

# Global Status and IAEA Activities on Small Modular Reactors

2024 LAS/ANS Symposium

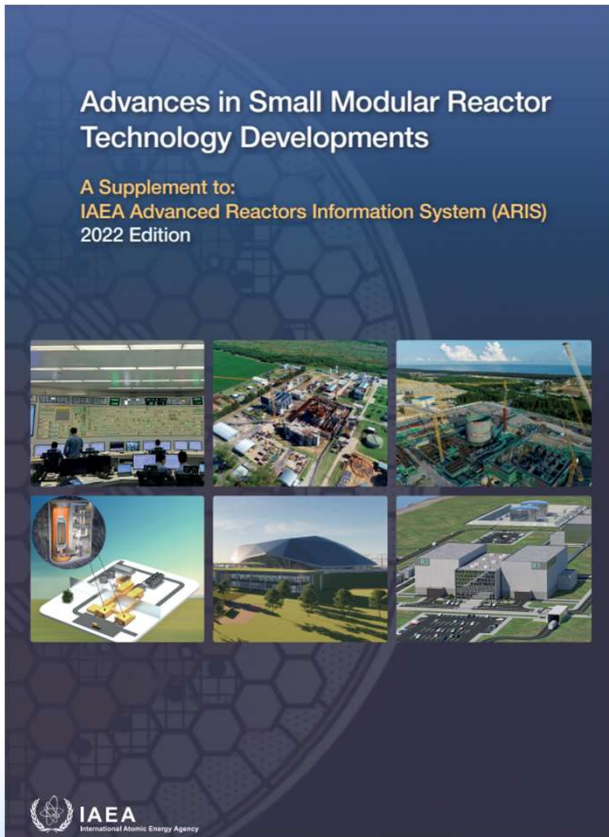
15 July 2024

**Dohee Hahn**

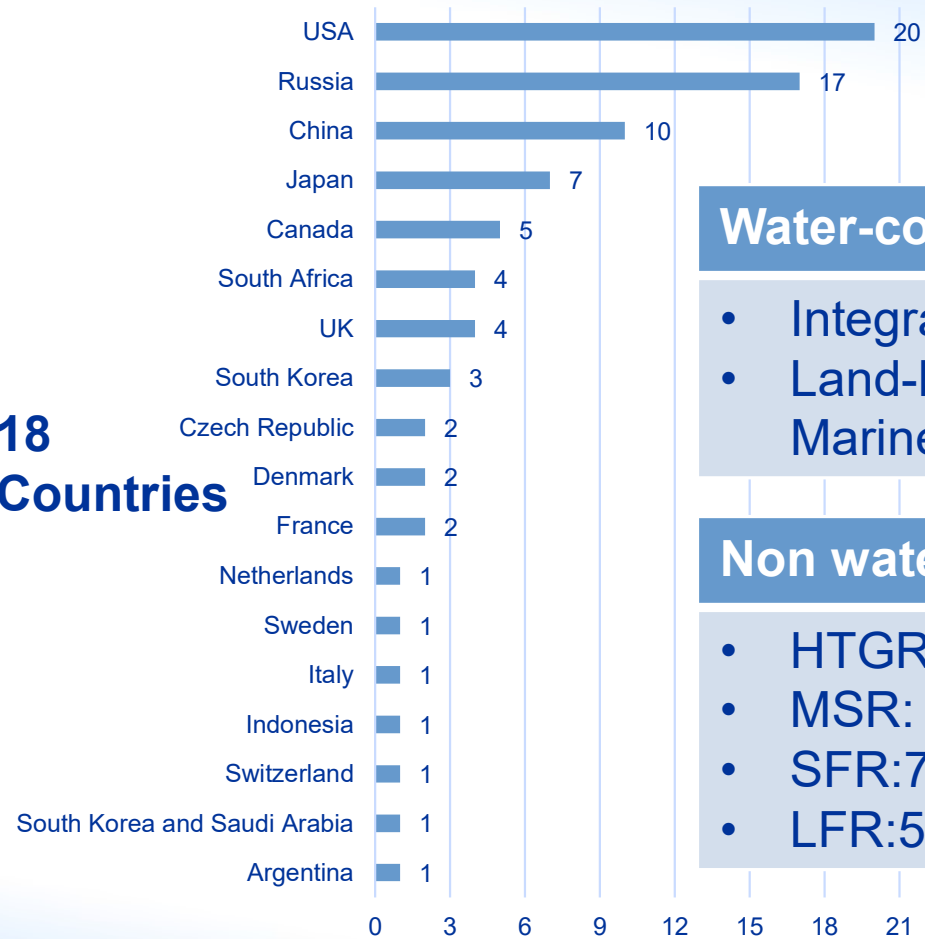
SMR Platform Coordinator

International Atomic Energy Agency

# SMRs under Development and Deployment



**18 Countries**



**83 Designs**

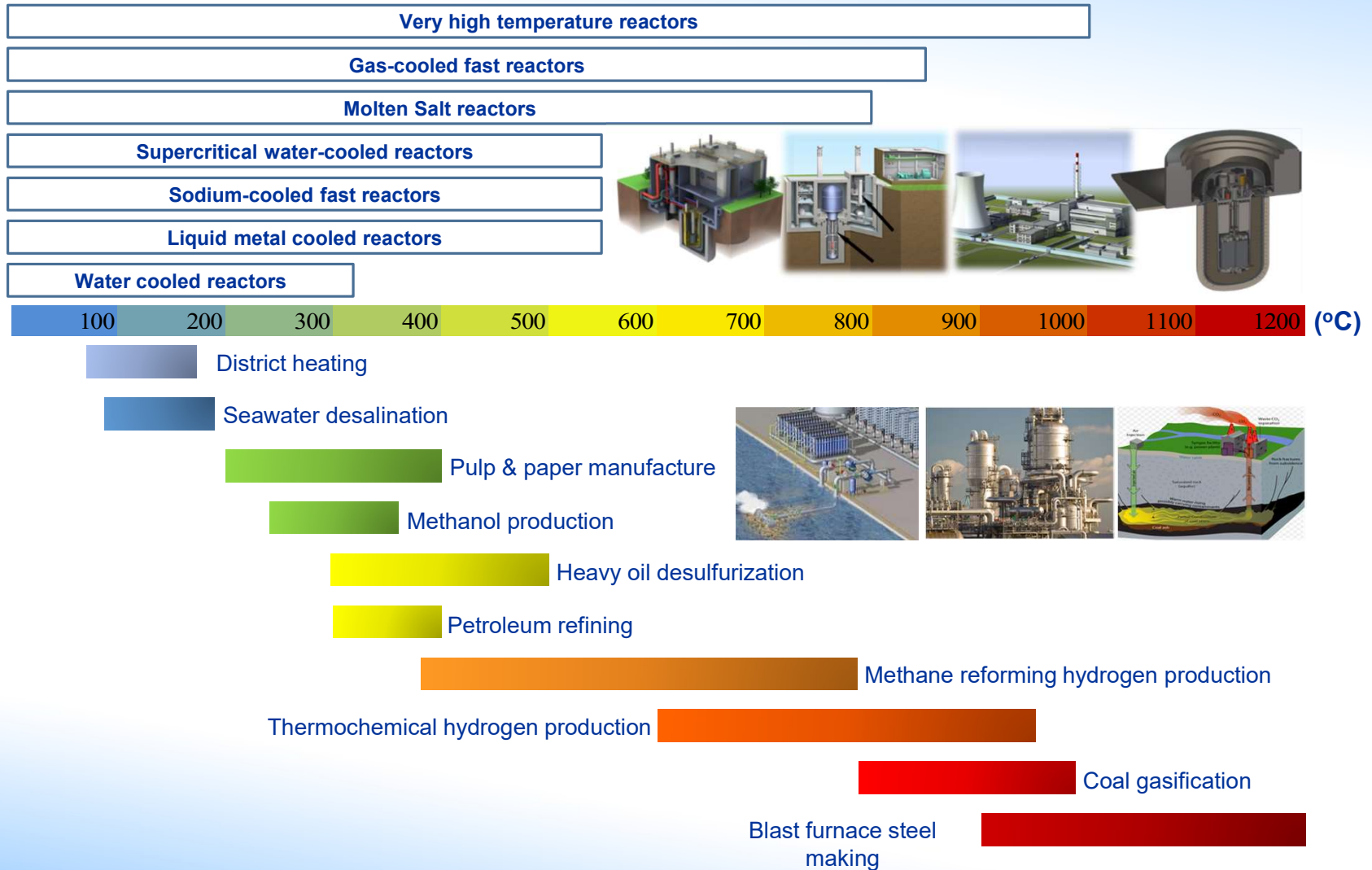
**Water-cooled reactors: 35**

- Integral type: 10
- Land-based: 27
- Marine-based: 8

**Non water-cooled reactors: 48**

- HTGR: 22
- MSR: 14
- SFR: 7
- LFR: 5

# SMR for Non-Electric Applications





# Challenges facing Successful Deployment of novel SMR designs

- **Demonstration of Safety and Operating Performance**
- **Secure Deployment:** physical, cyber, transport security
