Evaluation of Request by Exelon Generation Company, LLC for Exemptions from Certain Emergency Planning Requirements for the Three Mile Island Nuclear Station

The following U.S. Nuclear Regulatory Commission (NRC) staff evaluation verifies that the Exelon Generation Company, LLC (Exelon, the licensee) provided the analyses described in Section 5, "Evaluation of Exemptions to Emergency Planning Regulations," of the Office of Nuclear Security 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," dated May 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14106A057). These analyses meet the criteria in the ISG to justify elimination of the requirement on the licensee to maintain the plume exposure pathway and ingestion pathway emergency planning zones (EPZs) and formal offsite radiological emergency preparedness (REP) plans. The discussion that follows lists each ISG criterion, followed by the NRC staff's evaluation of the licensee's consistency with that criterion for the Three Mile Island Nuclear Station (TMI).

1. The licensee has performed an analysis indicating that any radiological release from applicable design-basis accidents (DBAs) would be within the dose limits of Section 50.67, "Accident source term," to Title 10 of the *Code of Federal Regulations* (10 CFR) and dose acceptance criteria in Regulatory Guide 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors." The licensee evaluated the maximum 2-hour total effective dose equivalent (TEDE) to an individual located at the exclusion area boundary (EAB), the 30-day TEDE to an individual at the outer boundary of the low population zone, and the control room. The resulting doses would not approach the U.S. Environmental Protection Agency (EPA) early phase protective action guides (PAGs) recommendation for protection of the public.[1]

   Evaluation: Exelon states that the irradiated fuel will be stored in the spent fuel pool (SFP) and later in an independent spent fuel storage installation (ISFSI), when built. Exelon further states, and the NRC staff agrees, that while spent fuel remains in the SFP, the only postulated DBAs that would remain applicable to the permanently defueled TMI facility that could contribute a significant dose would be a fuel-handling accident (FHA) in the Fuel Handling Building, where the SFP is located. However, for completeness, the NRC staff also evaluated the applicability of a waste gas tank rupture and a fuel cask drop accident, as documented in the TMI, Unit 1 (TMI-1) Updated Final Safety Analysis Report (UFSAR) (ADAMS Package Accession No. ML18117A343), and the applicability of any unanticipated releases as documented in the Unanticipated Events Analysis in the TMI, Unit 2 (TMI-2) Post-Defueling Monitored Storage Safety Analysis Report (ADAMS Package Accession No. ML17236A295), to ensure that these accidents would not have consequences that could potentially exceed the 10 CFR 50.67 dose limits and Regulatory Guide 1.183 dose acceptance criteria or approach the EPA early phase PAGs.

[1] Use of EPA early phase PAGs as a threshold is consistent with the planning basis for the 10-mile EPZ provided in NUREG-0396 (EPA 520/1-78-016), "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants," and endorsed by the Commission in a policy statement published on October 23, 1979 ("Planning Basis for Emergency Responses to Nuclear Power Reactor Accidents," 44 *Federal Register* 61123).

Fuel Handling Accident – Exelon defines an FHA as the dropping of a single spent fuel assembly in the SFP during fuel-handling activities, such that the entire row of fuel rods in the assembly suffers mechanical damage to cladding. This accident is postulated to occur despite the administrative and physical limitations imposed on fuel-handling operations. The gap activity in the damaged fuel rods is instantaneously released into the SFP; however, the release would occur under 23 feet of water, which acts as a filter.

Exelon performed an analysis that shows that 365 days after permanent cessation of power operations, doses from an FHA would decrease to a level that would not warrant protective actions under the EPA early phase PAG framework and would meet the dose limit requirements under 10 CFR 50.67 and dose acceptance criteria under Regulatory Guide 1.183.

The NRC staff notes that the doses from an FHA are dominated by the isotope Iodine-131. Exelon requests that the approved exemptions become effective 488 days following the permanent cessation of power operations at TMI-1. The permanent cessation of power operations occurred on September 20, 2019. Therefore, by the date of implementation of the proposed exemptions, the fuel will have decayed for 488 days. After 488 days of decay, the thyroid dose from an FHA would be negligible. With 488 days of decay, the only isotope remaining in significant amounts, among those postulated to be released in a DBA FHA, would be Krypton-85. Since Krypton-85 primarily decays by beta emission, the calculated skin dose from an FHA release would make an insignificant contribution to the TEDE, which is the parameter of interest in the determination of the EPA early phase PAGs for sheltering or evacuation.

Waste Gas Tank Rupture – The Waste Gas Disposal System collects, stores, monitors, samples and releases radioactive gas, hydrogen and oxygen from the primary coolant. Following permanent cessation of power operations, the waste gas tanks will be required to retain, and release waste gas generated from water management activities for a limited duration. Once the reactor is permanently shut down and defueled, there is no mechanism to increase the radioactive source term within the reactor coolant system, so the source term begins to decrease due to radioactive decay. Therefore, upon permanent cessation of power operations, the initial radioactive source term contained within the waste gas tanks represents the highest (i.e., worst case) source term and the current analysis in the TMI-1 UFSAR (ADAMS Accession No. ML19067A066) remains bounding. Subsequent additions to the waste gas tanks resulting from water management activities would be less than the final shutdown and cooldown waste gas tank source term.

Fuel Cask Drop Accident – The source term contained in a fuel cask is based on the assumptions that the fuel cask and its entire contents of 10 fuel assemblies are sufficiently damaged to allow the escape of all the noble gases and iodine in the gap activity of the primary coolant. The noble gases and iodine are assumed to be released directly to the atmosphere and to occur instantaneously. No credit is taken for any active safety system for the mitigation of the accident. The licensee's analysis demonstrates that 365 days after permanent cessation of power operations, the radiological consequences of the analyzed DBA will not exceed the limits of the EPA early phase PAGs at the EAB.

Exelon states that the fuel cask drop accident of record, as described in the TMI-1 UFSAR, remains valid after permanent defueling. However, as part of Exelon's ISFSI project, the Fuel Handling Building crane will be replaced and upgraded to a single failure-proof design and will no longer require a Cask Drop Analysis. Therefore, the only remaining applicable DBA will be an FHA.

