

Historical Perspective and Staff Evaluation Considerations

The regulations governing emergency preparedness/planning (EP) for nuclear power reactors are set forth in Section 50.47, paragraphs 50.54(q), (s), and (t) to Title 10 of the *Code of Federal Regulations* (10 CFR), and Appendix E to 10 CFR Part 50. Every nuclear power reactor licensee must establish and maintain emergency plans and preparedness in accordance with these regulations. The EP regulations for an operating nuclear power reactor include standards for both onsite and offsite¹ radiological emergency response plans. These regulations and the planning basis for EP are based upon an anticipated prompt response to a wide spectrum of events. However, for a decommissioning nuclear power reactor, the spectrum of accidents that can have significant offsite consequences is greatly reduced. At a decommissioning nuclear power reactor site, the only accident scenario that might lead to a significant radiological release is a highly unlikely, beyond-design-basis event resulting in a potential spent fuel zirconium cladding fire. This event involves a postulated major loss of water inventory from the spent fuel pool (SFP), where preplanned SFP mitigation measures are unsuccessful, generating a significant heatup of the spent fuel to the point where substantial zirconium cladding oxidation and fuel damage can occur.

The amount of decay heat present in irradiated fuel in the SFP is directly related to the amount of time that has passed after the reactor is shut down. As such, the potential for the conditions needed for a zirconium cladding fire to occur continues to decrease as a function of the time since the reactor was permanently shut down. However, current regulations do not reflect that: (1) considerably more time is available during decommissioning to respond to a postulated zirconium cladding fire incident than is available for many postulated operating power reactor accidents, and (2) comprehensive SFP mitigation measures and on-shift staff remain in place following the permanent cessation of power operations.

Since there are no explicit regulatory provisions distinguishing EP requirements for a nuclear power reactor that has permanently ceased operation from those for an operating nuclear power reactor, licensees transitioning to, or already in the decommissioning phase, usually seek to establish a level of EP commensurate with the risk of a radiological emergency at a decommissioning site. Exemptions from certain EP requirements are typically requested early in the decommissioning process. The U.S. Nuclear Regulatory Commission (NRC) reviews each request on a case-by-case basis and grants exemptions only after conducting a thorough analysis of each request. Historically, given the significant reduction in radiological risk from a decommissioning site, the NRC has approved exemptions from EP requirements based on site-specific evaluations and the objectives of the regulations. Between 1987 and 1999, the NRC issued exemptions from certain EP requirements for 10 licensees. More recently, exemptions from certain EP requirements have been granted for six plants, which include Kewaunee Power Station; Crystal River Unit 3 Nuclear Generating Plant, San Onofre Nuclear Generating Station, Units 1, 2 and 3; Vermont Yankee Nuclear Power Station; Fort Calhoun Station, Unit 1; and the Oyster Creek Nuclear Generating Station (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML14261A223, ML15058A906, ML15082A204, ML15180A054, ML17263B198, and ML18220A980, respectively).

Based on the reviews of the Kewaunee Power Station and Crystal River Unit 3 Nuclear Generating Plant exemptions, the NRC staff developed and issued an Office of Nuclear Security

¹ The offsite standards are addressed in the Federal Emergency Management Agency (FEMA) regulations in 44 CFR Part 350.5, "Criteria for Review and Approval of State and Local Radiological Emergency Plans and Preparedness," and are based on the standards established by the Commission in 10 CFR 50.47.

and Incident Response (NSIR), Division of Preparedness and Response (DPR) Interim Staff Guidance (ISG) document, NSIR/DPR-ISG-02, "Emergency Planning Exemption Requests for Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML14106A057) on May 11, 2015. This ISG provides guidance to staff for its technical review of requests for exemptions from certain EP requirements for nuclear power reactors that have been permanently shut down and defueled or are planning to transition to decommissioning and was used for the subsequent reviews.

The previously granted exemptions from EP regulations, identified above, reduced the requirements for decommissioning power reactors to those consistent with these standards: (1) 10 CFR 50.47(d), which states the requirements for a license authorizing fuel loading or low power testing only²; and (2) 10 CFR 72.32(a)³, which establishes the information required in an emergency plan for an ISFSI. Examples of previously granted exemptions from EP regulations for decommissioning power reactors include: setting the highest emergency plan classification level as an "Alert"; extending the timing requirements for notification of offsite authorities; requiring only onsite exercises with the opportunity for offsite response organization participation, and maintaining arrangements only for offsite response organizations (i.e., law enforcement, fire, and medical services) that might support the licensee's response to onsite emergencies.⁴ The EP exemptions also relieve the licensee from the requirement to maintain formal offsite radiological emergency preparedness (REP) plans, including the 10-mile plume exposure pathway and 50-mile ingestion pathway emergency planning zones. However, licensees that have been granted EP exemptions must continue to maintain an onsite emergency plan addressing the classification of an emergency, notification of emergencies to licensee personnel and offsite authorities, and coordination with designated offsite government officials following an event declaration.

