Lappert, Glenna

From: Andrukat, Dennis
Sent: Tuesday, April 13, 2021 5:20 PM
To: YOUNG, David
Cc: Coyne, Kevin; Mossman, Tim; Berrios, Ilka; AUSTGEN, Kati; NICHOL, Marcus; Valliere, Nanette
Subject: NRC RESPONSE | NEI's Question on the term "unmitigated" as used in proposed eligibility criterion § 73.55(a)(7)(i)(A)

Follow Up Flag: Follow up
Flag Status: Flagged

Hello David,

Thank you for allowing the NRC an opportunity to provide some clarification to your questions below.

NRC response:

The staff is providing its current thinking about the implementation of Eligibility Criterion A below, but believes further dialogue on this subject would be beneficial. We are interested in NEI's thoughts on this topic and note that issues related to the analyses of an unmitigated event have implications beyond this limited scope physical security rulemaking (e.g., in the Part 53 rulemaking).

Criterion A was meant to be the simplified approach to avoid analyzing against the DBT-initiated attack because even after assuming engineered features for decay heat removal are disabled and there are breaches in the structures, the offsite reference dose values are not exceeded. So this was a way to say, if you can meet this very high bar, it is proof that you meet Criterion A without having to go through the detailed analysis for a DBT-initiated attack. Essentially, an applicant would show that the loss of key safety functions would not result in a major release of radionuclides and therefore the design would not have a combination of failures from an attack that could result in consequences exceeding those in Criterion A.

The staff does not view "unmitigated" as meaning that the core inventory is placed on an open surface and instantaneously dispersed. "Unmitigated" means that engineered features are disabled (i.e., no longer available to perform their intended functions) and that there are no operator actions performed to mitigate a release, but an applicant can take credit for inherent physical or chemical characteristics.

The NRC believes that the definition for an unmitigated event from ANS 2.26 – 2004 (R2017) "Categorization Of Nuclear Facility Structures, Systems, And Components For Seismic Design" provides guidance consistent with the NRC view of Criterion A, with some caveats and additional explanation. ANS 2.26 states that "… unmitigated consequence analysis shall be performed considering only the inherent physical or chemical characteristics of the hazardous material and the energy sources for dispersing the material …" The staff expected that applicants proposing to meet Criterion A would perform the consequence analysis assuming something like a maximum hypothetical accident that would bound consequences from any event, including attack by a design basis threat (DBT) adversary. The engineered features (any structures, systems, and components) for decay heat removal are in place but assumed unavailable. Hence the need to assume "the loss of engineered systems for decay heat removal and possible breaches in structures." An applicant could credit inherent physical or chemical characteristics (e.g., conductive cooling to ground). The applicant would make these assumptions and then perform the consequence analysis assuming a bounding accident scenario. If the resulting doses were less than the criterion's dose reference values under these circumstances, there would be no need to further consider a

specific scenario involving a DBT-initiated attack because no combination of failures could get you to a place of exceeding the dose reference values.

Staff would like to have further discussions on this topic.

Cheers,
D

Dennis Andrukat
Rulemaking Project Manager
U.S. Nuclear Regulatory Commission
301.415.3561

From: YOUNG, David <dly@nei.org>
Sent: Monday, March 22, 2021 11:57 AM
To: Andrukat, Dennis <Dennis.Andrukat@nrc.gov>
Subject: [External_Sender] Question on the term "unmitigated" as used in proposed eligibility criterion § 73.55(a)(7)(i)(A)

Dennis,

Good morning.

As we discussed, I'm working on resolving the NRC staff comments on Draft B of NEI 20-05 and am unsure if there is a common understanding of the term "unmitigated" as it is used in proposed eligibility criterion § 73.55(a)(7)(i)(A). This uncertainty is impacting my ability to resolve some of the comments. The comment passages in question are shown below (with the key sentences in red text). The passages seem to suggest that a consequence analysis for eligibility criterion § 73.55(a)(7)(i)(A) would entail an assumption that the core inventory is placed on an open surface and instantaneously dispersed. While that is one reading of "unmitigated," it is also an unrealistic one and not the understanding we have.

We believe a technical analysis for eligibility criterion § 73.55(a)(7)(i)(A) should recognize that the facility is built with engineered safety and security features, all of which are part of the facility licensing basis. For the analysis, the DBT would attack the facility, as built and operated per licensing requirements, and do whatever actions they could do to accomplish radiological sabotage. "Unmitigated" here means there are no operator/manual actions performed in response to the attack. However, the engineered features (structures, systems and components) are there and the DBT must defeat those to achieve their objective. In addition, it should be permissible, with an adequate technical basis, to credit physical processes that reduce the offsite consequences (e.g., radioactive decay and plate out).

The text below shown in green appears to reflect a realistic approach to "unmitigated" but its difficult to understand exactly the commenter's point of view.

So the question is, what does the NRC staff intend "unmitigated" to mean in eligibility criterion § 73.55(a)(7)(i)(A)? If the response to this question includes understanding the qualifier "hypothetical," then the meaning of that term should be addressed as well.

Hopefully, this message clearly captured my question but feel free to contact me if you need additional information.

