NRC Comments on

NEI 20-05, "Methodological Approach and Considerations for a Technical Analysis to Demonstrate Compliance with the Performance Criteria of § 73.55(a)(7),"
Draft B (ADAMS Accession No.: ML20107D894)
February 2021

General Comments

Comment No.1

NEI 20-05 guidance should describe acceptable methods for performing analyses to meet the proposed eligibility criteria in Title 10 of the *Code of Federal Regulations* (CFR) Section 73.55(a)(7)(i), including differences from those currently used to show compliance with §§ 50.34(a)(1)(ii)(D) and 52.79(a)(1)(vi). The methods should address the assessment of the availability and reliability of safety features and other features for accident scenarios initiated by a design basis threat (DBT) adversary for analyses determining eligibility for criteria set forth in § 73.55(a)(7)(i)(B) and (C). The guidance should identify any supporting analyses or assessments that are needed to support performing the technical analyses for radiological consequences to demonstrate that the selected eligibility criterion is met, justifying the use of the alternatives described in § 73.55(s). The guidance should address the following matters.

a. Describe how methods in referenced guidance may be applied, including any limitations, in analyses for meeting the selected eligibility criterion identified in §73.55(a)(7)(i). Specifically, for references identified (e.g., Regulatory Guide (RG) 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," RG 1.226, "Flexible Mitigation Strategies for Beyond-Design-Basis Events," RG 5.81, "Target Set Identification and Development for Nuclear Power Reactors," NUREG 7145, "Nuclear Power Plant Security Assessment Guide"), where the guidance primarily addresses large LWRs and associated regulatory requirements, guidance should be provided on how to apply methods or approaches within the guidance to non-LWRs and SMRs, as appropriate.

b. Identify guidance that may be relevant in analyzing accident scenarios initiated by a DBT adversary that must account for the DBT characteristics, attributes, and capabilities established in § 73.1. Describe how to apply referenced guidance in determining DBT effects on safety and security features (e.g., passive and active barriers, structures, systems, and components, etc.) relied on to protect against a radiological release that would endanger the public.

   For example, the following references contain relevant information on how to perform assessments of the effects of explosives, weapons, and tools within the capabilities of the DBT for radiological sabotage on safety and/or security structures, systems, and components: NUREG 7201, "Characterizing Explosive Effects on Underground Structure," NUREG/CR-6190, "Protection Against Malevolent Use of Vehicle at Nuclear Power Plants: Vehicle Barrier System Siting Guidance for Blast Protection," U.S. Department of Energy, Sandia National Laboratories, Technology Transfer Manuals (not publicly available), SAND99-2168, "Access Delay Technology," SAND99-2486, "Explosive Protection," U.S. Department of Defense, "Structures to Resist the Effects of Accidental Explosions," United Facilities Criteria (UFC) 3-340-02, "Structures to Resist the Effects of Accidental

Explosions," and U.S. Department of Justice, National Institute of Justice (NIJ) Standard 0108.01, "Ballistic Resistant Protective Material," and SAND2008-5644, "Vital Area Identification for U.S. Regulatory Nuclear Power Reactor Licensees and New Reactor Applicants."

c. Reference guidance that may be used in performing safety analyses of licensing basis event sequences, including design basis events and accidents scenarios, for non-LWRs that may be applied, where the design basis events and accidents scenarios may be other than those associated with the risk of core damage, in determining how the selected eligibility criterion B or C in § 73.55(a)(7)(i) may be met. Guidance should identify limitations of methods or approaches described in referenced guidance and describe how such guidance may be adapted and further built upon to adequately analyze accident scenarios initiated by a DBT adversary.

   As an example, although accident scenarios initiated by a DBT adversary are not considered or assessed, information in the following references may be relevant to informing consequence analyses to demonstrate compliance with the selected eligibility criterion: NUREG-1368, "Preapplication Safety Evaluation Report for the Power Reactor Innovative Small Module (PRISM) Liquid-Metal Reactor," RG 1.233, "Guidance for a Technology-Inclusive, Risk-Informed, and Performance-Based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors," RG 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," RG 1.203, "Transient and Accident Analysis Methods," NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants"; ASME/ANS RA-S-1.4-2020, "Probabilistic Risk Assessment Standard for Advanced Non-Light Water Reactor Nuclear Power Plants," and other relevant technical guides.