TMI Unit 2 – Exelon states the bounding event for TMI-2 is a fire in the Reactor Building with the Reactor Building Purge System in operation. Based on its analysis, Exelon states that the dose at the EAB is 13.5 millirem (mrem) expressed as a bone dose. Due to the isotopic mix (e.g., negligible amounts of iodine) and the nature of potential releases (i.e., particulate matter), a more restrictive basis (i.e., the critical organ) for comparison was selected for reporting dose for TMI-2 fires.

The NRC staff reviewed the assumptions, inputs, and methods used by Exelon to assess the radiological impacts of the proposed changes. The NRC staff finds that the proposed changes use analysis methods and assumptions consistent with the guidance contained in Regulatory Guide 1.183. The NRC staff compared the doses estimated by Exelon to the applicable criteria. The NRC staff concludes that Exelon has demonstrated that the dose consequences for postulated accidents at the permanently defueled TMI facility would not have consequences that could potentially exceed the applicable dose limits in 10 CFR 100.11, "Determination of exclusion area, low population zone, and population center distance," and 10 CFR 50.67, and the dose acceptance criteria in Regulatory Guide 1.183. The analysis demonstrates that 365 days after permanent cessation of power operations, the radiological consequences of the analyzed DBAs will not exceed the limits of the EPA early phase PAGs at the EAB. Therefore, the NRC staff finds the proposed changes to be acceptable from a dose consequence perspective.

2. The licensee has performed an analysis demonstrating that after the spent fuel has decayed for 488 days, with a complete loss of SFP water inventory with no heat loss (i.e., adiabatic heatup), a minimum of 10 hours would be available before any fuel cladding temperature reaches 900 degrees Celsius (°C) from the time all cooling is lost.

   Evaluation: The NRC staff evaluates the ability to mitigate beyond-design-basis events considering the time available to implement measures to maintain spent fuel cooling or, if necessary, implement an appropriate emergency response. The NRC staff uses an assessment of the adiabatic heat-up to determine the available time because adiabatic heatup is generally the limiting condition. The

heat-up time calculated is the time to reach a temperature of 900°C, which correlates to 1,652 degrees Fahrenheit (°F), as the temperature where "runaway oxidation" (zirconium cladding fire) is expected to occur, as defined in NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants," dated February 2001 (ADAMS Accession No. ML010430066).

The 10-hour criterion, conservatively, does not consider the time to uncover the fuel and assumes instantaneous loss of cooling to the fuel. The 10-hour time period is also not intended to represent the time that it would take to repair all key safety systems or to repair a large SFP breach. The 10-hour criterion is a conservative period of time in which pre-planned mitigation measures to provide makeup water or spray to the SFP can be reliably implemented before the onset of a zirconium cladding ignition. In addition, in the unlikely event that a release is projected to occur, 10 hours would provide sufficient time for offsite agencies, if deemed warranted, to take appropriate action to protect the health and safety of the public.

Exelon provided a calculation in Attachment 2, "Three Mile Island Nuclear Station Zirconium Fire Analysis for Drained Spent Fuel Pool," to its application to determine the decay time necessary to ensure at least a 10-hour heat-up time considering the thermal capacity of the portion of the fuel assembly that heats uniformly and the decay heat rate of the fuel. The TMI-1 analysis shows that after the spent fuel has decayed for 488 days, for beyond-design-basis events where the SFP is drained and air cooling is not possible, at least 10 hours would be available from the time spent fuel cooling is lost until the hottest fuel assembly reaches a temperature of 900°C. This 10-hour minimum threshold provides sufficient time for TMI to take mitigative actions, or if governmental officials deem warranted, for offsite protective actions to be initiated using a comprehensive approach to emergency planning.

Exelon states that an initial fuel assembly temperature of 110°F was assumed. This is a conservative value based on the calculated maximum SFP temperature of 105.4°F, which assumes both SFP cooling trains are in service at 1 year after permanent cessation of power operations. The heat-up time is assumed to start when the SFP has been completely drained, which is conservative relative to the actual conditions following an event that could lead to a loss of SFP water. For these events, water would be expected to be present for a significant time, considering the large volume of water initially in the pool, and absorb a significant amount of the decay heat generated during that time. The adiabatic assumption also assumes there is no air cooling of the assemblies since natural circulation flow paths are not credited and assumed blocked. These assumptions eliminate other mechanisms in which decay heat would be transferred away from the fuel bundle either by convective heat transfer or by the boiling of SFP water.

As noted in Attachment 2, Section 2.4, "Three Mile Island Nuclear Station Zirconium Fire Analysis for Drained Spent Fuel Pool (Calculation C-1101-202-E410-476, Revision 1)," Exelon calculated a best estimate decay heat load for the fuel assembly with the maximum heat load in the TMI SFP. This calculation considered TMI-1 operation for an assumed 720 effective full power days ending

on September 30, 2019, which bounds the actual operating power history prior to permanent cessation of power operations on September 20, 2019.

Section 2.4 of the Exelon calculation contains a table of the decay heat load for the highest load fuel assembly as a function of decay time (in days) after the assumed end of power operations. The limiting assembly was selected from several subgroups of assemblies calculated to have the highest fuel burnups used in the last cycle. Using the fuel burnup data, the licensee used the ORIGEN2 computer code to determine decay heat value for decay times of 365 days and beyond. The licensee developed a correlation between decay time (days) and the maximum fuel decay heat rate using a 3rd order polynomial.

A heat up analysis was performed to calculate the time to reach a temperature of 900°C (1,652°F). The thermal capacity of the fuel assembly was calculated based on the dimensions and materials of the Areva fuel assembly design used in the TMI-1 core. Fuel assembly materials consisted of uranium dioxide, Alloy M5, CF3 Stainless Steel, and Inconel Alloy 718.

