CREDITING LAW ENFORCEMENT RESPONSE IN REGULATION OF U.S. NUCLEAR POWER REACTOR SECURITY PROGRAMS

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The U.S. Nuclear Regulatory Commission (NRC) is exploring ways to credit a broader set of operator actions, including the use of Diverse and Flexible Mitigation Capability (FLEX) equipment, and credit response by local, State, and Federal law enforcement[1] in the regulation of power reactor security programs. The NRC staff recently sent a paper to the NRC Commission with recommendations for crediting law enforcement response within the security inspection program and committed to explore the feasibility of allowing changes to licensees' physical protection strategies based on law enforcement response. Since sending the paper[2] to the Commission in 2019, staff has continued to interact with stakeholders and evaluate the merit of an industry proposal[3] to establish a security bounding time (SBT). Staff is currently developing recommendations for Commission consideration on whether and how to incorporate an SBT concept into the U.S. regulatory framework for operating reactors.

The SBT is defined as the elapsed amount of time following recognition of an attack that considers the licensee's physical protection program and a holistic approach, after which further adversary interference is precluded and additional actions that may prevent radiological sabotage can be taken by licensees. NRC's power reactor licensees are required to establish, maintain, and implement a physical protection program that is designed to protect against the design basis threat (DBT) of radiological sabotage. By establishing a security bounding time, and crediting law enforcement response, a licensee could add operator actions and components, including FLEX equipment, to target sets and potentially revise their protective strategies. The paper discusses the NRC staff's exploration of the feasibility of establishing an SBT.

1. INTRODUCTION

The purpose of this paper is to discuss the responsibility and role that State-sponsored law enforcement and other applicable governmental agencies in the United States (U.S.) play in support of nuclear power reactor physical protection programs and the impact of that support in the regulatory process. Additionally, this paper will discuss ongoing U.S. Nuclear Regulatory Commission (NRC) efforts associated with State and local law enforcement support of nuclear power reactors.

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[1] State sponsored law enforcement in the U.S. consists of resources allocated at the local, State and Federal levels. Here after these various levels of law enforcement support shall be referred to as State sponsored.

[2] SECY-19-0055 "Crediting Options for Operator Actions and Law Enforcement Response," dated May 23, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19080A274).

[3] NEI white paper, "Determination of a Site-Specific Security Bounding Time," dated January 10, 2019 (ML19078A127 (publicly available), ML19010A375 and ML19010A374 (non-publicly available)) is referenced in SECY-19-0055. NEI provided three additional revisions to the white paper, dated October 2018 (ML18323A395 and ML18323A394 (non-publicly available)), June 2019 (ML19317E747 (non-publicly available)), and September 2019 (ML19267A020 (publicly available), ML19263D886 (non-publicly available)), to address topics that the NRC staff presented in SECY-19-0055.

2. BACKGROUND

Nuclear Security Recommendations of Physical Protection of Nuclear Material and Nuclear Facilities [INFCRC/225/Revision 5] provides guidance related to the role of the State for the assignment of physical protection responsibilities. Specifically, Section 3. Elements of a State's Physical Protection Regime for Nuclear Material and Nuclear Facilities, part 3.8., states in part,

> "*The State should clearly define and assign physical protection responsibilities within all levels of involved governmental entities including response forces and for operators and, if appropriate, carriers."*…It further identifies the responsibilities of the license holder; *"The responsibilities for implementing the various elements of physical protection within a State should be clearly identified. The State should ensure that the prime responsibility for the implementation of physical protection of nuclear material or facilities rests with the holders of the relevant licenses or of other authorizing documents (e.g., operators or shippers)."*

In the U.S., power reactor licensees are required to document and maintain the process used to develop and identify target sets. NRC's Regulatory Guide 5.81 defines a target set as 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 likely result in radiological sabotage" (i.e., significant core damage or spent fuel sabotage). The reactor industry has developed a proposal that would allow target sets to be changed by crediting operator actions, law enforcement response, and use of "FLEX" equipment.

