Technical Meeting on Advanced Technology Fuels: Progress on their Design, Manufacturing, Experimentation, Irradiation, and Case Studies for their Industrialization, Safety Evaluation, and Future Prospects

Meeting room **M BR A**
Vienna International Centre

28 – 31 October 2025

Ref. No.: EVT2404561

Information Sheet

Introduction

The IAEA Coordinated Research Project (CRP) T12032 on Testing and Simulation for Advanced Technology and Accident Tolerant Fuels (ATF-TS) started in April 2020 and ended in December 2024. It involved 29 partners from 22 Member States (MSs) and 1 International Organization (EC-JRC), and 2 observers (OECD-NEA and US NRC). The main objectives of the CRP were: *(i)* to support interested MSs in their efforts to design and develop Accident Tolerant and Advanced Technology Fuels (ATFs) for light water reactors (LWRs), *(ii)* to enhance their computer code capabilities to predict nuclear fuel behaviour under Design Basis (DB) and Design Extension (DE) Conditions, and *(iii)* to increase the technology readiness for candidate ATF materials, with the following specific research objectives:

- To perform experiments including separate effect and bundle tests on ATFs' performance under normal, DB and DE conditions;
- To benchmark fuel codes against new test data obtained during the CRP as well as existing data relevant for advanced fuel and cladding concepts from other experimental programmes;
- To develop Loss of Coolant Accident (LOCA) evaluation methodology for ATF performance with a view for Nuclear Power Plant applications.

The CRP participants highlighted the success of the CRP T12032 on ATF-TS as an international Research & Development project with notable achievements. The collaboration among the 29 participating organizations, along with the effective coordination of all Work Tasks, was crucial to the success of the CRP. A dynamic network of experts was established to address the technical issues associated with ATF materials and the application of fuel performance codes and severe accident codes to ATFs. The CRP T12032 on ATF-TS provided valuable support to MSs by improving their understanding of ATF behaviour under normal operational and accidental conditions, sharing experimental data, and promoting best practices in fuel modelling and computer codes.

The CRP participants recommended focusing future ATF-related efforts on enhancing fuel performance codes and severe accident codes to better assess the benefits of ATFs at high burnups under Anticipated Operational Occurrences (AOOs), Design Basis and Design Extension conditions.

Meanwhile, significant progress has been made, worldwide, on ATF development, qualification (testing and simulation) and industrial implementations since the last IAEA Technical Meeting on "Modelling of Fuel Behaviour on Design Basis Accidents and Design Extension Conditions", held in Shenzhen, China on May 13-16, 2019, whose proceedings have been compiled in the IAEA TECDOC-1913, published in 2020. There is therefore a need to review the status of ATF development, to evaluate the safety benefits of ATFs, and to recommend future IAEA activities on ATFs.

In response to these recommendations and based on the advice of the members of the Technical Working Group on Fuel Performance and Technology, the IAEA is organizing a Technical Meeting on "Advanced Technology Fuels: Progress on their Design, Manufacturing, Experimentation, Irradiation, and Case Studies for their Industrialization, Safety Evaluation, and Future Prospects", that will serve as a platform to:

- Discuss the results of the CRP T12032 on ATF-TS,
- Assess the safety benefits and performance of ATFs,
- Identify gaps and challenges in ATF development, qualification and licensing,
- Explore future IAEA activities, including a new CRP on ATF testing and simulation including for Small Modular Reactors (SMRs).

Objective

The main purpose of the event is to discuss the outcomes of the coordinated research project entitled "Testing and Simulation for Advanced Technology and Accident Tolerant Fuels (ATF-TS)" to assess the benefits of ATFs and to make recommendations for the IAEA's future activities in this area. New results from other national and international ATF related projects will be presented and discussed.

Target Audience

The event is intended for participants from research organizations, nuclear fuel design organizations, nuclear power plant operators and engineering companies, regulatory bodies and technical support organizations, universities, and other organizations engaged in near- and mid-term ATF fuel development, design, manufacturing, licensing and operation for large and small water-cooled reactors.

Working Language(s)

English

Expected Outputs

The event will provide the basis for an IAEA publication on ATFs' behaviour, testing and simulation in Light Water Reactor including Small Modular Reactors.

Structure and topics

The programme will mainly consist of sessions dedicated to invited and selected oral talks and discussions. A Programme Committee made up of international representatives will be responsible for selecting the invited and registered oral presentations and for arranging the technical and discussion sessions, as well as their scientific content.

