Interregional Training Course on Application of INPRO Nuclear Energy System(s) Assessment Methodology for Sustainability Assessment of Small Modular Reactors (SMRs) and Microreactors (MRs)

Hosted by

The Government of the Russian Federation

through the

State Atomic Energy Corporation 'Rosatom'

Saint Petersburg, Russian Federation

2 to 6 October 2023

Ref. No.: TN-INT2023-2301225

Information Sheet

Purpose

The purpose of the event is to train participants on the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO) methodology and tools for performing modelling, analysis and sustainability assessments of nuclear energy systems (NES) with small modular reactors (SMRs) and microreactors (MRs), to strengthen capacity building in developing countries on strategic assessment and analysis of NES and to train on the application of INPRO tools.

Working Language

The training course will be conducted in English.

Deadline for Nominations

Nominations received after 15 July 2023 will not be considered.

Project Background

Small Modular Reactors (SMRs) are advanced nuclear reactors designed to generate electric power typically up to 300 MWe, whose structures, systems and components can be fabricated in factories and transported to installation sites based on demand. Modularization enables the economics of serial production, shorter construction schedules, and lower capital cost. The purpose of the project is to provide broad support to Member States in the deployment of SMRs and MRs. The INT2023 TC project (**Capacity Building on Small Modular Reactors and Micro-reactors and their Technology and Applications as a Contribution of Nuclear Power to the Mitigation of Climate Change)** provides a forum to enable effective capacity building through training and technology transfer activities on all aspects of SMR and MR development, including siting, design; technology; engineering, construction, commissioning, operation, maintenance, human resource management; fuel cycle; waste management; decommissioning; economics, financing; nuclear safety and security; emergency preparedness and response arrangements; and legal framework. The aim of the project is to enable national stakeholders to understand key characteristics of SMR and MR technologies and their applications, and to formulate, in line with international safety standards, countries' specific legal and regulatory frameworks, and generic user requirements and criteria. Member States are receiving technical assistance to evaluate the contribution of SMRs, MRs and their potential non-electric applications in addressing UN Sustainable Development Goals (SDGs) 6, 7, 9, 12 and 13, mitigating climate changes and integrating the basic principles of circular economy.

The International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO), established within the IAEA in 2000, has the goal of ensuring a sustainable nuclear energy supply to help meet 21st century global energy needs. INPRO's activities center on the key concepts of global nuclear energy sustainability and the development of long-range nuclear energy strategies, so that nuclear energy is and remains available to meet national energy needs.

In view of the interest of some Member States in the development and deployment of SMRs and MRs, it is necessary to improve the knowledge and to strengthen the capacity building in developing countries in strategic assessment and analysis of national NES.

This Training Course will familiarize participants with the concept and INPRO methodology for NES sustainability assessments and provide theoretical and practical introductory training on INPRO tools for NES modelling and analysis.

Scope and Nature

During this 5-day hybrid Training Course, the selected participants will receive lectures from international experts from the IAEA, the Russian Federation, and other Member States, as well as will conduct exercises, and participate in discussions. Also included is a field visit to a nuclear power plant and/or SMR simulator is considered as an option on the agenda.

This Training Course will include lectures, and practical exercises with active involvement of the participants.

By the end of this Training Course, participants are expected to be familiar with the main tendencies in SMR deployment and with INPRO Methodology and tools for strategic assessment of nuclear energy programs with SMRs and microreactors. The participants will benefit from a better understanding of the nuclear power (including SMRs) role in the long-term sustainability of energy production according to national priorities.

In addition, the training course will provide opportunities for participants to network and share information and good practices as well as other potential follow-up tasks and coordinated activities, as appropriate.

References:

- INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Energy for a Net Zero World.
- INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Technology Review 2022 - Report by the Director General, IAEA, Vienna (2022).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Advances in Small Modular Reactor Technology Developments — A Supplement to: IAEA Advanced Reactors Information System (ARIS) - 2022 Edition, IAEA, Vienna (2022).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Guidance for the Application of an Assessment Methodology for Innovative Nuclear Energy Systems: INPRO Manual – Overview of the INPRO Methodology IAEA TECDOC 1575 Rev. 1, IAEA, Vienna (2008)
- INTERNATIONAL ATOMIC ENERGY AGENCY, Introduction to the Use of the INPRO Methodology in a Nuclear Energy System Assessment, IAEA NE Series NP-T-1.12, 2011 (English, Russian, Arabic)
- INTERNATIONAL ATOMIC ENERGY AGENCY,Application of Multi-criteria Decision Analysis Methods to Comparative Evaluation of Nuclear Energy System Options (INPRO Collaborative Project KIND, Executive Summary), IAEA Brochure, 2020.
- INTERNATIONAL ATOMIC ENERGY AGENCY,Developing Roadmaps to Enhance Nuclear Energy Sustainability: Final Report of the INPRO Collaborative Project ROADMAPS. IAEA NE Series NG-T-3.22, 2021
- INTERNATIONAL ATOMIC ENERGY AGENCY, Planning enhanced nuclear energy sustainability: An INPRO service to Member States, Analysis Support for Enhanced Nuclear Energy Sustainability (ASENES)", IAEA Nuclear Energy Series No. NG-T-3.19, IAEA, Vienna (2021)
- INTERNATIONAL ATOMIC ENERGY AGENCY, Technology Roadmap for Small Modular Reactor Deployment, Nuclear Energy Series No. NR-T-1.18, IAEA, Vienna (2021).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Small modular reactor: A new nuclear energy paradigm, booklet, IAEA, Vienna (2022).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Applicability of Design Safety Requirements to Small Modular Reactor Technologies Intended for Near Term Deployment, TECDOC-1936, IAEA, Vienna (2020).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Legal and Institutional Issues of Transportable Nuclear Power Plants: A Preliminary Study, IAEA Nuclear Energy Series No. NG-T-3.5, IAEA, Vienna (2013).

