



UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of

TENNESSEE VALLEY AUTHORITY

(Clinch River Nuclear Site Early Site Permit
Application)

Docket No. 52-047-ESP

Hearing Exhibit

Exhibit Number:

Exhibit Title:

NRC Staff Response to FEMA Post-Hearing Letter

The U.S. Nuclear Regulatory Commission (NRC) staff offers the following response to the letter from the Federal Emergency Management Agency (FEMA) to the Office of the Secretary, that was received by the NRC on August 26, 2019 (FEMA Post-Hearing Letter).¹ The staff has attempted to identify FEMA's concerns and to respond to each.

FEMA Issue 1:

FEMA continues to be concerned that the exemption methodology used in the [Clinch River Nuclear Site (CRNS)] [early site permit (ESP)] application considers the [U.S. Environmental Protection Agency (EPA)] [protective action guide (PAG)] Manual as the principal threshold to determine if a formal offsite emergency preparedness program or an emergency preparedness zone (EPZ) is needed. During the hearing, NRC staff stated that "The 2017 update to the PAG manual states "the size of the EPZ is based on the maximum distance at which a PAG might be exceeded." This is exactly how the NRC proposes to use the PAGs to determine EPZ sizing in a risk-informed manner." *Tr. 95.*

However, according to the EPA PAG Manual, FEMA believes this is an incorrect application of the EPA PAG. A PAG is defined as the projected dose to an individual from a release of radioactive material at which a specific protective action to reduce or avoid that dose is recommended. (*January 2017 PAG Manual at 12*). PAGs are guides to help officials select protective actions under emergency conditions and are not guides to define the need for offsite preparedness. *Id.* It is FEMA's understanding that PAGs do not establish an acceptable level of risk for normal, non-emergency conditions nor do they represent the boundary between safe and unsafe conditions. *Id.* Advanced planning – such as provided by an EPZ which extends beyond the site boundary - reduces the complexity of the decision-making process during an incident. *Id.* at 58. "The nature of PAGs is such that they cannot be used to assure that a given level of exposure to individuals in the population is prevented." *NUREG-0396/EPA 520/1-78-016 at 4.*

FEMA Post-Hearing Letter, at 1-2 (internal footnote omitted).

NRC Staff Response: As stated in the staff's response to the Commission's Pre-hearing Question 15 (Exhibit NRC-005), the NRC staff agrees with FEMA that a PAG is the projected dose to an individual from a release of radioactive material at which a specific protective action to reduce or avoid that dose is recommended. The NRC staff also agrees that PAGs do not establish an acceptable level of risk for normal, non-emergency conditions, nor do they represent the boundary between safe and unsafe conditions. However, the NRC staff disagrees with FEMA's interpretation of the PAG Manual that the PAGs are only guides to help select protective actions and not guides to define the need for preplanning for offsite preparedness. An NRC/EPA Task Force developed the EPZ concept in response to a request by the Conference of Radiation Control Program Directors (CRCPD) in 1976 to establish bounds on planning so that offsite response organizations could understand the extent of necessary

¹ Letter from M. Casey, FEMA, to the Office of the Secretary, "Tennessee Valley Authority, Clinch River Nuclear Site Early Site Permit Application Hearing, Docket No. 52-047-ESP, August 14, 2019" (dated Aug. 24, 2019, received Aug. 26, 2019).

planning for cases in which accident doses could exceed the PAGs and therefore urgent protective actions are required. By the same logic, if the offsite doses from a specified suite of hypothetical accidents would not exceed the PAGs, then no specific preplanned protective actions would be necessary. The NRC and EPA both support this use of the PAGs as a threshold, as documented by the joint NRC/EPA Task Force in NUREG-0396, as well as in the 1992 EPA-400-R-92-001, "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents" (1992 PAG Manual) and the 2017 PAG Manual update.

The 2017 update to the PAG Manual acknowledges on page 23 that "the size of the EPZ is based on the maximum distance at which a PAG might be exceeded . . ." The 2017 update refers to the 1992 PAG Manual, Appendices B, C and E, for the bases for its risk discussion. The 1992 PAG Manual states on page 2-3 that "[s]ince it will usually not be necessary to have offsite planning if PAGs cannot be exceeded offsite, EPZs need not be established for such cases." Finally, the NRC/EPA Task Force used the PAGs in defining the technical criteria for EPZ sizing. NUREG-0396, at 16-17.

