



# **Interregional Workshop on Advances in Small Modular Reactor and Microreactor Designs**

**Hosted by**  
The Government of the People's Republic of China

**Through the**

Shanghai Nuclear Engineering Research & Design Institute Co., Ltd.

Shanghai, China

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## **Information Sheet**

### **Purpose**

The purpose of the event is to provide technical forum to discuss state-of-the-art in technology development for the Small Modular Reactors (SMRs) and Microreactors (MRs), showcasing design philosophy, key technical features, roadmaps to deployment, system and component design maturity level, as well as related IAEA resources available to Member States to advance deployment of SMRs and MRs.

### **Working Language**

The working language(s) of the event will be **English**.

### **Deadline for Nominations**

Nominations received after **1 July 2024** will not be considered.

## Project Background

To meet the growing demand for energy and to mitigate global climate change challenge, the interest in SMRs including microreactors is growing, especially in regions inaccessible to large electricity grids and regions with smaller electricity grids that need technology options deployed incrementally to closely match increasing energy demand. SMRs and MRs are also viable options for users with needs beyond electricity supply, e.g., district heating, desalination, industrial process heat, as well as hydrogen.

The purpose of the project is to provide broad support to Member States in the development and deployment of SMRs and MRs. The project provides a broad range of fora to enable effective capacity building through training and technology transfer activities on all aspects of SMR development. The project also covers the emerging MRs, the development of SMRs for electric and non-electric applications, and the coupling of such nuclear systems with renewables in integrated energy systems. The aim of the project is to enable national stakeholders to gain enhanced understanding of 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 for SMR technologies.

## Event Background

The event is being organized under the interregional INT2023 TC project "Supporting Member States' 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".

SMRs have attracted significant interest in recent years as a potential solution to meet the growing demand for clean and reliable energy, as well as for their utilization for non-electric applications, such as district heating, hydrogen production or water desalination. They are designed for high operational performance and reliability, enhanced transportability to site by modularity, adopt optimum safety margins, while also being economically competitive, e.g., affordable. In the beginning of 2024, there were more than 90 designs of SMRs/MRs of different stages of development in more than 20 Member States involving more than 50 technology developers and national laboratories. Several Member States have been actively working on demonstrating SMRs through pilot projects and prototypes.

The Akademik Lomonosov floating nuclear power plant (FNPP) using two units of KLT-40S SMR of 35 MW(e) each has completed the first fuel cycle since it began commercial operation in May 2020 in Pevek, Russian Federation. The high temperature gas-cooled reactor pebble bed module (HTR-PM) has started commercial operation in December 2023. The HTR-PM has two reactors that drive a single 210 MW(e) turbine-generator, and is located in Shidao Bay, Shandong Province, China.

Few other front runner designs are including CAREM25 in Atucha, Argentina that started construction in 2014 is expected to have the initial criticality by end of 2027. The Linglong One NPP is under construction at the Changjiang, Hainan, China since July 2021. The SMR-NPP uses ACP100 with first concrete date July 2021 for planned connection to the grid in 2026. Its outer containment dome was hoisted into place in the beginning of 2024. The BREST-OD-300, a lead-cooled fast reactor in Russian Federation is also under construction aiming for connection to the grid by 2026. The VOYGR design with 6-module configuration with 77 MW(e) generated from each module has received standard design approval in the United States of America, for near term deployment both for domestic and international market. NUWARD design with dual module of 170 MW(e) each is undertaking joint early review by several regulators in Europe. The SMR is aimed for first of a kind deployment in France in early 2030s.

The current technology development trend includes microreactors, which typically generate up to 20 MW(e). These reactors are primarily targeted to supply power at remote sites with mining operations, island

communities, to power oil platforms and to be applied in maritime shipping.

The light-water cooled reactor designs that are based on commercially available components applied in large reactors, are at higher level of technology readiness level. The development pathways utilising cutting-edge technologies like liquid metal, molten salt, or high temperature gas may be longer due to the design complexity and licensing framework. Understanding SMRs/MRs design and assessing various technology options is key for planning adoption nuclear power in an optimum energy mix.

