



**IAEA**

International Atomic Energy Agency  
*Atoms for Peace and Development*

# SMR Regulation and Licensing

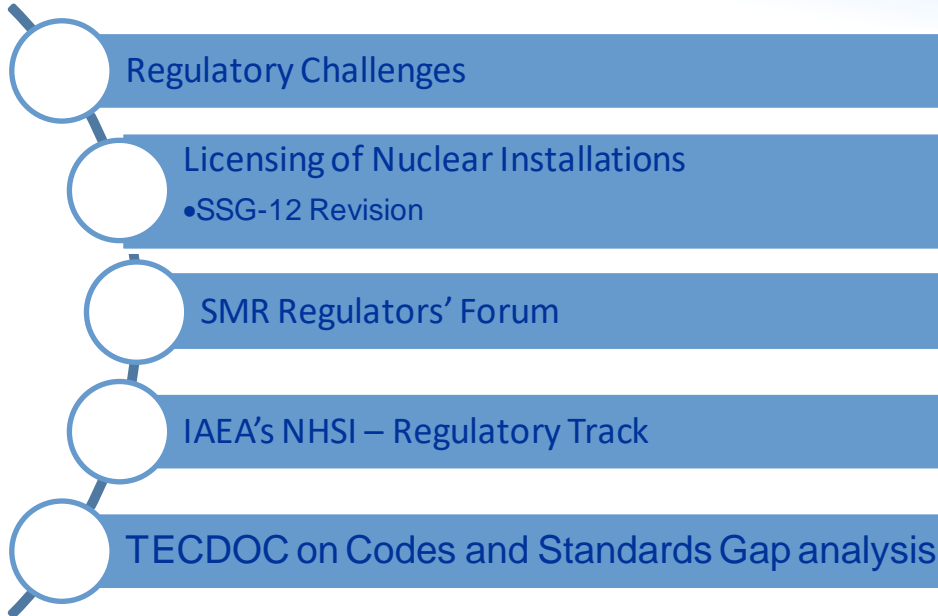
## Technical Meeting on Codes and Standards, Design Engineering and Manufacturing of Components for Small Modular Reactors

EVT2103861

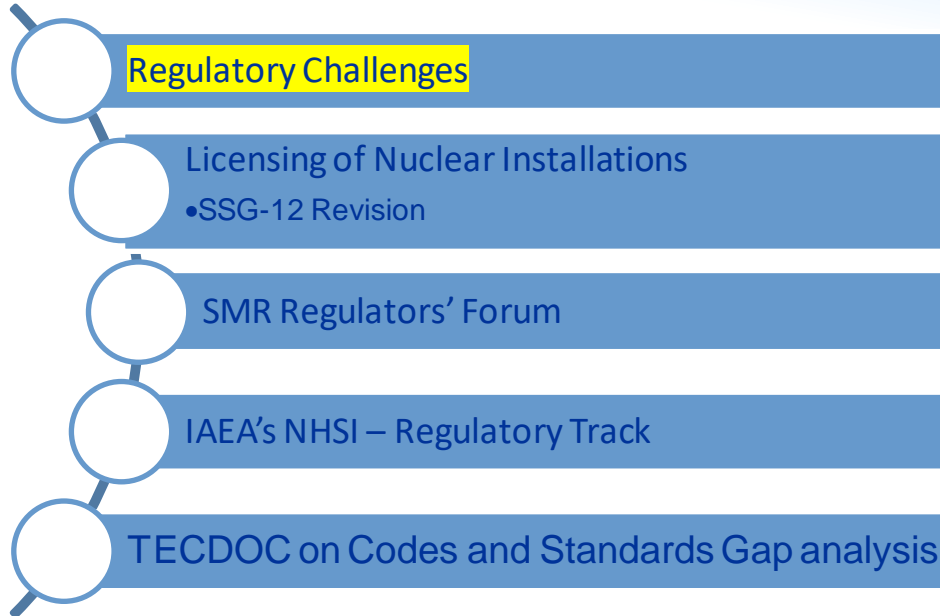
10 – 13 May 2022, Virtual on Webex Meeting

**Mario SANTOS**  
Regulatory Activities Section (RAS)  
Division of Nuclear Installation Safety (NSNI)  
Department of Nuclear Safety and Security (NS)