These values were used to calculate the heat-up time by dividing the heat necessary to raise the temperature of the length of the fuel, fuel cladding, and guide tube material from approximately 110°F to 1,652°F using the decay heat rate of the fuel. This value was used in conjunction with the derived formula to calculate the 488-day required decay time. The specific heat capacity values increase with temperature, and Exelon selected values at 881°F, which is the midpoint of the evaluated range. The uranium dioxide specific heat values were calculated using a formula and approach consistent with results found in NUREG/CR-7024, “Material Property Correlations: Comparisons between FRAPCON-3.4, FRAPTRAN 1.4 and MATPRO,” dated March 2011 (ADAMS Accession No. ML14296A063). The specific heat of other materials was defined using applicable material properties.

The NRC staff reviewed the calculation to verify that important physical properties of materials were within acceptable ranges and the results were accurate. The NRC staff determined that physical properties were appropriate and completed independent confirmatory calculations that produced similar results. Therefore, the NRC staff found that after 488 days of decay, at least 10 hours would be available before a significant offsite release could begin. The NRC staff concluded that the adiabatic heat-up calculation provided an acceptable method for determining that a minimum of 10 hours would be available before any fuel cladding temperature reaches 900°C from the time all cooling is lost.

3. The licensee has performed an analysis for a loss of SFP water inventory resulting in radiation exposure at the EAB and the control room (which indicates that any release would be less than EPA early phase PAGs at the EAB).

   Evaluation: Exelon analyzed the radiological consequences of a beyond-design-basis scenario to evaluate the effects of a loss of water inventory from the SFP. The primary purpose of this calculation is to determine the dose rates as a function of time at the EAB and in the control room due to loss of shielding for an event in which the spent fuel assemblies are uncovered following drain down.

The dose rates determined by this calculation are due to direct and indirect radiation from spent fuel assemblies. The NRC staff notes that while the direct dose rate above the unshielded fuel would be high, radiation protection personnel would restrict access to ensure that no one was subjected to the direct dose from the unshielded fuel.

The SFP water and the concrete pool structure serve as radiation shielding. A loss of water shielding above the fuel could increase the offsite radiation levels because of the gamma radiation emitted skyward interacting with air molecules and subsequently scattered back down to the ground where it can expose members of the public (known as "skyshine"). The offsite and control room radiological impacts of a postulated complete loss of SFP water were assessed by Exelon. A loss of water shielding above the fuel could increase the offsite radiation levels because of the gamma rays streaming up out of the SFP being scattered back to a receptor at the site boundary. With a decay of 365 days from permanent cessation of power operations, the dose rate at the EAB would be 0.404 mrem/hour, without crediting the shielding from the Fuel Handling Building roof. If the analysis credits the Fuel Handling Building roof structure, then the dose rate at the EAB would be well below 1 mrem/hour. The resultant dose rates if taken over the 10-hour accident duration would be less than the EPA early phase PAGs. Additionally, after 365 days of fuel decay, a postulated complete loss of SFP water would result in a gamma radiation dose rate in the control room below 0.1 mrem/hr. The NRC staff reviewed the licensee's analysis description and agrees that appropriate methods were used to evaluate the effects of this source of radiation at the control room and the EAB. Therefore, the NRC staff concludes that the dose consequence from skyshine emitted from the SFP due to a loss of SFP normal cooling would not exceed a level that would warrant protective actions under the EPA early phase PAGs.

4. Considering the site-specific seismic hazard, the licensee has performed either an evaluation demonstrating a high-confidence of a low probability (less than 1×10^{-5} per year) of seismic failure of the SFP storage structure, or an analysis demonstrating the fuel has decayed sufficiently that natural air flow in a completely drained pool would maintain peak cladding temperature below 565˚C (the point of incipient cladding damage).

   Evaluation: Exelon conducted a seismic evaluation of the SFP structure in response to an NRC letter to all power reactor licensees, "Request for Information Pursuant to Title 10 of the *Code of Federal Regulations* Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated March 12, 2012 (ADAMS Accession No. ML12073A348). The seismic hazard evaluation was applicable to all structures, including the SFP, and was prepared and submitted for NRC review. The Exelon submittal (ADAMS Accession No. ML14090A271) documents the seismic hazard evaluation in conformance with Near-Term Task Force (NTTF) Recommendation 2.1.

   The NRC staff review of the NTTF submittal associated with the reevaluated seismic hazard was documented in a letter dated August 14, 2015 (ADAMS Accession No. ML15223A215).

By letter dated August 31, 2016 (ADAMS Accession No. ML16244A326), Exelon summitted its TMI-1 SFP evaluation, which provided assurance of high-confidence of low probability of failure, for NRC review. Exelon stated that this assessment was performed using the Electric Power Research Institute (EPRI) document EPRI 3002007148, "Seismic Evaluation Guidance: Spent Fuel Pool Integrity Evaluation," dated February 2017 (ADAMS Accession No. ML16312A399), which the NRC staff endorsed for performance of SFP seismic re-evaluations by letter dated March 17, 2016 (ADAMS Accession No. ML15350A158). The NRC staff assessed Exelon's implementation of the EPRI guidance through the completion of a reviewer checklist. By letter dated October 27, 2016 (ADAMS Accession No. ML16293A873), the NRC staff concluded that sufficient information was provided, including the SFP integrity evaluation, to meet the SFP Evaluation Guidance (Item 9 in Enclosure 1 of the NRC's 10 CFR 50.54(f) letter), thus demonstrating high-confidence of a low probability (less than 1 X 10^{-5} per year) of seismic failure on the SFP storage structure.

In addition, Exelon provided, in its supplemental letter, that the off-loaded fuel assemblies (a.k.a. hot cells) will be arranged so that all four face-adjacent cells will have assemblies that have been discharged for at least 5 years (a.k.a. cold cells). Additionally, two or more hot cells may not take credit for the same cold cell. Storing spent fuel in such a dispersed pattern in the SFP promotes air cool-ability of the spent fuel in the unlikely event of a loss of water.

5. If the licensee is storing fuel in an SFP, the licensee should address, for the decommissioning site, the risk reduction measures identified in NUREG-1738 as industry decommissioning commitments (IDCs) and staff decommissioning assumptions (SDAs).[2] The IDCs and SDAs are a set of design characteristics and operational capabilities that either help prevent a substantial loss of coolant inventory or increase the likelihood of recovery from such an event.

