

Overview of Safeguards Challenges and Opportunities for Small Modular Reactor Technology

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Small Modular Reactor (SMR) technology is increasingly popular for its potential to provide clean, affordable, and dependable energy. However, implementing and adopting SMRs pose unique challenges and opportunities for nuclear safeguards. This paper provides an overview of these issues, including proliferation risk, safeguards implementation, resource constraints, novel technologies/designs, and adapting existing frameworks. SMRs' challenges include increased proliferation risk due to their concealability, complex designs, and the need to adapt existing safeguards frameworks to new reactor types. Resource constraints further exacerbate these challenges.

Nevertheless, SMR technology offers opportunities for enhancing nuclear safeguards through intrinsic features such as the use of proliferation-resistant fuel cycles and self-contained fuel designs, standardizing designs, and remote monitoring technologies. International cooperation is crucial in addressing the challenges and harnessing the opportunities presented by SMR technology by sharing best practices, technology, and information. Innovation in safeguards technologies, such as advanced sensors and data analytics, is necessary to address the unique challenges posed by SMRs. These technologies can overcome resource constraints, streamline safeguards implementation, and adapt existing frameworks to accommodate novel SMR designs.

In conclusion, while SMR technology presents several challenges for nuclear safeguards, it also offers numerous opportunities for enhancing proliferation resistance, streamlining implementation, and fostering international cooperation. By leveraging these opportunities and addressing the challenges, the global community can ensure the safe and responsible deployment of SMRs as a key component of the future energy mix.

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