In evaluating EP exemptions requested by Entergy Nuclear Operations, Inc. (Entergy), specifically in relation to relieving the licensee from the requirement to maintain formal offsite REP plans, the staff considered the conclusions from recent SFP studies completed since the publication of NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), which served as the technical basis for SECY-01-0100, "Policy Issues Related to Safeguards, Insurance, and Emergency Preparedness Regulations at Decommissioning Nuclear Power Plants Storing Fuel in Spent Fuel Pools" (ADAMS Accession No. ML011450420). In addition, the staff reviewed the following considerations put into place as a result of the events of September 11, 2001, and the March 11, 2011 accident at the Fukushima Dai-ichi site. The studies, described in more detail

² 10 CFR 50.47(d) states, in part, "Notwithstanding the requirements of paragraphs (a) and (b) of this section, and except as specified by this paragraph, no NRC or FEMA review, findings, or determinations concerning the state of offsite emergency preparedness or the adequacy of and capability to implement State and local or utility offsite emergency plans are required prior to issuance of an operating license authorizing only fuel loading or low power testing and training (up to 5 percent of the rated thermal power)."

³ The Final Rule to 10 CFR Part 72, "Emergency Planning Licensing Requirements for Independent Spent Fuel Storage Facilities (ISFSI) and Monitored Retrievable Storage Facilities (MRS)," (60 *Federal Register* (FR) 32430, June 22, 1995), states that "the postulated worst-case accident involving an ISFSI has insignificant consequences to public health and safety. Therefore, the final requirements to be imposed on most ISFSI licensees reflect this fact, and do not mandate formal offsite components to their onsite emergency plans." It also states, "based on the potential inventory of radioactive material, potential driving forces for distributing that amount of radioactive material, and the probability of the initiation of these events, the Commission concludes that the offsite consequences of potential accidents at an ISFSI or an MRS would not warrant establishing Emergency Planning Zones."

⁴ The requirements for licensees to maintain agreements for fire-fighting and local law enforcement services exist outside of EP requirements (i.e., the requirement for licensees to maintain a fire protection plan in 10 CFR 50.48, "Fire protection" and physical security requirements in 10 CFR Part 73).

below, support staff positions that only a highly unlikely beyond-design-basis event (e.g., extreme earthquake or large aircraft impact) would cause sufficient structural damage to the SFP structure resulting in a rapid SFP water draindown and potential zirconium cladding fire. In addition, there would be a significant amount of time between the initiating event and the possible onset of conditions that could result in a zirconium cladding fire. This time provides a substantial opportunity for event mitigation. Licensees are required to maintain effective strategies, sufficient resources and adequately trained personnel to mitigate such an event. If State or local governmental officials determine that offsite protective actions are warranted, then sufficient time and capability would also be available for offsite response organizations (OROs) to implement these measures using a comprehensive emergency management plan (CEMP) or “all-hazards” approach.⁵

Spent Fuel Pool Study Considerations

Following removal of spent fuel from the reactor vessel, the principal radiological risks are associated with the storage of spent fuel onsite. Generally, a few months after the reactor has been permanently shut down, there are no possible design-basis events that could result in a radiological release exceeding the U.S. Environmental Protection Agency (EPA) early phase protective action guide (PAG) limit of one roentgen equivalent man (rem) at the exclusion area boundary. The only potential accident that might lead to a significant radiological release at a decommissioning reactor is a zirconium cladding fire. The zirconium cladding fire scenario is a postulated, but highly unlikely, beyond-design-basis accident scenario that involves a major loss of water inventory from the SFP, resulting in a significant heatup of the spent fuel, and culminating in substantial zirconium cladding oxidation and fuel damage. The significance of the spent fuel heatup scenario that might result in a zirconium cladding fire depends on the decay heat of the irradiated fuel stored in the SFP. The amount of decay heat in the spent fuel is directly associated with the amount of time since the reactor permanently ceased operations. Therefore, the probability of a zirconium cladding fire scenario continues to decrease as a function of the time that the decommissioning reactor has been permanently shut down.

