

# **HOSTILE ACTION-BASED DRILL AND EXERCISE LESSONS INFORM EMERGENCY PREPAREDNESS FOR SECURITY PROGRAM EFFECTIVENESS**

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## **Abstract**

Emergency preparedness (EP) ensures that protective actions can and will be taken in the event of a significant radiological release. Radiological emergency planning is informed by the types of events that could result in a significant radiological release. This includes security-related events such as sabotage and hostile action against a commercial nuclear power plant (NPP). Based on observations and lessons learned from over a decade of hostile action-based drills and exercises, pre-arranged coordination among Federal, state, and local governments, and local law enforcement agencies remains an essential component for implementation of a radiological emergency response plan for a commercial NPP in an unknown security state. The paper highlights the effectiveness of key aspects of the hostile action-based drill and exercise program such as scenario development and communication. The paper also identifies lessons learned on effective integration of security and EP.

## 1. INTRODUCTION

The U.S. Nuclear Regulatory Commission (NRC) emphasizes the integration of safety, security, and emergency preparedness (EP) as the basis for its primary mission of protecting public health and safety. EP is an integral part of the NRC's regulatory framework and is regarded as a pillar and final level of protection within the NRC's defense-in-depth philosophy for nuclear safety and security.[1] Integration is achieved by considering the unique characteristics of events that could lead to a significant radiological release resulting in the need to take protective actions. Because of this, the NRC and the regulated, commercial NPP industry strive to incorporate lessons learned and operational experiences to ensure that the EP program is resilient and agile enough to respond to a variety of initiating events, both safety and security related. Among these events is hostile action, which the NRC defines as, "An act toward an NPP or its personnel that includes the use of violent force to destroy equipment, take hostages, and/or intimidate the licensee to achieve an end." [2]

In 2011, the NRC amended its EP regulations for commercial NPPs to enhance the integration of EP and security.[3] Since 2013, each U.S. commercial NPP licensee has had at least one opportunity to demonstrate that its emergency response organization (ERO) can respond to hostile action-based (HAB) or security-related initiating events on site. These demonstrations are made during the required (once every eight (8) years) HAB exercises. Over the last decade, regulatory and offsite-response organization (ORO) evaluators and inspectors have noted some trends and lessons learned that highlight the need for consistent, pre-arranged coordination by licensees with Federal, state, local governments and OROs, particularly law enforcement agencies, for adequate response to security-related initiating events. Additionally, inspectors and evaluators have noted the need for continued communications, more realistic exercise scenarios, and overall familiarity between the site personnel and offsite responders unaccustomed to being at a commercial nuclear facility.

The following sections provide a brief history of the events leading to the integration of HAB enhancements into radiological EP, and capture the observations and lessons learned from the first cycle of HAB exercises and observations from the exercises completed to date in the second 8-year cycle. This is followed by conclusions drawn from the NRC's lessons learned and observations as considerations for the international nuclear safety and security community going forward.

## 2. HOSTILE ACTION-BASED ENHANCEMENTS TO EMERGENCY PREPAREDNESS

### 2.1. Importance of drills and exercises to emergency preparedness

The regulations in Chapter 10 of the U.S. Code of Federal Regulations (10 CFR) Section 50.47(b) and requirements of Appendix E, require that operators (licensees) of commercial NPPs be capable of implementing adequate measures to protect public health and safety in the event of a radiological emergency.[3] Licensees are required to develop and maintain emergency plans that meet NRC requirements. The NRC then inspects those plans and evaluates how the licensees carry them out during drills and exercises that simulate actual emergencies.

The NRC evaluates an NPP ERO's ability to implement the emergency plan to protect the public during a full-scale exercise conducted at least once every two years. These exercises help the ERO to maintain emergency responder skills, and to identify and correct weaknesses in their exercise performance and EP programs. Evaluators from the Federal Emergency Management Agency (FEMA) examine performance of OROs during full-participation exercises and serve as the NRC's Federal partner in ensuring reasonable assurance is maintained for public health and safety. Between exercises, licensees conduct additional drills that are evaluated by the NRC.