Based on these cited references, the NRC staff concludes that its interpretation of the EPA PAG manual and NUREG-0396 is appropriate to support the staff's acceptance of use of the PAGs in the Tennessee Valley Authority's (TVA's) ESP application. Furthermore, even recognizing that well-meaning people or organizations can reach different interpretations of a given document, the quantitative approach specified in NUREG-0396 and accepted by the NRC staff provides a consistent, risk-informed method for determining whether credible accidents could pose a significant enough impact to warrant preplanning. Fundamentally, the staff's approach aligns the protective measures to the magnitude of the potential hazard, and it is therefore fully consistent with the NRC's regulatory principles and practice and protective of public health and safety.

FEMA Issue 2:

Based on the NRC staff hearing presentation, FEMA believes that the NRC staff conclusion that the proposed methodology for offsite emergency preparedness maintains the same level of protection as a ten-mile EPZ is unsupported. FEMA is aware of the few examples cited by NRC staff of commercial nuclear power reactors with less than a ten-mile EPZ (i.e., 5 mile EPZ). FEMA is, however, unaware of any commercial nuclear power reactor ESP or license with only a site-boundary EPZ.

FEMA Post-Hearing Letter, at 2.

NRC Staff Response: The "same level of protection" as used by TVA and the NRC staff refers to "dose savings" and not to overall established emergency response capabilities. As stated during the hearing, the NRC staff position is that the response capabilities should be proportional to the hazard. Facilities posing very low hazards should not be required to have the same level of response capabilities as those posing higher (though still low) hazards. TVA's dose criteria are consistent with the criteria that form the basis for the ten-mile plume exposure pathway (PEP) EPZ size requirement for large light-water reactors in current regulations. Thus, in terms of dose savings, application of TVA's dose criteria provides the same level of protection that the current ten-mile PEP EPZ requirement provides for large light-water reactors.

FEMA Issue 3:

Much of the analysis and discussion at the hearing was limited to the “technical” criteria contained in NUREG-0396. However, “Radiological emergency planning is not based upon probabilities, but on public perceptions of the problem and what could be done to protect health and safety. In essence, it is a matter of prudence rather than necessity.” *NUREG-0396 at I-2*. FEMA supports a methodology for EPZ sizing that takes into account such “nontechnical” criteria and further believes that a methodology that allows for a site boundary EPZ which purports to offer the same level of protection as a ten-mile EPZ is unsupported.

FEMA Post-Hearing Letter, at 2 (internal footnote omitted).

NRC Staff Response: As the NRC staff stated in response to Pre-hearing Question 13, the basis for EPZ sizing in NUREG-0396 is set out in technical terms:

Several possible rationales were considered for establishing the size of the EPZs. These included risk, probability, cost effectiveness and accident consequence spectrum. After reviewing these alternatives, *the Task Force chose to base the rationale on a full spectrum of accidents and corresponding consequences tempered by probability considerations.*

NUREG-0396, at 15 (emphasis added). The NRC/EPA Task Force based its “judgment on the extent of the Emergency Planning Zone” on the characteristics of design basis and severe accidents. *Id.* at 16.² NUREG-0396 goes on to discuss the technical criteria the NRC/EPA Task Force used to determine EPZ size. *Id.* at 16-17. These technical criteria are essentially the same as the technical criteria in TVA’s methodology.

At the time the technical criteria in NUREG-0396 were developed, public perception was taken under consideration in a general sense. The staff’s review of the TVA ESP application was based on the same rationale and resulting technical criteria as described in NUREG-0396. As such, while the staff did not include public perception as a standalone consideration for the proposed exemptions, public perception is accounted for by virtue of its consideration in the development of the NUREG-0396 criteria.

Finally, the staff’s approach to EPZ sizing in the Clinch River review is consistent with the 2016 update to FEMA’s Radiological Emergency Preparedness (REP) Program Manual. In this manual, on page 14, FEMA states: “The EPZ sizes represent a technical judgment based on the type and quantity of hazardous materials present (source term) and the potential risks where detailed planning is needed to ensure adequate response to an emergency.” FEMA’s document does not address public perception in its discussion of EPZ size.