The staff assessed the risk of an SFP accident at decommissioning nuclear power plants in the late 1990s to support development of a risk-informed technical basis for review of exemption requests and a regulatory framework for integrated rulemaking. The staff’s assessment, published in NUREG-1738, conservatively assumed that if the water level in the SFP did drop below the top of the spent fuel, a zirconium cladding fire involving all the spent fuel in the SFP would occur, and thereby bounded those conditions associated with inadequate air cooling of the fuel (including partial drain-down scenarios) and fire propagation. The study used simplified and sometimes bounding assumptions and models to characterize the likelihood and consequences of beyond-design-basis SFP accidents. Even with this conservative assumption, the study found the risk of a zirconium cladding fire in the SFP fire to be low and well within the Commission’s safety goals. The amount of time available after complete fuel uncover, but before a zirconium cladding fire, depends on various factors, including decay heat rate, fuel burnup, fuel storage configuration, building ventilation rates and air flow paths, and fuel cladding oxidation rates. Although NUREG-1738 did not completely rule out the possibility of a zirconium

⁵ A CEMP or “all-hazards” approach in this context, also referred to as an emergency operations plan, is addressed in Federal Emergency Management Agency’s (FEMA) Comprehensive Preparedness Guide 101, “Developing and Maintaining Emergency Operations Plans,” Version 2.0, dated November 2010. https://www.fema.gov/media-library-data/20130726-1828-25045-0014/cpg_101_comprehensive_preparedness_guide_developing_and_maintaining_emergency_operations_plans_2010.pdf

cladding fire, it did demonstrate that storage of spent fuel in a high-density configuration in SFPs is safe, and that the risk of accidental release of a significant amount of radioactive material to the environment is low.

After the events of September 11, 2001, Sandia National Laboratories (SNL) conducted studies (collectively referred to as the “Sandia studies”), which considered spent fuel loading patterns and other aspects of an SFP at a pressurized-water reactor and a boiling-water reactor, including the role that the circulation of air plays in the cooling of spent fuel. These studies are non-public because they contain security-related information. The Sandia studies indicated that there is a significant amount of time between the initiating event (i.e., the event that causes the SFP water level to drop) and the spent fuel assemblies becoming partially or completely uncovered. In addition, the Sandia studies indicated that for those hypothetical conditions where air cooling may not be effective in preventing a zirconium cladding fire, there is a significant amount of time between the spent fuel becoming uncovered and the possible onset of such a zirconium cladding fire, thereby providing a substantial opportunity for event mitigation. The Sandia studies, which account for relevant heat transfer and fluid flow mechanisms, also indicated that air-cooling of spent fuel could be sufficient to prevent SFP zirconium fires at a point much earlier following fuel offload from the reactor than previously considered (e.g., in NUREG-1738).

In NUREG-2161, “Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor,” dated September 2014 (ADAMS Accession No. ML14255A365), the NRC evaluated the potential benefits of strategies required in 10 CFR 50.54(hh)(2). The study results for the analyzed severe earthquake at the reference plant are consistent with conclusions in past studies that SFPs are robust structures and likely to withstand severe earthquakes without leaking. The study showed that the likelihood of a radiological release from the spent fuel resulting from a severe earthquake at the reference plant to be about one time in 10 million years or lower. If a radiological release were to occur, this study shows that the individual cancer fatality risk for a member of the public is several orders of magnitude lower than the Commission’s Quantitative Health Objective of 2 in 1 million (2×10^{-6} /year). As explained in NUREG-2161, successful implementation of mitigation strategies significantly reduces the likelihood of a release from the SFP in the event of a loss of cooling water. Additionally, the NRC found that the placement of spent fuel in a dispersed configuration in the SFP, such as the 1 x 4 pattern, more effectively used the heat capacity of the stored fuel and available cooling mechanisms to extend the heatup time and reduce the likelihood of a release from a completely drained SFP.

In 2013, the NRC documented a regulatory analysis of expediting the transfer of spent fuel assemblies in COMSECY-13-0030, “Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel” (ADAMS Accession No. ML13329A918). The staff concluded that SFPs are robust structures with large safety margins and recommended to the Commission that possible regulatory actions to require the expedited transfer of spent fuel from SFPs to dry cask storage were not warranted. The Commission subsequently approved the staff’s recommendation in the staff requirements memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

To inform the current integrated decommissioning rulemaking effort, the staff conducted an applied research study, as documented in “Transmittal of Reports to Inform Decommissioning Plant Rulemaking for User Need Request NSIR-2015-001,” dated May 31, 2016 (ADAMS Accession No. ML16110A416), and concluded:

- the representative plant staff can reliably implement mitigation strategies to timely mitigate cask-drop events and prevent spent fuel heatup damage;
- only the events causing a rapid SFP water draindown (e.g., extreme earthquake or large aircraft impact) would challenge the successful mitigation of fuel heatup, and
- even in the event of a highly unlikely beyond-design-basis accident leading to a rapid draindown of the SFP and subsequent zirconium cladding fire, there may be an additional time margin on the order of several hours beyond the 10-hour heatup time during which protective actions can be taken to protect the public before the dose levels associated with EPA early phase PAGs would be exceeded offsite.