In 2018, the U.S. Department of Defense (DOD) and the NRC established a Memorandum of Agreement (MOA) for temporary support for incidents at nuclear power plant facilities. The MOA outlines DOD support in transporting "Diverse and Flexible Coping Strategies,[4]" or "FLEX" equipment from the nearest airfield or staging area to an affected nuclear power plant, should the local infrastructure be so damaged as to not allow other means to be successful. FLEX strategies consist of an initial phase using installed plant equipment and resources; a transition phase using onsite, in some cases portable, FLEX equipment; and a final phase obtaining sufficient offsite resources to sustain the strategy indefinitely. The intent of FLEX equipment is to maintain long-term core and spent fuel cooling and containment integrity. Most FLEX equipment requires an operator action to align equipment for use. Under today's regulatory framework; FLEX equipment that could be utilized to prevent radiological sabotage may be included in licensee target sets[5]. However, licensees typically do not identify or include all FLEX equipment as target set elements. When specific FLEX equipment is identified as a target set element, it is analysed in the physical protection program. Including FLEX equipment in a target set means that an adversary would need to render the FLEX equipment unavailable to operators, in addition to eliminating each of the other elements of the target set, to achieve radiological sabotage. The MOA also includes a provision for annual coordination meetings to review lessons learned, plans, support requirements, and current procedures.

The NRC's regulations currently address law enforcement by requiring licensees to maintain agreements with law enforcement agencies "to include estimated [emphasis added] response times and capabilities," but only "[t]o the extent practicable" (10 CFR 73.55(k)(9)). These law enforcement agencies are outside the NRC's regulatory jurisdiction. However, the NRC Commission recently directed staff in SRM-SECY-17-0100[6] to credit the response by local, State, and Federal law enforcement in the NRC's security inspection program. The Commission directed that the staff "should take into consideration that the NRC has already codified its recognition of 'the reality that in an actual emergency, state and local government officials will exercise their best efforts to protect the health and safety of the public' in 10 CFR 50.47(c)(1)(iii)(B)." In the context of emergency planning, 10 CFR 50.47(c)(1)(iii)(B) reflects a presumption that state and local responders will

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[4] In response to the lessons learned at Fukushima and the NRC's Near-Term Task Force Recommendations, the NRC issued Order, Enforcement Action (EA) 12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML 12054A735). The NRC later endorsed the industry proposed safety strategy described in NEI 12-06, "Diverse and Flexible Coping Strategies," or "FLEX" (ADAMS Accession No. ML 12221A205).

[5] Title 10 of the *Code of Federal Regulations* (10 CFR) paragraph 73.55(f), "Target Sets," requires licensees to document and maintain the process used to develop and identify target sets. The NRC issued RG 5.81 to provide guidance to licensees for target set development. RG 5.81 defines a target set as 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 likely result in radiological sabotage" (i.e., significant core damage or spent fuel sabotage).

[6] SRM-SECY-17-0100 "Security Baseline Inspection Program Assessment Results and Recommendations for Program Efficiencies," (Adams Accession No. ML17240A360).

generally follow a licensee emergency plan. This paper further discusses the NRC staff's efforts to address this Commission direction.

3. DISCUSSION

3.1. Discussion of State sponsored resources for integrated response at nuclear power reactors

International partners, in many cases, have designated electric generation at nuclear power reactors as critical infrastructure. Additionally, these international partners have allocated on-site State resources for the protection of nuclear power reactors. In the U.S., nuclear power reactors have also been designated as critical infrastructure and are supported by governmental resources. However, in the U.S. program, many of the State backed resources are applied before an attack begins through efforts to identify those potential threats and thwart those threats before they go operational and conduct an attack on a nuclear power reactor. Through our international partnerships, the U.S. has observed how a wider range of State allocated resources, such as providing the physical security at their nuclear reactors, are applied throughout the entire evolution of protection at nuclear facilities. This model of full integration has significant merits and very much interests the staff of the NRC. One of the challenges faced by U.S. nuclear power reactors with respect to this practice is that they have been required through regulations to be responsible for protecting the facility against the design basis threat (DBT). Specifically, in accordance with NRC's security regulations, licensee physical protection programs must "[e]nsure that the capabilities to detect, assess, interdict, and neutralize threats up to and including [the DBT], are maintained at all times." The licensee must "establish and maintain" the personnel who implement the physical protection program, including the armed responders required to interdict and neutralize the DBT, and ensure that these personnel are trained and qualified in accordance with NRC requirements. The regulations address law enforcement by requiring licensees to maintain agreements with law enforcement agencies "to include *estimated* [emphasis added] response times and capabilities," but only "[t]o the extent practicable". However, law enforcement agencies are outside the NRC's regulatory jurisdiction and the NRC lacks the authority to compel these agencies to enter into agreements with licensees or to respond within specific timelines. This lack of jurisdictional authority places certain limitations from a regulatory perspective and poses challenges from an industry perspective during integration. Since the NRC only regulates the license holder and does not regulate or have the ability to control law enforcement agencies, it understands there is a certain amount of inherent risk assumed when allowing licensees to consider the impacts of integrated response in their physical protection programs.