# SMR Regulation and Licensing Outline

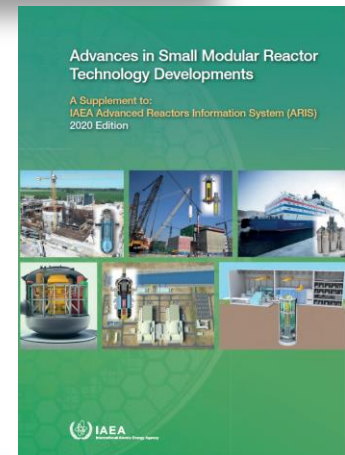
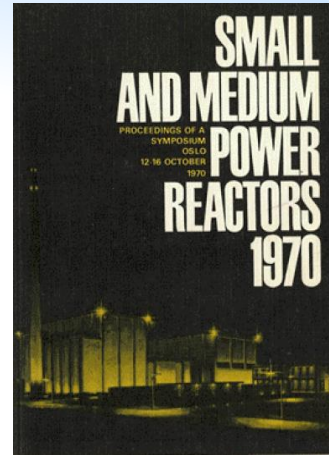


# SMR Regulation and Licensing Outline



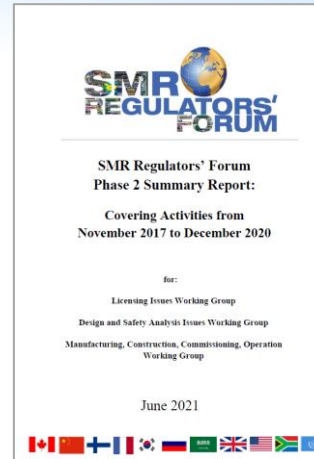
# SMR Regulatory Challenges (1)

- Large number of innovative designs (first of kind)
  - IAEA booklet on SMRs (2020)
- Unproven technology
  - Comprehensive analyses, simulations, and testing needed to close knowledge gaps
  - New design philosophy
  - New materials
  - New safety systems strategies
- Lack of operational experience
- Implications of SMR supply chain on licensee's core safety capabilities
- Faster construction time

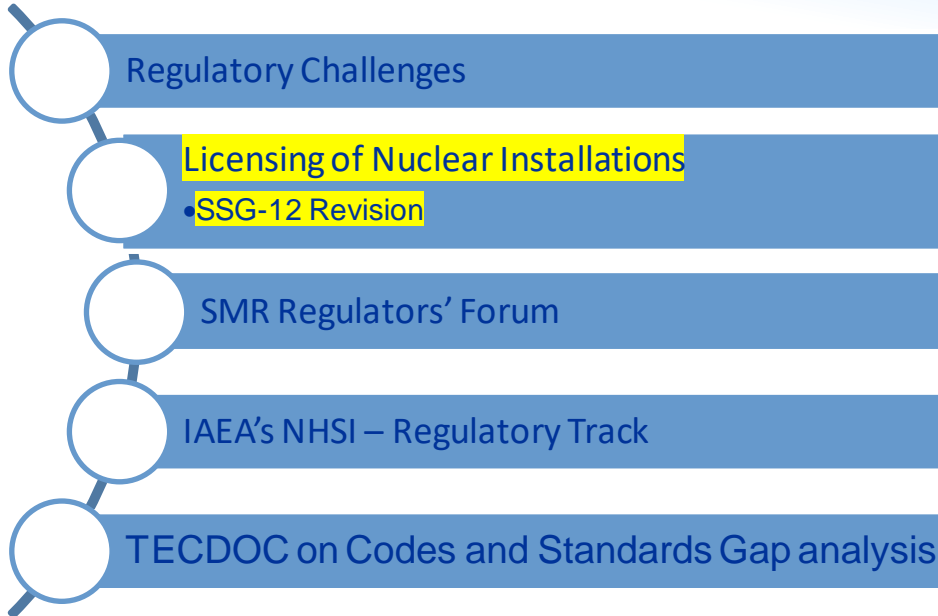


# SMR Regulatory Challenges (2)

- New deployment approaches
  - Serial production, largely in factories
  - Factory fuelling
  - Transport to final location
  - Factory (partial) commissioning
  - More than one regulatory jurisdiction involved in licensing/regulatory review
  
- Regulatory processes need to be adapted, as appropriate
  - Rules and Regulation
  - Safety Requirements and Guides