In addition, for the hypothetical event sequence considered in the highly unlikely beyond-design-basis accident leading to a rapid draindown of the SFP and subsequent zirconium cladding fire, acute fatal effects offsite appear to be unlikely from either source term evaluated, provided that individuals can be relocated within a reasonable time after plume arrival, which in most cases was longer than 24 hours.

As previously stated, these studies (NUREG-1738, the Sandia studies, NUREG-2161, COMSECY-13-0030, and studies supporting the decommissioning rulemaking efforts) support the staff positions that:

- there would be sufficient time between the initiating event and the possible onset of conditions that could result in a zirconium cladding fire, which would provide a substantial opportunity for successful mitigation measures, and
- only a highly unlikely, beyond-design-basis event (e.g., extreme earthquake or large aircraft impact) would cause sufficient SFP structural damage to uncover the fuel and potentially support development of a zirconium cladding fire and, even in such cases, the fuel may be air coolable following a complete draindown.

As such, the staff believes that for all but the most unlikely events, any offsite protective actions would be taken by governmental officials as a precautionary measure. In the highly unlikely event of a beyond-design-basis accident resulting in a loss of the SFP water inventory, there would be time to initiate appropriate SFP mitigating actions. If State or local governmental officials determine that offsite protective actions are warranted, then sufficient time and capability would be available for offsite response organizations to implement these measures using a CEMP approach.

Spent Fuel Pool Hostile Action-Based Event Considerations

Licensees develop strategies to protect against the NRC design-basis threat (DBT)⁶ for radiological sabotage and are required to maintain these strategies under the provisions of 10 CFR 73.55(b) until the termination of their Part 50 (or Part 52) license. In addition, other Federal agencies such as the Federal Aviation Administration, the Federal Bureau of Investigation, and the Department of Homeland Security have taken aggressive steps to prevent terrorist attacks in the United States. Taken as a whole, these systems, personnel, and procedures provide reasonable assurance that public health and safety, the environment, and the common defense and security will be adequately protected (*73 Federal Register* (FR) 46204, 46207; August 8, 2008).

⁶ The DBT represents the largest threat against which a private sector facility can be reasonably expected to defend, with high assurance. The NRC's DBT rule was published in the *Federal Register* on March 19, 2007 (72 FR 12705).

NRC regulatory activities and studies have reaffirmed the safety and security of spent fuel stored in pools and shown that SFPs are effectively designed to prevent accidents and minimize damage from malevolent attacks. In the wake of the terrorist attacks of September 11, 2001, the NRC took several actions to further reduce the possibility of a zirconium cladding fire in an SFP. The NRC issued Order EA-02-026, "Order for Interim Safeguards and Security Compensatory Measures," dated February 25, 2002 (ADAMS Accession No. ML020510635), requiring licensees to immediately implement additional security measures, including increased patrols, augmented security forces and capabilities, and more restrictive site-access controls to, among other things, reduce the likelihood of an SFP accident, resulting from a terrorist-initiated event. Through the NRC's issuance of the "Power Reactor Security Requirements" final rule on March 27, 2009 (74 FR 13926), the agency codified generically applicable security requirements that had been previously issued by orders. Subsequently, by letter dated November 28, 2011 (ADAMS Accession No. ML111220447), the NRC partially rescinded Order EA-02-026. The requirements of Order EA-02-026 that were addressed by Interim Compensatory Measure (ICM) B.1.a, involved operator training for specific security-initiated events that were not covered by proposed or existing regulations and remained in effect after the NRC rescinded part of the Order in November 2011.

By letter dated October 31, 2018 (ADAMS Accession No. ML18309A036), Entergy requested that the NRC rescind ICM B.1.a, in Order EA-02-026 for the Pilgrim Nuclear Power Station (PNPS), based on PNPS's transition from an operating reactor to a non-operating reactor. Entergy stated that once PNPS is permanently shut down and defueled, the primary security focus would be the protection of the spent fuel. As such, the specific security-initiated event addressed in ICM B.1. would not have any immediate effect on the storage or cooling of spent fuel. The staff recognizes that PNPS will maintain mitigation strategies for the protection of spent fuel under License Condition 3.K of its license, which requires PNPS to develop and maintain strategies and staff training to address large fires and explosions (as discussed in Spent Fuel Pool Mitigative Action Considerations below), including the protection of the spent fuel.

