UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

November 16, 2021

The Honorable Christopher T. Hanson
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: DRAFT FINAL RULE, "EMERGENCY PREPAREDNESS FOR SMALL MODULAR REACTORS AND OTHER NEW TECHNOLOGIES"

Dear Chairman Hanson:

During the 690th meeting of the Advisory Committee on Reactor Safeguards (ACRS), November 2-5, 2021, we reviewed the staff's draft final rule, "Emergency Preparedness for Small Modular Reactors and Other New Technologies," and the associated Regulatory Guide (RG) 1.242, "Performance-Based Emergency Preparedness for Small Modular Reactors, Non-Light-Water Reactors, and Non-Power Production or Utilization Facilities." Our Future Plant Designs Subcommittee also reviewed this matter on September 21, 2021. During this review, we had the benefit of the referenced documents and discussions with the U. S. Nuclear Regulatory Commission (NRC) staff, the Nuclear Energy Institute, the Union of Concerned Scientists, and other stakeholders.

RECOMMENDATIONS

Prior to the issuance of the proposed rule and the new RG 1.242 the following changes should be made:

1. Revise proposed Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.47(f) to not exclude the Federal Emergency Management Agency (FEMA) from being involved in reviewing emergency plans under this rule regardless of the boundaries of the emergency planning zone (EPZ) to ensure applicable offsite agencies are capable to coordinate with onsite nuclear emergency organizations.

2. Revise RG 1.242 to:

    a. Include additional clarifying guidance related to selection criteria for the spectrum of events to consider for determination of the source term that is to be applied for EPZ sizing.

    b. Clearly indicate that for sites licensed for transportable and mobile reactors the license application review and associated proposed emergency plan must be set

for the maximum number of modules, new arrivals, active, and shutdown or spent units. This ensures the emergency plan considers the cumulative on-site effect of all units during the full life cycle of the licensed site.

c. Include conforming changes regarding the changes made in response to Recommendation 1 above.

BACKGROUND

Currently, the NRC emergency planning regulations are found in 10 CFR Section 50.47 and Appendix E to 10 CFR Part 50. Over the last decade, several SECY papers proposed a framework to develop performance-based emergency plans for future small modular reactors (SMRs) and other new technologies (ONTs), culminating in the Commission's approval of the staff's plan to address the topic and direction to proceed with rulemaking in its staff requirements memorandum to SECY-16-0069.

The draft final rule establishes an approach to emergency planning that focuses on performance and results rather than an emphasis on emergency plans and procedures. The draft final rule has an accompanying regulatory guide, RG 1.242, Revision 0.

Previously, we reviewed earlier versions of the proposed rule and the associated regulatory guidance. We found no technical obstacles to proceeding with rulemaking but encouraged the staff to better define their expectations for mechanistic source terms.

During the extended public comment period, comments were received from over 2,200 individuals and organizations. The staff is to be commended for working through many difficult topics. However, FEMA commented that they were not in agreement with reducing the federal government's oversight and assistance for planning and preparedness for this unique hazard and that this rule, as written, would hinder FEMA's ability to determine that offsite plans provide reasonable assurance that public health and safety are protected.

DISCUSSION

In our review of the rule, we focused on four major categories:

- EPZ boundary selection and offsite planning and response,
- Hazards from non-nuclear, co-located facilities,
- Performance-based regulatory oversight of emergency response functions, and
- Event selection for sizing EPZ.

Detailed comments for each category are provided below.

EPZ Boundary Selection and Offsite Planning and Response

The main thrust of the new rule is to permit a risk-informed licensing path to produce an EPZ and to provide a complete modification to the approach to the ingestion pathway zone. The primary purpose of the EPZ is to provide an area where predetermined protective actions are implemented. The boundaries of the EPZ will establish the breadth and depth of the onsite and offsite response organizations needed to sufficiently protect the health and safety of the public.

The rule does not specify a minimum size for the EPZ; instead, it relies on a performance-based calculation of dose to the public to establish the EPZ size. For currently anticipated SMRs and ONTs, in most cases, the resulting EPZ is expected to be smaller than that used by the existing light water reactor fleet because of estimated lower source terms associated with the new designs.

