modular reactors (SMRs) and their applications, in part due to their consideration as a low carbon energy source in the climate change mitigation plans of many Member States. SMRs are newer generation reactors designed to generate electric power typically up to 300 MWe. According to the IAEA SMR Booklet (2020), there are 72 SMR concepts currently under development, spanning a significant range of reactor technologies. The SMR concepts can be deployed in a variety of configurations, ranging from single-unit installations to multimodule plants with a differing degree of modularisation across designs to suit the requirements of the operator.

SMR concepts vary from evolutionary variants of light water reactors (LWR-SMRs, either land or marine based), that benefit from many decades of operating experience; high temperature gas cooled reactors (HTGRs); liquid metal fast reactors (LMFRs) and molten salt reactors (MSRs). SMR designs use a variety of coolants (water, liquid metal, molten salts) and fuel forms (oxide/ceramic, metal, TRISO, liquid fuel salts, etc) having different technology readiness levels (TRLs) and fuel compositions (UOx (LEU, HALEU); Mixed U and Pu (oxide, metal, or salt); kernel particles; …).

While much focus has been given to aspects of SMR deployment such as reactor concepts, engineering, economics, infrastructure, safety and so on, the fuel cycle, and in particular the management of spent fuel, appears to have had limited consideration. As the SMR concepts are becoming more refined, it is an appropriate time to start identifying the challenges, opportunities, and issues for managing spent fuel from SMRs during storage, transportation, reprocessing & recycling, and disposal.

The implications for the backend of the fuel cycle are very dependent on the characteristics of the nuclear fuel to be managed as spent (e.g., enrichment, matrices and compositions) and its irradiation history (e.g., burnup).

These parameters impact the different stages of spent fuel management that are currently implemented, designed and licensed for the spent fuel arising from the current fleet of NPPs. Accommodating different spent fuels coming from SMRs will require adaptation at all stages of the backend of the fuel cycle due to higher thermal outputs, higher criticality risks, different radionuclide inventories, new matrices and cladding behaviours, etc. implying the need of R&D and demonstrations to ensure that the main safety objective is met.

The IAEA is organizing a Technical Meeting from 20 to 23 September 2022 to facilitate the exchange of information and discussion regarding the management of spent fuels coming from all envisaged SMR types to enable experts to collaboratively identify the opportunities and challenges faced in all stages of the backend of the fuel cycle (storage, transportation, reprocessing & recycling, and disposal), gaps in current infrastructures and knowledge, and the potential ways to move forward in addressing them in the near, medium, and long terms.

Objectives

The purpose of the event is to share technical information on the management of spent nuclear fuel from the operation of small modular reactors, to anticipate related opportunities and challenges, identify infrastructures and knowledge gaps and the potential ways to move forward in addressing them in the near, medium, and long term.

Target Audience

The event is intended for participants from nuclear fuel cycle research organizations, nuclear power plants, utilities, operators, waste management organizations, regulatory bodies, universities and other organizations who are already engaged in the operation and subsequent management of spent nuclear fuels from different types of SMRs. Participants should be actively involved in the subject of the event and have considerable experience in the relevant activities

Working Language(s)

English.

Expected Outputs

The event will provide the basis for preparing a report compiling technical papers capturing the state of the art, discussions during the event, and recommendations for future activities to support the development and implementation of SMR nuclear fuel cycles from a spent fuel management perspective.

Discussions on potential synergies among different SMRs' fuel cycle options, challenges for the different stages of the backend of the fuel cycle, enablers for their implementation and the identification of new infrastructures to address those challenges are foreseen.

Topics

Papers and presentations on the following topics are welcomed:

- National and international programmes for SMRs' nuclear fuel cycle options;
- SMRs' nuclear fuel cycle strategies and their potential synergies with current industrially implemented nuclear fuel cycle strategies;
- Impacts of SMRs' spent fuels on storage conditions and systems (wet and dry) and needs to address identified gaps and challenges;
- Impacts of SMRs' spent fuels on transportation systems and needs to address identified gaps and challenges;
- Impacts of SMRs' spent fuels on reprocessing and potential recycling routes and needs to address identified gaps and challenges;
- Challenges of SMRs' spent fuel disposal.