## Scope and Nature

The specific objectives of the workshop are as follows:

- To facilitate Member States in understanding the state-of-the-art in technology development of SMRs including microreactors, by discussing their design philosophy, key technical features, roadmaps to deployment, as well as technology readiness level for deployment.
- To disseminate information about the development of SMR designs from major technology lines for both electricity generation as well as cogeneration of electricity and industrial process heat for various non-electric applications.
- To solicit insights from potential end-users on specific SMR applications in different geographical regions and Member States' expectations from cooperation with technology holders, related industrial stakeholders and the IAEA.

The event will feature presentations from the IAEA, developers of SMRs technologies and invited speakers from potential user countries with a focus on various options for applications such as industrial heat generation, water desalination, and electricity generation for remote areas among others. Hence, the event will provide opportunities for participants to network and continue sharing information and good practices as well as other potential follow-up tasks and coordinated activities, as appropriate.

The host organization arranges technical visits for participants.

## Expected Outputs

The key outcome of the workshop would be an enhanced knowledge and understanding of SMRs and MRs technologies for near and mid-term deployment (up to the next decade). To achieve the outcome, the workshop will feature presentations from IAEA, local experts, international SMR industries, and selected Member States participants, highlighting in particular:

- Design philosophy and technical features of reactor technologies available for SMRs/ MRs;
- System and component design and readiness;
- Engineering, safety features and operating fundamentals;
- Technology roadmaps for deployment;
- IAEA resources available to Member States to advance deployment of SMRs/MRs.

## Participation

The event is open to up to 45 participants from the following Member States participating in the TC INT2023 Project: Algeria, Argentina, Brazil, China, Czech Republic, Egypt, El Salvador, Estonia, Ethiopia, Ghana, Hungary, Indonesia, Jordan, Kenya, Mongolia, Mexico, Nigeria, Pakistan, Poland, Romania, Saudi Arabia, Serbia, Slovakia, South Africa, Türkiye and Uzbekistan.

At no cost to the IAEA, participants from following countries are also considered: Belgium, Canada, Denmark, Finland, France, Japan, Republic of Korea, Russian Federation, United Kingdom, United States of America.

## Participants' Qualification and Experience

The target audience of this event are those professionals from Technology Developers' organizations or prospective Owner/Operator organizations/Technical Support Organizations/Regulatory Bodies/potential users, having an interest in deepening their knowledge in SMR and MR designs and technologies.

Primary focus is on SMRs and MRs presently in operation or at basic or detailed stages of design and targeted for licensing and deployment in the next decade.

Identified Member States are invited to nominate up to two candidates, ideally from the OEM / technology developer(s) and/or from the operating, regulatory or technical support organizations from countries that meet one of the following conditions:

- Countries that are either designing, constructing and operating nuclear power plants (NPPs) and are actively considering SMRs or MRs to expand their nuclear power programme.
- Newcomer countries considering SMR or MRs as part of their national energy strategy, that have selected or are ready to make a final decision on the power technology selection; have active TC infrastructure-related projects and Infrastructure Working Plan (IWP) for the new power programme.

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

Accepted participants are encouraged to familiarize themselves with the following references to get the most out of the event:

- INTERNATIONAL ATOMIC ENERGY AGENCY, [Advanced Reactors Information Systems \(ARIS\) Database](#), [Glossary of Terms in ARIS Reports](#), IAEA, Vienna.
- 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, [Technology Roadmap for Small Modular Reactor Deployment](#), IAEA NR-T-1.18, IAEA, Vienna (2021).

## 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. Download and complete the [Designation of Beneficiary and Emergency Contact Form](#), and upload to InTouch+ ('Profile' tab under the personal section) specifying the document name. If already provided, kindly discard this step.
  - c. Search for the relevant technical cooperation event (EVT2301235) 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](mailto:InTouchPlus.Contact-Point@iaea.org).

Should online application submission not be possible, candidates may download the nomination form for the meeting from the [IAEA website](#).

**NOTE:** A medical certificate signed by a registered medical practitioner dated not more than four months prior to starting date of the event must be submitted by candidates when applying for a) events with a duration exceeding one month, and/or b) all candidates over the age of 65 regardless of the event duration.

## **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 will receive an allowance from the IAEA sufficient to cover their costs of lodging, daily subsistence, and miscellaneous expenses. They will also receive either a round-trip air ticket based on the most direct and economical route between the airport nearest their residence and the airport nearest the duty station through the IAEA's travel agency American Express, or a travel grant, or they will be reimbursed travel by car/bus/train in accordance with IAEA rules for non-staff travel.

## **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.

## IAEA Contacts

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