The NRC began requiring annual full-scale exercises in the 1980s as a result of the accident at the Three Mile Island Nuclear Generating Station in 1979 and as part of the subsequent EP rules.[4] These annual exercises involved the licensee ERO and the OROs. In order for FEMA to evaluate the capabilities of the OROs, the licensees had to conduct annual exercises with scenarios that included a release that would impact the offsite community. This led to very unrealistic conditions in exercises in which each year a licensee would have an exercise that resulted in a General Emergency (GE) with a release. As a result, the NRC's EP program evolved to account for a variety of accident scenarios beyond just the progression to a GE with a release. By the mid-1980s, the NRC had extended the required exercise cycle to every two years, which allowed the licensees to run drills to develop and exercise skills in responding to accidents in the off years.

### 2.2. Hostile action-based drills and exercises

The September 11, 2001, terrorist attacks on the United States (9/11) prompted yet another review of the NRC's EP program, specifically of the EP planning basis [5] and the licensees' abilities to respond to a security-initiated event. The NRC's review concluded that the planning basis for EP remained valid, and that security-related events were at least partly addressed, but also identified additional enhancements for hostile action events. These enhancements included emergency action levels for hostile action, ERO augmentation at an alternative offsite facility, coordination with local law enforcement agencies (LLEAs), protection of onsite personnel, and challenging drills and exercises. The latter enhancement includes a HAB exercise to ensure that the licensees can effectively implement the emergency plan in an unknown security state on site. These enhancements were made final with issuance of the 2011 EP Rule [3], which required varying the content of exercise scenarios to avoid preconditioning of responders and to provide the licensee opportunities to demonstrate the key skills and capabilities necessary to respond to the following scenario elements: (1) hostile action directed at the NPP site; (2) no radiological release or an unplanned minimal radiological release that does not require public protective actions; (3) an initial classification of, or rapid escalation to, a Site Area Emergency or GE; (4) implementation of strategies, procedures, and guidance in response to beyond-design basis external events; and (5) integration of offsite resources with onsite response. The NRC has released additional guidance on the purpose and performance of these exercises. [6, 7]

### 2.3. HAB exercises vs. Force-on-Force exercises

The HAB exercises and evaluations are a post-9/11 enhancement to ensure that licensees provide measures in their emergency plans to address situations in which hostile actions are taken against the facility. The intent of the HAB exercise is to demonstrate the ability to implement the emergency response plan in an unknown security state. It is important to note that the HAB is not an evaluation of the adequacy or implementation of the licensee's security plan and does not require a demonstration of the tactical ability of site security and/or offsite law enforcement to regain control of occupied areas. The security event in a HAB exercise sets the stage for the ERO response; as such, the evaluation is on the adequacy of the ERO implementation of the emergency plan.

In contrast, Force on Force (FOF)<sup>1</sup> exercises and inspections have been regularly carried out at operating nuclear power plants and Category 1 fuel cycle facilities since 1991 and are designed to assess a licensee's physical protection measures to defend against the NRC's design basis threat (DBT). The DBT is a description of the type, composition, and capabilities of an adversary against which a security plan is designed to protect. The NRC uses its DBT<sup>2</sup> as a basis for designing safeguards systems to protect against acts of radiological sabotage, the theft of special nuclear material or both. Prior to 9/11, licensees were required to conduct FOF exercises every eight (8) years in addition to the regular baseline security inspections. After the attacks of 9/11, the NRC strengthened its security program by requiring commercial NPP licensees to conduct FOF exercises every three (3) years against a revised DBT that reflected the new threat environment.[8] This redesigned security program, which was implemented by 2004, was captured by the U.S. Congress in the Energy Policy Act of 2005<sup>3</sup> and became law in the subsequent Amendment to the U.S. Atomic Energy Act of 1954.[9]

Furthermore, and in contrast to the FOF exercise, the initiating hostile-action event for a HAB exercise typically goes beyond the DBT. It should be an event that requires the licensee to resolve the security event and mitigate any damage caused by the attack with a coordinated response from operations, security, the ERO, OROs, and Federal, state, and local law enforcement agencies. [10] In contrast, NRC security regulations do not require licensee security plans to address potential hostile attacks beyond the DBT. As a result, use of an attack beyond the DBT ensures the ERO exercises' coordination of the implementation of the emergency plan with the security plan and support from OROs.