- **Implementation of Safeguards**
- **Demonstration of Economic Competitiveness** through Serial Construction with robust Supply Chain
- **Harmonization of Regulatory Approaches** for global deployment
- **Establishment of International Legal Framework**

# Growing interest in SMRs among Newcomer Countries

**27** Newcomers

17

## Decision-making phase

Countries considering nuclear power without having made a final decision



10

## Post-decision-making phase

Countries that have made a decision and are building the infrastructure or have signed a contract and are preparing for or started construction



# Key IAEA Activities on SMR



## Technology Development and Deployment

- TWG-SMR/GCR
- ARIS Database
- SMR Booklet



## Reactor Technology Assessment

- Updated Method incorporates SMR

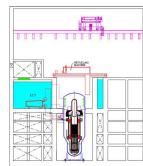


## Fuel, Safe management of Spent Fuel, Radioactive Waste and Decommissioning



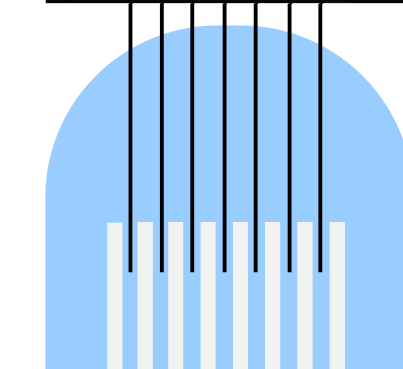
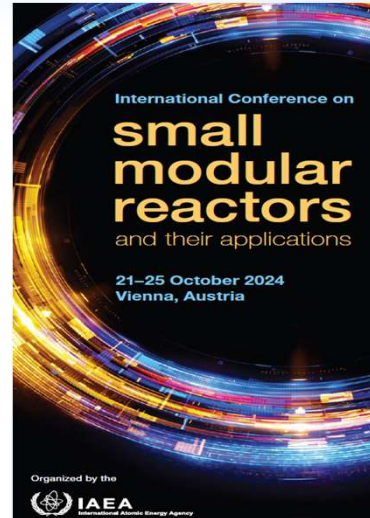
## Approaches to Commissioning and Operation

- Issues on the conduct of operation, OLC and MCR for multi-unit plant



## Economics

- Economic Appraisal of SMR Projects: Methodologies and Applications



## Technical Cooperation for MS Capacity Building



## Legal Frameworks for safety, security, safeguards and civil liability for nuclear damage



## Safety & Security

- Applicability of Safety Standards and Security Guides
- Emergency Preparedness and Response