FEMA Issue 4:

As part of our July 8, 2019 letter, FEMA stated that when determining an EPZ size, either a site boundary or 2-mile EPZ, FEMA supported the integration of the

² NUREG-0396 uses the term “Class 9 accidents”; Class 9 accidents are “those accidents in which there is melting of the core and/or containment failure.” *Id.* at 5 (footnote *). In other words, Class 9 accidents are severe accidents.

full spectrum of threats (Insider Threat, Cyber, Nation-State National Security Emergency, Electromagnetic Pulse, etc.) and their associated impacts into the Accident Analyses and the Probabilistic Risk Analysis (PRA).

FEMA Post-Hearing Letter, at 2.

NRC Staff Response: The staff addressed the concerns in FEMA's July 8, 2019, letter in the staff's response to Pre-hearing Question 15.

FEMA Issue 5:

During the hearing, Commissioner Baran asked NRC staff, "Does the Staff believe that all hazards planning is just as effective in an actual radiological emergency as dedicated radiological emergency planning?" *Tr. 129*. In response, NRC staff stated in part, "If you look at FEMA's guidance, which is called CPG 101, developing and maintaining emergency operations plans, they don't call out radiological planning as separate. Indeed, part of this guidance addresses radiological hazards. What FEMA does in this particular guidance is suggest that if you are ever in a community where there's a radiological plan, you include this in your all hazards planning. So, to answer your question, I think this particular guidance would say, yes, they believe that it's all part of all hazards. And indeed, in FEMA's guidance, which is CPG 101 right here." *Tr. 131*. The stated NRC staff response is not an accurate representation of FEMA's Comprehensive Preparedness Guide 101: Developing and Maintaining Emergency Operations Plans (CPG-101). Left uncorrected, NRC staff's reference to CPG-101 misrepresents how planners can and should factor for possible radiological incidents from a fixed-facility commercial nuclear power plant in their jurisdiction.

FEMA Post-Hearing Letter, at 2-3 (internal footnote omitted). FEMA's letter goes on to describe how particular hazards are addressed in an integrated fashion in an emergency operations plan (EOP) consistent with CPG-101. *Id.* at 3. FEMA's letter also cites CPG-101 guidance on how radiological hazards should be addressed in the EOP annex for such hazards:

More importantly, CPG-101 describes that the radiological incidents section of the annex should address the hazard-specific methods to prepare for and respond to releases that involve radiological materials that are at licensed facilities or in transport. *Id.* at C-30. The radiological incident specific annex describes/identifies the jurisdiction's specific concerns, capabilities, training, agencies, and resources that will be used to mitigate against, prepare for, respond to, and recover from radiological hazards. The annex also includes a hazard analysis summary that discusses where/how radiological materials are likely to impact the jurisdiction, including incidents that occur at fixed facilities, along transportation routes, or as fallout from a nuclear weapon. *Id.* at C-30. If applicable, hazard- or incident-specific annexes address the requirements of FEMA/U.S. Nuclear Regulatory Commission NUREG-0654 and 44 C.F.R. Part 350 as it applies to the jurisdiction's planning for emergencies/disasters involving regulated nuclear power plants. *Id.* at C-30.

FEMA Post-Hearing Letter, at 3-4.

NRC Staff Response: The NRC requires a level of emergency preparedness commensurate with the potential consequences to the public health and safety. All nuclear power plant licensees have onsite emergency preparedness plans and procedures. If a site boundary PEP EPZ is approved for the Clinch River Nuclear Site in a future combined license or construction permit, the licensee will be required to have onsite emergency response plans for the site. TVA submitted a proposed emergency plan specific to a site boundary EPZ in Part 5A of its application. This proposed plan includes the capability to assess the consequences of potential or actual releases of radioactivity offsite as well as communicate with offsite officials regarding the conditions at the facility. In the highly unlikely event that offsite protective actions become necessary, such protective actions may be implemented using an all-hazards approach to emergency planning.

