Rulemaking: Alternative Physical Security Requirements for Advanced Reactors

Public Meeting/Workshop

August 17, 2021

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Agenda

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- Opening Remarks & Logistics
- NRC Presentation with NEI discussion
- Final Questions & Answers
- Closing Remarks

Purpose

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Purpose

- The purpose of this meeting is to discuss the draft implementation guidance document (NEI 20-05) related to proposed rulemaking on alternative physical security requirements for non-light water reactors and small modular reactors.

Logistics

- This is a "Comment-Gathering" meeting, which means that NRC staff meet directly with individuals to receive comments from participants on specific NRC decisions and actions to ensure that NRC staff understands their views and concerns.
- No regulatory decisions will be made at this meeting.

Background

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Rulemaking

- NRC is currently developing *Alternative Physical Security Requirements for Advanced Reactors* – proposed rule
- More information about this rulemaking and its supporting guidance can be found:
  - www.regualtions,gov under docket ID: NRC-2017-0227

Supporting Guidance

- Implementation guidance for this proposed rulemaking will consist of DG-5071, DG-1365, and may endorse NEI 20-05.
- The NRC staff is developing DG-1365 which focuses on the physical security alternatives and will serve as the vehicle for endorsing any external implementing guidance for this rulemaking.
- The NRC staff is developing DG-5071 (a revision to RG 5.81) which focuses on target sets.
- NEI is developing NEI 20-05 which focuses on the eligibility criteria contained in the proposed rulemaking.

Overview

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- Workshop – Eligibility Criteria
  - Discuss terminology
    - Ensure common understanding for specific terms and
    - Ensure consistency with target set requirements.
  - Discuss high level objectives of eligibility criterion A, B, and C
  - Ensure guidance provides clear and consistent approaches to implement criteria

Terminology

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- Identification of a target set is the determination of what needs to be analyzed.
  - This is not equivalent to determining if that target set is achievable.

- Target Set
  - For small modular reactors (SMRs) and non-light water reactors (LWRs), the minimum combination of equipment, operator actions, and/or structures that, if all are prevented from performing their intended safety function or prevented from being accomplished, barring extraordinary actions by plant operations, could result in a potentially significant radiological release.

Terminology

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- Identification of an achievable target set is the determination of what needs to be accounted for in the design of the physical protection program.

  - Achievable Target Set - A target set that, in the case of any DBT initiated event: (1) is within the capabilities of design basis threat; (2) results in an offsite release greater than dose reference values defined in 10 CFR 50.34(a)(1)(ii)(D)(1)&(2) and 52.79(a)(1)(vi)(A)&(B); and (3) results in a release that cannot be mitigated prior to offsite release.

NEI Guidance

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2.3 Target Sets

As used in this document:

- A "target set" is the minimum combination of equipment or operator actions which, if all are prevented from performing their intended safety function or prevented from being accomplished, would result in offsite doses greater than the reference values in §§ 50.34(a)(1)(ii)(D) and 52.79(a)(1)(vi).
- An "achievable target set" means a target set that is within the ability of the DBT to compromise, destroy, or render nonfunctional, absent actions by onsite armed responders.

The relationship of a target set to each of the three eligibility criteria presented in § 73.55(a)(7)(i) is shown below.

Eligibility Criterion	Facility Possesses a Target Set?	Facility Possesses an Achievable Target Set?	Mitigation Measures Exist for Loss of a Target Set?
§ 73.55(a)(7)(i)(A)	No	N/A	N/A
§ 73.55(a)(7)(i)(B)	Yes	No	N/A
§ 73.55(a)(7)(i)(C)	Yes	Yes	Yes

Target Set Requirements

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Target set requirements are needed to provide reasonable assurance that the design of the physical protection program accounts for the conditions that could result in radiological sabotage.

- 73.55(b)(4)
  - Provides the requirement for a site-specific analysis and identification of target sets to determine how they are accounted for in the physical protection program [to prevent offsite release]
- 73.55(f)(1)
  - Requires that a process exists to develop and identify target sets
- 73.55(f)(2)
  - Requires consideration of a cyber attack
- 73.55(f)(3)
  - Requires that all target set components and elements, regardless of location, are appropriately considered and analyzed (i.e., may be beyond probabilistic risk assessment)
- 73.55(f)(4)
  - Requires oversight for configuration or mode changes that may be distinct and different than normal power operation
- 73.55(m)
  - Requires review of elements of the physical protection program to address and identify changes to the threat environment, plant modifications, and digital upgrades to determine if target sets remain valid.