# SMR Regulation and Licensing Outline



# Licensing Stages

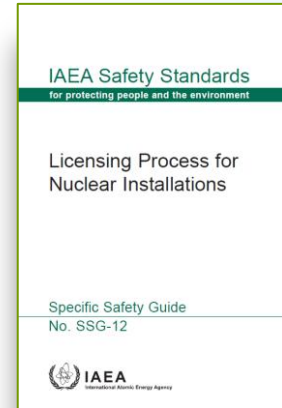
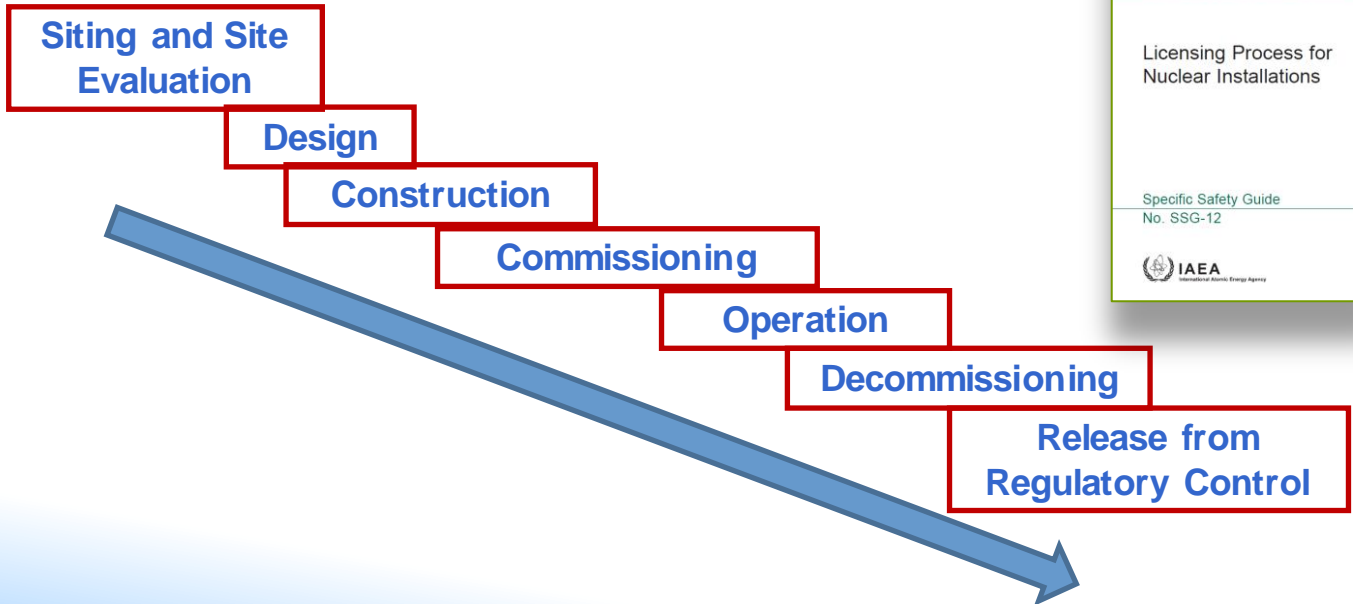
## GSR Part 1 - Requirement 24: Demonstration of safety for the authorization of facilities and activities

- **§4.29** Different types of authorization shall be obtained for the different stages in the lifetime of a facility or the duration of an activity. The regulatory body shall be able to modify authorizations for safety related purposes. *For a facility, the stages in the lifetime usually include: site evaluation, design, construction, commissioning, operation, shutdown and decommissioning (or closure).*



# Licensing Stages for NNPs | 1

Life of a nuclear installation includes 7 major steps





# Licensing Process for Nuclear Installations – SSG-12 Revision



- Changes needed to provide suitable recommendations for the application of the Safety Requirements to the licensing of small modular reactors (SMRs). For example:
  - Changes in the licensing process when considering newly proposed deployment models for SMRs (such as factory fuelling and transportation to the final destination in a different State)
  - Additional guidance for collaboration between regulatory bodies when a licensing process may be applied to SMR components or to transportable SMRs by two or more jurisdictions simultaneously