3.2. Discussion of ongoing NRC efforts associated with crediting State-sponsored law enforcement support at nuclear power reactors

In 2017, the Commission directed the NRC staff to include recommendations for providing credit for response by local, State[7], and Federal law enforcement in the security inspection program. Specifically, the Commission directed that the staff "should take into consideration that the NRC has already codified its recognition of 'the reality that in an actual emergency, state and local government officials will exercise their best efforts to protect the health and safety of the public.' This represented a change from how the NRC had historically implemented regulatory requirements for security. The staff had not previously considered that licensees could rely on offsite law enforcement response as part of their physical protection program and subsequently part of their licensing basis beyond the requirement for law enforcement liaison.

Additionally, prior to the Commission direction in 2017, industry representatives had engaged the NRC relative to establishing a time limit whereby licensees would be responsible for defending the site against the DBT adversary with the assistance of off-site support in the form of law enforcement response. Specifically, the industry's proposal was to develop a path toward establishing an SBT. The industry SBT was defined as the elapsed time, measured from recognition of an attack, required for the licensee to preclude adversary interference sufficiently, with the assistance of law enforcement, to allow performance of operator actions that can prevent significant core damage or spent fuel sabotage. In its review, the NRC identified several regulatory issues associated with the proposed SBT methodology. Those issues include 1) the NRC or licensee lacks the authority to compel law enforcement agencies to enter into agreements with licensees to respond within specific timelines, and 2) licensees remain responsible for protecting the facility against the DBT "at all times." Accordingly, the NRC staff believes utilization of law enforcement as the sole basis for establishing an SBT lacks the appropriate level of risk considerations and poses regulatory concerns.

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[7] The term State is used in this context as an element of government sponsored assets and or activities.

Taking these points into consideration, the NRC staff began an evaluation utilizing risk-informed decision-making to determine how law enforcement response could reasonably be integrated within the physical protection program at nuclear power reactors under the existing regulatory framework. The evaluation included public meetings, soliciting feedback from internal and external stakeholders, including members of the public, law enforcement community, industry representatives, Federal partners and NRC subject matter experts. NRC staff also reviewed data from its baseline inspection program that provides for a risk-informed approach utilizing a suite of inspection procedures that total more than 270 hours of annualized inspection activity at each reactor site. This evaluation led staff to determine that licensee physical protection programs exhibit a high-level of assurance related to their ability to thwart the DBT adversary. Furthermore, the review supported the finding that during the performance-based force-on-force inspections[8], licensees successfully implement its protective strategy and defend against the DBT adversary at a success rate of better than 97%. Staff also recognized that in an actual event, at some point in time, additional resources, such as law enforcement, would be available to the licensee.

Following this evaluation, NRC staff concluded that it agrees, in part, with the concept described in the industry SBT proposal. Both NRC staff and industry agree that, if available, law enforcement will make their best efforts to respond at some point in time to ensure protection of public health and safety. Additionally, NRC staff agree that law enforcement should be considered as a factor when determining an SBT; however, NRC staff believe that law enforcement cannot be used as the sole basis for the establishment of an SBT as it was presented in the industry proposal. NRC staff have determined that the application of an SBT, that allows a licensee to make changes to their protective strategy, requires consideration of the totality of conditions, both safety and security, available for licensee use. There are many layers of defense in place at operating power reactors that should be recognized. Specifically, the SBT should be developed within a framework that demonstrates the licensees' physical protection capabilities associated with the following inspectable elements: (1) law enforcement response and adversary capabilities, (2) licensee strategies verified through performance-based testing, (3) FLEX equipment, (4) operator actions, (5) recall of licensee security personnel, and (6) calculations associated with irreversible time to core damage (TTCD). The staff have identified a list of criteria (hereinafter referred to as "generic criteria") for these elements that must be included in a licensee's discussion of the application of an SBT. The generic criteria layout a framework that considers each layer of defense that can support the application of an SBT. This concept allows licensees to individualize their site's assets to support establishment of an SBT.