Existing regulations generally require the plume exposure pathway EPZ for nuclear power reactors with an authorized power level greater than 250 MWth to consist of an area nominally 10 miles in radius and the ingestion pathway zone area nominally 50 miles in radius. The new rule allows the applicant to propose an EPZ boundary that provides public protection from dose levels above a 10 mSv (1 rem) total effective dose equivalent threshold that is anticipated to be less than the 10 miles. For designs with sufficiently low source terms, the EPZ could be bounded by the site boundary. In such a case, because the public is excluded from this area and it is under the control of the licensee, traditional predetermined protective actions within the EPZ by external agencies are not needed. If the EPZ is determined to be within the site boundary, the proposed revision to 10 CFR 50.47(f) exempts a FEMA review during the license application phase. The proposed 10 CFR 50.47(f) also exempts other planning attributes such as establishing arrangements for offsite services, dissemination of public information and radiological response training for offsite services such as fire, medical and law enforcement.

The primary basis for precluding normal and collaborative planning with agencies outside the site boundary is the concept that SMRs and ONTs are comparable in terms of the hazards associated with small research and test reactors (RTRs). Generally, there are no required offsite actions for RTRs due to the lower source term of the smaller reactors. However, this basis does not recognize the reduced operating experience with new nuclear technologies and differences in operating practices of commercial facilities versus RTRs. Emergency preparedness being the last line of defense for the health and safety of the public, precaution in the case of unforeseen events is prudent. Therefore, we advise that the proposed revision to 10 CFR 50.47(f) be amended or deleted so that the longstanding engagement with FEMA reviewing offsite emergency plans is triggered by a new nuclear reactor license application. When the EPZ is within the site boundary, FEMA review could be straightforward and, at least, informative of the new technology application to the various other federal, state, local and tribal stakeholders. This is especially important given the adoption of new and advanced nuclear technologies and the potential wide range of applications.

FEMA directs local and state agencies to have an all-hazards plan, commonly referred to as the emergency operations plan (EOP). Locals with an existing light water reactor nuclear plant have an additional radiological emergency plan (REP). Where an REP does not exist, the EOP has a radiological annex that should include radiological information from nearby nuclear material licensed facilities. Introduction of a new nuclear reactor in a community without an REP would certainly affect the content of EOPs and as such, should be reviewed specifically for the nuclear technology being introduced to the local region, regardless of the EPZ size. For example, fire and ambulance response, as well as local law enforcement should be informed of potential new radiological and other hazards.

FEMA also has a responsibility to ensure the capabilities of offsite organizations to protect the ingestion pathway. Proposed emergency plans, regardless of the EPZ size, must provide detail on the ingestion pathway capabilities of federal, state, local, and tribal entities. These capabilities include intermediate and long-term monitoring, analysis, interdiction, and possible embargo for the products identified as a part of the local site's food and water ingestion pathway. The rule and regulatory guide rely on ad-hoc ingestion planning and actions during

and after the nuclear event. This rule should ensure FEMA is involved in the review of these capabilities regardless of the location of the EPZ.

One class of reactors that may not be adequately considered is transportable or mobile microreactors. Of concern are sites where a fueled reactor is moved into place and when expended, a new fully fueled reactor is moved onto the site co-present with the initial reactor. In addition to decommissioning implications, it is unclear how the source term, accident selection, release duration, and site EPZ boundary will be established in this case. The guidance in RG 1.242 should clearly indicate that for sites with transportable and mobile reactors, the proposed emergency plan must be set for the maximum number of modules, new arrivals, active, and shutdown or spent units. This ensures the emergency plan considers the cumulative on-site effect of all radiation sources during the full life cycle of the licensed site.

Hazards from Non-Nuclear, Co-Located Facilities

The applicant for an SMR or ONT must perform a hazards analysis that includes determination if contiguous or nearby facilities pose a credible hazard that could adversely impact implementation of the emergency plans. The submitted plan must describe the planning activities that spawn out of the analysis and the emergency response functions that must be included to address the credible hazards. The hazard from these non-nuclear facilities may pose a more significant risk to public health and safety than the reactor facility. Radiological emergency plans and actions may be overshadowed by actions required for mitigating impact from non-nuclear hazards related to the other industries. Although the NRC does not have jurisdiction over the other facilities, plans and actions should be reviewed to ensure the radiological mitigating actions are not impeded or hindered. Again, the role of FEMA in reviewing impacts from other non-nuclear hazards should not be excluded when the EPZ is determined to be within the site boundary.