d. Provide guidance on methods or approaches for determining reasonable source terms to adequately analyze radiological consequences for the required analyses to demonstrate that the selected eligibility criterion is met. For analyses of accident scenarios initiated by a DBT adversary, the guidance should describe how to account for effects of large explosions and fires on source terms, release fractions, respirable fractions, facility damage ratio, release pathways, and dispersions in postulating possible radiological releases and consequences. The guidance should include how to account for changes to radiological source terms, including respirable release fractions, where additional energy or motive forces are imparted from detonation, deflagration, and large fire in analysis of accident scenarios initiated by a DBT adversary. Accident conditions could also include exothermic chemical reactions (detonation, deflagration, salt and water interactions, metal fire) initiated by other means within the capabilities of the DBT adversary that may impact estimated release fractions of source material which could be aerosolized and respirable.

e. Reference guidance that may be used for estimating source terms in determining radiological consequences in accordance with requirements of § 50.34(a)(1)(ii)(D) and § 52.79(a)(1)(vi).

f. The guidance on analysis of radiological consequences should describe how and what site characteristics should be considered in determining possible offsite radiological consequences.

Specific Comments for Sections of NEI 20-05

Comment No. 2

Section 2.1, Threat Characteristics

Substitute “tactics” with “attributes” to accurately reflect information contained in RG 5.69. The following is suggested:

> “The threat to be considered in a technical analysis is the design basis threat of radiological sabotage as stated in § 73.1, “Purpose and scope,” and referred to as the DBT. Analysis elements involving consideration of specific DBT capabilities and attributes should be informed by the guidance in Regulatory Guide (RG) 5.69, “Guidance for the Application of Radiological Sabotage Design-Basis Threat in the Design, Development and Implementation of a Physical Security Program that Meets § 73.55. Requirements.”

Comment No. 3

Section 2.1, Threat Characteristics

Clarify that the alternate approach discussed in this section refers to the deployment of DBT characteristics, and it doesn’t mean changing those characteristics. Verify that this section is not suggesting the use of alternate characteristics in the DBT.

Comment No. 4

Section 2.1, Threat Characteristics

Reference guidance on how to characterize the DBT for the analysis of accident scenarios initiated by a DBT adversary to satisfy a selected eligibility criterion, including the following:

a. Reference guidance on how to analyze the DBT based on the characteristics, attributes, and capabilities established in § 73.1, conforming to guidance in RG 5.69, to assess the severity of damage to reactor structures, systems, and components and damage to special nuclear material for accident scenarios initiated by a DBT adversary .

b. Analysis performed should account for uncertainties in quantifying damage severity for accident scenarios initiated by a DBT adversary, and account for appropriately realistic and reasonably conservative parameters where needed using analytical modeling/simulation and empirical test data in assessing the DBT effects.

c. Reference available guidance on how to evaluate plant damage from the detonation of DBT vehicle bombs. Guidance should identify references for methods and analytical tools for the propagation of dynamic waves through air, crater formation, and propagation through structures from an explosive, blast-induced pressure wave, resulting in pressure, or impulse forces affecting important plant features. Describe analytical tools and methods that may be applied to evaluate and characterize the explosive effects on plant structures, systems, and components or features relied on to contain radionuclides based on explosions initiated by a DBT adversary.

d. Reference guidance for considering the cyber attacks for events initiated by a DBT adversary and how to assess possible attack vectors and established-protection from the DBT cyber threat. Describe method for systematically determining critical digital systems that may be affected and determining how a cyber attack can result in loss or alteration of digitally controlled safety or security functions. Describe method to assess cyber threats to determine whether cyber attacks could directly lead to radiological sabotage.

Comment No. 5

Section 2.2. Probabilistic Risk Assessment Information

The guidance on probabilistic risk assessment (PRA) in this section, and other sections, of NEI 20-05 should describe how to apply existing PRA guidance and any limitations for the application of this guidance to analyses of radiological consequence stemming from accident scenarios initiated by a DBT adversary . Describe how methods or approaches presented in existing guidance may be modified and built upon to perform assessments of non-LWRs and SMRs to meet each of the eligibility criteria. Consider the following:

a. RG 5.81 and NEI 13-05 provide high-level guidance and considerations for developing target sets using PRA information; however, neither provides detailed, step-by-step, "how to" guidance. Users of NEI 20-05 would benefit from detailed guidance on how to adapt a PRA developed to support the licensing safety case to the identification of target sets; the availability of such guidance would reduce the need for the NRC staff to conduct a detailed case-by-case review of each submittal under § 73.55(a)(7).