## Nuclear Harmonization and Standardization Initiative

- Industry Track
- Regulatory Track



## Safeguards-by-Design

- Facilitation of safeguards inspection early in reactor design stage

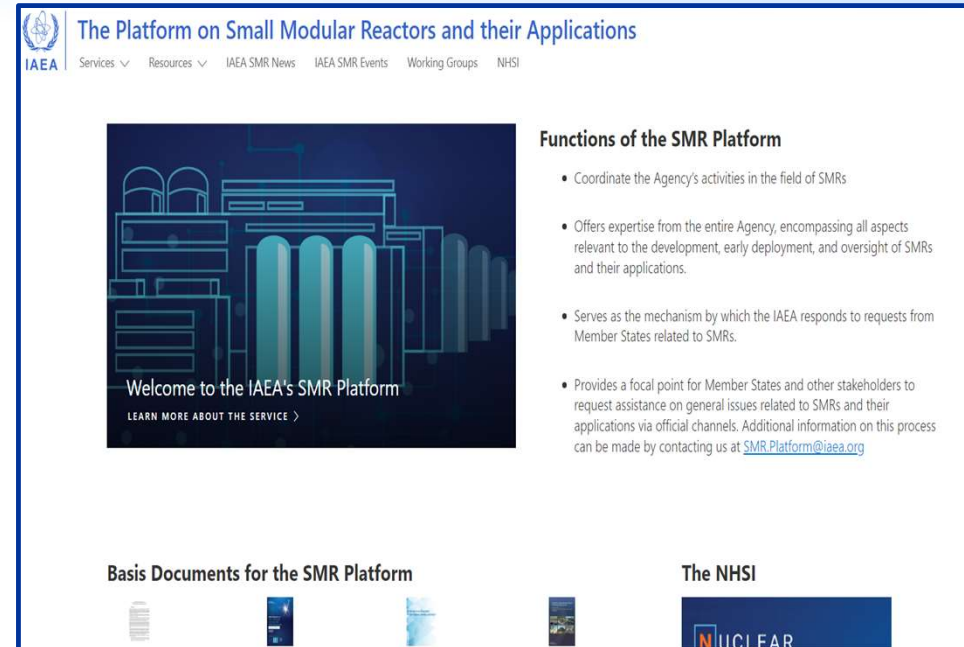


## Infrastructure Development

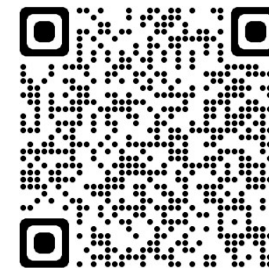
- IAEA Milestones Approach applicable to SMR
- New deployment models

# IAEA SMR Platform

- Serves as a **focal point** for the IAEA activities on SMRs and their applications
- Provides **coordinated support and expertise from across the entire Agency**, for consideration, development, deployment, and oversight of SMRs
- **SMR Portal** provides latest news, IAEA events, and publications on SMRs
- **SMR School** will be launched for increased awareness and training among Member States interested in SMR
- Enquiries and requests for assistance: [\*\*SMR.Platform@iaea.org\*\*](mailto:SMR.Platform@iaea.org)



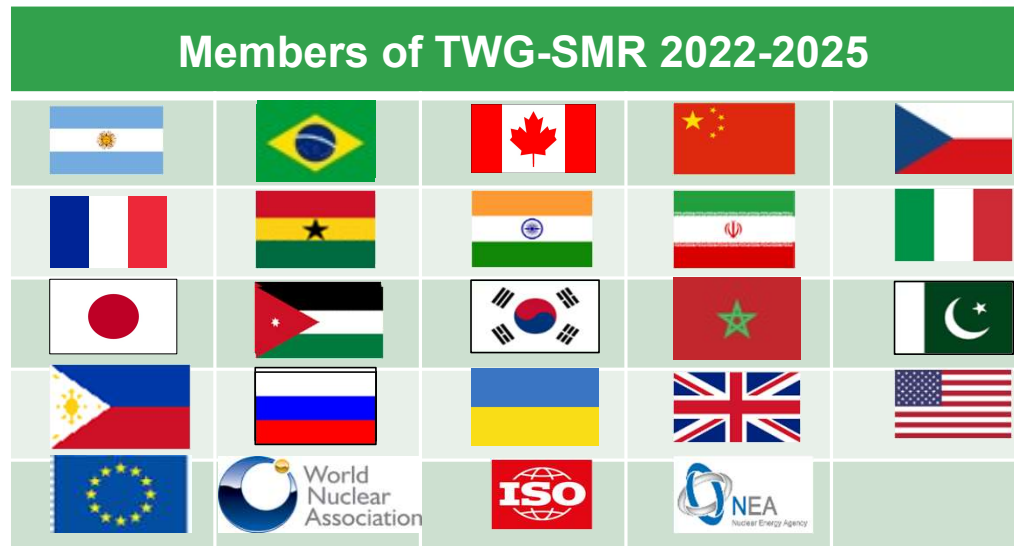
The screenshot shows the IAEA SMR Platform website. The header includes the IAEA logo and navigation links: Services, Resources, IAEA SMR News, IAEA SMR Events, Working Groups, and NHSI. The main content area features a large graphic of SMR components with the text "Welcome to the IAEA's SMR Platform" and a link "LEARN MORE ABOUT THE SERVICE >". To the right, under "Functions of the SMR Platform", there are four bullet points: 1. Coordinate the Agency's activities in the field of SMRs. 2. Offers expertise from the entire Agency, encompassing all aspects relevant to the development, early deployment, and oversight of SMRs and their applications. 3. Serves as the mechanism by which the IAEA responds to requests from Member States related to SMRs. 4. Provides a focal point for Member States and other stakeholders to request assistance on general issues related to SMRs and their applications via official channels. Additional information on this process can be made by contacting us at [SMR.Platform@iaea.org](mailto:SMR.Platform@iaea.org). At the bottom, there are sections for "Basis Documents for the SMR Platform" and "The NHSI" with a "NUCLEAR" logo.





