

Tier 3 – SECY-11-0137 Additional Recommendation 5 (AR5)

Purpose

The purpose of this project plan is to evaluate the adequacy of spent fuel safety and analyze the safety benefit of expedited transfer of spent fuel from spent fuel pools into dry cask storage, and determine whether additional regulatory action (e.g., order, rulemaking) is needed.

NTTF Recommendation and Other Direction

This recommendation was identified by the staff in SECY-11-0137, which included a number of additional issues that were judged to warrant further consideration and potential prioritization based on relative safety significance, nexus to NTTF recommendations, and other ongoing staff activities. The staff indicated that a determination of whether any regulatory action is necessary would be made after the completion of this consideration.

The Commission directed the staff to provide the results of its determination of whether any regulatory action is recommended or necessary in the form of a SECY paper (information or notation vote, as appropriate).

Regulations

1. General Design Criterion 61, “Fuel Storage and Handling and Radioactivity Control” of Appendix A, “General Design Criteria for Nuclear Power Plants,” to 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities,” requires that fuel storage and handling, radioactive waste, and other systems which may contain radioactivity shall be designed to assure adequate safety under normal and postulated accident conditions. These systems shall be designed (1) with a capability to permit appropriate periodic inspection and testing of components important to safety, (2) with suitable shielding for radiation protection, (3) with appropriate containment, confinement, and filtering systems, (4) with a residual heat removal capability having reliability and testability that reflects the importance to safety of decay heat and other residual heat removal, and (5) to prevent significant reduction in fuel storage coolant inventory under accident conditions.
2. 10 CFR 50.54, “Conditions of Licenses,” Subpart (hh)(2) requires licensee to develop and implement guidance and strategies intended to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities under the circumstances associated with loss of large areas of the plant due to explosions or fire.

Technical Analyses

Over the years, the NRC staff has conducted technical studies of the safety of spent fuel pools and the storage of spent fuel in dry cask storage systems. These studies have concluded that

the current approaches to storage of spent fuel maintain safety. Representative examples of these studies include:

1. NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, 'Beyond Design Basis Accidents in Spent Fuel Pools,'" dated April 1989. This report presented the staff's evaluation of additional protective measures for the safe storage of spent fuel in high-density storage racks. The analysis determined that the risk from the storage of spent nuclear fuel in pools was dominated by beyond design basis earthquakes, but the objectives of the Commission's Safety Goal Policy Statement were satisfied with no action. Based on the evaluation, the NRC staff concluded that no new regulatory requirements were warranted concerning the use of high density storage racks.
2. NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Plants," dated February 2001. This report provided the results of the NRC staffs evaluation of the potential accident risk in spent fuel pools at decommissioning plants in the United States. This study was prepared to provide a technical basis for potential rulemaking relaxing emergency planning, insurance, and security requirements for permanently shutdown nuclear power plants. The study included a conservative modeling of spent fuel pool accidents consistent with its purpose. Nevertheless, the results demonstrated the overall spent fuel pool accident risk was well below the quantitative health objectives derived from the Commission Safety Goal Policy Statement.
3. NUREG-1864 – A Pilot Probabilistic Risk Assessment of a Dry Cask Storage System at a Nuclear Power Plant, dated March 2007. This study assesses the risks from damage to fuel within dry cask storage systems and shows that a resulting calculated risk from storage of spent nuclear fuel in a dry cask storage system is extremely small. The study assumes operators load and handle the casks in accordance with procedures and neglects the effects of postulated accidents on the nuclear power plant structures and systems, but a generic frequency of heavy load drops is considered for estimating the risk from these events from fuel within the cask system.

Staff Assessment

Following the event at Fukushima, stakeholders have submitted comments to the NRC requesting that regulatory action be taken to require the transfer of spent fuel stored in spent fuel pools (SFPs) more than 5 years to dry cask storage. Some stakeholders believe that SFPs were not originally designed to handle the current amount of spent fuel being stored in the SFPs. Stakeholders have pointed out that a reduced amount of spent fuel in the SFPs would provide more effective cooling of the remaining fuel and reduce the inventory of radionuclides (e.g. Cs-137) that could be released if the fuel overheated.