   Evaluation: In accordance with the safety analysis in NUREG-1738, the beyond-design-basis event sequences that dominate risk at a decommissioning nuclear power reactor are large earthquake or cask-drop events. This is an important difference relative to an operating nuclear power reactor, where typically a large number of different initiating events make significant contributions to risk.

   Assurance that the results of the NUREG-1738 analysis are representative of the plant-specific conditions at TMI can be established by assessing the facility against certain design and operational characteristics that were assumed in the NUREG-1738 analysis. These characteristics were identified in the NUREG-1738 study as recovery, mitigation, and emergency response activities assumptions that were relied on to evaluate the likelihood of success in event sequences. In Section 5.5, "Comparison to NUREG-1738 Industry Decommissioning Commitments and Staff Decommissioning Assumptions," to its application, Exelon described the conformance of the TMI facility

[2] Refers to IDCs proposed by the Nuclear Energy Institute (NEI) in a letter to the NRC dated November 12, 1999 (ADAMS Accession No. ML993340413), and several additional SDAs identified through the NRC staff's risk assessment and the NRC staff's evaluation of the safety principles for decommissioning plants in Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis." The IDCs and SDAs are summarized in Tables 4.2-1 and 4.2-2 to NUREG-1738.

and operations with the IDCs and the SDAs. In their discussion of the IDCs and SDAs, Exelon addressed measures in place to minimize the potential risk from event sequences that dominate risk at a decommissioning reactor with fuel stored in an SFP (for example, those IDCs and SDAs related to fuel cask handling activities and seismic events).

The NRC staff evaluation focused on Exelon's conformance with IDCs and SDAs that are related to the design and operation of structures, systems, and components associated with the SFPs. The summary below of the NRC staff's findings is based on an assessment of Exelon's IDC and SDA items.

IDC #1: Cask drop analyses will be performed or single-failure-proof cranes will be used for handling of heavy loads (i.e., phase II of NUREG-0612 "Control of Heavy Loads at Nuclear Power Plants: Resolution of Generic Technical Activity A-36," dated July 1980 (ADAMS Accession No. ML070250180) will be implemented).

Evaluation: Exelon has analyzed the Fuel Cask Drop Accident, defined as the dropping of a fuel cask through the maximum drop height during transfer operations of a fuel cask onto a rail car. A cask drop into the SFP is prevented by the Technical Specifications requirement that the key operated travel interlock system for automatically limiting the travel area of the Fuel Handling Building crane shall be imposed whenever loads in excess of 15 tons are lifted and transported, which prevents cask movement in locations where the cask could drop into the SFP.

Section 9.7.1.1, "Fuel Handling System," of the TMI-1 UFSAR contains discussion on the fuel handling system designed to minimize the possibility of mishandling or maloperations that could cause fuel assembly damage, potential fission product release, or both. This UFSAR section further defines travel limitations and administrative controls for normal operation and load handling over or near the SFP. Section 9.7.1.1 of the TMI-1 UFSAR states:

> The fuel handling crane during its normal operation is prevented from handling heavy loads over the spent fuel pool and its adjacent area by a key-interlock system. The automatic travel interlock system is administratively imposed during normal operation from a keylock switch whenever the fuel handling crane is to transport loads in excess of 15 tons and confines the crane bridge and trolley horizontal motions to the shaded areas indicated on Figure 9.7-2 [Allowable Load Handling Area When Fuel Handling Building Crane Travel Interlock System is Activated]. The vertical lift height of such a load is under strict administrative control. The only area of the spent fuel pool structure that may be exposed to a spent fuel cask accidentally dropped from a height greater than one foot is the shipping cask area (Figure 9.7-1 [Fuel Handling System]) which has been designed to withstand the impact from a dropped spent fuel cask. The bottom of the spent fuel cask storage area is constructed of solid reinforced concrete to bedrock…

Exelon stated that the Fuel Handling Building crane will be upgraded (or replaced) to a single-failure-proof design to handle spent fuel casks for the facility ISFSI, which minimizes the potential for a load drop. Exelon described planned future upgrades to a

single-failure-proof overhead handling system that would permit removal of some or all of the load limitations and travel restrictions by eliminating a load-drop accident as a credible design-basis event. Therefore, the NRC staff finds that Exelon satisfies NUREG-1738 IDC #1.

IDC #2: Procedures and training of personnel will be in place to ensure that onsite and offsite resources can be brought to bear during an event.

IDC #3: Procedures will be in place to establish communication between onsite and offsite organizations during severe weather and seismic events.

IDC #4: An offsite resource plan will be developed which will include access to portable pumps and emergency power to supplement onsite resources. The plan would principally identify organizations or suppliers where offsite resources could be obtained in a timely manner.

Evaluation: Exelon states that TMI-1 has procedures in place to ensure onsite and offsite resources can be brought to bear during an event. Exelon provided a list of event-related procedures (e.g., loss of SFP cooling, security threat or intrusion, flood, earthquake), that will be implemented as necessary depending on the type of event. In addition, these procedures provide direction for additional actions and communications between offsite agencies and the onsite emergency response organization (ERO) during severe weather and seismic events. Exelon states TMI-1 has multiple portable pumps and emergency generators that meet Extensive Damage Mitigation Guidelines (EDMG) requirements. These can be used as required by abnormal procedures. In addition, emergency plan drills will be conducted to maintain proficiency in response to a plant event. As further described in its proposed Permanently Defueled Emergency Plan (ADAMS Accession No. ML19182A182), Exelon would provide for deployment of onsite resources and access to offsite resources, including provisions for training, communications, and coordination to obtain offsite resources. Exelon further states that resources are available from other Exelon facilities nearby. Therefore, the NRC staff concludes Exelon has adequate procedures to satisfy the conditions assumed in the NUREG-1738 analysis regarding effective use of onsite and offsite resources to respond to events affecting the SFP.

IDC #5: SFP instrumentation will include readouts and alarms in the control room (or where personnel are stationed) for SFP temperature, water level, and area radiation levels.