b. The guidance in RG 5.81 and NEI 13-05 is oriented towards LWRs (as evidenced by references to core damage events and large early releases). In contrast, PRAs for non-LWRs are expected to be Level 3 PRAs; core-damage frequency (CDF) will not be determined because it is not generally applicable to non-LWRs. Provide guidance addressing any limitations in current PRA guidance for analyzing LWR-SMRs and non-LWRs against eligibility criteria. For example:

   RG 1.200 provides technical characteristics and attributes of an acceptable PRA that addresses low power and shutdown (LPSD) modes of plant operation; however, there is no NRC-endorsed industry consensus standard that addresses LPSD PRA for LWRs. For the non-LWRs, the non-LWR PRA standard addresses all plant operating modes with the exceptions of LPSD internal fires; the NRC staff is currently developing regulatory guidance that could endorse the non-LWR PRA standard.

   RG 1.200 provides technical characteristics and attributes of an acceptable PRA that develops mechanistic source terms. The Level 1+Large Early Release Frequency (LERF) PRA standard for LWRs provides some requirements. A better source of requirements for LWR mechanistic source term development may be the Level 2 PRA standard; however, this standard has only been issued for trial use and pilot applications and has not been endorsed by the NRC. The non-LWR PRA standard provides detailed requirements for non-LWR mechanistic source term analyses.

c. Reference guidance addressing acceptable systematic assessment methods, such as fault trees, event trees, failure mode analysis, barrier analysis, etc., that may be applied to assess the effectiveness of the physical protection system to credit as “features” relied on and available for meeting eligibility criteria § 73.55(a)(7)(i)(B) and (C).

d. The NRC draft regulatory guidance (DG) being developed for potential endorsement of ASME/ANS RA-S-1.4-2020, "Probabilistic Risk Assessment Standard for Advanced Non-Light Water Reactor Nuclear Power Plants," and intends to issue for trial use in December 2021 and then revise based on lessons learned. How will NEI 20-05 incorporate this DG for performing analyses for non-LWRs.

Comment No. 6

Section 2.2. Probabilistic Risk Assessment Information

This section of NEI 20-05 describes methods for performing analyses to determine whether eligibility criteria can be met. Accordingly, this section of NEI 20-05 should discuss the following:

a. Acceptable methods should consider how to address operator manual actions and plant equipment needed to achieve prevention or mitigation of accidents, which may no longer be assumed reliable or available in events initiated by a DBT adversary. Consider how operator actions, including equipment unavailability in security events, would be addressed in analyzing accident sequences previously assumed to be not credible, precluded, or of very low likelihood. Consider how to address availability of equipment in evaluating events initiated by a DBT adversary (both to cause damage and to prevent the use of equipment and/or operators from performing recovery and mitigations) for eligibility criterion C.

b. The guidance should include methods that could be applied to address the variability of radiological source terms for spent fuel, stored in wet, dry, or other forms of spent fuel storage for evaluating accident scenarios, including that of spent fuel sabotage initiated by a DBT adversary.

Comment No. 7

Section 2.2. Probabilistic Risk Assessment Information

Guidance, in this section, and other sections, of NEI 20-05, should address how to build on PRA information to analyze accident scenarios initiated by a DBT adversary. Guidance on using PRA information to address security events as part of the technical analysis to demonstrate the eligibility criteria are met should at a minimum include consideration of the following:

a. Systematic evaluation of accident sequences and systems responses for accident scenarios initiated by a DBT adversary for all inventories of radioactive material, including scenarios not analyzed in the site and design specific PRA. Such evaluation should also consider concurrent accident sequences that may result from intentional failures of systems and resulting loss of safety functions.

b. Failures of passive and active structures, systems and components previously assumed to be reliable and available within the PRA.

c. Effects of explosive and mechanical breaching of structures, systems, and components on accident progression and severity of off-site radiological releases.

d. Effects of explosion, detonation and fires resulting from accidents initiated by a DBT adversary on radiological release and characteristics for transport in the environment.

e. Effects of large plant area fires and concurrent events initiated by a DBT adversary affecting multiple reactors and other sources of radioactive material on site.

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.

c. Guidance should indicate that the assessment of the radiological consequences should consider all modes of plant operations unless specified otherwise.