Terminology

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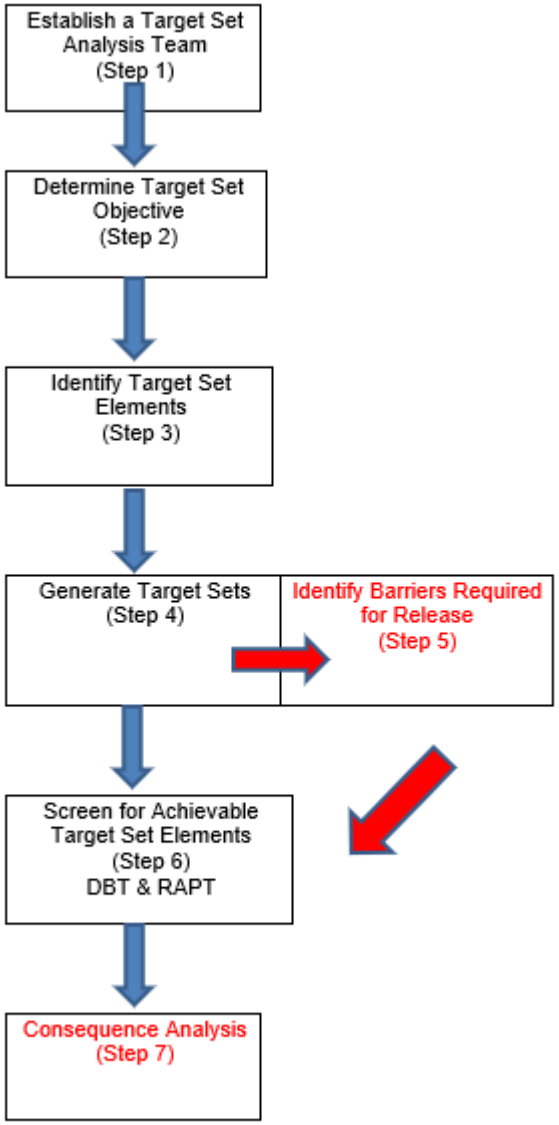
- The development of target sets does not consider the effectiveness of the licensee's physical protection program.
  - i.e., defense-in-depth, such as the insider mitigation program, is a way to protect elements; not identify what elements could result in offsite release when subject to the design basis threat (DBT) adversary.

Overview of Guidance to Identify Target Sets & Achievable Target Sets



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Eligibility Criteria

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- Eligibility Criterion A
  - Bounding safety analysis indicates no offsite release*.
    - DBT cannot exacerbate offsite consequences beyond the reference dose.
- Eligibility Criterion B
  - The DBT adversary cannot achieve a target set.
- Eligibility Criterion C
  - Regardless of damage caused by the DBT adversary, mitigation and recovery measures will prevent an offsite release*.
- No eligibility criteria met
  - Achievable target sets exist.

* offsite release greater than dose reference values defined in 50.34(a)(1)(ii)(D)(1)&(2) and 52.79(a)(1)(vi)(A)&(B)

Discussion

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- The next few slides provide a starting point for discussions.
  - The items listed for the eligibility criteria are not an exhaustive list.
  - It is the purpose of this meeting to develop/align on the expectations and guidance that are reasonable for the criteria.

Eligibility Criterion A

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- Current language: The radiological consequences from a hypothetical event
- Proposed Language: The radiological consequences from a DBT initiated event

Eligibility Criterion A

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Discussion for Eligibility Criterion A

- Assumes elements in the target set do not perform their intended function (to prevent offsite release greater than reference values*).
- Assumes a DBT-initiated event.

  - What can be credited?
    - » Inherent physical or chemical characteristics of the hazardous material (e.g., conductive cooling to the ground)
    - » Energy sources for dispersing the material

  - What should not be credited?
    - » Operator Actions, Mitigation & Recovery Measures, Security Programs

  - Analysis required?
    - » Analyze all DBT attributes, such as passive and active insider threats pursuant to 10 CFR 73.1(a)(1)(B).
    - » If it is determined that regardless of target set failure, there would be no offsite release*, then there are no achievable target sets.
    - » No further analysis is required.

* offsite release greater than dose reference values defined in 50.34(a)(1)(ii)(D)(1)&(2) and 52.79(a)(1)(vi)(A)&(B)

Eligibility Criterion B

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Discussion for Eligibility Criterion B

- The licensee needs specific structures or elements to prevent an offsite release greater than reference values*. Can the DBT adversary prevent these from performing their intended function?
  - What can be credited?
    - » Credible Operator Actions
    - » Passive Security Systems
  - What cannot be credited?
    - » Mitigation & Recovery Measures
    - » Security response or active security features (except for credible operator actions)
  - Analysis required?
    - » Analyze all DBT attributes, such as passive and active insider threats pursuant to 10 CFR 73.1(a)(1)(B).
    - » Consideration of DBT tactics that are most advantageous for the adversary
    - » If it is determined that the DBT adversary cannot achieve offsite release*, then there are no achievable target sets.
    - » No further analysis is required.