Evaluation: Exelon stated that the SFP instrumentation includes instruments, indicators, and alarms for SFP water level, temperature, and radiation levels. SFP temperature is monitored on the plant process computer and has a high temperature alarm function in the control room. There are low level alarm functions available in the TMI-1 control room. Two channels of continuous SFP water level indicators were added for reliable SFP level indication in response to NRC Order EA-12-051, “Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation,” dated March 12, 2012 (ADAMS Accession No. ML12054A679). A radiation monitor located in the Fuel Handling Building provides radiation levels in the spent fuel storage area and is monitored and alarmed in the control room. Therefore, the NRC staff concludes that Exelon will maintain adequate SFP monitoring instrumentation to satisfy the conditions assumed in the NUREG-1738 analysis regarding monitoring events affecting the SFP.

IDC #6: SFP seals that could cause leakage leading to fuel uncovery in the event of seal failure shall be self-limiting to leakage or otherwise engineered so that drainage could not occur.

Evaluation: The TMI-1 spent fuel storage facility is contained in the Fuel Handling Building and consists of two connected pools, Pool A (1,494 storage locations) and Pool B (496 storage locations). A cask loading pit is located within Pool B, and Pool A is connected to the fuel transfer canal in the reactor building via two fuel transfer tubes. Exelon indicated there are no seals in the SFP that would be subject to leakage. In the Exelon response to an NRC staff request for additional information (ADAMS Accession No. ML19344C115), Exelon described that the transfer tube gate valves would remain locked closed under administrative control and the blank flange on the reactor building side of each transfer tube will remain bolted in place to prevent loss of coolant inventory via the fuel transfer system because there is no longer a need to transfer fuel between the reactor and the SFP.

The SFP cooling system pumps are equipped with seals. However, the configuration of the SFP cooling system and its connections to the SFP prevent a substantial loss of SFP coolant inventory from becoming a consequence of a pump seal failure. Specifically, the cooling water inlet and outlet connections to the SFP are near the normal water level to protect against a substantial loss of water.

The NRC staff finds that the described design features that limit the potential for drainage through the fuel transfer system and SFP cooling system are consistent with the assumptions used in the analysis presented in NUREG-1738 (IDC #6).

IDC #7: Procedures or administrative controls to reduce the likelihood of rapid drain-down events will include (1) prohibitions on the use of pumps that lack adequate siphon protection, and (2) controls for pump suction and discharge points. The functionality of anti-siphon devices will be periodically verified.

Evaluation: Exelon provided a description of SFP configuration and use of siphon breakers to minimize the potential for draindown. Fuel storage in the Fuel Handling Building is provided in two pools: SFP A which has the capability for new fuel and spent fuel storage and handling; and SFP B which has the capability for spent fuel storage as well as fuel cask handling.

Exelon further described the SFP and its cooling system connection design to show that the physical arrangement of the piping inlets, outlets and anti-siphon devices precludes draining below the level of the top of the stored fuel in its storage rack. To protect loss of water, the cooling water inlet and outlet connections to SFP B all enter slightly below or at the normal water level in the pool. SFP A has a drain connection from the spent fuel cooling system extending downward from 10 feet above the top of fuel stored in this pool to near bottom of the pool with a normally locked open valve to prevent siphoning below an elevation 10 feet above the stored fuel. The spent fuel cask pit is in the corner of SFP B and is separated from the remainder of the SFP by a thin barrier with a gated opening for fuel transfer operations. For the spent fuel cask pit in SFP B, the combined drain/fill connection enters the pit at an elevation 12 feet above top of fuel and contains a siphon breaker with a normally locked-open valve to prevent siphoning in the unlikely event the line breaks outside of the pool.

As indicated in NUREG-1738, the low likelihood of loss of inventory is dependent upon design provisions (IDC #6) and procedures and controls (IDC #7) to limit leakage.

The NRC staff concludes that the physical configuration of inlet and outlet connections and use of anti-siphon devices provide adequate control to minimize the potential for rapid drainage through permanent systems and are consistent with the assumptions used in the analysis presented in NUREG-1738.

IDC #8: An onsite restoration plan will be in place to provide repair of the SFP cooling systems or to provide access for makeup water to the SFP. The plan will provide for remote alignment of the makeup source to the SFP without requiring entry to the refueling floor.

Evaluation: Exelon indicated that procedure TMI OP-TM-AOP-035, "Loss of Fuel Pool Cooling," provides plans for the initial response to abnormal conditions in the SFP and additional reference to makeup source and procedures. The following procedures describe makeup capability:

- Makeup from Fire Service (OP-TM-251-901, "High Capacity Fire Service Makeup to Spent Fuel Pool")
- Makeup from raw water sources (OP-TM-919-922, "FSG-6-Makeup from Raw Water Sources")
- Fuel Pool Makeup from FX-P-2A/B (OP-TM-919-914, "Spent Fuel Pool Makeup Using FX-P-2A or FX-P-2B") (This method does not require access to the spent fuel pool refueling floor)
- SFP Spray (OP-TM-251-902, "Spent Fuel Pool Spray")
- SFP Spray from outside the SFP Building (OP-TM-251-904, "Spent Fuel Pool Building (External) Spray"), including using an off-site fire truck

The NRC staff finds that the planned SFP cooling and make-up water capability, with access to numerous sources of makeup inventory, conforms to the capabilities assumed for the analysis presented in NUREG-1738.

IDC #9: Procedures will be in place to control SFP operations that have the potential to rapidly decrease SFP inventory. These administrative controls may require additional operations or management review, management physical presence for designated operations or administrative limitations such as restrictions on heavy load movements.

Evaluation: Exelon states that procedure WC-DC-100, "Decommissioning Work Control Process," dictates the review and approval of work conducted while in decommissioning. This procedure directs performance of integrated risk assessment per procedure OP-DC-104, "Decommissioning Integrated Risk Management," which provides for evaluation of potential operational risk. Heavy loads are controlled through the use of procedure MA-AA-716-022, "Control of Heavy Loads Program." Fuel and heavy load movements that could affect the safe handling and storage of nuclear fuel require approval by the shift manager. Additionally, the ISFSI transfer equipment will be designed such that there will be no ISFSI-related movements (when built). As stated in

NUREG-1738, having procedures in place helps reduce the chance of human errors, especially under stressful conditions such as during a severe accident.