# Technical Working Group on SMR

- **Members:** 20 MSs and 4 International Organizations as observers

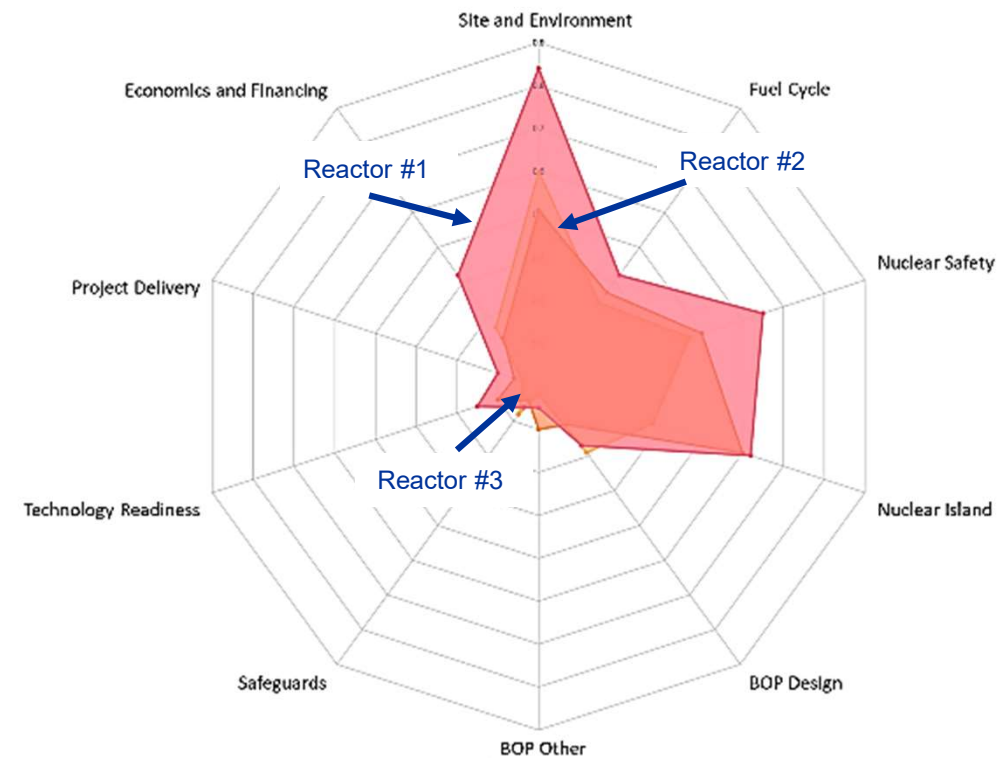
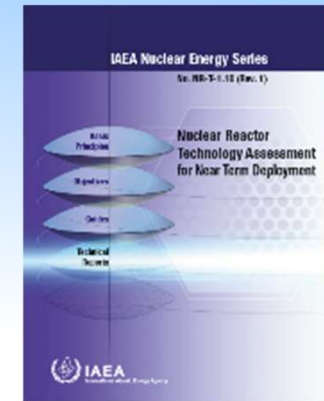


