



Department of Energy

Washington, DC 20585

May 22, 2020

Kristine L. Svinicki
Chairman
Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

Dear Chairman Svinicki:

The purpose of this letter is to notify the Nuclear Regulatory Commission (NRC) that the Department of Energy (DOE) fully supports the NRC staff's rulemaking efforts for a technology-neutral, dose-based, consequence-oriented emergency preparedness (EP) framework for small modular reactors (SMRs) and other new technologies (ONTs). The NRC's proposed rule, as described in SECY-18-0103, is a critical step in determining the appropriate Emergency Planning Zone (EPZ) size for SMRs using a risk-informed methodology as it will properly credit the advanced safety and performance characteristics of these new advanced reactor designs. The proposed rule allows determination of a plume exposure pathway (PEP) EPZ size that is commensurate with the potential radiological risk for a specific facility and the Department agrees that a risk-informed EPZ sizing approach, as applied to SMR designs and other new technologies, accurately reflects the technological advances in reactor design, gained nuclear industry experiences, and regulatory guidance updates while ensuring that there is no undue risk to public health and safety.

The current EP regulations are focused on regulating the current domestic fleet of large light-water reactors (LWRs) and do not sufficiently address the advances in designs, safety, and their application to SMRs and ONTs. Currently, the plume exposure EPZ size requirement of about 10 miles in radius is based on the NRC technical report (NUREG) NUREG-0396 (U.S. Environmental Protection Agency [EPA] EPA 520/1-78-016), "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants." As discussed in NUREG-0396, the objective of emergency response plans should be to provide dose savings for a spectrum of accidents that could produce offsite doses in excess of the EPA protective action guidelines (i.e., protection from doses above the 1 rem total effective dose equivalent (TEDE) limit at the EPZ boundary)¹, which was the fundamental objective for the 10 mile EPZ sizing rationale.

When developed, NUREG-0396 applied design, source term, risk, and consequence analyses information using available analytical tools that reflected the characteristics of large LWR technologies. Industry knowledge and analytical tools that address design

¹ As a reference point, 1 rem TEDE is approximately equivalent to receiving a Technetium nuclear cardiac stress test or a Barium contrast for a gastrointestinal X-ray procedure.



basis and beyond-design-basis nuclear reactor accident behavior, probabilistic risk assessment, source terms, radionuclide transport and atmospheric dispersion has significantly improved in the 42 years since the issuance of NUREG-0396 due to extensive research and development funded by the NRC, DOE, and similar international regulatory and research organizations. Today, advanced SMR developers are improving their designs and have incorporated inherent, passive safety features to improve plant resistance to design basis and beyond-design-basis accidents and to assure any potential off-site dose is minimized. These features include design elements such as smaller reactor cores, lower reactor core power densities, below-ground siting, and redundant passive accident response capabilities. Due to these innovations, the probability of an accident involving a significant release of radioactive material in SMRs is expected to be considerably lower when compared to the large LWRs. Moreover, if such an event were to occur, the SMR design results in a significant time delay before any release to the environment can occur; thereby allowing for additional actions that could mitigate or preclude any release. NRC's proposed rule relies on an analysis of projected offsite dose from a range of design-specific potential accidents with radiological releases to establish a pre-determined PEP EPZ to inform protective actions.

Several of our nuclear power industry partners have pointed out that the 10-mile EPZ sizing also considers an analysis and evaluation of the public risk of significant early injuries from beyond-design-basis accidents (BDBA). The probability of significant early injuries, directly related to a whole body (WB) dose of 200 rem, were shown to drop significantly at 10 miles in NUREG-0396. Although the proposed new rule is consistent with the assessment done in NUREG-0396 using the same 1 rem TEDE dose requirements for design basis accidents, it could be expanded to include the 200 rem WB dose requirements for BDBA. While it is unlikely that the 200 rem WB dose criterion would be applied to SMRs and ONTs, its inclusion would further support the basis that a reduced EPZ size can protect the public in an equivalent manner to the 10-mile EPZ for current operating plants. DOE supports the underlying basis for this rulemaking to ensure the same level of public protection as a 10-mile EPZ boundary. It is our opinion that a scalable EPZ is a product of improved SMR designs and safety performance and does not equate to a reduction in the health and safety of the public. The NRC recognized this by providing for different EPZs in the past for small power reactors and a reactor with a non-LWR design on a case-by-case basis (10 CFR 50 Appendix E, Footnote 1).