Expected outputs

The expected output of the Training Course is to strengthen capacity in the following topics related to the sustainability of nuclear energy systems and SMRs:

- IAEA activities on SMRs Ums, including the Agency-wide Platform on SMRs and Their Applications.
- INPRO project as IAEA strategic service for MSs
- Methodology for assessing the sustainability of nuclear energy systems (the INPRO Methodology and NESA)
- Methods and tools for modelling and analysis of nuclear energy systems.

Participation

The event is open to up to 20 participants from the following Member States participating in the TC Project INT2023:

Algeria, Argentina, Armenia, Belarus, Bolivia, Brazil, Bulgaria, China, Croatia, Czech Republic, Egypt, El Salvador, Estonia, Ethiopia, Georgia, Ghana, Greece, Guatemala, Hungary, Indonesia, Islamic Republic of Iran, Jamaica, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Latvia, Libya, Lithuania, Madagascar, Malaysia, Mexico, Morocco, Nigeria, Pakistan, Peru, Philippines, Poland, Qatar, Romania, Rwanda, Saudi Arabia, Singapore, Slovakia, Slovenia, South Africa, Sri Lanka, Sudan, Thailand, Tunisia, Türkiye, United Republic of Tanzania, Uzbekistan, Zambia.
The selected participants to attend will be funded through INT2023.

Australia, Canada, Czech Republic, France, Italy, Japan, Belgium, Denmark, Spain, China, Finland, India, Republic of Korea, South Africa, Russian Federation, United Kingdom, United States of America.
The participants to attend will be cost free to IAEA.

The selected participants can attend this course virtually in a case if is unable to attend in face to face due to travel restriction and or other reason.

Participants' Qualification and Experience

The target audience of this Training Course are those individuals working in Member States' governments/nuclear energy programme implementing organizations (NEPIOs), universities and prospective owner/operator organizations, particularly those needing to understand the key issues and challenges associated with SMR introduction into national energy systems.

The activities will be conducted in English and candidates should have sufficient English proficiency to participate in the training course without difficulty.

Candidates are requested to provide a summary of how this training will provide direct benefit to their current or future job position.

Accepted participants should visit the IAEA e-Learning modules on INPRO collaborative platform:

- International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO) (iaea.org)

including:

- Pages - System Dynamics Models of Nuclear Energy Systems (NES) - NES Simulators (iaea.org).

Application Procedure

Candidates wishing to apply for this event should follow the steps below:

1. Access the InTouch+ home page (https://intouchplus.iaea.org) using the candidate's existing Nucleus username and password. If the candidate is not a registered Nucleus user, she/he must create a Nucleus account (https://websso.iaea.org/IM/UserRegistrationPage.aspx) before proceeding with the event application process below.
2. On the InTouch + platform, the candidate must:
    a. Finalize or update her/his personal details, provide sufficient information to establish the required qualifications regarding education, language skills and work experience ('Profile' tab) and upload relevant supporting documents;
    b. Search for the relevant technical cooperation event (EVT2301225) under the 'My Eligible Events' tab, answer the mandatory questions and lastly submit the application to the required authority.

NOTE: Completed applications need to be approved by the relevant national authority, i.e., the National Liaison Office, and submitted to the IAEA through the established official channels by the provided designation deadline. **All nominations must include a scan of the candidate's first page of passport with photo.**

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

Should online application submission not be possible, candidates may download the nomination form for the training course from the IAEA website.

Administrative and Financial Arrangements

Nominating authorities will be informed in due course of the names of the candidates who have been selected and will at that time be informed of the procedure to be followed with regard to administrative and financial matters.

Selected participants who indicate their need, will receive financial support to contribute to the expenses of their costs for internet connection for the duration of the event in line with IAEA rules and procedures.

Disclaimer of Liability

The organizers of the event do not accept liability for the payment of any cost or compensation that may arise from damage to or loss of personal property, or from illness, injury, disability or death of a participant while he/she is travelling to and from or attending the course, and it is clearly understood that each Government, in approving his/her participation, undertakes responsibility for such coverage. Governments would be well advised to take out insurance against these risks.

Note for female participants

Any woman engaged by the IAEA for work or training should notify the IAEA on becoming aware that she is pregnant.

The Board of Governors of the IAEA approved new International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources. The Standards deal specifically with the occupational exposure conditions of female workers by requiring, inter alia, that a female worker should, on becoming aware that she is pregnant, notify her employer in order that her working conditions may be modified, if necessary. This notification shall not be considered a reason to exclude her from work; however, her working conditions, with respect to occupational exposure shall be adapted with a view to ensuring that her embryo or foetus be afforded the same broad level of protection as required for members of the public.

Programme Management Officer

Mr Jing Zhang
Division for Europe
Department of Technical Cooperation
International Atomic Energy Agency
Vienna International Centre
PO Box 100
1400 VIENNA
AUSTRIA
Tel.: +43 1 2600 26540
Fax: +43 1 26007
Email: J.Zhang@iaea.org

Administrative Contact

Mr Nikita Butakov
Division for Europe
Department of Technical Cooperation
International Atomic Energy Agency
Vienna International Centre
PO Box 100
1400 VIENNA
AUSTRIA
Tel.: +43 1 2600 21058
Fax: +43 1 26007
Email: N.Butakov@iaea.org