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Should a Radiological Acceptance Criterion for Security Scenarios Be Applied Consistently To All ISFSIs? (Policy Issue 1)

Summary

Specific-license independent spent fuel storage installations (ISFSIs) are currently required under 10 CFR 73.51, "Requirements for the Physical Protection of Stored Spent Nuclear Fuel and High-level Radioactive Waste," to meet a 0.05-Sv (5-rem) dose limit for acts of radiological sabotage.¹ The regulations do not currently specify an explicit dose limit for security events for general-license ISFSIs. The staff has historically considered general licensees—which are required under 10 CFR 72.212, "Conditions of general license issued under § 72.210," to protect the spent fuel against the design basis threat (DBT) for radiological sabotage—as having the same level of protection required of specific licensees (i.e., all ISFSIs are protected to the same level). The staff has identified four options to consistently apply or not apply a dose limit for security events for all ISFSIs:

1. Retain the current dose limits and clarify the applicability of the ISFSI security requirements.
2. Eliminate the radiological dose criterion for all ISFSIs and apply the current protective strategy, which includes the security orders.
3. Eliminate the radiological dose criterion for all ISFSIs and require ISFSI licensees to prevent or impede attempted acts of radiological sabotage.
4. Apply the radiological dose criterion to all ISFSIs.
 - (a) The staff performs the assessments to determine whether the ISFSI is in compliance with the dose limit; or
 - (b) The licensee performs the assessments and demonstrates that the ISFSI is in compliance with the dose limit.

The staff recommends Option 4(b). This option is performance-based, and affords the ISFSI licensee the greatest amount of flexibility in meeting the regulations. This option is also consistent with the historic NRC regulatory model requiring licensees to demonstrate compliance, and minimizes licensee fee costs and the impact on staff resources. Additionally, this option provides consistency for the differing types of ISFSI licensees, and also provides a metric that is independent of future fuel loading characteristics and dry-cask storage designs.

¹ Currently, the dose criteria in Title 10 of the *Code of Federal Regulations* (CFR) 72.106, "Controlled Area of an ISFSI or MRS," are 0.05 Sievert (Sv) (5 rem) total effective dose equivalent; 0.15 Sv (15 rem) to the lens of the eye; or 0.5 Sv (50 rem) as either the sum of the deep dose equivalent and any organ dose, or the shallow dose equivalent to the skin or any extremity. For simplicity, these limits are hereinafter referred to as the 0.05-Sv (5-rem) dose limit.

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The licensee's assessments that their ISFSI was in compliance with the dose limits would be subject to review and/or inspection by the staff, as appropriate.

Under a dose-based acceptance criteria, some ISFSI licensees might have to revise their current protective strategy from a "detect, assess, and communicate" protective strategy to a "denial of task" protective strategy due to site-specific limitations (e.g., limited room to expand the distance between their ISFSI and their controlled area boundary). Consequently, if a constrained licensee cannot meet the dose limit through the use of passive security measures (e.g., the use of engineered security features or through changes to the ISFSI's design), one of the options available to the licensee would be to use active security measures (e.g., a "denial" protective strategy) to prevent a successful terrorist attack. However, the staff envisions that only very few licensees may be sufficiently constrained to be unable to meet the radiological dose criterion through the use of passive security measures and thus would be compelled to shift to a "denial of task" protective strategy.

Background

Section 73.51 currently requires specific-license ISFSIs to meet a 0.05-Sv (5-rem) dose limit for security events. The regulations do not currently specify an explicit dose limit for security events for general-license ISFSIs. The staff's historical perspective was that general-license ISFSIs, which are required to protect against the DBT for radiological sabotage, have the same level of protection as is required for specific-license ISFSIs.

Although the regulations do not require general-license ISFSIs to meet a 0.05-Sv (5-rem) dose limit for security events, since
the staff's practice has been to ensure that general-license ISFSIs, as well as specific-license ISFSIs, meet this criterion.

. Every ISFSI licensee was informally requested by staff to use a minimum distance to their controlled area

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boundary [REDACTED]. Every licensee acceded to the staff's informal request. The staff did not revisit the issue of a minimum [REDACTED] distance to the controlled area boundary [REDACTED], largely because efforts to do so were interrupted by the events of September 11, 2001. Consequently, the 0.05-Sv (5-rem) dose limit has been effectively applied to all ISFSI licensees [REDACTED] [REDACTED], including general licensees, by the staff informally requesting a minimum distance [REDACTED] to the controlled area boundary. However, no ISFSI licensee has been required to verify compliance with a 0.05-Sv (5-rem) dose limit.

