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## POLICY ISSUE

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(Information)

August 24, 2016

SECY-16-0100

FOR: The Commissioners

FROM: Victor M. McCree  
Executive Director for Operations

SUBJECT: STAFF REVIEW AND RESPONSE TO NATIONAL ACADEMY OF SCIENCES STUDY OF THE LESSONS LEARNED FROM THE FUKUSHIMA NUCLEAR ACCIDENT FOR IMPROVING SAFETY AND SECURITY OF U.S. NUCLEAR POWER PLANTS

PURPOSE:

The purpose of this paper is to inform the Commission of the assessment and actions planned by the U.S. Nuclear Regulatory Commission (NRC) staff related to the National Academy of Sciences (NAS) report titled “Study of the Lessons Learned from the Fukushima Nuclear Accident for Improving Safety and Security of U.S. Nuclear Power Plants—Phase 2.” This paper does not address any new commitments or resource implications.

BACKGROUND:

The conference report associated with the Consolidated Appropriations Act, 2012, directed the NRC to fund an NAS study of the lessons learned from the events at the Fukushima nuclear plant. The National Research Council (an operating agency of NAS) subsequently undertook an assessment for improving the safety and security of nuclear plants in the United States. The study was organized to address the following issues:

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- 1) causes of the Fukushima nuclear accident, particularly with respect to the performance of safety systems and operator response following the earthquake and tsunami;
- 2) reevaluation of the conclusions from previous NAS studies on safety and security of spent nuclear fuel and high-level radioactive waste storage, particularly with respect to the safety and security of current storage arrangements and alternative arrangements in which the amount of commercial spent fuel stored in pools is reduced;<sup>1</sup>
- 3) lessons that can be learned from the accident to improve commercial nuclear plant safety and security systems and operations; and
- 4) lessons that can be learned from the accident to improve commercial nuclear plant safety and security regulations, including processes for identifying and applying design-basis events for accidents and terrorist attacks to existing nuclear plants.

The NAS study was carried out in two phases. Phase 1 focused on the causes of the Fukushima Dai-ichi accident and safety-related lessons learned for improving nuclear plant systems, operations, and regulations exclusive of spent fuel storage. The Phase 1 report, "Lessons Learned from the Fukushima Dai-ichi Nuclear Accident for Improving Safety of U.S. Nuclear Plants," was issued in July 2014. The report documented various findings and recommendations. The staff's review of and responses to the Phase 1 recommendations are described in Enclosure 6 of SECY-15-0059, "Seventh 6-Month Status Update on Response to lessons learned from Japan's March 11, 2011, Great Tohoku Earthquake and Subsequent Tsunami," dated April 9, 2015. In summary, the staff found that ongoing or planned NRC and industry activities adequately address the recommendations from Phase 1 of the NAS study. The Phase 2 report was issued in May 2016 and focused on three issues:

- 1) security-related lessons learned from the Fukushima Dai-ichi accident for improving nuclear plant systems, operations, and regulations;
- 2) lessons learned from the accident for improving safety of spent fuel storage; and
- 3) reevaluation of the findings and recommendations from previous NAS reports on spent fuel storage safety and security.

#### DISCUSSION:

The NAS Phase 2 report included several findings and recommendations related to the safety and security of nuclear power plants. The study paid particular attention to the safety and security of spent fuel storage, including reevaluating findings and recommendations from the previous NAS reports. The findings, recommendations, and staff assessment and planned actions for each recommendation in the most recent NAS report are provided in Enclosure 1. The recommendations in the NAS Phase 2 report are summarized below:

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<sup>1</sup> The phrase "previous NAS reports" refers to a study carried out in 2003-2004 at the request of the U.S. Congress. That study focused on the safety and security of commercial spent fuel storage and resulted in two reports: a report containing classified and other security-sensitive information issued in 2004, and an abbreviated version suitable for unrestricted public release, issued in 2006. A description of the NRC's assessment and actions related to that study are provided in a report to Congress issued in March 2005 (Agencywide Documents Access and Management System Accession No. ML050280428).