Comment No. 9

Section 2.4, Definition of Target Set and Relationship to Performance Criteria

a. Provide guidance on how analysis for each eligibility criterion would consider active and passive barriers required to contain radioactive material in identifying target sets where loss of functions provides pathways leading to radiological release that may endanger the

public health and safety (i.e., target sets for radiological sabotage and not for the purpose of designing a physical security program to prevent severe core damage for LWRs).

b. Provide guidance to clarify how target set achievability is applicable in the analysis of consequences for the eligibility criterion of § 73.55(a)(7)(i). Specifically, for eligibility criterion of § 73.55(a)(7)(i)(C), how does a licensee analyze the absence or presence of an onsite armed response force for "S*ecurity features that allow for facility recovery and mitigation strategy."* Provide guidance for how to determine what would be acceptable security features that would be included for analyzing facility recovery and mitigation strategy. Describe how uncertainty for assumptions or characterizations of DBT adversary decisions and actions would be addressed.

Comment No. 10

Section 2.5, Credit for Manual Action

a. Clarify the difference between "operator actions", as discussed in RG 5.81, and "manual action", as referenced in NEI 20-05. Clarify which facility staff may perform manual actions, and what is involved in those actions.

b. Provide guidance on what would be considered in crediting manual operator actions initiated from offsite locations. Where manual operator actions are initiated offsite for response of site engineered features, address how the credit of such actions would consider their availability or reliability due to the DBT adversary actions that may sabotage of systems and equipment at the site

c. Clarify guidance on how to credit manual operator actions by personnel responding from offsite. Provide the basis and additional guidance in Section 2.5, which indicates that "manual actions initiated remotely from an offsite location may also be credited."

d. Provide more detail on how DBT cyber attacks should be addressed in the reliability and availability analysis of safety and security engineered systems, structures, and components, for manual operator actions that may be initiated onsite or offsite.

Comment No. 11

Sections 2.5, Credit for Manual Actions, 2.10, Use of Security Modeling Tools, 3.2, Performance Criterion § 73.55(a)(7)(i)(B), and 3.3, Performance Criterion § 73.55(a)(7)(i)(C)

a. Guidance should describe how RG 5.81 may be applied in crediting or accounting for the use of mitigation equipment as target set equipment. In addition, describe how guidance in RG 5.76 (i.e., timing of DBT event or reasonable assurance of protection time (RAPT)) may be applied, or provide additional guidance on how to apply the timeline for assessing manual action for security response that enable mitigating radiological release for eligibility criterion § 73.55(a)(7)(i)(C).

Comment No. 12

Section 2.6, Credit for Law Enforcement Support

Guidance for considering law enforcement support should address the following:

a. Describe how law enforcement support would be considered in the analysis determining the radiological consequences for eligibility criteria set forth in § 73.55(a)(7)(i)(A) and (B).

b. Provide specific guidance on how a licensee could credit law enforcement support in the consequence analysis for eligibility criteria set forth in § 73.55(a)(7)(i)(C). Clarify what the standards or criteria would be for crediting law enforcement support (e.g., the reliability and availability of securing the plant from the DBT adversary, protecting operators to perform required tasks, or the combination of both) and identify the "engineered safety and security features" that would remain reliable and available for implementing recovery and mitigation strategy. Specific guidance should include how to consider the law enforcement capabilities, including response times, to enable operator actions during an ongoing DBT attack for accident scenarios initiated by a DBT adversary.

c. Provide guidance on how the analysis would take into account the concept of reasonable assurance of protection time (RAPT) for loss of barriers containing radiation hazards that would result in radiological sabotage (i.e., as defined in § 73.2). Guidance should describe what to consider in analysis where core damage does not necessarily bound the possible means of radiological sabotage. Where spent fuel sabotage must be considered, provide guidance on how to analyze or account for the protection time for release of radiation that would endanger operators performing recovery/mitigation actions and/or the public. Include guidance on what design and site-specific initial conditions (systems and/or operator-initiated safe shutdown, etc.) should be considered and would be acceptable for determining RAPT for non-LWRs and SMRs.

Comment No. 13

Section 2.7, Safety/Security Interface

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).

b. Guidance should address whether offsite licensee security and safety response resources and law enforcement support are included as physical protection elements when implementing the facility recovery and mitigation strategy for the eligibility criterion set forth in § 73.55(i)(a)(7)(i)(C). Also, provide guidance on how the analysis would account for the safety/security interface for recovery/mitigation operator responses in changing plant conditions (e.g., changes to plant environment (hazards) and equipment/system configurations) for onsite physical protection elements and offsite response in accident scenarios initiated by a DBT adversary.

c. Additional guidance should be provided on what portions of RG 5.74 referenced in the guidance may be applied in the consequences analysis for the eligibility criteria § 73.55(i)(a)(7)(i)(B) and (C).