Before [REDACTED], the staff believed that the consequences of security scenarios were bounded by the consequences resulting from (safety-related) design-basis accidents (DBAs), such that licensees meeting the 0.05-Sv (5-rem) dose limit for safety-related events, would also meet a 0.05-Sv (5-rem) dose limit for any security-related events invoked by 10 CFR 73.51(b)(3). [REDACTED] [REDACTED] the staff determined that licensees would comply with 10 CFR 73.51(b)(3) as long as their distance to the controlled area boundary was at least [REDACTED] [REDACTED]. [REDACTED] the staff's informal practice was to apply a minimum distance [REDACTED] [REDACTED] to the controlled area boundary for any new ISFSI licensee, thereby obviating the need for the licensee to verify compliance with a dose limit.

Discussion

Based upon [REDACTED] in SECY-06-0045,² the staff has gained new insights indicating that a minimum distance [REDACTED] to the controlled area boundary may no longer be bounding for all ISFSI licensees. The events of September 11, 2001, caused the staff to reevaluate both the threat environment and the previously studied scenarios. [REDACTED] [REDACTED] under SECY-06-0045 have shown that the staff should not necessarily rely [REDACTED] [REDACTED] to ensure that all ISFSI licensees meet the 0.05-Sv (5-rem) dose limit for security events.

As discussed in Enclosure 6 to this paper,³ the SECY-06-0045 security assessments were generic for different storage cask types (i.e., the same threats, meteorological conditions, and spent fuel characteristics were applied to each storage cask design in order to evaluate the consequences from the major cask designs currently in use). However, the resulting offsite dose from an ISFSI sabotage event depends on factors that would likely vary between sites, including: (a) the spent fuel characteristics (assembly design, burnup, and cooling time); (b) the spent fuel storage cask design and fuel loading; and (c) the site characteristics (the distance

² SECY-06-0045, "Results of Implementation of the Decisionmaking Framework for Materials and Research and Test Reactor Security Assessments," ADAMS No. ML060340452, dated March 1, 2006. [Non-public]

³ Enclosure 6, "Response to ISFSI Security Questions." [Non-public]

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their controlled area boundary. The staff may not recognize all the options available to the individual sites when performing the consequence assessments and recommending changes to the physical protection plans. Alternatively, the results of the staff's analysis may cause the licensee to consider different approaches for its physical protection plan or protective strategy. Such changes would then require the staff to reperform the consequence assessment. This process could be repeated several times as the licensee evaluates potential options, since the licensee would not have all the information developed during the staff evaluations.

If the staff were to start requiring site-specific ISFSI licensees to demonstrate compliance with the 0.05-Sv (5-rem) dose limit for security scenarios, the non-collocated, specific licensee would have to perform calculations that they were not previously required to perform. If the licensees perform the calculations, the staff would need to share sensitive and/or classified information such that the licensees would know which security scenarios to evaluate in order to demonstrate compliance with the dose limit. Because not all ISFSI licensees would be required to meet a dose limit, this would result in some, but not all, licensees having access to sensitive or classified information. Additionally, the staff would likely need to issue some regulatory guidance on an acceptable methodology for performing the dose assessments and would also need to review and/or inspect the licensee's evaluations.

This option has a few advantages. Under this option, the staff would not have to develop a technical basis for requiring the currently exempt licensees to meet 10 CFR 73.51(b)(3). Additionally, this option would not set a precedent for other licensees or licensed activities that currently do not have a dose limit for security scenarios, such as spent fuel transportation and sealed-source manufacturers and distributors.

However, this option has several disadvantages. Site-specific ISFSI licensees at power reactor sites that undergo decommissioning (i.e., shift from an operating to a possession-only license status) would not have consistent security requirements. Specifically, when the reactor holds a license to operate, the ISFSI is not required to meet a dose limit for security scenarios; but when the reactor licensee switches to a possession-only license, the ISFSI would then be required to meet a 0.05-Sv (5-rem) dose limit for specified security scenarios. An ISFSI in this situation (i.e., transferring from a collocated, specific licensee to a non-collocated, specific licensee) would have to evaluate whether the 0.05-Sv (5-rem) criterion is met before the reactor licensee switches from the operating to possession-only license and would likely have to supplement its physical protection plan.