Spent Fuel Pool Mitigative Action Considerations

NRC Order EA-02-026 also established new requirements for licensees to have mitigating strategies for the potential loss of SFP water inventory and for large fires or explosions at nuclear power plants. In response, the Nuclear Energy Institute (NEI) provided detailed guidance in NEI 06-12, "B.5.b Phase 2 & 3 Submittal Guideline," Revision 2, dated December 2006 (ADAMS Accession No. ML070090060), which the NRC endorsed on December 22, 2006 (ADAMS Accession No. ML063560235⁷). The NRC found the NEI guidance to be an effective means for mitigating the potential loss of large areas of the plant due to fires or explosions. In addition, these strategies enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium cladding fire, which further reduced the probability of a radiological release from an SFP zirconium cladding fire initiation.

The Power Reactor Security Requirements final rule (74 FR 13926; March 27, 2009), added 10 CFR 50.54(hh)(2) to require licensees to implement mitigating measures to maintain or restore SFP cooling capability in the event of loss of large areas of the plant due to fires or explosions, which further decreases the probability of a zirconium cladding fire in an SFP.

⁷ Not publicly available because it contains security-related information.

Under 10 CFR 50.54(hh)(2), nuclear power reactor licensees are required to implement strategies such as those provided in NEI-06-12.⁸

Further, other organizations, such as SNL, as discussed previously in this enclosure under “Spent Fuel Pool Study Considerations,” have confirmed the effectiveness of the additional mitigation strategies to maintain spent fuel cooling in the event that the pool is drained, and its initial water inventory is reduced or lost entirely.

In response to the accident at the Fukushima Dai-ichi site, the NRC implemented regulatory actions to further enhance reactor and SFP safety. On March 12, 2012, the NRC issued Order EA-12-049, “Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events” (ADAMS Accession No. ML12054A735), which requires licensees to develop, implement, and maintain guidance and strategies to maintain or restore SFP cooling capabilities, independent of normal alternating current power systems, following a beyond-design-basis external event. In addition, on March 12, 2012, the NRC issued Order EA-12-051, “Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation” (ADAMS Accession No. ML12054A679), which requires that licensees install reliable means of remotely monitoring wide-range SFP levels to support effective prioritization of event mitigation and recovery actions in the event of a beyond-design-basis external event. Although the primary purpose of the order was to ensure that operators were not distracted by uncertainties related to SFP conditions during the accident response, the improved monitoring capabilities will help in the diagnosis and response to potential losses of SFP integrity. These requirements ensure a more reliable and robust mitigation capability is in place to address degrading conditions in SFPs resulting from certain significant but unlikely events.

Spent Fuel Pool Offsite Radiological Emergency Preparedness Considerations

In a letter dated February 20, 2019 (ADAMS Accession No. ML19057A234), FEMA provided the following statements for inclusion based on their review of a draft of this SECY paper. Following each quoted FEMA statement are the NRC staff’s perspectives and views on the statement.

[FEMA Statement 1] As nuclear power plants decommission and the nature of the risk changes, capabilities that state and local governments need to maintain offsite in order to protect the health and safety of the public will be affected. Given the risk implications both onsite and offsite during decommissioning, it is imperative that FEMA and the NRC consult with one another when the topic of risk is under consideration. However, FEMA also recognizes the authority of state and local governments to determine, reduce, and manage the risk to public health and safety and the required associated capabilities needed to protect their communities. State and local authorities are ultimately the decision authority over what constitutes an appropriate risk reduction strategy to all hazards within their jurisdictions. One approach may be for all offsite emergency preparedness and response resources and licensing requirements remain in place until all the spent nuclear fuel is placed into dry cask storage. As described in NRC’s Regulatory Improvements for Power Reactors Transitioning to Decommissioning:

⁸ The guidance in NEI-06-12 specifies that portable, power-independent pumping capabilities must be able to provide at least 500 gallons per minute (gpm) of bulk water makeup to the SFP, and at least 200 gpm of water spray to the SFP. Recognizing that the SFP is more susceptible to a release when the spent fuel is in a non-dispersed configuration, the guidance also specifies that the portable equipment is to be capable of being deployed within 2 hours for a non-dispersed configuration.

Regulatory Basis Document issued on November 20, 2017 (ADAMS ML17215A010), several public stakeholders raised similar concerns. For example, on pages 44 and 45, NRC noted that “[s]everal stakeholders generally opposed the relaxation of EP requirements until the spent fuel is removed from the SFP” or “[s]everal stakeholders expressed concern that local jurisdictions will face increased burden associated with emergency response and preparedness if staffing, insurance, qualifications, and training requirements are reduced. These stakeholders requested that EP funding be maintained at current levels.”