This event will feature five main technical sessions, covering key aspects of ATF development, testing, modelling, safety analysis, and future applications.

1. Advances in ATF Materials and Manufacturing

- ATF cladding and fuel fabrication
- Coating designs and optimization
- Industrialization of ATFs and associated challenges

2. Experimental Testing of ATF Materials and Validation Database

- Bundle Tests – Bundle tests with ATFs simulating DBA, DEC-A and DEC-B conditions including tests with air ingress
- Separate Effect Tests (SETs) – SETs focused on nominal operating conditions and anticipated occupational occurrences (long-term corrosion testing, mechanical tests, coating defects), accidental scenarios (HT steam/air oxidation, LOCA- and RIA-related SETs)
- In-pile Testing– Irradiation testing of candidate ATF materials both in research reactors or accelerators and commercial power plants (e.g., LTRs, LTAs)

3. ATF Modelling

- Verification, Validation, and Uncertainty Quantification of fuel performance codes
- Multi-physics and Multi-scale Modelling
- Benchmarking of fuel performance codes for ATF materials in operational and accident conditions. This can also be extended to behaviour in storage conditions.
- Data-driven and artificial intelligence (AI) applications

4. ATF Safety Analysis and Licensing Practices

- New Safety Criteria for ATFs
- Innovative Qualification & Licensing Approaches for DBA and DEC scenarios
- Risk-Informed Approaches
- Margin Quantification and Management

5. Future prospects of ATF

- Effect of ATFs on occurrence and consequences of Fuel Fragmentation, Relocation, and Dispersal (FFRD),
- Definition of Post- Critical Heat Flux (CHF) Time at Temperature Limits
- Improved ATF designs
- Use of LEU+ with ATFs for High Burnup (HBU)
- Deployment of ATFs in Small Modular Reactors (SMRs)

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 or invited organization, participants are requested to submit their application via the InTouch+ platform (https://intouchplus.iaea.org) to the competent national authority (Ministry of Foreign Affairs, Permanent Mission to the IAEA or National Atomic Energy Authority) or organization for onward transmission to the IAEA by **15 July 2025**, following the registration procedure in InTouch+:

1. Access the InTouch+ platform (https://intouchplus.iaea.org):
   - Persons with an existing NUCLEUS account can sign in to the platform with their username and password;
   - Persons without an existing NUCLEUS account can register here.

2. Once signed in, prospective participants can use the InTouch+ platform to:
   - Complete or update their personal details under 'Complete Profile' and upload the relevant supporting documents;
   - Search for the relevant event under the 'My Eligible Events' tab;

- Select the Member State or invited organization they want to represent from the drop-down menu entitled 'Designating Authority' (if an invited organization is not listed, please contact InTouchPlus.Contact-Point@iaea.org);
- If applicable, indicate whether financial support is requested and complete the relevant information (this is not applicable to participants from invited organizations);
- Based on the data input, the InTouch+ platform will automatically generate the Participation Form (Form A) and/or the Grant Application Form (Form C);
- Submit their application.

Once submitted through the InTouch+ platform, the application, together with the auto-generated form(s), will be transmitted automatically to the required authority for approval. If approved, the application, together with the applicable form(s), will automatically be sent to the IAEA through the online platform.

NOTE: The application for financial support should be made, together with the submission of the application, by **15 July 2025**.

For additional information on how to apply for an event, please refer to the InTouch+ Help page. Any other issues or queries related to InTouch+ can be sent to InTouchPlus.Contact-Point@iaea.org.

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. The IAEA may also use the contact details of Applicants to inform them of the IAEA's scientific and technical publications, or the latest employment opportunities and current open vacancies at the IAEA. These secondary purposes are consistent with the IAEA's mandate. Further information can be found in the Data Processing Notice concerning IAEA InTouch+ platform.

Papers and Presentations

The IAEA encourages participants to give presentations on the work of their respective institutions that falls under the topics listed above. Approximately 25 minutes will be allotted for each presentation, including floor discussion.