Exelon provided a description of procedures for approval of decommissioning work and heavy load handling controls. NRC staff finds the described procedures are consistent with the administrative controls considered in the analysis presented in NUREG-1738.

IDC #10: Routine testing of the alternative fuel pool makeup system components will be performed and administrative controls for equipment out of service will be implemented to provide added assurance that the components would be available, if needed.

Evaluation: Exelon described several alternate makeup sources for TMI-1, including an electric-driven fire pump (FS-P-2) and a diesel-driven fire pump (FS-P-3) that can supply makeup water to the SFP via the fire service system. The TMI-1 Fire Protection Program provides controls for operation with equipment out of service and periodic functionality testing. TMI-1 also has two diesel-driven emergency makeup pumps capable of taking suction from the river to satisfy the EDMG requirements. The EDMG equipment provides defense-in-depth and has testing and out-of-service requirements controlled by their program procedures. The NRC staff finds that the described administrative controls conform to those considered in the analysis presented in NUREG-1738.

SDA #1: SFP cooling design will be at least as capable as that assumed in the risk assessment, including instrumentation. Licensees will have at least one motor-driven and one diesel-driven fire pump capable of delivering inventory to the SFP.

Evaluation: Section 9.4., “Spent Fuel Cooling System,” of the TMI-1 UFSAR describes the SFP cooling system, which is a Class I system configured with two pumps in parallel. Exelon describes the TMI-1 SFP cooling system design as having two independent trains of SFP cooling. Each train of spent fuel cooling rejects its heat to the nuclear service closed cooling water system, which in turn rejects its heat to the Susquehanna River (which serves as an ultimate heat sink) via the nuclear river water system.

Normal makeup to the SFP, which accounts for evaporation losses, is provided by reclaimed water. To provide makeup to address abnormal loss in the SFP, there are multiple means available. The primary method would be to use fire service water to provide makeup via hoses to the SFP. The fire service system includes a motor-driven fire service pump (FS-P-2) and a diesel-driven fire pump (FS-P-3), both of which take suction from the Susquehanna River. Each fire service pump has the capability to deliver 500 gallons per minute (gpm) of makeup water to the SFP. In addition to the river, the fire service system has a water storage tank (Altitude Tank), which provides an additional 100,000-gallon water source to the fire service system. Instrumentation was described in the discussion of IDC #5.

The NRC staff finds the described cooling and makeup capabilities are comparable to the capabilities considered in the analysis presented in NUREG-1738.

SDA #2: Walk-downs of SFP systems will be performed at least once per shift by the operators. Procedures will be developed for, and employed by, the operators to provide guidance on the capability and availability of onsite and offsite inventory makeup sources and time available to initiate these sources for various loss-of-cooling or inventory events.

Evaluation: Exelon states that it currently performs a walk-down of TMI-1 SFP systems once per day. Once the reactor has permanently ceased power operations, Exelon proposes to continue to perform walk-downs of the SFP systems once per day. These shift operator rounds will include spent fuel cooling system operating parameters, availability (status) of EDMG equipment, and availability of onsite makeup sources. Exelon also stated that there are other methods available in the control room to alert operators to potential SFP events, such as annunciators and level indication. Specifically, the SFP temperature is monitored on the plant process computer and has a high temperature alarm function in the control room. There are low-level alarm functions available in the TMI-1 control room. Additionally, TMI has two channels of continuous remote indication of the SFP water levels in the 322-foot control tower.

Exelon states that the TMI-1 procedure 1104-6, “Spent Fuel Pool Cooling System,” describes the normal operation of the SFP cooling system. Procedure OP-TM-AOP-035, “Loss of Fuel Pool Cooling,” provides the initial response to the abnormal conditions in the SFP. This abnormal operating procedure will direct mitigation actions related to restoring SFP cooling and/or makeup water. Exelon’s response for IDC #8 provides more details on procedures for SFP mitigation strategies. Exelon stated that the ability to use EDMG strategies to provide makeup from the river using portable pumps has been demonstrated to be capable of being implemented within 4 hours.

The operation and control of the SFP cooling systems and mitigation of a loss of SFP cooling will be addressed in the Certified Fuel Handling and Non-Certified Operator training programs.

Although Exelon proposes to perform walk-downs of the SFP daily instead of once per shift, the NRC staff finds that the proposed monitoring of the SFP systems would be comparable to the capability assumed for the analysis presented in NUREG-1738 based on the improvements in SFP monitoring capability and reliability implemented since the publication of NUREG-1738, specifically in response to the Fukushima accident.

SDA #3: Control room instrumentation that monitors SFP temperature and water level will directly measure the parameters involved. Level instrumentation will provide alarms at levels associated with calling in offsite resources and with declaring an emergency.

Evaluation: Exelon states that the SFP temperature is monitored on the plant process computer and has a high temperature alarm function in the control room. There are low-level alarm functions available in the TMI-1 control room. Additionally, TMI has two channels of continuous remote indication of the SFP water levels in the 322-foot control tower. Radiation channel RM-G-9 located in the Fuel Handling Building provides radiation levels in the spent fuel storage area and is monitored and alarmed in the control room.

Exelon states that the facility will employ permanently defueled emergency actions levels (EALs) using an EAL scheme based on the NEI document NEI 9901, Revision 6 (ADAMS Accession No. ML13091A209), which was endorsed by the NRC in a letter dated March 28, 2013 (ADAMS Accession No. ML12346A463), and has submitted the EAL scheme for NRC approval. Consistent with the NEI 99-01 permanently defueled EAL scheme, Exelon expects that station conditions will not have the capacity to reach any threshold requiring the declaration of a Site Area Emergency or a General Emergency classification level.

The NRC staff finds that the SFP monitoring capability is consistent with the assumptions in the analysis presented in NUREG-1738.