Comment No. 14

Section 2.9, NUREG/CR-7145

a. Describe guidance within NUREG/CR-7145 that may be applied in assessing the effectiveness of the physical protection system design in supporting (i.e., input to) the technical analysis for eligibility criteria set forth in § 73.55(a)(7)(i)(B) and/or § 73.55(a)(7)(i)(C).

b. Provide guidance on how the limited DBT cyber attack guidance in NUREG/CR-7145 would be assessed in determining the effectiveness of the physical protection system design. Specifically, provide guidance on identifying critical digital assets, what cyber attack vectors should be considered, how to assess effectiveness of designed digital protection and layered protection-in-depth, how to assess physical controls for cyber security, and how to determine the impact of a cyber attack on safety and security systems to ensure that they can perform their intended functions. Describe how to integrate cyber security with physical security for the analysis of the effectiveness of a designed physical protection system to respond to the DBT in radiological consequence analyses determining the radiological consequences for eligibility criteria set forth in § 73.55(a)(7)(i)(B) and (C).

c. Describe how guidance within NUREG/CR-1745 can be used for non-LWRs, where the determination would be based on radiological sabotage, not based on preventing significant core damage (i.e., non-incipient, non-localized fuel melting and core disruption) for LWR in § 73.55(b)(3). The guidance should reference the methods found in Sandia Report, SAND2008-5644, “Vital Area Identification for U.S. Regulatory Nuclear Power Reactor Licensees and New Reactor Applicants,” for determining structures, systems, and components that are target sets for radiological sabotage.

Comment No. 15

Section 2.10, Use of Security Modelling Tools:

Guidance should address how modeling/simulation tools would be used in conducting consequence analyses.

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.

Clarify whether “plant features” include both passive and active engineered safety and security structures, systems and components for considering criteria § 73.55(a)(7)(i)(B) and (C). The descriptions for inherent reactor characteristics, should be clarified as to whether they would include the reactor fuel material composition, form, enrichment, and other properties that are not necessarily engineered structures, systems, components, or physical plant features.

2) The guidance should also address what would be included in “facility recovery and mitigation strategy implementation,” in § 73.55(a)(7)(i)(C).

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).

c. Guidance should describe whether methods of performing consequence analysis to demonstrate specific criteria set forth in § 73.55(a)(7)(i) should be worst-case/bounding or best estimate with consideration of uncertainty. The discussion in Section 3 seems to be describing a bounding analysis for Criterion A. Guidance for bounding accident dose analyses can be found in RG 1.183, except for source terms for SMRs and non-LWRs, which would require design-specific source terms rather than the assumptions on release to containment in RG 1.183. The consequence analysis may apply methods for bounding

accident dose analysis based on prescriptive accident scenarios that would bound both DBA and accident scenarios initiated by a DBT adversary. Accident scenario and source term information in RG 1.183 or other accident guidance documents may not be sufficient to bound consequence analysis for postulated facility damage ratios and release pathways for accident scenarios initiated by a DBT adversary.

Comment No. 18

Section 3.2, Performance Criterion § 73.55(a)(7)(i)(B)

a. Provide guidance on what prerequisite analyses (e.g., target sets; physical protection system effectiveness; DBT effects on structures, systems and components, including barriers, relied on for safety; and cauterization of source terms) should be performed in order to adequately analyze radiological consequence.

b. Provide guidance to clarify that prerequisite analysis for physical protection system effectiveness against the DBT (i.e., effectively assuring protection against radiological release, directly or indirectly) would be a prerequisite for the analysis of radiological consequences for the criterion of § 73.55(a)(7)(i)(B). Guidance should address analyses that would be needed to determine the DBT vehicle bombs' effects on structures, systems, and components relied on for safety and security and assess how the design of a physical protection system is capable of ensuring safety structures, systems, and components remain reliable and available for performing intended safety functions in determining radiological consequences.