While the NRC agrees that States and local governments retain the authority to determine, reduce, and manage the risk to public health and safety, and the required associated capabilities to protect their communities, the NRC retains the sole authority to regulate commercial nuclear power for the purposes of radiological safety. The exemptions from EP regulations reflect the NRC’s determination of the significant reduction in risk based on the limited spectrum of accidents that can have significant offsite consequences for a nuclear reactor site that has permanently ceased operation and permanently removed fuel from the reactor vessel to the SFP. The staff determined, based on EP exemption evaluation criteria provided in Section 5, “Evaluation of Exemptions to EP Regulations,” to NSIR/DPR-ISG-02, that in the event of an SFP accident, the licensee will maintain effective strategies, sufficient resources and adequately trained personnel available on-shift to promptly initiate mitigative actions without the support of OROs. If State or local governmental officials determine that offsite protective actions are warranted, then sufficient time and capability would be available for OROs to implement these measures using a CEMP approach. Therefore, the staff concluded, consistent with previous exemption requests, that formal offsite REP plans, required under 10 CFR Part 50, are not necessary for a permanently shutdown and defueled nuclear power reactor licensee once the evaluation criteria outlined in Section 5 of NSIR/DPR-ISG-02 have been addressed.

The NRC has previously considered the need to require expediting the transfer of spent fuel assemblies from the SFP into dry cask storage and has concluded it is not necessary based on risk. As discussed in COMSECY-13-0030, an expedited transfer of spent fuel to dry cask storage would provide only a minor or limited safety benefit. The NRC’s regulatory activities and past studies have shown that SFPs are effectively designed to prevent accidents that could affect the safe storage of spent fuel. Additionally, operating experience has shown that SFPs have safely withstood challenging events, maintaining structural integrity and a large inventory of coolant to protect the stored fuel. The staff also determined that further study would not likely support a requirement that reactor licensees expedite the transfer of spent fuel from their SFPs into dry cask storage. The NRC’s regulatory practice has consistently not required an offsite REP plan to remain in place until all spent fuel has been removed from the SFP at decommissioning power reactor sites. As previously discussed, offsite REP requirements will be removed when they are no longer needed in the view of the extremely small risk and the ability of CEMP measures to protect public health and safety in response to that extremely small risk, just as it protects against other non-nuclear hazards in the community.

[FEMA Statement 2] The Pilgrim exemption, if issued, will create a transitional environment for offsite emergency preparedness programs and associated planning for radiological hazards. FEMA will continue to support offsite response organizations (OROs) as they adjust their plans, sustain capabilities, and manage resources to the changing radiological hazard. The resources available to support FEMA stakeholders during the transition process include, but are not

limited to, the National Integration Center, the Federal Radiological Preparedness Coordinating Committee, and technical assistance from FEMA's National Preparedness Headquarters and Regional Staff.

The discontinuation of FEMA's REP Services, once the Commission determines that the risks from spent fuel stored in the SFP no longer warrant formal offsite REP plans and preparedness, is addressed in Sections V.A.11 and V.B.11 of the Memorandum of Understanding Between the Department of Homeland Security/Federal Emergency Management Agency and Nuclear Regulatory Commission Regarding Radiological Response, Planning and Preparedness (FEMA/NRC MOU) (ADAMS Accession No. ML15344A371). At 10 months after permanent cessation of power operations under 10 CFR 50.82(a)(1) (i.e., 10-month decay time), requirements on the licensee to maintain an offsite REP plan would no longer exist.

The period from permanent cessation of power reactor operations until the thresholds established in Section 5.0 to NSIR/DPR-ISG-02 are met is intended to serve as a transitional period to allow for appropriate planning by OROs to support the transition of offsite emergency preparedness programs and associated planning to a CEMP approach. The NRC will continue to coordinate with FEMA's National Preparedness Headquarters and Regional staff, and with the Federal Radiological Preparedness Coordinating Committee during this transition period.

[FEMA Statement 3] With respect to offsite radiological emergency response, as described in enclosure to the SECY paper, *NRC Historical Perspective and Staff Evaluation Considerations*, "In the highly unlikely event of a zirconium cladding fire in the SFP due to a beyond design-basis event resulting from the loss of all spent fuel cooling, sufficient time would also exist for OROs to implement protective measures, if warranted, using a Comprehensive Emergency Management Program (CEMP), "all-hazards," approach." Therefore, NRC staff concluded, consistent with previous exemption requests, that formal offsite REP plans, required under 10 CFR Part 50, are not necessary for a permanently shut down and defueled nuclear power reactor licensee once the evaluation criteria outlined in Section 5, "Evaluation of Exemptions to EP Regulations," of the NSIR Division of Preparedness and Response (DPR) Interim Staff Guidance (ISG) document NSIR/DPR-ISG-02, "Emergency Planning Exemption Requests for Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML14106A057), have been addressed." The belief expressed by the NRC staff that State and local governments surrounding a decommissioned plant which are not involved in formal radiological emergency planning would nonetheless respond expeditiously and with optimum effectiveness to an actual emergency in a coordinated fashion using its CEMP is open to question. FEMA has no data that would indicate what State and local government reactions might be in such circumstances.