David Young | *Technical Advisor*

Nuclear Security and Incident Preparedness
Nuclear Energy Institute
(202) 739-8127

Comment No. 8

Section 2.3, Plant Configuration/Mode Changes

a. Clarify how the text which states "controls that will be implemented to ensure that the performance criterion will always be met," would or would not apply as guidance for the analyses of radiological consequences to meet the eligibility criterion set forth in § 73.55(a)(7)(i)(A), where the technical analysis must be for "a hypothetical, unmitigated event involving the loss of engineered systems for decay heat removal and possible breaches in physical structures surrounding the reactor, spent fuel, and other inventories of radioactive materials."

b. Provide additional guidance on how analysis would address multiple eligibility criteria. Explain the basis for the statement " [a]tentatively, a technical analysis could be directed at two (or all three) performance criteria whereby one performance criterion is met in one plant configuration or mode, and another criterion is met in a different configuration or mode," and describe how plant configurations or modes would be partitioned to meet certain criteria. For example, how would analysis of radiological consequences for the first eligibility criterion, unmitigated without considerations of plant features (i.e., engineered safety and security features) justify allowing for a facility recovery and mitigation strategy; and how would the analysis of radiological consequences for the first eligibility criterion be applicable to the two remaining eligibility criteria? Similarly, how would the analysis for the second eligibility criteria, § 73.55(a)(7)(i)(B), be applicable to the first and third eligibility criteria, § 73.55(a)(7)(i)(A) and (C). Finally, how would the analysis for the third eligibility criterion be applicable to the first and second criteria? The NRC staff is not saying such applicability is not possible; we are interested in hearing your thoughts on how an analysis specific to one criterion would be applicable to the other criteria.

Comment No. 13

a. Provide guidance on how the analysis would take into account the concept of 'physical protection elements' for each of the eligibility criteria. Provide the basis for the applicability of the safety/security interface management requirements (§ 73.58) for the analysis of radiological consequences for eligibility criteria, § 73.55(a)(7)(i)(A), where the analysis may be based on a bounding unmitigated event (i.e., no safety or security related features would need to be considered).

Comment No. 16

Section 3, Performance Criteria

Guidance should clarify certain terms appearing in § 73.55(a)(7)(i). Specifically, guidance should clarify the following:

1) What would be included in the term "unmitigated?" Does it include "response actions" or is it limited to only "engineered systems," which appear to be the same as "design provisions," or "plant features"? Define design provisions and plant features. Clarify if those are the same as engineered systems.

Comment No. 17

Section 3.1, Performance Criterion § 73.55(a)(7)(i)(A)

Guidance for analyses needed for eligibility criterion § 73.55(a)(7)(i)(A) should address the following:

a. Revise guidance to clarify how the analysis will demonstrate that the licensee or applicant will meet the criteria set forth in § 73.55(a)(7)(i)(A), which specifies that "[t]he radiological consequences from a hypothetical, unmitigated event involving the loss of engineered systems for decay heat removal and possible breaches in physical structures surrounding the reactor, spent fuel, and other inventories of radioactive materials result in offsite doses below the reference values defined in § 50.34(a)(1)(ii)(D)(1) & (2) and § 52.79(a)(1)(vi)(A)&(B) of this chapter." Specifically, an acceptable method for the analysis of radiological consequences must be based on analysis of unmitigated events, including accident scenarios initiated by a DBT adversary (i.e., **considering the DBT effects on radiological release, but unmitigated**), to determine if the postulated unmitigated radiological consequences remain below the referenced values defined § 50.34(a)(1)(ii)(D)(1) & (2) and § 52.79(a)(1)(vi)(A)&(B).

b. The guidance should describe the prerequisite analyses (e.g., target sets, physical protection system effectiveness, DBT effects on structures, systems, and components relied on for safety, source terms, etc.) that should be performed to support an adequate consequence analysis. For example, in an acceptable method of analysis for eligibility criterion § 73.55(a)(7)(i)(A), the final analysis determining a bounding unmitigated radiological consequence may not need prerequisite analyses that identify target sets and the assess physical protection system effectiveness, **but may need supporting analyses assessing DBT effects on structures, systems, and components relied on for preventing radiological release and DBT effects on release fractions for radiological source terms**. The supporting analysis or characterization of the DBT effects on source terms would be a pre-requisite for adequately performing analysis of the radiological consequence for eligibility criteria § 73.55(a)(7)(i)(A).

Comment No. 21

Section 4.1, General Instructions and Assumptions

a. Indicate that Assumption Item a, "[b]oth active and passive safety features may be considered in the analysis," is not applicable to eligibility criteria set forth in § 73.55(a)(7)(i)(A), where the bounding radiological consequence is based on unmitigated events.

b. Clarify if Assumption Item a applies to the first or third eligibility criterion. Clarify whether or not Assumption Item a would only need to be considered within the context of the ability to credit active/passive safety features not affected by scenarios associated with the DBT. Finally, clarify that in the application of Assumption Item a to the first eligibility criterion, consequences analyses are based on unmitigated events."

c. Provide guidance on the limitations for the assumption that "[t]he atmospheric release consists of aerosols or gasses (with radioactive decay and in-growth corrections as appropriate)." Specifically, indicate that an advanced reactor technology that could result in releases of dense gasses or reactive aerosols would require additional considerations or analysis. Also, address the applicability of this assumption to the analysis of radiological consequences for eligibility criteria set forth in § 73.55(a)(7)(i)(A), where one method of an initial analysis of unmitigated release may not consider or limit the assumption of radioactive decay due to deposition and plating out of aerosols or gases in containment or building structures (passive barriers). The guidance should also address the DBT

effects (e.g., large explosions, incendiary devices, large fires) on changes to release of aerosols and gases for the atmospheric release and the limitations of an assumption of energetic aerosol or gases dominant effect over radiation exposure for an analysis of radiological consequence for eligibility criteria set forth in § 73.55(a)(7)(i)(C).