

Specific Issues of Licensing Small Modular Reactors

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Small Modular Reactors (SMRs) are considered as a promising option for enhancing energy security, supporting decarbonization goals, significantly increasing nuclear safety and enabling faster, economical and flexible deployment of nuclear power. Large expectations need to be confronted with realistic consideration of existing issues resulting from limited experience with deployment of SMRs. While many SMR concepts build upon

proven reactor technologies, their innovative design features, deployment concepts, and operational modes introduce specific challenges for the existing nuclear licensing frameworks, which have historically been developed for large, site-specific nuclear power plants. The first part of the presentation will introduce general licensing issues associated with SMRs. These include the applicability of current regulatory requirements to SMR designs, the treatment of modularity and factory fabrication, multi-module sites, novel ownership and deployment models, siting flexibility, the potential use of graded or risk-informed approaches, etc. Particular attention is paid to the balance between maintaining established safety principles and adapting regulatory processes to accommodate innovation, while preserving the prime responsibility of the operating organization for nuclear safety. An overview of existing relevant regulatory efforts in selected countries and international frameworks will be provided.

The second part focuses on specific licensing challenges related to deterministic safety analysis (DSA) of SMRs. Key topics include the coupled analysis of neutronic, thermal-hydraulic, chemical, structural and radiological processes, identification and classification of postulated initiating events and accident scenarios reflecting innovative designs, validation of computer codes for unusual plant configurations, selection of design specific acceptance criteria, the definition of design basis and design extension conditions, the treatment of multiple reactors and shared systems, the effects of both internal and external hazards the specification of the levels and demonstration of compliance with the principles of defence-in-depth. The presentation will also discuss issues such as the selection of bounding scenarios, the role of passive safety features with specific failure modes, closer integration of deterministic and probabilistic approaches, the demonstration of practical elimination of early and large radioactive releases, and independent verification of safety analysis. The presentation aims to highlight areas where regulatory guidance may require clarification, adaptation, or further development to ensure a consistent, transparent, and robust licensing process for SMRs, while maintaining a high level of nuclear safety and public confidence.

Keywords: *Small modular reactors, nuclear safety, regulatory framework, licensing issues, deterministic safety analysis*