Another disadvantage to this option is the continued lack of consistent security requirements for the different types of ISFSI licensees. Some future ISFSI sites may load combinations of fuel into casks that are not bounded by current analyses, and no radiological criterion would be in place to limit the potential dose resulting from a terrorist

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attack. For example, loading high-burnup fuel, loading fuel with shorter cooling times, or loading into new, as-of-now-unlicensed cask designs, are all factors that may increase the radiological consequences resulting from a terrorist attack, even if the threat environment remains unchanged.

General-license ISFSIs are exempted, via 10 CFR 72.212(b)(5)(v), from the requirements of the current 10 CFR 73.55(h)(4)(iii)(A), ("Requirements for Physical Protection of Licensed Activities in Nuclear Power Reactors Against Radiological Sabotage"), which requires licensees to "... prevent or impede attempted acts of radiological sabotage" Therefore, the current protective strategy for a general-license ISFSI does not require the licensee to prevent or impede attempted terrorist attacks from succeeding, but instead relies upon local law enforcement personnel to neutralize the adversaries after detection and assessment by the licensee. Additionally, specific-license ISFSIs subject to 10 CFR 73.51 are not required to design their physical protection systems to defend against the DBT for radiological sabotage, but are required to provide high assurance that the storage of spent fuel does not constitute an unreasonable risk, i.e., one that would exceed a 0.05-Sv (5-rem) dose limit. Accordingly, the staff's view is that establishment of a radiological criterion for security scenarios, will provide greater certainty that public health and safety is being protected with high assurance from malevolent attacks.

2. *Eliminate the radiological dose criterion for all ISFSIs and apply the current protective strategy, which includes the security orders.*

This option would require all ISFSI licensees to meet the same regulations. Although ISFSI licensees would still be required to meet the 0.05-Sv (5-rem) dose limit for (safety-related) DBAs the radiological criterion would be eliminated for specified security scenarios. All ISFSI licensees would have to continue to conform with the prescriptive requirements in the ISFSI security orders that would be made generically applicable in the proposed ISFSI security rulemaking.

This option has a few advantages. Under this option, there would be no added burden on the staff or the licensee to perform dose assessments, and this option has the advantage of limiting the dissemination of sensitive and/or classified information. This option also provides consistency in security requirements for all ISFSI licensees. Additionally, this option would not set a precedent for other licensees or licensed activities which currently do not have a dose limit for security scenarios, such as spent-fuel transportation and sealed-source manufacturers and distributors.

However, this option has several disadvantages. It would appear to reduce the security requirements for non-located, specific licensees, which could negatively impact public confidence. Additionally, this option may not be consistent with assumptions used in site-specific environmental impact statements (e.g., the assumption that a dose at the controlled area boundary resulting from a security scenario would not exceed a 0.05-Sv

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(5-rem) dose limit), and likely would result in significant licensee and staff effort in revisiting and updating the current environmental evaluation. Removing the dose limit for specified security scenarios may also affect emergency planning requirements such that non-collocated, specific ISFSIs may have to develop more comprehensive emergency plans. (See Policy Issue 2 for a fuller discussion of ISFSI emergency planning versus dose issues.)⁸

Another disadvantage associated with this option is that, as discussed in more detail under Option 1, some future ISFSI sites may load combinations of fuel into casks that are not bounded by current analyses, and no radiological criterion would be in place to limit the potential dose resulting from a terrorist attack. Essentially, if this option were adopted, the Commission would need to rely on the prescriptive security measures imposed on the licensees to ensure adequate protection of public health and safety. Significant staff effort would be required to evaluate the technical bases supporting the rulemaking to ensure that the prescriptive security measures are sufficient (without a dose limit requirement) to limit the potential consequences of a security-related event.