Although FEMA states that the NRC staff is not accurately representing CPG-101, FEMA appears to agree with the staff that CPG-101 addresses radiological hazards and that emergency planning for radiological hazards is integrated in an emergency operations plan that addresses all hazards. FEMA may be disagreeing with the staff's statement that CPG-101 "do[es]n't call out radiological planning as separate," but in context, the staff was stating that CPG-101 does not address radiological planning as being independent of the all-hazards approach.

The NRC staff can cite multiple examples in FEMA's radiological emergency preparedness program documents that support the staff's view that FEMA planning documents include radiological preparedness as part of the all-hazards preparedness framework. For example, in the forward of the 2016 REP Program Manual, Administrator Fugate states, "We believe that your radiological emergency response plans are a part of your comprehensive emergency management program. This provides a 'Whole Community' approach to strengthen your community's preparedness against any catastrophic event."

Also, FEMA states in the 2016 REP Program Manual, that "Comprehensive Preparedness Guide (CPG) 101 provides general guidelines on developing emergency operations plans. It promotes a common understanding of the fundamentals of planning and decision making to help emergency planners examine a hazard and produce integrated, coordinated, and synchronized plans." 2016 REP Program Manual, at 5 (internal footnote omitted). FEMA applies this principle when it considers "granting REP Program exercise credit to [Offsite Response Organizations (OROs)] for their participation in a response to a real-world incident" per the criteria in Part III, Section B.7, "REP Program Credit for Participation in Actual Incidents," of the 2016 REP Program Manual. FEMA states on page 158 of this manual, "An actual event could serve to validate elements for a facility's annual assessment where a significant commonality in plans and personnel exists." For example, if offsite response officials stand up a joint field office or a joint information center in response to a non-nuclear event such as a hurricane and personnel who respond and staff these centers perform a similar function under a radiological emergency preparedness program, then FEMA in its review of the response actions considers that those functions have been demonstrated successfully and need not be included in the next exercise of the radiological emergency plan. In this way FEMA recognizes the similarities in response between radiological and non-radiological events; if response officials can successfully demonstrate response to a real world non-nuclear event, then FEMA will not require them to demonstrate that capability in a nuclear power plant full participation exercise.

Further, the NRC and FEMA have developed, and requested public comment on, a draft Revision 2 of NUREG-0654/FEMA-REP-1 (ADAMS Accession No. ML14246A519) that

addresses both CPG-101 and CPG-201. Page 10 of this draft document states, “Together, these two CPGs provide a risk-informed basis for the offsite planning effort, as well as encourage the engagement of the whole community to address all risks that might impact a jurisdiction and allow for the radiological emergency plan to be integrated with all-hazards plans.”

Finally, FEMA states, and the NRC staff agrees, that CPG-101 provides guidance on how to address aspects of radiological hazards in an annex of the EOP that specifically addresses such hazards. CPG-101 states that the annex should address the *hazard-specific* methods to prepare for and respond to releases that involve radiological materials that are at licensed facilities or in transport. However, CPG-101 also states on page 1-2:

While the causes of emergencies can vary greatly, many of the effects do not. Planners can address common operational functions in their basic plans instead of having unique plans for every type of hazard or threat. For example, floods, wildfires, HAZMAT releases, and radiological dispersal devices may lead a jurisdiction to issue an evacuation order and open shelters. Even though each hazard’s characteristics (e.g., speed of onset, size of the affected area) are different, the general tasks for conducting an evacuation and shelter operations are the same. Planning for all threats and hazards ensures that, when addressing emergency functions, planners identify common tasks and those responsible for accomplishing the tasks.

While NRC recognizes that FEMA, as issuer of CPG-101, is the ultimate authority on its intent, a reasonable interpretation of the document is that nuclear and radiological hazards are envisioned as just one of the many that should be addressed in all-hazards planning. In any event, as the staff stated in the hearing, the NRC does not base its acceptance of TVA’s proposed PEP EPZ sizing approach on any assumption about the effectiveness of all-hazards planning. The staff’s position, consistent with long-standing NRC licensing practice, is that facilities of very low hazard do not warrant formal offsite radiological emergency preparedness. So, FEMA’s interpretation of its document does not impact the NRC staff’s position on this issue.

