



IAEA

International Atomic Energy Agency

Atoms for Peace and Development

Technical Meeting on Advances in Post-Irradiation Examination Techniques for Power Reactor Irradiated Fuels and Innovative Fuels

Virtual Event

21–27 July 2021

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Information Sheet

Introduction

For decades the IAEA has supported Member States in various aspects to improve the reliability of fuel for power reactors. Post-irradiation examinations (PIEs), accomplished by destructive fuel examinations in hot cells and non-destructive fuel examinations in both hot cells and spent fuel pool, are essential for the understanding of fuel behaviour and its further improvement with respect to the performance and safety in the reactor. The IAEA has fostered the exchange of information on advances in PIE techniques via Coordinated Research Projects (CRPs), Technical Meetings or equivalent, and edited several technical documents, such as:

- TRS-322 published in 1991, Guidebook on Non-Destructive Examination of Water Reactor Fuel, Final Report of CRP on Examination and Documentation Methodology for Water Reactor Fuel, 1983-1988;
- TRS-385 published in 1996, Guidebook on Destructive Examination of Water Reactor Fuel, Final Report of CRP on Examination and Documentation Methodology for Water Reactor Fuel, 1990-1995;
- IWGFPT-37 published in 1991, Post-Irradiation Examination Techniques for Water Reactor Fuel, Proceedings of a Technical Committee Meeting held in Workington, Cumbria, U.K, 11-14 September 1990;

- IAEA-TECDOC-692 published in 1993, Poolside Inspection, Repair and Reconstitution of LWR Fuel Elements, Proceedings of a Technical Committee Meeting held in Lyon, France, 21-23 October 1991;
- IAEA-TECDOC-1050 published in 1998, Poolside Inspection, Repair and Reconstitution of LWR Fuel Elements, Proceedings of a Technical Committee Meeting held in Bad Zurzach, Switzerland, 7-10 October 1997;
- IAEA-TECDOC-1277 published in 2002, Advanced Post-Irradiation Examination Techniques for Water Reactor Fuel, Proceedings of a Technical Committee Meeting held in Dimitrovgrad, Russian Federation, 14-18 May 2001;
- IAEA-TECDOC-CD-1635 published in 2009, Post-Irradiation Examination and In-Pile Measurement Techniques for Water Reactor Fuels;
- IAEA-TECDOC-CD-1693, Hot Cell Post-Irradiation Examination and Poolside Inspection of Nuclear Fuel, Proceedings of the IAEA-HOTLAB Technical Meeting held in Smolenice, Slovakia, 23-27 May 2011.

In the last decade, fuel communities in Member States have pursued R&D to advance PIE technologies in order to ensure fuel reliability under operational states including high burnup operation and power manoeuvring operation; to enhance fuel safety through understanding of fuel and material degradation and failure mechanisms under accident conditions; to support the development of innovative fuels and materials (e.g. accident tolerant fuel (ATF), fast reactor (FR) fuels, GEN-IV fuels, small modular reactor (SMR) fuels, inert matrix fuel (IMF)); and to support the development and validation of computer codes (e.g. 3D analysis codes, multi-scale codes).

Recognizing the importance of these topics, the members of the Technical Working Group on Fuel Performance and Technology (TWG-FPT) recommended at the TWG-FPT plenary meeting in 2018 to organize a Technical Meeting on Advances in Post-Irradiation Examination Techniques for Water Reactor and Innovative Fuels.

Objectives

The purpose of the event is to exchange information on advanced post-irradiation examinations (PIE) techniques for materials of existing and future reactor fuels, cladding, in-core structural components and coolant. The event will support Member States in addressing technical challenges encountered when examining existing and innovative fuels.

Target Audience

The event is intended for staff members of nuclear fuel research facilities (including PIE facilities), nuclear power plants, utilities, regulatory bodies, universities and other organizations engaged in the design, operation and fabrication of existing and innovative power-reactor fuels. Participants should be actively involved in the subject of the event and have considerable experience of the relevant activities.

Working Language(s)

English.

Expected Outputs

The event will provide the basis for preparing a report compiling papers/presentations and discussions of the event, recommendations for future activities to support the development and qualification of materials for existing and future reactor fuels, cladding, in-core structural components and coolant.

Structure

This event will comprise four main technical sessions as follows:

1. Materials for existing power reactor fuels, cladding, in-core structural components and coolant;
2. Materials for innovative reactor fuels, cladding, in-core structural components and coolant;
3. Post irradiation examination (PIE) support to code development and validation;
4. PIE facility improvements and safe transportation of irradiated materials.

Each technical session will include a group discussion to discuss specific issues related to the subject items of the session.

Topics

Under Technical Sessions 1 and 2, the following topics can be discussed:

- (1) Pool side inspection (non-destructive), such as:
 - o Visual inspection (e.g. oxide layer measurements by optical testing, infrared camera technology, profilometry),
 - o Non-destructive defect or layer detection (e.g. ultrasonic testing (UT) and eddy-current testing (ET), sipping and sniffing testing).
- (2) Hot cell examination, such as:
 - o Non-destructive inspection (e.g. UT, ET, gamma scanning, tomography, acoustic microscopy, diffuse reflection spectroscopy, gamma tomography),
 - o Preparation of samples and subsamples for lab destructive investigation (e.g. focused ion beam or mechanical micro fragmentation),
 - o Destructive inspection (e.g. x-ray absorption, X-ray powder diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), TIMS, mechanical testing, metallography, laser flash, inductively coupled plasma mass spectrometry (ICPMS), inductively coupled plasma optical emission spectrometry (ICPOES), SIMS, other analytical techniques),

- o Specific hot cell, glove box atmosphere (inert gas hot cells for molten salt reactor, uranium-nitride (UN) fuel, uranium-carbide (UC) fuel, metallic fuel),
 - o Alpha and tritium tight systems (e.g. portals, penetration sealing technology).
- (3) Root cause investigations.

Under technical Session 3, the following topics can be discussed:

- o Validation data for fuel performance codes and safety analysis codes,
- o Knowledge gap assessments to provide required data to the fuel modellers.

Under Technical Session 4, the following topics can be discussed:

- o Upgrade the use of existing units,
- o Equipment development and capability maintenance and financial investment,
- o Collaborate with universities, other research facilities and vendors/operators/regulators,
- o Sample packaging and irradiated material disposition after PIE,
- o Transportation logistics and improvements.

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 **15 April 2021**. 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.

Papers and Presentations

Participants are expected to give presentations falling within the scope of topics listed above. Approximately 30 minutes will be allotted for each presentation, including floor discussion.

Participants who wish to give presentations are requested to submit an abstract of their presentation. The abstract will be reviewed as part of the selection process for presentations. The abstract should be in A4 page format, should be more than one page and no more than three pages. It should be sent electronically to Mr Ki Seob Sim, the Scientific Secretary of the event (see contact details below), not later than **15 May 2021**. Authors will be notified of the acceptance of their proposed presentations by [Acceptance Deadline](#).

Participants have to submit the presentation slides together with the **Form for Submission of a Paper**

(Form B) 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 **15 June 2021**.

For this event, the submission of a full paper is not required.

IAEA Contacts

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