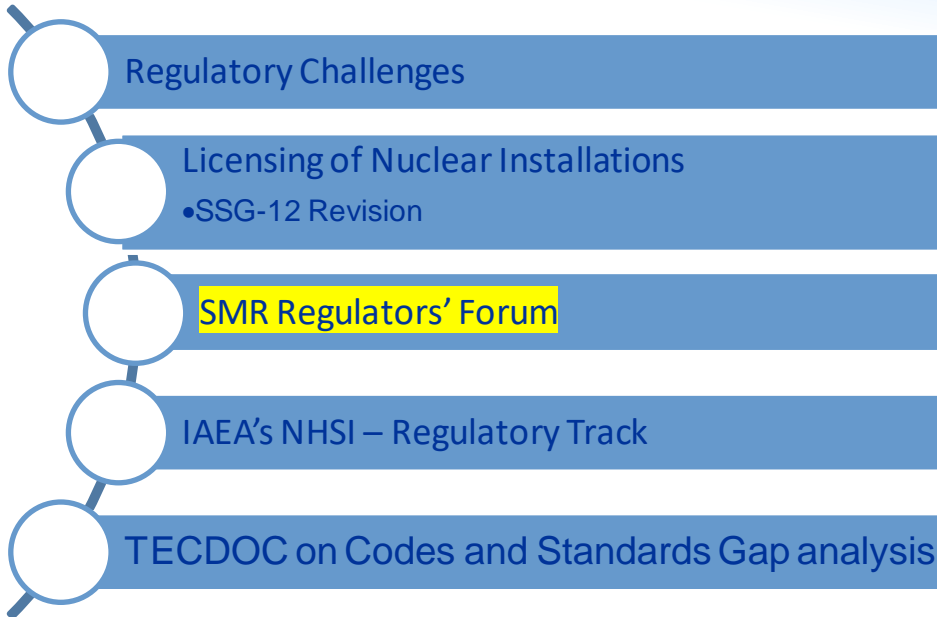
“Deployment model” is understood as the approach taken for the deployment of a NPP that will impact the general ownership of the NPP, the responsibility for the lifetime of the NPP including operation, decommissioning and management of spent fuel and radioactive waste, and the responsibility for liability for nuclear damage in case of a nuclear accident.

# Licensing Process for Nuclear Installations – SSG-12 Revision



- Address potential changes or adjustments to the licensing process in the case of licensing of first of a kind (FOAK) reactors – safety demonstration
- Document preparation profile (DPP) - under development
- New Appendixes with:
  - Recommendations to support regulatory bodies collaboration to reduce regulatory duplication, while maintaining independence and levels of due diligence.
  - Recommendations to reduce regulatory burden for designs that have been licensed by the regulatory body of one State which is proposed for a licence in a different State.

# SMR Regulation and Licensing Outline



# What Is the Forum?

Regulator-to-Regulator group with 10 participating countries

## Members

- Canada
- China
- Finland
- France
- Japan
- Korea
- Russian Federation
- South Africa
- United Kingdom
- United States

## Observers:

- European Commission (JRC)
- OECD Nuclear Energy Agency
- WNA-CORDEL



# Objectives of the Forum

- Share regulatory experience amongst Forum members preparing to:
  - Facilitate efficient, robust, and thorough regulatory decisions
  - Encourage enhanced nuclear safety and security
  - Facilitate international cooperation among regulators performing SMR-related assessments
- Identify and discuss common safety issues that may challenge regulatory reviews associated with SMRs and, if possible, recommend common approaches for resolution
- Advise IAEA on the need for revision of development of new IAEA publications on safety of SMRs



# Examples of near-term versus long term regulatory areas of interest

## Near-term – First of a Kind

- Leveraging information between regulators based on experience
- Implications of modular design and modular construction
- Key areas of regulatory interest in licensing process/conduct of regulated activities
- Factors in risk-informed assessment of safety claims and evidence (use of Graded Approach)

## Long-term – “Nth” of a Kind

- Mutual recognition of regulators’ assessment/ Joint assessments/ Collaboration
- Serial manufacturing/construction
- Transportable factory fueled reactors
- Improving sharing of experience on regulatory oversight
- Enhancing and aligning requirements and guidance using case studies and experience



# Areas of technical work of the Forum

- **Phase 1 (2015 - 2017)**

- Graded Approach
- Defence-in-Depth
- Emergency Planning Zone Size

- **Phase 2 (2018 - 2020)**

- Licensing Issues
- Design and Safety Analysis
- Manufacturing, Commissioning and Operation



- **Phase 3 (2021 – 2023 )**

- Mutual recognition of regulators' assessment/ Joint assessments/ Collaboration
- Security/Safeguards by design, interface with safety
- Containment/confinement
- Regulatory oversight of long lead SSC procurement
- Organizational stakeholders' capabilities



# Phase 3 Licensing WG

## In Progress Now

- Framework for mutual recognition of regulators' assessment/joint assessments collaboration
- Implications of SMR supply chain on licensee's core safety capabilities
- Harmonization