FEMA Issue 6:

The NRC staff’s misunderstanding of the all-hazard emergency management process involves not only concepts described in CPG-101, but also concepts described in Comprehensive Preparedness Guide 201: *Threat and Hazard Identification and Risk Assessment (THIRA) and Stakeholder Preparedness Review (SPR) Guide* (CPG-201). CPG 201 discusses the need for communities to determine what threats, both man-made and natural, pose risks to their communities. Planning for those specific risks make up an important part of building a community’s all-hazard plan. The misunderstanding of this important piece of community emergency planning makes NRC staff responses for scaling emergency preparedness to a site boundary EPZ (with no specialized radiological emergency planning) unrealistic. Emergency response scaling from non-existent plans, lack of necessary equipment, and shortage of trained emergency personnel could have unfortunate consequences. Such an *ad hoc* approach does not assure that the full range of necessary actions will be taken, and it makes it much more likely that any response will be not coordinated as well as if there were REPP preparedness activities.

FEMA Post-Hearing Letter, at 4 (internal footnote omitted).

NRC Staff Response: As stated in the prior response, a reasonable interpretation of FEMA's documents is that nuclear and radiological hazards are envisioned as just one of the many that should be addressed in all-hazards planning.

The all-hazards response plans are tested by real events almost daily across the U.S. These responses are frequently ad hoc responses and save lives. The hazards which prompt the implementation of response actions are those which are immediately dangerous to life and health (IDLH). This is very different from the criteria which prompt protective actions for nuclear power plant accidents. These criteria (the EPA PAGs) are based on the risk of a stochastic effect, such as a fatal cancer, at some distant point in the future rather than IDLH conditions. It is reasonable to assume that if responders can protect the public under IDLH conditions, they can protect the public from hypothetical future stochastic risk of cancer.

The NRC determines the appropriate level of protection for radiological hazards posed by all its licensees. The NRC has not required formal offsite radiological emergency preparedness for facilities with a very low potential hazard. The dose-based, risk-informed PEP EPZ sizing approach proposed by TVA, in the staff's judgment, provides a supportable basis for determining whether preplanning is warranted – an approach that is protective of public health and safety. Because that approach is based on hypothetical doses as a result of a spectrum of credible accidents, it is aligned with the hazard, and requires no more planning than the hazard warrants. If the ESP is issued, and a subsequent combined license application for the site cannot show that TVA's dose criteria would be met at the site boundary, then the applicant will be required to implement the formal radiological planning advocated by FEMA.

FEMA Issue 7:

The level of emergency response capabilities that a defense-in-depth approach provides to protect the surrounding populations may not be as robust if a State or local EOP does not take into account a jurisdiction's specific concerns, capabilities, training, agencies, and resources that will be used to mitigate against, prepare for, respond to, and recover from radiological hazards. Accordingly, FEMA supports hazard-specific procedures section of an EOP that addresses the unique preparedness, response, and recovery strategies relevant to a radiological incident.

FEMA Post-Hearing Letter, at 4.

NRC Staff Response: Defense in depth is an approach to designing and operating nuclear facilities that prevents and mitigates accidents that release radiation or hazardous materials. The key is creating multiple independent and redundant layers of defense to compensate for potential human and mechanical failures so that no single layer, no matter how robust, is exclusively relied upon. Defense in depth includes the use of access controls, physical barriers, redundant and diverse key safety functions, and emergency response measures. Nuclear power plant sites that have a site boundary PEP EPZ will be required to have onsite emergency response measures as part of a defense-in-depth approach to provide reasonable assurance of adequate protection of public health and safety.

The NRC staff does not assert that the defense-in-depth capabilities in response to a nuclear or radiological event are the same with or without formal offsite radiological planning as required by NRC's planning standards. As stated in the hearing and in response to earlier FEMA concerns discussed in this document, the staff bases its conclusions on the acceptability of the proposed PEP EPZ sizing approach on whether the potential hazard supports the need for the robust measures and capabilities FEMA advocates. If the hazard is very low, the staff does not support requiring a robust response capability that exceeds the need for such a capability to protect public health and safety. If the application of TVA's dose criteria to the potential hazard indicates that a given PEP EPZ size is necessary to protect public health and safety, that PEP EPZ, and the resulting formal offsite radiological emergency planning as appropriate, would be imposed.