As directed by the Commission in SRM-SECY-12-0025, the staff has undertaken regulatory actions to enhance reactor safety as well as that of SFPs, which originated from the Near Term Task Force (NTTF) recommendations. As directed by the Commission and recommended by

the NTTF, the staff has issued an order (EA 12-051) for all power reactor licensees to install reliable spent fuel pool instrumentation. In addition, the staff is continuing to work with stakeholders on the implementation of an order requiring mitigation strategies for beyond-design-basis external events (EA 12-049), including mitigation capabilities for SFPs. Because of these regulatory actions, the staff views that SFP safety has been significantly increased.

The NRC has maintained that both SFPs and dry casks provide adequate protection of the public health and safety and the environment, based on a number of past safety and security studies. Regarding the event at Fukushima, the information the NRC has to date indicates there was no significant offsite radioactive release from spent fuel stored in the SFP or the dry casks. In addition, there is no new information from the Fukushima event that would indicate there is a safety or security reason to mandate expedited transfer of spent fuel from SFPs to dry casks.

The staff has conducted a number of studies over the years to assess the safety of SFPs at power reactors. In NUREG-1353, the staff completed a regulatory analysis of alternatives to enhance the safety of spent fuel during beyond design basis accidents (Generic Issue 82). Based on the evaluation, the NRC staff concluded that no new regulatory requirements were warranted. In NUREG-1738, the staff completed a study of spent fuel pool accident risk at decommissioning nuclear power plants. Based on the study, the staff concluded that the risk at both operating and decommissioning plants is low and well within the Commission's safety goals based on the very low frequency of initiating events that could expose the stored fuel to air.

The Office of Nuclear Regulatory Research has been conducting a study to produce updated consequence estimates for scenarios of interest related to SFPs, as well as to help inform the NRC's determination of whether a significant increase in safety would be gained through expedited transfer of spent fuel to dry cask storage. The Spent Fuel Pool Scoping Study (SFPSS) will evaluate the consequences associated with a large seismic event and its impact on the SFP. The staff understands that a beyond design basis earthquake accident scenario is a prominent contributor to SFP risk. The SFPSS includes consideration of several credible damage states, including some scenarios that lead to a release of fission products for a boiling water reactor with a Mark I containment design. The SFPSS will provide the consequences of any resulting fission product release from the various cases that reflect the effect of changes in configuration during the operating cycle, the loading of the SFP, and the deployment of mitigation capabilities. Details of the SFPSS can be found in numerous public presentations, such as the Regulatory Information Conference presentation and the Advisory Committee on Reactor Safeguards meeting on April 12, 2012. The staff in the regulatory offices will be starting a review of the study's results concurrently with the issuance of this SECY.

As the staff believes that there is ample regulatory basis for the current NRC position that spent fuel storage is safe, the staff plans to perform a validation of spent fuel safety with the consideration of the events at Fukushima Daiichi, the regulatory actions on spent fuel pools being taken in Tier 1 and Tier 2 activities, as well as the SFPSS. The staff plans to document our understanding on spent fuel safety with respect to the Commission Safety Goals. If any

new information or gaps in our understanding are identified that could change the NRC's current understanding of spent fuel safety, the staff will recommend that additional research be undertaken. The staff will also evaluate the issue within the context of the current regulatory framework. Supposing that the staff has all of the information necessary to complete the evaluation in the current regulatory framework, the staff will engage with stakeholders and ultimately inform the Commission if any regulatory action is needed.

As a result of the staff analysis and documentation of our understanding of spent fuel safety, the staff may identify that further work needs to be done to understand other considerations associated with transfer of spent fuel to dry cask storage. These other considerations include the operational and radiological risks associated with expedited transfer of spent fuel, financial costs, industry capabilities, and impact on spent fuel final disposal. These considerations are recognized, but are not part of the SFPSS. However, some of these issues have been the subject of recent industry studies performed by EPRI and NAC, and may be considered in future agency activities. Another factor to consider is the impact of seismic events on spent fuel pools for different types of reactors.

The staff concludes that this recommendation needs additional information to determine if any regulatory action needs to be taken.

Staff Plan

The staff will undertake the following activities:

1. Staff will perform a validation of our understanding of spent fuel safety with respect to the Commission Safety Goals. Consideration of the SFPSS will be included in the staff's review.
2. Staff will analyze currently available information to inform a recommendation.
3. Staff will undertake additional research if new information or identified gaps could change the NRC's current understanding of spent fuel safety.
4. Staff will gather stakeholder input on staff analysis of information.
5. Staff will provide a recommendation on the need for any regulatory action to the Commission.

Staff Recommendations

The staff recommends that the Commission approve this plan for addressing the additional issue of transfer of spent fuel from spent fuel pools to dry cask storage.