Participants who wish to give presentations are requested to submit **an extended abstract** of their work, including figures and references (see Appendix for the template). The abstract will be reviewed as part of the selection process. The abstract should be in A4 page format, should be **more than two pages and no more than four pages**. It should be sent electronically to **Ms Anzhelika KHAPERSKAIA**, the Scientific Secretary of the event (see contact details below), not later than **15 July 2025.** Authors will be notified of the acceptance of their proposed presentations by **15 August 2025.**

In addition to the registration already submitted through the InTouch+ platform, participants have to submit the abstract, together with the Form for Submission of a Paper (Form B), to the competent national authority (e.g. Ministry of Foreign Affairs, Permanent Mission to the IAEA or National Atomic Energy Authority) or organization for onward transmission to the IAEA not later than **15 July 2025.**

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, together with the submission of the application, by **15 July 2025**.

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.

Programme Committee

The International Programme Committee is composed of the following members:

,

Mr Jinzhao Zhang	Belgium (Tractebel) - Chair
Mr Martin Sevecek	Czech Republic (Czech Technical University) - Co-Chair
Mr Antoine Bouloré	France (CEA)
Mr Juri Stuckert	Germany (Karlsruhe Institute of Technology (KIT)
Mr Zoltan Hozer	Hungary (Centre for Energy Research)
Mr Paul Van Uffelen	European Commission (Joint Research Centre)
Mr Kan Sakamoto	Japan (Nippon Nuclear Fuel Development Co.)
Ms Alice Chung	USA (NRC)
Mr Yongjun Jiao	China (Nuclear Power Institute of China)
Mr Youho Lee	Korea (SNU)
Mr Robert Hansen	USA (INL)
Ms Nuria Doncel Gutierrez	Spain (ENUSA)
Mr Nathan A. Capps	USA (Oak Ridge National Laboratory)
Mr Aleksei Gusev	Russia (TVEL)

IAEA Contacts

Scientific Secretary:

Ms Anzhelika KHAPERSKAIA
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 22760
Fax: +43 1 26001
Email: A.Khaperskaia@iaea.org

Administrative Secretary:

Mr Ufuk Can KALENDER
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 24 656
Email: U.kalender@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/EVT2404561

IAEA
International Atomic Energy Agency
Atoms for Peace and Development

Form B

EVT2404561

Form for Submission of a Paper

Technical Meeting on Advanced Technology Fuels: Progress on their Design, Manufacturing, Experimentation, Irradiation, and Case Studies for their Industrialization, Safety Evaluation, and Future Prospects

IAEA Headquarters, Vienna, Austria

28 to 31 October 2025

To be completed by the participant and sent to the competent national authority (e.g. Ministry of Foreign Affairs, Permanent Mission to the IAEA, or National Atomic Energy Authority) of his/her country for subsequent transmission to the International Atomic Energy Agency (IAEA) either by email to: Official.Mail@iaea.org or by fax to: +43 1 26007 (no hard copies needed). Please also send a copy by email to the Scientific Secretary (A.Khaperskaia@iaea.org) and to the Administrative Secretary (U.Kalender@iaea.org).

Participants who are members of an invited organization can submit this form to their organization for subsequent transmission to the IAEA.

Deadline for receipt by IAEA through official channels as per Conference Announcement.

Title of the paper:		
If applicable: Abstract ID in IAEA-INDICO:		
Family name(s) and first name(s) of all author(s): e.g. Smith, John	Scientific establishment(s) in which the work has been carried out	City/Country
1.		
2.		
3.		
Family name and first name(s) of author presenting the paper: e.g. Smith, John	Mr/Ms:	
Mailing address:		
Tel. (Fax):		
Email:		

I hereby agree to assign to the International Atomic Energy Agency (IAEA):

the copyright; or

the non-exclusive, worldwide, free-of-charge licence (this option is only for those authors whose parent institution does not allow them to transfer the copyright for work carried out in that institution) granting the IAEA world rights for the use of the aforementioned material in this and any future editions of the publication, in all languages, and in all formats available now, or to be developed in the future (digital formats, hard copy etc.).

Please note: If granting the licence mentioned above, please supply any copyright acknowledgement text required.

Furthermore, I herewith declare:

that the material submitted to the IAEA is original, except for such excerpts from copyrighted works as may be included with the permission of the copyright holders thereof, has been written by the stated authors, has not been published before, and is not under consideration for publication by another entity;

that any permissions and rights to publish required for third-party content, including but not limited to figures and tables, have been obtained, that all published material is correctly referenced; and

that the material submitted to the IAEA does not contain any libellous or other unlawful statements and does not contain any materials that violate any personal or proprietary rights of any person or entity.

Date: **Signature of main author:**