### 3. LESSONS LEARNED FROM HAB EXERCISES

#### 3.1. Observations from the first cycle of HAB exercises (2013-2021)

A joint FEMA/NRC HAB Lessons Learned Working Group gathered lessons early in the first cycle of HAB exercises (2013-2021) and published a report of their findings.[11] The lessons learned report reflects observations of NRC and FEMA staff, as well as stakeholders, including licensees, the nuclear industry, Federal, state, and local OROs and LLEAs. The working group concluded that licensee planning, scheduling, and logistical arrangements with OROs—and especially LLEAs—enhanced the coordination and effectiveness of the HAB response. Similarly, there were some HAB exercises in which the lack of appropriate planning and scheduling with the OROs and LLEAs presented challenges.

The working group cited further observations concerning the scenario development, exercise implementation, HAB training, Incident Command Post (ICP) coordination and support, and communications as areas for continued focus. For example, concerning HAB scenario development:

“Onsite security and offsite law enforcement involvement in the exercise scenario development is needed to ensure a realistic and accurate expected response and interface with operations and the ERO. This involvement is needed to ensure a scenario is developed in which security and or offsite law enforcement perform tasks that support the scenario performance and are reflective of what would be an actual security and or offsite law enforcement response. With an intentional attack by an adversary force, security and offsite law enforcement need to ensure their role includes response actions to an HAB event.” [11]

The working group found that the simulation of the security response had a negative impact on the exercise play/implementation:

“At times, scenarios did not reflect Security's support as it would be for an actual event; And that

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<sup>1</sup> Force on Force Exercises, their evaluations, and inspections, make up a significant portion of the NRC's comprehensive physical security program to prevent radiological sabotage under NRC regulations [10].

<sup>2</sup> The NRC periodically reassesses the DBT and makes revisions as necessary. Certain nuclear facility licensees are required to defend against the DBT.

<sup>3</sup> The U.S. Congressional Energy Policy Act of 2005 (Public Law 109-58) is a statute which was passed by the United States Congress on July 29, 2005, and signed into law on August 8, 2005. Section 651(a)(1) of the Energy Policy Act of 2005 added section 170D to the Atomic Energy Act of 1954, as amended. [9]

[p]ost-attack personnel accountability and movement procedures [needed] greater detail or clarification for how the movement of ERO personnel (i.e. damage control teams, field monitoring teams, etc.) will be coordinated and tracked in a post-attack environment.” [11]

Additionally, the working group included a recommendation for additional HAB training, noting that the control room staff would benefit from additional training and familiarity with security procedures. The report also recommends that going forward, items such as new HAB procedures, checklists, and new equipment, should be identified and integrated into a licensee’s EP program to support development of skills and knowledge management. [11]

The report included a discussion and examples concerning the ICP; in particular, the coordination with the offsite first responders to mitigate the onsite events. The working group observed and noted that although the short duration of a HAB exercise necessitates the pre-staging of personnel and equipment, it can also decrease the effectiveness of the ERO’s response in a real HAB event—a challenge going forward:

“...making personnel, equipment, and other resources available before they would realistically be available during an actual event could constrain the overall effectiveness of the training. Realism is necessary to properly demonstrate decision making skills that would be of substantial impact during an actual event, and needed program enhancements could go unrealized if available resources and associated timelines are not realistically incorporated.” [11]

The final key observation discussed in the report focuses on issues associated with communications and identified them as challenges for the future:

“Coordination of communications between multiple facilities and using a commonly understood language...Coordination of communications and establishing a commonly understood language for those communications is a routine challenge in the conduct of all EP drills and exercises. The addition of the ICP and alternate [Emergency Response Facilities] ERFs created additional groups through which communications need to be coordinated. Additional challenges were also presented by the need for all players to use universally understood terminology.” [11]