- The U.S. nuclear industry and its regulator should give additional attention (i.e., beyond the current post-Fukushima response) to improving the ability of plant operators to measure real-time conditions in spent fuel pools and maintain adequate cooling of stored spent fuel during severe accidents and terrorist attacks. (Recommendation 2.1)
- Nuclear plant operators and their regulators should upgrade and/or protect nuclear plant security infrastructure and systems and train security personnel to cope with extreme external events and severe accidents. (Recommendation 3.1)
- The U.S. nuclear industry and the NRC should strengthen their capabilities for identifying, evaluating, and managing the risks from terrorist attacks. (Recommendation 4.1A)
- The NRC should sponsor a spent fuel storage (wet and dry storage) security risk assessment for U.S. nuclear plants. (Recommendation 4.1B)
- The independent examination of surveillance and security measures for protecting stored spent fuel recommended by NAS (2006) should include an examination of the effectiveness of the NRC's programs for mitigating insider threats. (Recommendation 4.3)
- The NRC should (1) sponsor an end-to-end validation of the MELCOR code for use in modeling coolant loss in spent fuel pools, and (2) validate key submodels in the code. (Recommendation 4.6)
- The NRC should take the following actions to more fully implement Recommendation 3E-2 in the 2006 NAS report: (1) reexamine the need for the 60-day limit for fuel dispersion and reduce the allowable time if feasible, and (2) reexamine and, if needed, redesign the water makeup and spray systems and strategies to ensure that they can be implemented when physical access to pools is hindered or the site becomes inaccessible. (Recommendation 4.8)
- The NRC should give high priority to completing its analyses on dry cask storage vulnerabilities and rulemaking. (Recommendation 4.10)
- The NRC should perform a spent fuel storage risk assessment to elucidate the risks and potential benefits of expedited transfer of spent fuel from pools to dry casks. (Recommendation 4.11)

The staff has assessed the NAS findings and recommendations to determine whether additional actions or studies are warranted. Several of the NAS recommendations are addressed by recent reviews and assessments performed by the staff and by recent Commission decisions. As the NRC pursues its ongoing regulatory activities, the staff will consider if and how insights from the NAS study should be incorporated into associated studies, analyses, and decisionmaking. The staff did not, however, identify a need to initiate new activities or otherwise redirect resources to address recommendations in the NAS Phase 2 report.

The staff concludes that spent fuel continues to be stored safely and securely at nuclear power plants in both spent fuel pools and dry casks. The security of U.S. nuclear power plants remains extremely robust. The enclosed NRC assessment of the current NAS study reflects an extensive history of how spent fuel safety and security have been assessed and improved in the United States. Significant enhancements to the safety and security of nuclear power plants, including spent fuel pools, were made following the terrorist events of September 11, 2001, and the Fukushima accident in 2011. Spent fuel pool safety was enhanced at U.S. reactors when licensees implemented new NRC requirements to develop strategies for spent fuel pool cooling following losses of large areas of the plant due to fires, explosions, or extreme natural events. The NRC will continue to cooperate with other federal agencies and international organizations to assess possible threats to nuclear power plants and to improve risk assessment techniques. The staff will continue to bring policy matters to the Commission for consideration and action as appropriate.

CONCLUSIONS:

Based on the staff's assessment provided in the enclosure to this document, the staff did not identify a need to initiate new activities or otherwise redirect resources to address recommendations in the NAS Phase 2 report. The staff will, as appropriate, incorporate insights from the NAS Phase 2 report into ongoing initiatives and interactions with other Federal agencies and international organizations.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection.

*/RA/*

Victor M. McCree  
Executive Director  
for Operations

Enclosure:  
Assessment and Planned Actions Related to  
Phase 2 of NAS Study of Lessons  
Learned from Fukushima Nuclear Accident

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Victor M. McCree  
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for Operations

### Enclosure:

Assessment and Planned Actions Related to  
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Learned from Fukushima Nuclear Accident

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*\*via email*

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