c. Provide guidance clarifying that prerequisite analysis of plant physical system effectiveness (e.g., using guidance in NUREG/CR-1745, SAND 2007-5591, vulnerability assessment simulation/modeling tool, etc.) cannot consider any onsite security personnel response for Bullet No. 4. Also clarify whether automated or remotely controlled engineered security systems that perform security response functions, such as performing interdiction/neutralization and automatic placement of barriers, may be considered as "plant features" and included as "capability of security features" in the assessment of the plant physical protection system designed to protect against the DBT. Provide guidance to address the need to evaluate the availability and reliability of plant operators, assigned both safety and security responsibilities, to initiate engineered systems that would perform security functions as part of plant features in response to the DBT external assault.

d. Provide guidance on whether prerequisite analyses of DBT effects on source terms would be necessary where the analysis of the effectiveness of a physical protection system design, without onsite security response, demonstrates successful protection of identified target sets (i.e., do not compromise target sets). Also provide guidance on determining whether radiological consequences from the maximum credible design basis accident, may be bounding where the DBT cannot compromise structures, systems, and components protecting against radiological release (i.e., designed plant safety and security features are effective in performing intended functions).

e. Provide guidance on how an insider threat may be addressed by plant features. Specifically, describe how the assessment of the physical protection system would need to demonstrate the capability of safety and security features to mitigate the DBT insider threat. Also, describe programmatic and administrative controls (e.g., access

authorization, access control, fitness for duty, act.) along with plant physical security features needed to address the DBT's passive, active and violent active insider threat.

f. Provide clarification on what is meant or may be considered for the fourth bullet: "actions by the facility staff or performed remotely." Guidance should clarify operator actions for security functions, specifically whether actions can include any onsite security response to perform interdiction/neutralization.

g. Guidance should describe whether methods of performing consequence analysis to demonstrate specific criteria set forth in § 73.55(a)(7)(i) should be based on worst-case/bounding or best estimate with consideration of uncertainty, including differing assumptions. If a consequence assessment is done for Criterion B, it seems like it would require something similar to a severe accident assessment in Chapter 19 of the Standard Review Plan, NUREG-0800, and the analysis results would therefore be better stated as best estimate with uncertainty.

Comment No. 19

Section 3.3, Performance Criterion § 73.55(a)(7)(i)(C)

a. Revise eligibility criterion § 73.55(a)(7)(i)(C) to include the term "recovery" to accurately capture the proposed rule text:

> *Plant features include inherent reactor characteristics combined with engineered safety and security features that allow for facility recovery and mitigation strategy implementation if a target set is compromised, destroyed, or rendered nonfunctional, such that offsite radiological consequences are maintained below the reference values defined in § 50.34(a)(1)(ii)(D) and § 52.79(a)(1)(vi) of this chapter.*

b. Provide guidance clarifying that the term "recovery" for this criterion includes the response necessary to address accident scenarios initiated by a DBT adversary (e.g., offsite assistance by law enforcement, licensee, other responding organizations) to regain control of the facility from the adversary or establish security (i.e., recovery) that would be prerequisite to enable implementation of operator actions to address any damage to the facility to restore safety functions (e.g., mitigation of progression of accidents and/or radiological release).

c. The guidance should clarify that the security aspects for "recovery" of the facility would be assessed to determine whether mitigating operator actions could be implemented with reasonable assurance of reliability and availability using available onsite, not sabotaged equipment and/or equipment from offsite (i.e., the term "recovery" is necessary and consistent with how it is used in § 50.155, Mitigation of beyond-design-basis events).

d. Provide guidance on how to determine the shortest elapsed time from event initiation to onset of conditions that would produce a radiological release, including what things should be accounted for. Guidance should address whether the determination of the shortest elapsed time, not the quantity of radiological release, provides the bounding scenario that should be used to analyze the mitigation strategies that would be implemented.

e. Where the plant safety and security features are determined to be unsuccessful in protecting against radiological release for accident scenarios initiated by a DBT adversary, analysis should consider the elapsed times for these radiological release scenarios that exceed the referenced values defined in § 50.34(a)(1)(ii)(D) or § 52.79(a)(1)(vi). Provide guidance to integrate the analyses or assessments of (1) the progression of the accident, (2) the radiological release, (3) the offsite (licensee and/or law enforcement agency) security actions, and (4) the implementation of safety (onsite and offsite) mitigation actions from the beginning of accident to the completion of required recovery and mitigation actions.

f. Provide guidance on how licensee onsite security responses (including the response of offsite licensee personnel) and how credited offsite law enforcement security responses need to be evaluated for implementing safety mitigation actions. Include guidance on how to credit the use of onsite and/or offsite equipment within time available to recover or mitigate accident sequences for radiological releases.