Some have raised concerns that the proposed rule will allow an EPZ to be exclusively established through quantitative, risk-based determinations rather than through risk-informed decision making that accounts for expert judgement, defense-in-depth, and public confidence. In our opinion, this proposed rule does not ignore the importance of defense-in-depth and deterministic analyses, but rather provides an opportunity for new, safer, and more advanced reactor designs to meet the same level of protection through a risk-informed and consequence-based approach. In addition, the proposed rule does not preclude the public from commenting on a future application, nor does it alleviate an applicant's responsibility to work with their Federal, State, and local agencies to establish the appropriate emergency planning responsibilities for each agency (as required in 10 CFR 52.17 and 10 CFR 50 Appendix E). The proposed rule simply allows the nuclear

industry to be credited for recent and continuing design innovations and to deploy new designs employing these innovations in a way that enhances safety. When finalized, this proposed rule will also encourage and promote future advances in nuclear power plant safety.

The nuclear industry has been pursuing a scalable EP approach for SMRs parallel to NRC's rulemaking efforts, specifically described in the Nuclear Energy Institute White Paper titled "Proposed Methodology and Criteria for Establishing the Technical Basis for Small Modular Reactor Emergency Planning Zone" (December 23, 2013). In partnership with DOE, Tennessee Valley Authority (TVA) developed an early site permit application (ESPA) which includes a risk-informed, technology-neutral, dose-based, consequence-oriented EPZ sizing methodology. The Commission authorized the issuance of the Clinch River Site early site permit in December 2019. TVA's EPZ methodology is aligned with the approach in NRC's proposed rule in that it is consistent with the NUREG-0396 approach and has the same dose requirements. In the case of the Clinch River Site, this methodology determined that an EPZ boundary of two miles in radius, or at the site boundary, meets the conditions of the regulation, and would provide appropriate levels of protection to public health and safety (consistent with that for the 10-miles developed in NUREG-0396 for large LWRs), provided the reactor design selected in the combined license application meets the established acceptance criteria. Furthermore, in an effort to support future arrangements with Federal, State, and local agencies, TVA coordinated with local communities and counties during the development of the ESPA to communicate the associated emergency planning approach. As a result of these outreach efforts, several letters of support were received by TVA which were subsequently submitted to the NRC in support of the ESPA review.

DOE has made significant investment in the development of SMRs over the past decade based on their potential to provide safe, economic, and resilient power to improve the Nation's energy security posture. These investments include research and development on the viability of passive safety systems based on the use of natural circulation, improved manufacturing techniques and qualification of materials for use in SMR-specific environments, and multi-module instrumentation and control capabilities, all of which are focused on enhancing the safety of SMR designs. Pursuant to the Nuclear Energy Innovation Capabilities Act of 2017 (Public Law 115-248), DOE will continue to work with the NRC to share the technical expertise gained in these efforts, as well as future knowledge and information on advanced nuclear reactor technologies and nuclear energy innovation.

The Commission's approval of the proposed rule is crucial for the advanced SMR industry, as incorporation of these improved design features have prompted the nuclear industry to question whether the status quo on EP is still appropriate. It is important that the current regulations are updated to reflect the safety enhancements offered by new reactor designs, specifically on topics regarding the appropriate size of an EPZ, the extent of onsite and offsite emergency planning required, and the number of emergency response staff needed. The approach for the EP framework for SMRs and ONTs described in the NRC proposed rule provides the assurance of adequate protection of

public health and safety and is consistent with the Commission's direction, as well as the current methodology for establishing plume exposure EPZ. Accordingly, the Department supports the move towards a technology-neutral, performance-based, risk-informed, and consequence-oriented approach for developing requirements.

If you or your staff have any questions, or wish to further discuss the Department's position on this issue, please contact Alice Caponiti, Deputy Assistant Secretary for Reactor Fleet and Advanced Reactor Deployment, at alice.caponiti@nuclear.energy.gov or (301) 903-6062.

Sincerely,

A handwritten signature in black ink, appearing to read 'R. Baranwal', is centered on the page.

Dr. Rita Baranwal
Assistant Secretary
for Nuclear Energy