

Safety and Security for small modular nuclear reactors (SMRs)

In the past decade, there have been significant developments in Small Modular Reactor (SMR) technology. SMRs range from approximately one-third the size of current nuclear power plants or about 300 MWe, to as low as 5 MWe. SMRs are promoted as economically competitive alternatives to large Nuclear Power Plants for electrical power production and other applications. The advantages of SMRs arise from being simpler and modular, carrying smaller financial risk, more adaptable for load following demands, factory production, and applicability for off-grid applications. SMRs feature simplified, compact designs, which typically include built-in passive safety systems, limited on-site refueling, and provisions for remotely monitored operation and reduced on-site staffing. A number of SMRs concepts have been proposed by various international companies for pre-licensing design review and eventually construction in Canada.

Traditional nuclear safety and security analyses and design are impacted by the proposed advanced fuel types (liquid metal, gas-cooled and molten salt), and understanding their proliferation, control, and monitoring aspects. Other challenges for SMR safety and security include: geographic isolation and distribution, lack of strong thermal or radiation signatures, lack of access to core for monitoring, aqueous fuel forms, harsh environmental conditions, tools for comprehensively assessing proliferation resistance (e.g., proliferation resistant fuels), and cyber security considerations for remote monitoring/control (e.g., anomaly detection, secure data transmission, ...). This paper discusses these considerations and describes possible strategies for these novel facets of SMR concepts.

Gender

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