Participation and Registration

All persons wishing to participate in the event have to be designated by an IAEA Member State or should be members of organizations that have been invited to attend.

In order to be designated by an IAEA Member State, participants are requested to send the **Participation Form (Form A)** to their competent national authority (e.g. Ministry of Foreign Affairs, Permanent Mission to the IAEA or National Atomic Energy Authority) for onward transmission to the IAEA by **27 July 2022**. Participants who are members of an organization invited to attend are requested to send the **Participation Form (Form A)** through their organization to the IAEA by the above deadline.

Selected participants will be informed in due course on the procedures to be followed with regard to administrative and financial matters.

Participants are hereby informed that the personal data they submit will be processed in line with the Agency's Personal Data and Privacy Policy and is collected solely for the purpose(s) of reviewing and assessing the application and to complete logistical arrangements where required.

Papers and Presentations

Participants are expected to present relevant information falling within the scope of topics listed above and provide an extended abstract to be included in the Proceedings of the Technical Meeting.

Form for Submission of a Paper or Extended Abstract (Form B) including the title of the presentation and extended abstract should be submitted together with **Participation Form (Form A)** by the author to their competent national authority (e.g., Ministry of Foreign Affairs, Permanent Mission to the IAEA or National Atomic Energy Authority) or their organization for onward transmission to the Scientific Secretary of the event, not later than **27 July 2022**.

Extended abstract is to be submitted to the Scientific Secretary not later than **31 August 2022**.

Expenditures and Grants

No registration fee is charged to participants.

The IAEA is generally not in a position to bear the travel and other costs of participants in the event. The IAEA has, however, limited funds at its disposal to help meet the cost of attendance of certain participants. Upon specific request, such assistance may be offered to normally one participant per country, provided that, in the IAEA's view, the participant will make an important contribution to the event.

The application for financial support should be made using the **Grant Application Form (Form C),** which has to be stamped, signed and submitted by the competent national authority to the IAEA together with the **Participation Form (Form A)** by **27 July 2022**.

Venue

The event will be held at the Vienna International Centre (VIC), where the IAEA's Headquarters are located. Participants must make their own travel and accommodation arrangements.

General information on the VIC and other practical details, such as a list of hotels offering a reduced rate for IAEA participants, are listed on the following IAEA web page:

www.iaea.org/events.

Participants are advised to arrive at Checkpoint 1/Gate 1 of the VIC one hour before the start of the event on the first day in order to allow for timely registration. Participants will need to present an official photo identification document in order to be admitted to the VIC premises.

Visas

Participants who require a visa to enter Austria should submit the necessary application to the nearest diplomatic or consular representative of Austria at least four weeks before they travel to Austria. Since Austria is a Schengen State, persons requiring a visa will have to apply for a Schengen visa. In States where Austria has no diplomatic mission, visas can be obtained from the consular authority of a Schengen Partner State representing Austria in the country in question.

IAEA Contacts

Scientific Secretary:

Ms Amparo González-Espartero
Division of Nuclear Fuel Cycle and Waste Technology
Department of Nuclear Energy
International Atomic Energy Agency
Vienna International Centre
PO Box 100
1400 VIENNA
AUSTRIA

Tel.: +43 1 2600 22507
Fax: +43 1 26007
Email: A.G.Espartero@iaea.org

Administrative Secretary:

Mr Andi Keco
Division of Nuclear Fuel Cycle and Waste Technology
Department of Nuclear Energy
International Atomic Energy Agency
Vienna International Centre
PO Box 100
1400 VIENNA
AUSTRIA

Tel.: +43 1 2600 25809
Fax: +43 1 26007
Email: A.Keco@iaea.org

Subsequent correspondence on scientific matters should be sent to the Scientific Secretary/Secretaries and correspondence on other matters related to the event to the Administrative Secretary.

Event Web Page

Please visit the following IAEA web page regularly for new information regarding this event:

www.iaea.org/events/EVT2105850