Insight

Security Regulations Pose Economic Challenge for SMRs

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EXECUTIVE SUMMARY

- Small Modular Reactors (SMRs) are smaller nuclear reactors that the federal government believes will be a critical component of the United States' ability to meet its low-carbon energy needs in the future.
- Deployment of SMRs will depend on their economic viability, and one way to make them more viable is to lower their regulatory compliance costs commensurate to their reduced risk.
- Current physical security requirements can cost traditional large plants at least $10.1 million annually, based on American Action Forum estimates, and SMRs are unlikely to be viable in the face of such requirements.
- The Nuclear Regulatory Commission is currently working on a rulemaking to streamline requirements, though it may be able to be more ambitious than the limited reforms it is publicly considering.

INTRODUCTION

Small Modular Reactors (SMRs) are smaller nuclear reactors capable of generating up to 300 megawatts of power on an as-needed basis. The U.S. Department of Energy (DOE) views SMRs as a critical development in nuclear energy, capable of providing carbon-free energy in areas where traditional nuclear power plants would be too large, or in conjunction with renewable energy sources such as wind and solar when those sources cannot meet demand.

Deployment of SMRs, which may occur within a few years depending on design approval, will depend on their economic viability. One hurdle to that viability are the physical on-site

security requirements currently in the regulatory code of the Nuclear Regulatory Commission (NRC). Security of nuclear power facilities is indeed necessary, but the current regulations are specifically written for traditional large nuclear power plants. New SMRs pose less of a risk of sabotage than traditional plants because of their design.

The NRC is considering changing its security requirements to make them more commensurate with the lower risks of SMRs. Congress further encouraged these changes when it passed the Nuclear Energy Innovation and Modernization Act, which directed the NRC to consider amending regulatory requirements – including those related to security – to further support advanced reactors such as SMRs. This analysis reviews the current state of NRC's security requirements and examines possible regulatory changes that could help improve the economic viability of SMRs.

SAFETY FEATURES OF SMRs

SMRs, the most developed of which remain in the design-approval phase at the NRC, are expected to have key features to improve safety. The primary safety feature is that they can be designed specifically to the safety standards of the NRC, which were most recently updated in 2012. Traditional reactors had to meet these standards after they had already been operating for decades in some cases. The design improvements available to SMRs allow for a more efficient incorporation of enhanced safety features, such as passive components that do not rely on human action to shut down or cool reactors when necessary.

A second feature is their size. According the Idaho National Laboratory, SMRs are about one-third to one-quarter the size of a traditional nuclear plant. This concentrated size will not require as much manpower to patrol and secure, nor certain alarms and other controls. A third feature that enhances safety is that they can be deployed underground, which minimizes possible entry points for saboteurs.

CURRENT SECURITY REQUIREMENTS

The current security regulations were developed for traditional, large light-water reactor power plants. The regulations stipulate that plants must have an NRC-approved physical security plan and execute it.[1] They contain a multitude of costly requirements, including physical barriers, isolation areas, limited-access areas, and a security organization.

Estimating the costs of these requirements on a per-plant basis is difficult, because plans are developed to meet the specific needs of the plant, and many of specific components are withheld from publicly available documents for security reasons. The American Action Forum developed an estimate of security-staff costs (based on mentions in the regulations) and the cost of security paperwork utilizing Paperwork Review Act information from the

Office of Management and Budget (OMB). The estimated cost of these two components per plant is $10.1 million annually.

Of this estimate, the security organization makes up the majority. At least one supervising director and 26 security personnel need to be on site at all times, including 10 armed responders. Applying Bureau of Labor Statistics wage rates for these positions, the costs are an estimated $7.4 million annually. Paperwork submissions total an estimated average of $2.7 million annually per plant, based on OMB's cost estimates for active NRC information collections related to security. Other annual costs not included in this estimate include maintenance and upgrading of security equipment and physical barriers to ensure compliance.

While these security requirements may make sense for traditional plants, NRC believes they are likely incommensurate with the lower safety risks of SMRs.[2] Developers and operators of potential SMRs can apply for exemptions from these requirements, but such requests would likely be time consuming and expensive. NRC analyzed the possible benefits of replacing exemptions requests with streamlined regulations and estimates it would save each entity about 100 labor hours, valued at $12,400.[3] Accordingly, the NRC is in the early stages of a rulemaking process to develop more appropriate standards for SMRs.

NRC RULEMAKING AND OPPORTUNITES TO REMOVE REGULATORY HURDLES

The NRC publicly signaled its intent to explore streamlining the security requirements for SMRs in July 2019, when it published in the Federal Register a notice of availability of a regulatory basis document. The regulatory basis outlines a potential "proposed limited-scope physical security rulemaking for advanced reactors, which would propose alternative, optional physical security regulations specifically for advanced reactor designs."

NRC outlines two current security requirements that could be streamlined in the regulatory basis. The first is the requirement that a facility have at least 10 armed responders. NRC recommends eliminating the minimum requirement and instead allowing facilities to demonstrate in their security plans that fewer are necessary. This change could reduce costs by about $273,000 per eliminated armed responder per year, using the cost methodology outlined above. Similarly, with their smaller footprint SMRs will have fewer access points that require security personnel, offering the potential for significant cost reductions in these area without compromising security.

The second NRC recommendation is to review the requirement that facilities have a redundant, secondary alarm system with separate power supply from the main system. NRC suggests this requirement could be removed "if intrinsic, engineered security measures are

incorporated into the designs that limit the amount and timing of potential radioactive material releases."

While NRC recommended this limited-scope rulemaking over a broader overhaul of security requirements for SMRs, it did invite the NRC's commissioners to consider other possible reforms.

Public comments offered some suggestions. One possibility is to eliminate or scale down the requirement for force-on-force drills, where a plant must repel a mock forced entry. This change may make particular sense if the SMR is located underground.

A second possibility is to allow security personnel, which currently cannot have other responsibilities, to serve other functions in addition to security, provided security remains their primary function.

A third option could be to bifurcate SMRs into larger and micro classifications, and then vastly overhaul the requirements for micro reactors. The negative consequences of a problem at micro reactors are similar to those at research and test reactors, which currently have less stringent requirements – including not having to meet certain terrorism-resistance levels. NRC could consider adopting the recommendations presented in the regulatory basis for larger SMRs, and something closer to the requirements for research and test reactors for micro reactors.

OUTLOOK

Due to the smaller size and inherent security design improvements of SMRs over large traditional nuclear power plants, a consensus exists among the NRC and industry that the current physical security requirements for power plants is unnecessarily onerous for SMRs. Both sides seem to recognize that reform would help enable deployment of advanced technologies. What form a streamlined regulatory regime should take, however, is open to debate.

Since the regulatory basis document drafted by NRC became public, there has not been any clear advancement of reform. According to the most-recent Unified Agenda of Regulatory and Deregulatory Actions, NRC issuance of a proposed rule falls into the "Long Term Actions" category, with a proposal tentatively planned for April 2021. NRC continues to have public meetings related to SMRs, most recently in February.

Because SMRs are not yet operational, the possibility exists that the timeline for reforms lingers beyond the April 2021 proposal target. That delay could affect investment in SMRs, setting back advancement and deployment. To achieve its goal of helping to make SMRs

more economically viable, the NRC would be best served by remaining committed to timely reforms.

[1] 10 CFR § 73.55

[2] Nuclear Regulatory Commission. Rulemaking for Physical Security for Advanced Reactors, Regulatory Basis for Public Comment. Page 1-3.

[3] *Ibid*. Table 4.