### **3.2. Observations from the second cycle of HAB exercises (2021-2023)**

As previously stated, the purpose of the HAB exercise is to provide an opportunity for EROs to demonstrate their ability to implement the emergency plan in an unknown security state on site. The NRC EP inspectors evaluate licensee HAB exercises to determine if the site ERO demonstrates reasonable assurance of their capability to effectively implement the emergency plan to adequately protect public health and safety in the event of a HAB event. Additional input and observations from EP inspectors from the NRC’s Regional Offices as well as Headquarters EP inspection staff were sought in an effort to capture lessons learned thus far from the HAB exercises conducted between 2021 and 2023. In addition to identifying areas that continue to be challenges, the NRC staff observed positive trends that lend to maintaining an ERO that is effective and flexible enough to respond to various initiating events.

Although the second 8-year cycle of the NRC required HAB exercises is not yet complete, observations from the HAB exercises between 2021 and 2023 reinforce that pre-arranged coordination by Federal, state, and local OROs, and LLEAs remains an essential component for implementation of an emergency response plan in an unknown security state on site. Furthermore, advanced coordination—such as early engagement on scenario development, planning, scheduling, and logistic coordination—enhanced the demonstration and effectiveness of the HAB response and as such, is identified as a best practice for supporting the EP program. The NRC EP inspection staff observed additional aspects of the most recent HAB exercises that indicate continued challenges going forward and that may warrant early and additional regulatory engagement to ensure they are addressed. These challenges are communications in a security event, the need for realism in the scenario development, and site access for security event responders.

#### *3.2.1. Communication in a security event*

NRC staff observed continued challenges with communication during HAB exercises. In many instances, the ERO staff were not communicating the site status to the LLEAs. When the ERO was communicating specific site status information, many LLEAs and security responders demonstrated great deficit in their understanding of the radiological makeup of a commercial NPP. Furthermore, NRC staff observed continued challenges with the ERO's ability to follow specific security protocols when communicating information over broadcast channels.

A majority of the communication challenges both with the ERO staff and the security responders could be addressed with more frequent interactions such as additional security-related drills outside the 8-year regulated cycle. NRC staff have recommended licensees address the lessons learned from the 8-year HAB exercise in off-year mini drills, tabletops, or planning sessions to ensure the EP/security communication and coordination infrastructure is maintained.

### *3.2.2. Realistic scenarios*

NRC staff observed some licensees using HAB scenarios that included multiple simulated responses for the security staff and LLEAs. In addition to a lack of realism in the scenario, it also resulted in failed opportunities for the site ERO staff to interact with the actual OROs and LLEAs for a response to an event in unknown security state on site.

To address this, the NRC has begun providing early feedback on scenario development and encouraging scenarios that offer multiple opportunities for the site security and ERO to interact with the LLEAs and other OROs. NRC staff recommends scenarios that challenge both the ERO and the security responders and encourages licensee not to develop "win-win" scenarios. The NRC staff also recommends that licensees engage OROs and LLEAs for input on the scenario to permit them to identify aspects that allow appropriate and adequate play/participation in the exercise.

### *3.2.3. Site access for offsite response organizations and local law enforcement*

NRC staff also observed continued challenges associated with providing site access to the LLEAs as well as access to ERFs and the ICP. The issues with site access were mainly due to the site security's unfamiliarity with the responders during a HAB event.

This challenge, like the others, can be overcome by having more interaction with the LLEAs and other OROs on a more frequent basis other than on an 8-year exercise cycle. Licensees as well as LLEAs and OROs should engage in continued and periodic familiarization tours and training, as invited to participate by the licensee. This would allow opportunities to maintain and improve the HAB related relationships.