Performance-Based Regulatory Oversight of Emergency Response Functions

The demonstration of adequate emergency planning is shifting from a programmatic and procedural infrastructure inspection to performance-based inspection and oversight. Presently, as the rule and guidance are structured, the licensee proposes their version of key performance metrics. There is no standard or minimum set of metrics defined and as such, the key performance metrics and associated management response action levels could differ among applicants. This may lead to many different types of qualitative and quantitative metrics with varied action levels to initiate the yet to-be-defined management corrective actions. A consistent, foundational framework should be established for all emergency plans and technologies. The staff indicated that they are developing a framework for oversight of emergency preparedness performance and associated inspection guidance under this rule. We plan to review the results of the efforts to establish an oversight program for emergency preparedness related to this new rule.

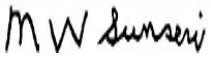
Event Selection for Sizing EPZ

A significant issue is the selection criteria for scenarios that will be used to develop the source term used as a key decision point in applying the new rule. The staff addressed a comment in our letter of October 19, 2018, related to source term determination by revising RG 1.242, Appendix A, “General Methodology for Establishing Plume Exposure Pathway Emergency Planning Zone Size,” and adding Appendix B, “Development of Information on Source Terms.” Providing some examples and additional clarifying information on the use of appendices of the new RG 1.242 should help in reducing ambiguity.

SUMMARY

The staff has methodically worked through some very difficult concepts and comments during this long rulemaking process. We plan to follow staff efforts to develop event selection and source term guidance to ensure connectivity among this and future new reactor activities. In addition, we plan on reviewing the guidance that will be used to verify, through inspection, the performance-based emergency plans are meeting the intended metrics and benchmarks. We conclude the new rule is necessary, well developed, and should be issued after our comments have been addressed.

Sincerely,


Signed by Sunseri, Matthew
on 11/16/21

Matthew W. Sunseri, Chairman

REFERENCES

1. U.S. Nuclear Regulatory Commission, “Pre-Decisional, Final Rule: Federal Register Notice: Emergency Preparedness for Small Modular Reactors and Other New Technologies,” October 15, 2021 (ML21285A034).

2. U. S. Nuclear Regulatory Commission, “Pre-Decisional, Final Rule: Regulatory Guide 1.242, ‘Performance-Based Emergency Preparedness for Small Modular Reactors, Non-Light-Water Reactors, and Non-Power Production or Utilization Facilities’,” October 15, 2021 (ML21285A035).

3. U.S. Nuclear Regulatory Commission, “Pre-Decisional, Final Rule: Federal Register Notice: Emergency Preparedness for Small Modular Reactors and Other New Technologies,” August 31, 2021 (ML21238A069).

4. U. S. Nuclear Regulatory Commission, “Pre-Decisional Regulatory Guide 1.242, ‘Performance-Based Emergency Preparedness for Small Modular Reactors, Non-Light-Water Reactors, and Non-Power Production or Utilization Facilities’,” August 31, 2021 (ML21238A072).

5. U.S. Nuclear Regulatory Commission, Rulemaking NRC-2015-0225, 85 FR 28436, “Emergency Preparedness for Small Modular Reactors and Other New Technologies,” May 12, 2020.

6. U. S. Nuclear Regulatory Commission, Draft Regulatory Guide, DG-1350, “Performance-Based Emergency Preparedness for Small Modular Reactors, Non-Light-Water Reactors, and Non-Power Production or Utilization Facilities,” May 12, 2020 (ML18082A044).

7. Advisory Committee on Reactor Safeguards, “Early Site Permit – Clinch River Nuclear Site,” January 9, 2019 (ML19009A286).

8. Advisory Committee on Reactor Safeguards, “Draft Proposed Rule, ‘Emergency Preparedness for Small Modular Reactors and Other New Technologies’,” October 19, 2018 (ML18291B248).

9. U. S. Nuclear Regulatory Commission, “SECY-18-0103 – Proposed Rule: Emergency Preparedness for Small Modular Reactors and Other New Technologies (RIN 3150-AJ68),” October 12, 2018 (ML18134A076).

10. U. S. Nuclear Regulatory Commission, “Staff Requirements – SECY-16-0069 – Rulemaking Plan on Emergency Preparedness for Small Modular Reactors and Other New Technologies,” June 22, 2016 (ML16174A166).

11. U. S. Nuclear Regulatory Commission, “SECY-16-0069 – Rulemaking Plan on Emergency Preparedness for Small Modular Reactors and Other New Technologies,” May 31, 2016 (ML16020A388).

12. U. S. Nuclear Regulatory Commission, NUREG-0396, “Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants,” December 31, 1978 (ML051390356).

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