SDA #4: The licensee determines that there are no drain paths in the SFP that could lower the pool level (by draining, suction, or pumping) more than 15 feet below the normal pool operating level and that the licensee must initiate recovery using offsite sources.

Evaluation: Exelon referred to discussions in IDC #6 and IDC #7. In these IDCs, Exelon described potential drain or siphon paths within the SFP. Neither of the normal SFP cooling suction and discharge paths within the SFP could lower pool level more than 15 feet below the normal operating level. However, SFP A contains a drain line penetrating the SFP liner more than 15 feet below the normal SFP operating level. The drain line contains a siphon break to protect against water siphoning from the pool below 10 feet above the top of fuel. Although not normally used for spent fuel storage, the cask loading pit (located in SFP B) contains a similar drain with siphon-protecting drainage below 12 feet above the top of fuel.

The TMI-1 SFP is contained in the Fuel Handling Building and is connected to the fuel transfer canal via two fuel transfer tubes. As indicated in TMI-1 UFSAR Section 9.4.6, “Leakage Considerations,” a locked closed gate valve (on the Fuel Handling Building side) and blind flange (on the Reactor Building side) are used to isolate the fuel transfer tube when not actively performing refueling. The transfer tube passes through the primary containment wall and exterior wall of the Fuel Handling Building.

As discussed in Exelon’s application, the top of active fuel in the pool is approximated at 320 feet. TMI documentation shows the transfer tubes penetrating the pool wall below the top of stored fuel (Transfer Tube CL at 314′-6″ and pool floor at 305′-0″). Since the fuel transfer tube penetration has the capability of inadvertent draining below the top of fuel, Exelon was requested by letter dated November 15, 2019 (ADAMS Accession No. ML19319B208), to provide additional details regarding administrative control of the pool-side gate valves, and to describe any design features that could prevent or mitigate the consequences of opening the gate valve when the reactor refueling cavity is not flooded. In its December 10, 2019, response to the request for additional information (ADAMS Accession No. ML19344C115), Exelon stated that the locked-closed manual gate valves will remain locked-closed under administrative control per TMI-1 procedure OP-M-108-103, “Locked Equipment Program.” Exelon further indicated that the blank flange on the Reactor Building side of the fuel transfer tube is bolted in place and not readily removable.

The NRC staff concludes that the SFP design protections against drainage are consistent with the assumptions used in the analysis presented in NUREG-1738.

SDA #5: Load drop consequence analysis will be performed for facilities with non-single failure-proof systems. The analyses and any mitigative actions necessary to preclude catastrophic damage to the SFP that would lead to a rapid pool draining would be sufficient to demonstrate that there is high enough confidence in the facility's ability to withstand a heavy-load drop.

Evaluation: Currently, Exelon has analyzed the Fuel Cask Drop Accident in the TMI-1 UFSAR Section 14.2.2.8, "Fuel cask drop Accident." As discussed under IDC #1, Exelon plans to upgrade (or replace) the current Fuel Handling Building crane with a single-failure-proof design to handle the spent fuel casks. With use of a single-failure-proof crane, the cask drop event will not be considered credible and a cask drop analysis may no longer be required. In addition, use of a single-failure-proof overhead handling system would permit removal of some or all of the load limitations and travel restrictions by eliminating a load-drop accident as a credible design-basis event. Therefore, the NRC staff finds that Exelon's protection against heavy load drops is consistent with the assumptions considered in the analysis presented in NUREG-1738.

SDA #6: Each decommissioning plant will successfully complete the seismic checklist provided in Appendix 2B to NUREG-1738. If the checklist cannot be successfully completed, the decommissioning plant will perform a plant-specific seismic risk assessment of the SFP and demonstrate that SFP seismically induced structural failure and rapid loss of inventory is less than the generic bounding estimates provided in NUREG-1738 ($<1 \times 10^{-5}$ per year including non-seismic events).

Evaluation: Exelon conducted a seismic evaluation of the TMI SFP structure in response to the NRC's 10 CFR 50.54(f) letter dated March 12, 2012. By letter dated August 31, 2016 (ADAMS Accession No. ML16244A326), Exelon submitted its TMI-1 SFP evaluation, which provided assurance of high confidence of low probability of failure, for NRC review. Exelon stated that this assessment was performed using the seismic evaluation guidance document EPRI 3002007148. The NRC staff assessed Exelon's implementation of the SFP Evaluation Guidance Report through the completion of a reviewer checklist. By letter dated October 27, 2016 (ADAMS Accession No. ML16293A873), the NRC staff concluded that sufficient information was provided, including the SFP integrity evaluation, to meet the SFP Evaluation Guidance (Item 9 in Enclosure 1 of the NRC's 10 CFR 50.54(f) letter), thus demonstrating a high confidence of a low probability (less than 1×10^{-5} per year) of seismic failure of the SFP storage structure.

SDA #7: Licensees will maintain a program to provide surveillance and monitoring of Boraflex in high-density spent fuel racks until such time as spent fuel is no longer stored in these high-density racks.

Evaluation: Exelon states that the TMI-1 SFP A contains high density storage racks that employ neutron absorber material (Boral and Metamic). There are three coupon trees located in the high-density racks. Two are located in the Region II racks containing Boral, and one is located in the Region II racks containing Metamic. Exelon maintains a program that defines and tracks a surveillance program to verify the long-term integrity of the neutron absorber material used in high-density SFP storage racks. This program

is a license renewal aging management program commitment that has been maintained after permanent cessation of power operations and is required by License Condition 2.(c).21 of TMI-1's Part 50 license.

Based on the above evaluations, the NRC staff concludes that the design and operation of structures, systems, and components associated with SFP storage provide for safe storage of spent fuel and are consistent with the capabilities assumed in the analysis presented in NUREG-1738.

In addition to an evaluation against the specific NSIR/DPR-ISG-02 criteria above, Table 1, "Evaluation of Specific Exemptions to Emergency Planning Requirements," provides the NRC staff's evaluation of Exelon's specific exemptions, shown as "strikethrough" text, requested from the requirements of 10 CFR 50.47 and Appendix E to Part 50, based on the justification provided by Exelon and evaluation criteria above.