3. *Eliminate the radiological dose criterion for all ISFSIs and require ISFSI licensees to prevent or impede attempted acts of radiological sabotage.*

This option would require all ISFSI licensees to meet the same regulations. Although ISFSI licensees would still be required to meet the 0.05-Sv (5-rem) dose limit for (safety-related) DBAs, the radiological criterion would be eliminated for specified security scenarios. All ISFSI licensees would have to continue to conform with the prescriptive requirements in the ISFSI security orders. Furthermore, ISFSI licensees would have to prevent or impede attempted acts of radiological sabotage, such that a release of radioactive material would not occur. For example, use of a below ground ISFSI would "prevent" certain acts of radiological sabotage from succeeding

This option has a few advantages. It would provide assurance that ISFSI licensees would adequately protect the public from terrorist attacks, and would also provide a consistent protective strategy for all ISFSI licensees. Additionally, this option ensures consistency between both ISFSI- and reactor-protective strategies. Because ISFSI licensees would not be required to perform dose assessments, this option limits the need to disseminate sensitive and/or classified information to a broader group of licensees and/or cask certificate holders (i.e., cask vendors).

However, this option has several disadvantages. Perhaps the greatest disadvantage is the backfit and significant cost burden placed on ISFSI licensees to upgrade their protective strategies so that they are able to prevent or impede attempted acts of radiological sabotage (i.e., implementing a "denial of task" protective strategy). This

⁸ Enclosure 2, "Should the Dose Limits for Acts of Radiological Sabotage (If Any Are Established under Policy Issue 1) Be the Same as the Dose Limits for Design-basis Accidents?"

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option represents a significant departure from previous Commission requirements for ISFSI licensees. Additionally, this option may be precedent-setting for other non-reactor facilities and/or activities, such as spent fuel transportation (i.e., there are currently no regulations requiring transporters of spent fuel to impede terrorist attacks). The public may have a difficult time understanding the Commission's rationale on why such drastically different protective strategies are placed on spent nuclear fuel in dry storage casks, but not on spent nuclear fuel in transportation packages, which in some cases is the same identical physical storage cask/transportation package. Finally, this option would require the staff to dedicate a significant amount of resources toward developing the technical basis for increasing the ISFSI protective strategy.

4. *Apply the radiological dose criterion to all ISFSIs.*

(a) *Staff performs the assessments to determine whether the ISFSI is in compliance with the dose limit.*

This option keeps the current protective strategy, and includes making the ISFSI security orders generically applicable. Under this option, all ISFSI licensees would be required to meet the same regulations. ISFSI licensees would be required to meet the 0.05-Sv (5-rem) dose limit for (safety-related) DBAs, as well as for specified security scenarios; however, the staff would perform the assessments to ensure compliance with the dose limit. All ISFSI licensees would have to continue to conform with the prescriptive requirements in the ISFSI security orders, which would be made generically applicable to all ISFSI licensees.

This option has several advantages. Perhaps the greatest advantage is that, by bringing consistency to the regulations, the Commission would have assurance that all ISFSI licensees would be protecting to the same level, regardless of ISFSI license type and location. This option does not need to assume that defending against the DBT provides the same level of protection as a 0.05-Sv (5-rem) dose limit for security scenarios, since the dose limit would be applied to all ISFSI licensees.

This option also has the advantage of not directly burdening the licensees to perform the dose consequence assessments. However, the staff would have to perform the dose consequence assessments as a fee-based activity. The staff would then work with the individual licensees to ensure that their protective strategy adequately ensures that no release with a potential for exceeding the dose limit would occur as a result of the postulated terrorist attack. Since the licensees would not need security scenario and/or threat information to perform calculations, this option limits the dissemination of such sensitive and/or classified information.

However, this option also has several disadvantages. Even though this option is performance-based, the staff is performing the dose assessments to determine whether the licensee is in compliance. Consequently, licensees may not have the same amount

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of flexibility or understanding of the potential options in meeting the regulations as if they performed the analysis themselves. For example, if a licensee were performing the dose calculation to determine compliance, the licensee may find a more efficient and less costly means of meeting the regulations other than by increasing the distance to their controlled area boundary. The staff may not recognize all the options available to the individual sites when performing the consequence assessments. Alternatively, a licensee (because of limitations specific to its site) may be compelled to implement a "denial of task" protective strategy. Furthermore, the results of staff's analysis may cause the licensee to consider different approaches for its physical protection plan or protective strategy, which would then require the staff to reperform the consequence assessment (all of which would be subject to additional fees). This process could be repeated several times as the licensee evaluates potential options, since the licensee would not have all the information developed during the staff's assessment.