g. Provide guidance on the need to identify whether recovery and mitigation strategies rely on operator actions, not limited to communications, for implementing mitigation strategies that would be reliable and available in accident scenarios initiated by a DBT adversary. Specifically, guidance should describe how to account for the need to protect required equipment to preclude adversary actions which may render it unavailable or unreliable in the analysis of credible operator actions.

h. Refer to RG 5.76, “Physical Protection Programs at Nuclear Power Reactors” for guidance related to the acceptable method for the application of “Reasonable Assurance of Protection Time” (RAPT) in performing analyses that determine the “shortest elapsed time” from event initiation to the onset of conditions that would produce a release with radiological consequences exceeding the cited reference values.

i. Provide additional guidance to expand on what “planned safety and security” mitigation strategies should be described. Specific guidance should address how analysis should address safety and security task times required for implementing mitigation strategies within the RAPT or shortest elapsed time (i.e., available time) on establishing reasonable assurance of mitigation of accident progression and/or minimizing radiological release.

j. Revise the guidance on strategy to indicate the following:

> A “strategy” ~~should be understood as~~ is a plan of action for maintaining or restoring ~~a~~ security and safety functions to recover and mitigate an accident and radiological release ~~that is challenged due to the loss of a target element or target se~~t. A strategy can be implemented by one or more methods. A “method” is a series of actions designed to implement a specific strategy.

k. Provide guidance on how the items listed on Page 7, 2nd Paragraph, should be considered in an analysis crediting recovery and mitigation strategies involving onsite/offsite responses. Specifically, how should an analysis determine the preplanning and administrative measures necessary for the reasonable assurance of reliability and availability of implementing strategies for recovery and mitigation. In addition, the guidance should describe what should be included for each of the items listed, such as types of offsite resources providers and what management measures are included for

change and configuration controls, maintenance, testing, and calibration of equipment (including those items staged onsite and offsite) for implementing mitigation strategies, and what personnel must be trained. Guidance should also address how procedures necessary for implementing strategies need to be maintained, updated, and available for each of the items identified.

Comment 20

Section 4 Consequence Analysis Guidelines

a. NEI 20-05 should indicate where a deterministic or probabilistic analysis of radiological consequences is required. In this context, the term "deterministic" refers to the methods used in design basis accident (DBA) analyses, and the term "probabilistic" refers to the methods used in a Level 3 PRA.

b. NEI 20-05 should indicate that RG 1.200 does not provide technical characteristics and attributes of an acceptable PRA that estimates offsite radiological consequences. One source of requirements for LWR radiological consequence analysis may be the Level 3 PRA standard; however, this standard has only been issued for trial use and pilot applications and has not been endorsed by the NRC. The non-LWR PRA standard provides detailed requirements for non-LWR radiological consequence analysis.

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. With respect to Assumption Item b, it is not clear to the staff that the atmospheric release pathway would necessarily be the risk-dominant release pathway for all scenarios initiated by a DBT adversary for all potential advanced reactor designs. Some designs (e.g., microreactors) are anticipated to justify an exclusion area and low population zone that would be much smaller than those for large LWRs, potentially even contained within the facility building walls. The consequence analysis guidance should be revised to state that consideration should be given to whether direct radiation exposure is a significant contributor to the dose to an individual estimated at the exclusion area boundary and at the outer boundary of the low population zone.

d. Indicate for Assumption Item c that an advanced reactor that could result in releases of dense gasses or reactive aerosols would require additional considerations or analysis.

e. Provide guidance to expand on Assumption Item c and Assumption Item d on how to address circumstances where release pathways and straight-line Gaussian plume segment-type atmospheric dispersion models require more complex atmospheric transport modeling analyses and modifications may not be suitable. Provide guidance for more complex atmospheric transport and dispersion modeling that may be needed from assumptions stated, including identifying references for regulatory and technical guidance on models and methods on how to perform such analyses.

f. For facilities that have small exclusion areas, the guidance for Assumption Item d should identify that the applicant should provide justification for the "other consequence analysis models" that would be acceptable for performing consequence analysis accounting for near field transport and dispersion of radiological hazards to aid in NRC review. Additional guidance could include references on available methods and consequences modeling, if available.

g. 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).