In 1987, the NRC published a final rule, "Evaluation of the Adequacy of Off-Site Emergency Planning for Nuclear Power Plants at the Operating License Review Stage Where State and/or Local Governments Decline to Participate in Off-Site Emergency Planning" (52 FR 42078; November 3, 1987). The rule incorporates the "realism doctrine," in 10 CFR 50.47(c)(1) that states, "the NRC will recognize 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." Prior to this, the final rule, "Emergency Planning and Preparedness," (47 FR 30232; July 13, 1982), had already laid a foundation that findings and determinations on the state of offsite EP were not needed to support issuance of a license for fuel loading and low-power

testing because there was sufficient time (at least 10 hours) in which to take action to protect the public in even the worst case accident.

The NRC staff's position is strengthened by the acknowledgement of national level efforts, in which both FEMA and the NRC participate, to improve the state of EP of the nation. The FEMA document CPG 101 provides guidance about response and recovery planning to State, Territorial, Tribal, and local Governments. It also extends those planning concepts into the prevention and protection mission areas. CPG 101 reflects the current emergency operations plan (EOP) development environment by integrating concepts from the National Preparedness Guidelines, National Incident Management System (NIMS), National Response Framework (NRF), National Strategy for Information Sharing (NSIS), National Infrastructure Protection Plan (NIPP), lessons from recent disasters and attacks, and recommendations from the Nationwide Plan Review. CPG 101 replaces State and local Guide 101, "Guide for All-Hazards Emergency Planning," and is the cornerstone for a series of CPGs providing planning considerations for a variety of hazards, security and emergency functions. CPG 101 also describes how the State and local planning process will vertically integrate with the Integrated Planning System at the Federal level.

For facilities licensed by the NRC where radiological hazards are unlikely to have an offsite impact, the risk posed by the remaining low-level hazard is somewhat analogous to that posed by non-nuclear hazards (e.g., train derailments or chemical spills) that are addressed by a CEMP approach, except that the hypothetical event at a decommissioned nuclear plant leading to an offsite radiological release would likely develop much more slowly. Protective actions, such as evacuation, are not unique to radiological events and occur in response to other hazards such as chemical spills, fires, and natural disasters, and are often initiated without any pre-planning, as discussed in NUREG/CR-6864, "Identification and Analysis of Factors Affecting Emergency Evacuations,' Main Report" (ADAMS Accession No. ML050250245), and NUREG/CR-6981, "Assessment of Emergency Response Planning and Implementation for Large Scale Evacuations" (ADAMS Accession No ML082960499). Based on the results of these studies, the NRC has confidence in the ability of OROs to implement appropriate response actions when necessary in the highly unlikely event of an incident at a low-risk nuclear facility having offsite consequences.

[FEMA Statement 4] Additionally the NRC notes in the enclosure to the SECY paper, *NRC Historical Perspective and Staff Evaluation Considerations* that "Entergy Nuclear Operation, Inc., would still be required to maintain an onsite emergency plan, which would provide for the notification of, and coordination with, offsite organizations, to an extent commensurate with the approved exemptions." In another enclosure to the SECY paper, *Evaluation of Request by Entergy Generation Company, LLC for Exemptions from Certain Emergency Planning Requirements for the Pilgrim Nuclear Power Station*, the NRC staff's evaluation for exempting protective action requirements contained in 10 CFR 50.47(b)(10) states that "Although formal offsite REP plans (in accordance with 44 CFR 350), licensee requirements for offsite fire-fighting, emergency medical services and law enforcement responding onsite will continue to be maintained under the licensee's fire protection plan and physical security plan in accordance with 10 CFR 50.48 and 10 CFR 73 respectively." In the enclosure to the SECY paper, the NRC staff's evaluation for exempting protective action requirements contained in 10 CFR 50.47(b)(10) states that "Although formal offsite REP planning (in accordance with 44 CFR 350) has typically been exempted for decommissioning sites, OROs will continue to be

relied upon for firefighting, law enforcement, ambulance and medical services in support of the licensee's (onsite) emergency plan."

Simply put, if the exemption is granted, OROs would still be required and expected to perform activities to satisfy licensing requirements, and these same ORO's would be evaluated by the NRC. As described in *NRC Historical Perspective and Staff Evaluation Considerations*, if the Commission approves these exemptions, the NRC would "evaluate, as part of periodic oversight activities under their respective regulatory programs, the adequacy of OROs that are identified by licensees to respond onsite in the event of an emergency, such as firefighting law enforcement and medical transportation/treatment. Agreement with these OROs to respond onsite or provide assistance in the event of an emergency will be documented in formal letters of agreement, which will be contained or referenced in the licensee's emergency plan, physical security plan, or fire protection plan, as applicable."