- **Technical subgroups**

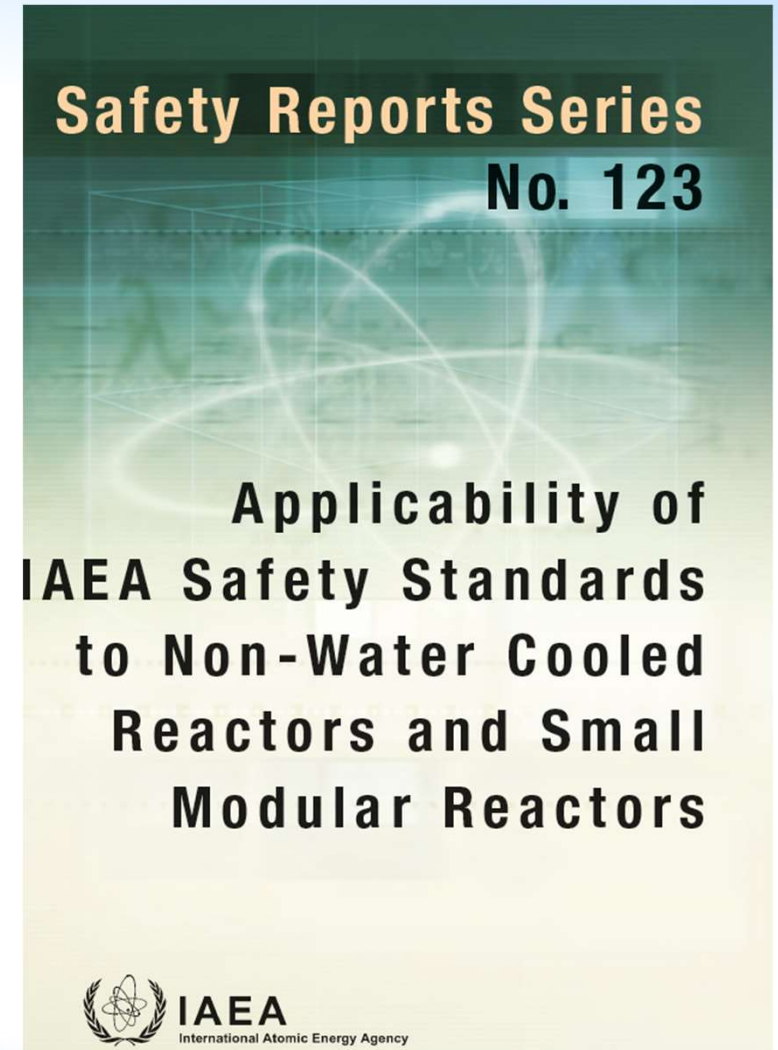
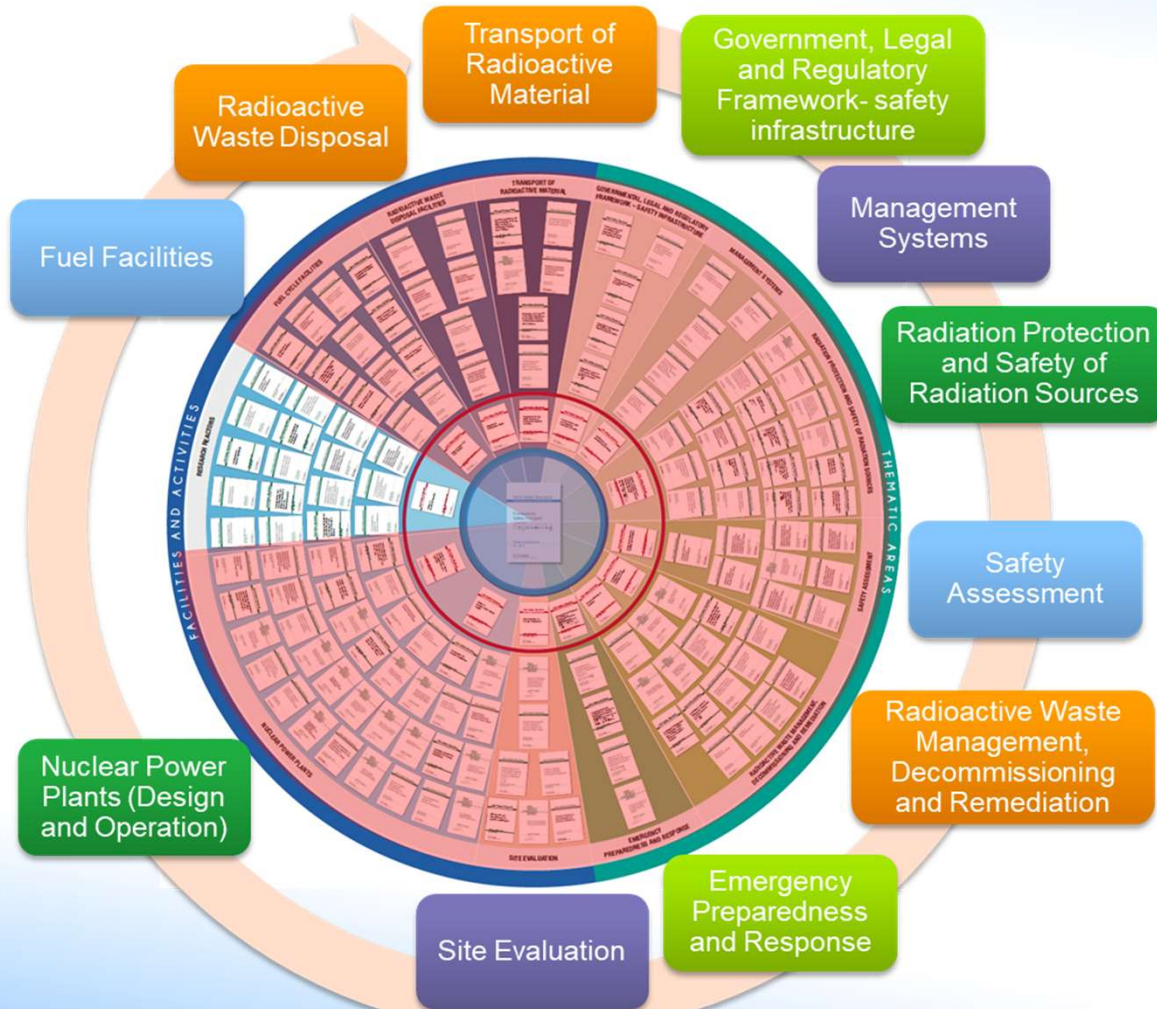
- **SG-1:** Update of SMR Technology Roadmap
- **SG-2:** R&D, Codes & Standards and Preparation for Operation
- **SG-3:** SMR Technology Deployment for Cogeneration