Additionally, this option is also disadvantageous because it requires the staff, rather than the ISFSI licensee, to demonstrate compliance with the regulations. Thus, this option would require significant staff effort. As discussed earlier in this enclosure, the staff has demonstrated compliance for ISFSI licensees in the past, because of exigent circumstances (i.e., information security concerns). However, this approach was a departure from the historic NRC regulatory model in which the licensee is responsible for demonstrating compliance with the regulations and the staff is responsible for verifying that the licensee's demonstration of compliance is adequate. Fundamentally, the staff's view is that the burden of proof for meeting the regulations ultimately rests on the licensee.

Finally, this option would likely impose a backfit on those ISFSI licensees that are not currently specifically required to meet a radiological criterion for security scenarios.

(b) Licensee performs the assessments and demonstrates that the ISFSI is in compliance with the dose limit.

This option would require all ISFSI licensees to meet the same regulations. ISFSI licensees would be required to demonstrate compliance with the 0.05-Sv (5-rem) dose limit for (safety-related) DBAs, as well as for specified security scenarios. All ISFSI licensees would have to continue to conform with the prescriptive requirements in the orders, which would be made generically applicable to all ISFSI licensees.

This option has several advantages. As in Option 4(a) above, the greatest advantage would be that, by bringing consistency to the regulations, the Commission would have assurance that all ISFSI licensees would be protected to the same level, regardless of license type and location. This option does not need to assume that defending against the DBT for radiological sabotage provides the same level of protection as a 0.05-Sv (5-rem) dose limit for security scenarios.

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This option has the added advantage of placing the responsibility for demonstrating compliance on the ISFSI licensees, rather than on the staff. This approach would be consistent with the historic NRC regulatory model of the licensee demonstrating compliance, and it has the further advantage of providing flexibility to the licensee in meeting the regulations. A licensee would be able to assess how to best meet the dose limit at its site (e.g., through limiting the spent fuel characteristics, extending the distance to the controlled area boundary, etc.). Additionally, the staff would expend much fewer resources because the staff would not have to perform multiple analyses per site, if the licensees choose to evaluate various protective strategy options.

Despite its advantages, this option is not without its disadvantages. As with Option 4(a), use of dose-based limits could compel licensee with limitations specific to their site to adopt a "denial of task" protective strategy. Additionally, because the burden would be on the licensees to accomplish the assessments, the staff would be required to provide licensees with the necessary Safeguards Information and/or classified information to perform the assessments. Therefore, the staff would have to establish controls to limit the dissemination of sensitive and/or classified information pertaining to the specified security scenarios. Additionally, the staff recognizes that some licensees may turn to contractors (e.g., the cask certificate holder (i.e., vendor)) to perform these consequence analyses, thus broadening the potential range of dissemination of this information. It is likely, however, that the staff could develop sufficient guidance at the Safeguards Information level for the licensees' dose assessment calculations. As in safety reviews, the staff may receive a wide variety of methodologies for demonstrating compliance, which may complicate and/or lengthen staff reviews.

Finally, similar to Option 4(a), this option would likely impose a backfit on those ISFSI licensees that are currently not specifically required to meet a radiological criterion for security scenarios.

Issue 1 Recommendation

The staff recommends Option 4(b), "Apply the radiological dose criterion to all ISFSIs. The licensee performs the assessments and demonstrates that the ISFSI is in compliance with the dose limit." This option is performance-based, and affords the ISFSI licensee the greatest amount of flexibility in meeting the regulations. This option is consistent with the historic NRC regulatory model requiring licensees to demonstrate compliance, and minimizes licensee fee costs and the impact on staff resources. Additionally, this option provides consistency for the differing types of ISFSI licensees, and also provides a metric that is independent of future fuel loading characteristics and dry-cask storage designs. The licensee's assessments would be subject to review and/or inspection by the staff, as appropriate.

The staff notes that for all options discussed above—which all have a dose-based acceptance criteria—some ISFSIs might have to revise their current protective strategy from a "detect, assess, and communicate" protective strategy to a "denial of task" protective strategy. The

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reason for this change is that some licensees (due to limitations at their specific site, e.g., the inability to expand the distance between the ISFSI and the controlled area boundary) may be constrained in their options to meet the radiological dose criterion; and thus may be compelled to shift to a "denial of task" protective strategy. The staff would propose requiring ISFSI licensees that choose to use of a "denial of task" protective strategy to provide their applicable security plans to the NRC for prior review and approval.