The NRC staff agrees with FEMA, that if the Commission approves these exemptions, Entergy would still be required to maintain an onsite emergency plan, which would provide for the notification of, and coordination with, offsite organizations, to an extent commensurate with the approved exemptions. Section V.B.1 of the FEMA/NRC MOU states an NRC responsibility is "[t]o assess licensee emergency plans for adequacy. This review will include organizations with which licensees have written agreements to provide onsite support services under emergency conditions." As such, the NRC will continue to evaluate, as part of periodic oversight activities under the respective regulatory programs, the adequacy of OROs that are identified by licensees to respond onsite in the event of an emergency, such as fire-fighting, law enforcement, and medical transportation/treatment. Agreement with these OROs to respond onsite or provide assistance in the event of an emergency will be documented in formal letters of agreement, which will be contained or referenced in the licensee's emergency plan, physical security plan, or fire protection plan, as applicable.

[FEMA Statement 5] While previous exemption requests may not have required FEMA to provide the NRC with a continuous reasonable assurance finding related to offsite radiological emergency preparedness considerations mentioned above, there is nothing in existing NRC regulations or the December 7, 2015, "Memorandum of Understanding Between the Department of Homeland Security/Federal Emergency Management Agency and Nuclear Regulatory Commission Regarding Radiological Response, Planning and Preparedness" (ADAMS Accession No. ML15344A371) that would preclude the NRC from requesting FEMA to provide the NRC with evaluations and findings concerning appropriate offsite radiological emergency preparedness considerations. FEMA stands ready, consistent with this MOU, to work with NRC in this regard and to ensure that appropriate funds are provided to FEMA to accomplish this effort.

The staff's exemption recommendation, if approved by the Commission, would not affect the responsibility that FEMA has under its regulations in 44 CFR Chapter I, "Federal Emergency Management Agency," for assistance to State and local response organizations, nor would it affect the responsibilities of State and local governments to establish and maintain CEMPs under the National Preparedness System. In the absence of offsite REP requirements, which in the NRC's judgment are not needed to protect public health and safety for facilities posing very low risks, the NRC would have no regulatory basis or reason to seek FEMA findings or determinations on offsite emergency preparedness. The NRC would base its finding of

reasonable assurance on its review of licensee onsite emergency preparedness and would not require a finding from FEMA on the adequacy of State and local CEMPs. Under its role as described in the National Response Framework, the NRC remains ready to support FEMA by providing it and State, local, and Tribal governments with technical advice related to the safety and security of operations at decommissioning nuclear facilities such as Pilgrim. In accordance with the MOU with FEMA, the NRC will continue to use the FEMA/NRC Steering Committee on Emergency Preparedness as the focal point for coordination of EP and preparedness issues and will continue to provide FEMA the opportunity to review and comment on guidance and relevant research and development programs prior to adoption as formal agency guidance and/or implementation.

Though not considered part of the NRC's evaluation of the Pilgrim exemption request, the staff is informing the Commission of letters of agreement (LOAs) between the PNPS and the Town of Plymouth and the Commonwealth of Massachusetts, which are provided as an enclosure to Entergy's February 14, 2019, letter, "Response to Request for Additional Information – Exemption from the Requirements of 10 CFR 50.47 and Appendix E to 10 CFR Part 50" (ADAMS Accession Package No. ML19050A298). These LOAs establish conditions regarding the timeliness for classification of emergency events and notification of the Town of Plymouth and the Commonwealth of Massachusetts and will take effect when all agreements and requirements for the maintenance and existence of an off-site emergency planning zone are no longer in effect. Commitments under the LOA with the Commonwealth of Massachusetts include, in part:

- The Licensee and Commonwealth agree to exchange and coordinate in the maintenance, updating, and exercise of both Licensee and State Emergency Plan and Emergency Procedure changes that pertain to those elements of interface prior to implementing the change.
- The Licensee and Commonwealth agree to exchange in a timely manner all information known and available for emergency decision making regarding plant conditions, plant radiological releases, off-site radiological impact and other technical data.
- Pilgrim Nuclear Power Station will use a dose assessment methodology acceptable to the Massachusetts Department of Public Health, Radiation Control Program.
- In the event of a radiological emergency requiring off-site response or monitoring, the Licensee agrees to make an Environmental Laboratory available to the Commonwealth as close as reasonably possible to the plant for radiochemical processing of all types of environmental media sampled.
- The Alert and Notification System will no longer be in effect when all agreements and requirements for the maintenance and existence of an off-site emergency planning zone are no longer in effect.