# Reactor Technology Assessment

- **Design selection process for the most suitable reactor technology** to meet the objectives of a Member State's nuclear power programme
- User defines its own **degree of importance** among different Key Topics and Elements
- **Self assessment tool** revised in 2022 after 10 years of practice by MSs



# Review and Adjustment of IAEA Safety Standards



# International Symposium on the Deployment of Floating Nuclear Power Plants – Benefits and Challenges

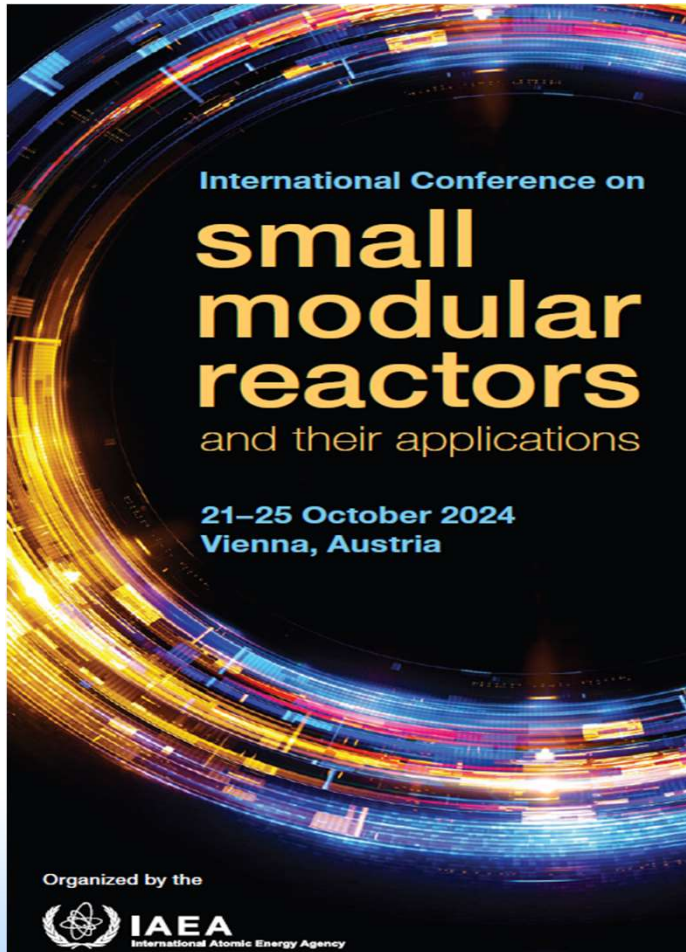


14-15 November 2023, Vienna International Centre



- Discussed the feasibility of **FNPP deployment**: 1) in territorial waters — near and away from the shoreline, and 2) in international waters
- Examined **legal aspects** (safety, security, safeguards, liability) with a focus on legally binding instruments in place
- Examined challenges related to **licensing and regulation** in scenarios where FNPPs are constructed and commissioned in one country and then exported/transported to another country
- Proposed **further actions** by the international community to facilitate the expanded safe, secure and sustainable use of FNPPs for peaceful applications

# SMR Conference



- To provide **an international forum** for relevant stakeholders to discuss opportunities, challenges and enabling conditions to accelerate the development of safe and secure SMRs
- **Plenaries, Side Events and Technical Sessions**
- **Main topics**
  - SMR Design, Technology and Fuel Cycle
  - Legislative and Regulatory Frameworks
  - Safety, Security and Safeguards
  - Considerations to Facilitate Deployment of SMRs

# Nuclear Harmonization and Standardization Initiative

Effective Global Deployment of  
Safe and Secure Advanced  
Nuclear Reactors



**H**armonization of  
Regulatory  
Approaches Track

- **WG1:** Framework for information exchange
- **WG2:** International pre-licensing regulatory reviews
- **WG3:** Leveraging other regulatory reviews

**IAEA as facilitator  
within and between the tracks**

**H**armonization  
and  
**S**tandardization of  
Industrial  
Approaches Track

- **TG1:** Harmonization of high-level user requirements
- **TG2:** Common Approaches to Codes and Standards
- **TG3:** Experimental Testing and Validation for Design and Safety Analysis Computer Codes
- **TG4:** Acceleration of nuclear infrastructure implementation for SMR

Regulators

Governments

Technology Holders

Operators and other end-users

International Organizations and Associations

# Industry Track

Harmonization of high-level user requirements

Common Approaches to Codes and Standards

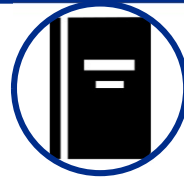


Experimental Testing and Validation for Design and Safety Analysis  
Computer Codes

Accelerating the implementation of nuclear infrastructure for SMRs

# Regulatory Track

## NHSI WG1



### Framework for information sharing

- Agreements to share controlled information and repository collating publicly available information

## NHSI WG2



**Towards harmonization:** multinational pre-licensing review process

- A single team and a single review outcome
- Early identification of design “showstoppers”
- **Commitment to avoid duplication**

## NHSI WG3



Two processes increasing cooperation – building on **current initiatives**

1. Leveraging existing regulatory reviews
2. Collaborative reviews: collaboration between national reviews (independent national reviews in parallel but with information exchange)



# Takeaway

- **Expanded role of nuclear** expected for energy security and climate change mitigation
- **Various SMR designs** at various stages with challenges to be addressed in a timely manner for early deployment
- **Growing interests in SMRs in newcomer countries** mainly for lower upfront capital cost, scalability, and operation in small or off-the-grid
- **Capacity building** essential for knowledgeable decision in newcomer countries
- **IAEA SMR Platform** provides coordinated support for early deployment of SMRs



**IAEA**

International Atomic Energy Agency  
*Atoms for Peace and Development*

**Thank you!**