h. The guidance should indicate that "[t]he exposure duration ***must*** be the duration specified in §§ 50.34(a)(1)(ii)(D) and 52.79(a)(1)(vi)," as specified in § 73.55(a)(7)(i) and (ii). The duration time is explicitly specified in these regulation sections and required for calculating the reference value of dose."

i. Reference the guidance used to develop and screen DBT-specific event sequences and develop source term information. Specific guidance should be provided to address the challenges in developing event sequences and a mechanistic source term. Guidance should be sufficiently detailed for performing required analyses. Specific guidance should consider incorporating ASME/ANS RA-S-1.4-2020, Probabilistic Risk Assessment Standard for Advanced Non-LWR Nuclear Power Plant, once it is released and found acceptable for use or endorsed.

j. Add guidance in this section on treatment of uncertainties.

k. Guidance should address what specific dose result should be compared to dose referenced criteria, including how the analysis results and comparison to the dose criteria capture uncertainty.

Comment No. 22

Section 4.2, Meteorological Parameters

a. Provide additional guidance on the methodology basis/assumptions by identifying available guidance on the subject that could be used in determining the appropriate meteorological parameters for the site-specific analysis, and guidance available to address the subject of meteorological, atmospheric transport, and exposure parameters).

b. Guidance should reference additional existing guidance acceptable for meteorological data collections and atmospheric transport dispersion models for a range of meteorological data. The guidance should provide specifics for the application of site-specific meteorological data.

c. Guidance should clarify whether a conservative or representative meteorological model is recommended for the analyses, or, if there is a choice, considerations for making that choice. Guidance should establish the following for the analyses of eligibility criteria:

    1) If the analyses are worst-case or bounding RG 1.23, “Meteorological Monitoring Programs for Nuclear Power Plants,” and RG 1.145, “Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants,” provide meteorological data and atmospheric dispersion modeling guidance which are applicable to siting and safety accident doses. These RGs should be referenced. Assuming average meteorological transport and dispersion conditions would not be appropriate for a worst-case or bounding accident analysis.

    2) If the analyses are best-estimate with uncertainty, the guidance should clarify that at least one year of hourly meteorological data should be used for input to the modeling code to develop a range of atmospheric transport and dispersion assumptions and report the median dose while also presenting a range of dose results based on variability of weather conditions. See also RG 1.23 Rev 1, page 5.

d. The guidance should indicate that the use of median dispersion would not be conservative as it is typical to use 95th percentile meteorology in conservative calculations. Either clarify what justifications could be given for assumption of average expected atmospheric dispersion characteristics or delete the following sentence:

    “For example, with appropriate justification, site-specific meteorological information could be used to develop average expected atmospheric dispersion characteristics (i.e., 50th percentile meteorology for the site), which would then be employed in the analysis."

Comment No. 23

Section 4.4, Exposure Parameters

a. Provide reference to RG 1.183, “Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors,” with the following guidance:

    - If the analyses are more like a DBA dose analysis, exposure parameters from RG 1.183 should be used.

- If the analyses are more like a severe accident assessment, guidance should consider referencing the NRC DG being developed for potential endorsement of ASME/ANS RA-S-1.4-2020, "Probabilistic Risk Assessment Standard for Advanced Non-Light Water Reactor Nuclear Power Plants," and intends to issue for trial use in December 2021 and then revise based on lessons learned. How will NEI 20-05 incorporate this DG for performing analyses for non-LWRs.

- If the analyses include groundshine from deposited material for evaluating exposure, then wet and dry deposition would be included in the analyses. If not, then wet and dry deposition (referred to in Section 4.3) would not be modeled.

- Remove shielding factors from the parenthetical statement in Section 4.4, given that protective actions are not considered in the analysis.

- Specify that use of Federal Guidance Report (FGR)-11 and FGR-12 dose conversion factors is acceptable, but other dose factors may be justified.

b. Provide guidance to identify known specific dosimetry systems (dose conversion factors) that would be acceptable for use for exposure assessment of accidents.

Comment No. 24

Section 5, Update

a. Revise guidance to state the following:

> "The credited technical analysis should be updated to reflect changes to facility features or offsite support resources described in the analysis. The NRC should be notified of a change that affects compliance with an applicable eligibility criterion (e.g., an anticipated change will result in the eligibility criterion no longer being met)."

b. Guidance should provide examples of what would be included in the "offsite resource providers." Indicate whether they would include local law enforcement agencies along with other off-site response organizations (e.g., local, state, and federal agencies, local fire, hazard material and emergency medical response organizations, National SAFER Response Center, etc.).