## 4. RADIOLOGICAL PROTECTION AND EVENTS BEYOND THE DESIGN BASIS THREAT/ARMED CONFLICT

NRC regulations employ a graded approach to EP such that response capabilities are commensurate with the radiological risk. Similarly, the NRC employs a graded approach to security of nuclear and radioactive material, such that greater security is required for material of higher risk. Furthermore, certain NRC regulated facilities are responsible for protecting against the DBTs of theft and diversion and radiological sabotage, which involve postulated attacks by non-state actors. As discussed in the paper, the HAB exercises and evaluations are a post-9/11 requirement by the NRC to ensure that the licensees provide additional measures in their emergency preparedness procedures to address situations where hostile or security-related actions were taken against the commercial NPP. Specifically, licensees are evaluated on the ERO's ability to implement the emergency plan in a beyond DBT security event. However, for postulated attacks by adversaries with capabilities exceeding the DBT (e.g., those carried out by a Nation State), NRC licensees would rely on support from state and Federal resources. The NRC does not require licensees to maintain specific response plans and capabilities to protect against events beyond the DBT, and such planning is not a prerequisite to have reasonable assurance of adequate protection of public health and safety.[12] The responsibility and capability to prevent, mitigate, and respond to attacks beyond the DBT, such as armed conflict led by a Nation State, reside with other U.S. agencies and within the national defense system, as opposed to being the role of the regulator (NRC) or the regulated community.

The NRC first addressed the issue of radiological protection and armed conflict in 1967 in its “Enemy of the State” rule, which was promulgated amid concerns that Cuba might launch attacks against nuclear power plants in Florida. In that rule, the NRC made it clear that privately-owned nuclear facilities were not responsible for defending against attacks that typically could only be carried out by foreign military organizations, concluding that the responsibility for responding to such attacks remained with the nation’s military and other government-coordinated responses.[13] Following the 9/11 attacks, the NRC again addressed the issue of events beyond the DBT that were carried out by enemies of the state, either foreign or domestic. The NRC maintained that response to security related events beyond the DBT remained the responsibility of the nation and not individual licensees.[12] In its 2009 Aircraft Impact Assessment Rule, the NRC further stipulated that although its licensees were not required to neutralize a threat from an aircraft, the licensee was responsible for identifying and incorporating design features and functional capabilities to show that, with reduced use of operator action, the reactor core remained cooled, or the containment remained intact; and that spent fuel cooling or spent fuel pool integrity was maintained.[14] The NRC required the licensee and its ERO to be prepared to mitigate any radiological consequences of an explosion caused by such an attack but reiterated the responsibility for responding to the security attack beyond the DBT remained with the national response and defense system.

As a result, neither the NRC nor its licensees are required to be prepared to respond to events beyond the DBT. The responsibility for such a response is shared by the broader U.S. government and defense system which is further described in the U.S. National Response Framework (NRF) that is maintained by the U.S. Department of Homeland Security (DHS) and FEMA. The NRF is a guide to how the U.S. responds to all types of disasters and emergencies (including an attack on a nuclear power plant) and is built on scalable, flexible, and adaptable concepts of incident management, dividing critical infrastructure into 16 key sectors, including commercial nuclear.[15] Examples of key agencies that have a role or responsibility for responding to an attack on a commercial NPP under the NRF include the DHS, FEMA, and the Federal Bureau of Investigation. The U.S. agencies that comprise the NRF meet and engage on a regular basis to ensure effective communication and coordination in the event of an incident.

In the U.S., preparedness is also a nationally shared responsibility, and roles and responsibilities are clearly defined in the National Planning Framework (NPF), which is also maintained by DHS and FEMA.[16] FEMA also maintains the U.S. National Preparedness Goal under the NPF which has a goal for the “whole community” to be prepared for all types of disasters and emergencies:

“A secure and resilient nation with the capabilities required across the whole community to prevent, protect against, mitigate, respond to, and recover from the threats and hazards that pose that greatest threat.” [16]

The U.S. NPF describes how the whole community works together to achieve the National Preparedness Goal within five key mission areas of prevention, protection, mitigation, response, and recovery.

The NRC embraces the whole community approach outlined in the National Preparedness Goal. The responsibility to maintain capabilities to implement the emergency plan in an unknown security state achieves an adequate level of preparedness and builds resilient communities able respond to all threats and hazards. These capabilities are demonstrated in HAB drills and exercises, in which licensee EROs, state and local OROs, and LLEAs are able to effectively implement radiological emergency plans and make sound decisions to protect workers and the public health and safety, even amidst the uncertainty of an unknown security state on site at a commercial NPP.