# Phase 3 - Manufacturing, Commissioning and Operation WG

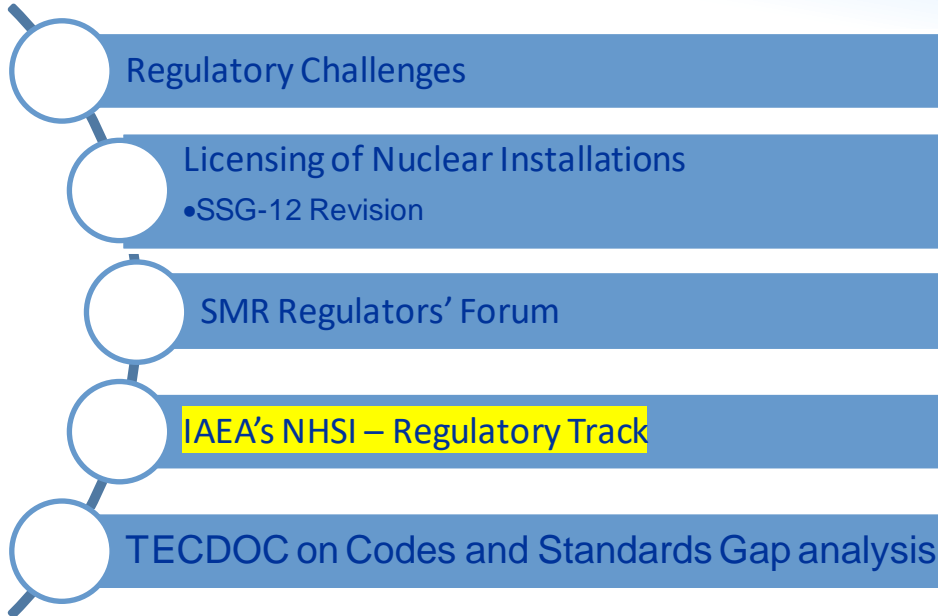
In Progress Now

Based on a review of global experience and pertinent regulatory practices used by Forum Member States, we sought to document common regulatory positions on:

- Implications of modularization
- Manufacturability
- Supply Chain Management
- Commissioning
- Leveraging international co-operation



# SMR Regulation and Licensing Outline



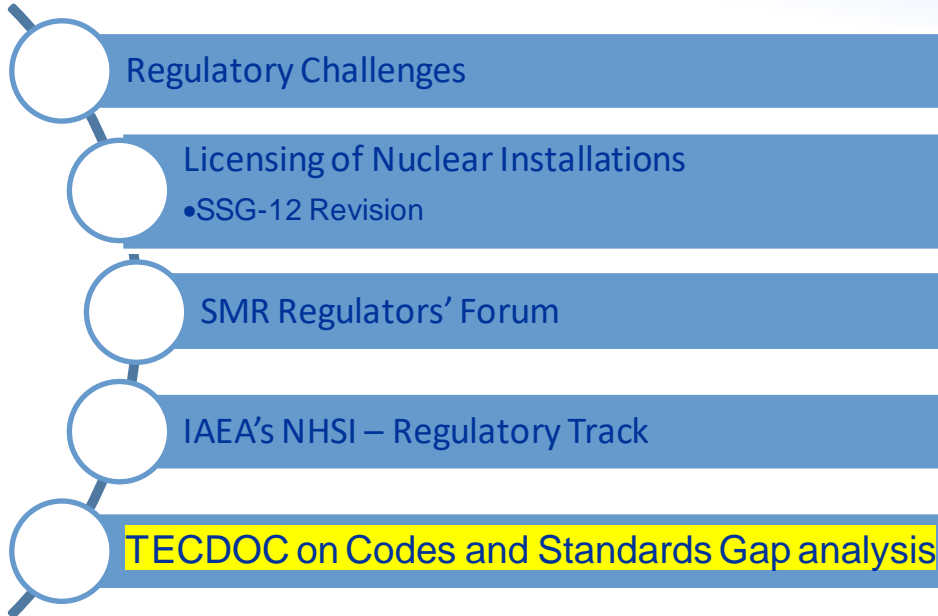
# IAEA's Nuclear Harmonization and Standardization Initiative (NHSI)

## Regulatory Track



- A roadmap with concrete actions and milestones for increasing regulatory collaboration towards global harmonisation in the pre-licensing process, and international certification of selected SMR designs

# SMR Regulation and Licensing Outline



# TECDOC on Codes and Standards Gap Analysis



- Based on SMR Regulators' Forum WG on Manufacturing, Commissioning and Operation
- Early stages of discussion of the document preparation profile (DPP)
- Scope under review, for proper alignment with the Nuclear Harmonization and Standardization Initiative (NHSI)
- Existing experiences by Member States' regulatory bodies in the gap analysis of codes and standards used for certifying and/or licensing reactor designs



**IAEA**

International Atomic Energy Agency

*Atoms for Peace and Development*



*Thank you!*