* offsite release greater than dose reference values defined in 50.34(a)(1)(ii)(D)(1)&(2) and 52.79(a)(1)(vi)(A)&(B)

Eligibility Criterion C

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Discussion for Eligibility Criterion C

- If an adversary compromises a target set; can the licensee mitigate/recover to prevent an offsite release greater than reference values*?
  - What can be credited?
    - » Credible Operator Actions, Active and Passive Security Features, Security Response, Mitigation and Recover Measures, Offsite Assistance
  - What cannot be credited?
  - How do we define when mitigation/recovery actions can occur?
  - How long does the licensee's physical protection program have to prevent offsite release greater than reference values*?
  - Analysis required?
    - » May or may not require consequence analysis
    - » Safety analysis may bound consequence analysis.
    - » If it does not, provide additional guidance and/or endorse Section 4.0 of NEI 20-05.

* offsite release greater than dose reference values defined in 50.34(a)(1)(ii)(D)(1)&(2) and 52.79(a)(1)(vi)(A)&(B)

Safety Analysis

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- If the licensee can demonstrate that safety analysis performed can bound the dose and release parameters of the DBT–initiated compromise of a target set, then no additional consequence analysis may be needed.
- If not, additional consequence analysis should be performed to ensure 73.55(b)(3) is met.
  - NEI Guidance
  - NRC Guidance

Target Sets

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Target Set 1 =	Elements A, B, C	+ Release Barrier/Structures:	G
Target Set 2 =	Elements A, D	+ Release Barrier /Structures :	H
Target Set 3 =	Element F	+ Release Barrier /Structures :	Not Required for Release

A primary objective of the physical protection program and protective strategy is to demonstrate the ability to protect target sets. While the assumed goal of the adversary is to disable a complete target set, the goal of the physical protection program and protective strategy is to ensure that at least one element of each target set remains in order to prevent the adversary from achieving its objective. This goal can be achieved by protecting each target set or by protecting a set of equipment derived from the target sets that includes one element from each target set.

- Protecting A and F will prevent an offsite release*.

* offsite release greater than dose reference values defined in 50.34(a)(1)(ii)(D)(1)&(2) and 52.79(a)(1)(vi)(A)&(B)

Discussion Topics: NEI Guidance

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- Target sets do exist for non-LWRs and SMRs and must be identified.
  - It's what is being analyzed… you can't analyze without identification.

- The performance objective to prevent an offsite dose above specific reference values should be used to determine if PROTECTION is REQUIRED to be accounted for in the design of the physical protection program, not if the target set should be IDENTIFIED, ANALYZED, AND DOCUMENTED.
  - Target set identification allows for NRC inspection to determine if target sets are complete and accurate for the duration of plant operation.
  - Avoids unintended relief from 10 CFR 73.55(f)(1)–(4) and 10 CFR 73.55(m) requirements.

Discussion Topics: NEI Guidance

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- Target set identification is needed to demonstrate compliance with 73.55(b)(3) and performance criteria A, B, and C.
  - Ensure the correct elements and combinations are being analyzed.

- Security Modeling Tools – May be effective with more guidance.

- Requires potentially unnecessary analysis.
  - NEI guidance specifies that consequence analysis is needed to support demonstration of compliance with 73.55(a)(7)(i)(A) and 73.55(a)(7)(i)(C).
  - Target set screening should occur to inform the decision regarding whether a consequence analysis, as described in NEI 20-05, Section 4.0, "Consequence Analysis Guidelines," is needed.

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Questions?

Thank You!

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Regulations.gov docket ID: NRC-2017-0227

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Additional Slides

RG 5.81 versus Eligibility Criteria

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- The process to identify target sets occurs regardless of eligibility criteria A, B, and C.
  - Licensees can potentially screen-out ALL target sets.
    - In screening out all target sets, the licensee would have identified that there are no achievable target sets.
    - All target sets would still be identified, analyzed, documented, and periodically reviewed.

NEI 20-05 Security Modeling Tools

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- Some security modeling tools are not accredited for all the functional areas necessary to assess the system effectiveness of an applicant or licensee's protective strategy (e.g., pathway analyses, combat simulation).
  - Software tools are complex applications, and NEI 20-05 should include more guidance than a reference to a high-level security considerations document like the SNL technical report.
- Except for identifying credible operation actions, target sets are identified independent of the response strategy.
- Should use licensee training data to model response force actions and performance.