## 5. CONCLUSION

The HAB exercise was designed and implemented after the terrorist attacks of September 11, 2001 as a tool to evaluate the ERO and ORO ability to respond to emergency events for a facility in an unknown security state. Based on observations and lessons learned from over a decade of HAB drills and exercises in the U.S., advanced coordination—such as early engagement on scenario development, planning, scheduling, and logistic coordination—have enhanced the demonstration and effectiveness of the HAB response and is identified as a best practice for enhancing EP programs.

Continued challenges such as issues with communications, the need for ORO and LLEA input on realistic scenarios, and issues with site-access for LLEAs, were identified during the most recent HAB exercises. These

observations emphasize the importance of advanced and continued coordination. Lastly, these lessons learned—specifically the need for advanced, practiced coordination between multiple organizations during a security-initiated event—can be addressed with increased opportunities of engagement and practice. This can be accomplished through the conduct of off-year drills, tabletops, or planning sessions to ensure the EP/security communication and coordination infrastructure is maintained.

## REFERENCES

- [1] U.S. NUCLEAR REGULATORY COMMISSION, Historical Review and Observations of Defense-In-Depth, NUREG/KM-0009, NRC, Washington, DC (2016).
- [2] U.S. NUCLEAR REGULATORY COMMISSION, Emergency Preparedness and Response Actions for Security-Based Events, NRC Bulletin 2005-02, NRC, Washington, DC (2005).
- [3] U.S. NUCLEAR REGULATORY COMMISSION, Enhancements to Emergency Preparedness Regulations; Final Rule. *Federal Register*, 76 FR 72559–72600, Washington, DC (2011).
- [4] U.S. NUCLEAR REGULATORY COMMISSION, Emergency Planning; Final Rule. *Federal Register*, 45 FR 55402–55413, Washington, DC (1980).
- [5] U.S. NUCLEAR REGULATORY COMMISSION, Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants, NUREG-0396/EPA 520/1-78-016, NRC, Washington, DC (1978).
- [6] U.S. NUCLEAR REGULATORY COMMISSION, Interim Staff Guidance: Emergency Planning for Nuclear Power Plants, NSIR/DPR-ISG-01, NRC, Washington, DC (2011).
- [7] U.S. NUCLEAR REGULATORY COMMISSION, Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants, NUREG-0654/FEMA-REP-1, Rev. 2, NRC, Washington, DC (2019).
- [8] U.S. NUCLEAR REGULATORY COMMISSION, Frequently Asked Questions About Force-on-Force Security Exercises at Nuclear Power Plants, (2020), <https://www.nrc.gov/security/faq-force-on-force.html>.
- [9] U.S. ATOMIC ENERGY ACT of 1954, As Amended, Section 170 D “Security Evaluations”. Public Law 109–58, § 651(a)(1), 119 Statute 799, Washington, DC (2005).
- [10] NUCLEAR ENERGY INSTITUTE, Conducting a Hostile Action-Based Emergency Response Drill, NEI 06-04, Rev. 3, NEI, Washington DC (2016).
- [11] U.S. NUCLEAR REGULATORY COMMISSION, Report on Hostile Action-Based (HAB) Emergency Preparedness Biennial Exercise Lessons Learned, NRC, Washington, DC (2016).
- [12] U.S. NUCLEAR REGULATORY COMMISSION, Design Basis Threat; Final Rule. *Federal Register*, 72 FR 12705–12727, Washington, DC (2007).
- [13] U.S. NUCLEAR REGULATORY COMMISSION, 50.13 Enemy of the State, Final Rule. *Federal Register*, 32 FR 13445, Washington, DC (1967).
- [14] U.S. NUCLEAR REGULATORY COMMISSION, 50.150 Aircraft Impact Assessment, Final Rule. *Federal Register*, 74 FR 28146, Washington, DC (2009)
- [15] U.S. DEPARTMENT OF HOMELAND SECURITY, National Response Framework, Fourth Edition, DHS, Washington DC (2019).
- [16] U.S. DEPARTMENT OF HOMELAND SECURITY, National Preparedness Goal, Second Edition, DHS, Washington DC (2015).