3.2.1. Proposed description of the Generic Criteria.

Generic Criteria:

Criterion 1: The recognition that law enforcement support will be available at some point during an attack to assist the licensee. Licensees plans and procedures for these actions should be documented to describe the site's coordination with the various levels of law enforcement response.

Criterion 2: The recognition that licensee physical protection programs are robust programs providing tested protective measures against the DBT. Specifically, licensee protective strategies when inspected during the baseline security inspection program, including NRC performance-based Force-on-Force (FOF) inspections, demonstrate reasonable assurance for protection against the DBT. Additionally, it is reasonable to assume that the DBT adversary capability will decrease over time due to personnel attrition and resource depletion.

Criterion 3: The recognition that under the current regulatory framework FLEX equipment is a required part of the licensee safety program. It is already provided some protective measures, and some FLEX equipment that could be utilized to prevent radiological sabotage may be included in licensee target sets today. Licensees' plans to utilize FLEX equipment to maintain long-term core, spent fuel cooling, and containment integrity, required operator actions to align equipment for use, and the ability to conduct these actions should be documented. It should be noted that FLEX equipment is not applicable in all scenarios, it is often located outside the protected area, and that the need to utilize FLEX equipment assumes some level of adversary success has occurred.

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[8] A performance test of the physical protection system the uses designated trained personnel in the role of an adversary force to simulate and attack consistent with the threat of the design basis threat. NRC Force-on-Force inspections consist of mock attacks and do not represent an actual failure of a licensee's protective strategy, as these exercises are conducted under simulated circumstances.

Criterion 4: The recognition that licensees have trained and qualified operators who can perform actions, such as realigning systems and equipment to ensure continued cooling capability. Licensees' should have written procedures for conducting these actions. It should be noted that operators performing these functions could be targeted during movement or while attempting to complete the necessary actions.

Criterion 5: The recognition that licensees have processes in place to recall off-duty security and operations personnel. Licensees' plans and procedures demonstrating these capabilities and recalled timelines, as applicable, should be documented. It should be noted that timelines for recalled off-duty personnel could extend significantly beyond the initiation of the DBT event and they may not have access to firearms, ammunition, and protective equipment outside the protected area which would inhibit their ability to respond.

Criterion 6: The documentation of time to core damage (TTCD) (time to significant core damage) calculations for target sets utilizing a sound methodology. There is no prescribed methodology to determine a standardized TTCD, and the staff has observed variations in these calculations across industry. It should be noted that these variations could result in inconsistent identification of target sets across industry.

4. CONCLUSION

Staff has concluded that by utilizing the six generic criteria which are already part of the regulatory framework, a sound, risk-informed basis could be developed to support the SBT concept for operating nuclear reactors in the U.S. Unlike the industry methodology which only considered law enforcement support as the sole basis for establishing an SBT, the staff's methodology considers the many attributes of a licensee's program to include support from State sponsored law enforcement resources in a more holistic manner. Moreover, the staff recognizes that considerations of the impact for utilization of additional resources and applying an SBT is not to place the burden of defending the site on law enforcement but to acknowledge that the licensees will have the ability to utilize additional resources for support, such as law enforcement or recalled off-duty site personnel, while continuing to maintain physical protection of their sites. The NRC staff also recognizes there are risks associated with the concepts provided in the NRC SBT methodology; however, the staff believe that the concept accepts a reasonable level of risk. The NRC has evaluated what can go wrong, how likely is it, and what the consequences would be. The NRC staff then determined how they could manage those risks to reasonably assure that the physical protection program can provide defense against the DBT event.

The NRC staff believes that an SBT that considers the holistic capabilities and assets available to licensees is both risk-informed and provides reasonable assurance that licensees can maintain physical protection of their sites at all times while providing protection against the DBT of radiological sabotage. In conclusion, the regulatory environment that has been established over the last decade is being evaluated to determine if new approaches are more realistic and provide for a framework that supports the advancement of consistent policies and guidance that give NRC staff confidence in accepting well-managed risks in our decision-making without compromising the NRC's mission. Continuing to move forward as a transformational regulator will provide opportunities to maximize use of resources in a dynamic environment while ensuring continued protection of public health and safety.