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
10 CFR 50.47(b): The onsite ~~and, except as provided in paragraph (d) of this section, offsite~~ emergency response plans for nuclear power reactors must meet the following standards:
NRC Staff's Evaluation: The NRC requires a level of licensee emergency preparedness and planning (EP) commensurate with the potential consequences to public health and safety, and common defense and security at the licensee's site. Exelon's exemption request included radiological analyses to show that, as of 365 days after the permanent cessation of power operations, the radiological consequences of DBAs would not exceed the limits of the EPA early phase PAGs at the EAB. Exelon also concluded, and the NRC staff confirmed, as of 488 days after the permanent cessation of power operations, in the unlikely event all cooling is lost to the spent fuel and a heat up under adiabatic conditions resulted, at least 10 hours would be available to take mitigative actions before the hottest fuel assembly reached 900˚C. NUREG-1738, and enhancements put into place as a result of the events of September 11, 2001, and Fukushima Dai-ichi, support the NRC staff assumption that only a highly unlikely, beyond-design-basis event (e.g., extreme earthquake or large aircraft impact) could result in an SFP 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 an SFP 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 be available for OROs to implement these measures using a comprehensive emergency management plan or "all hazards" approach. Considering the very low probability of beyond-design-basis events affecting the SFP and with the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel, and the time before the onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not necessary for a permanently shut down and defueled nuclear power reactor.
10 CFR 50.47(b)(1): Primary responsibilities for emergency response by the nuclear facility licensee and by State and local organizations ~~within the Emergency Planning Zones~~ have been assigned, the emergency responsibilities of the various supporting organizations have been specifically established, and each principal response organization has staff to respond and to augment its initial response on a continuous basis.

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
NRC Staff's Evaluation: NUREG-0396 provided that emergency response plans should be useful for responding to any accident that would produce offsite radiological doses in excess of the EPA early phase PAGs. Additionally, it introduced the concept of generic plume exposure pathway zones as a basis for the planning of response actions that would result in dose savings in the environs of nuclear facilities in the event of a serious power reactor accident. As previously discussed, Exelon has provided radiological analyses, which show that 365 days after the permanent cessation of power operations, the radiological consequences for DBAs at TMI will not exceed the limits of the EPA early phase PAGs at the EAB. In addition, reactor core melt (Class 9) scenarios, which were also considered in NUREG-0396, are no longer applicable to a permanently shut down and defueled power reactor. Considering the very low probability of beyond-design-basis events affecting the SFP and the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel and the time before the onset of a postulated zirconium cladding fire), offsite REP plans (in accordance with 44 CFR Part 350) are not needed. Therefore, designated plume exposure and ingestion pathway EPZs are no longer needed.
10 CFR 50.47(b)(3): Arrangements for requesting and effectively using assistance resources have been made, ~~arrangements to accommodate State and local staff at the licensee's Emergency Operations Facility have been made,~~ and other organizations capable of augmenting the planned response have been identified.
NRC Staff's Evaluation: With the termination of reactor power operations at TMI-1 and the permanent removal of the fuel from the reactor vessel to the SFP, most of the accident scenarios postulated for operating reactors are no longer possible. The spent fuel will be stored in the SFP and ISFSI (when built) and will remain onsite until it can be moved offsite for long-term storage or disposal. The reactor, reactor coolant system (RCS), and secondary systems will no longer be in operation and have no function related to the storage of the spent fuel. Therefore, postulated accidents involving failure or malfunction of the reactor, RCS, or secondary systems will no longer be applicable. During reactor decommissioning, the principal public safety concerns involve the radiological risks associated with the storage of spent fuel onsite. The Emergency Operations Facility (EOF) is a support facility for the purpose of managing the overall licensee emergency response (including coordination with Federal, State, and local officials), coordination of radiological and environmental assessments, and determination of recommended public protective actions. Considering the very low probability of beyond-design-basis events affecting the SFP and the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel and the time before the onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not needed. Therefore, an EOF would not be needed to coordinate these types of assessments for determining public protective actions. Onsite personnel will continue to maintain and provide for communication and coordination capabilities with offsite authorities and OROs for the purpose of notification and for the level of support required for remaining DBAs and the prompt implementation of mitigative actions in

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
response to an SFP accident.
10 CFR 50.47(b)(4): A standard emergency classification and action level scheme, the basis of which include facility system and effluent parameters, is in use by the nuclear facility licensee~~, and State and local response plans call for reliance on information provided by facility licensees for determinations of minimum initial offsite response measures~~.
NRC Staff's Evaluation: Considering the very low probability of beyond-design-basis events affecting the SFP and the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel and the time before the onset of a postulated zirconium cladding fire), offsite REP plans (in accordance with 44 CFR Part 350) are not needed. The TMI Emergency Plan will continue to maintain arrangements for requesting and using assistance resources from offsite support organizations. Therefore, minimum initial offsite response measures are not required.
10 CFR 50.47(b)(5): Procedures have been established for notification, by the licensee, of State and local response organizations and for notification of emergency personnel by all organizations; the content of initial and follow up messages to response organizations ~~and the public~~ has been established~~; and means to provide early notification and clear instruction to the populace within the plume exposure pathway Emergency Planning Zone have been established~~.
NRC Staff's Evaluation: Considering the very low probability of beyond-design-basis events affecting the SFP and the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel and the time before the onset of a postulated zirconium cladding fire), offsite REP plans (in accordance with 44 CFR Part 350) are not needed. Therefore, a means to provide early notification and clear instruction to the populace within a designated plume exposure pathway EPZ is no longer required.
10 CFR 50.47(b)(6): Provisions exist for prompt communications among principal response organizations to emergency personnel~~ and to the public~~.
NRC Staff's Evaluation: Considering the very low probability of beyond-design-basis events affecting the SFP and the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel and the time before the onset of a postulated zirconium cladding fire), offsite REP plans (in accordance with 44 CFR Part 350) are not needed. Therefore, the requirement to provide prompt communication to the public within a designated plume exposure EPZ in regard to initial or pre-determined protective actions is no longer needed.
10 CFR 50.47(b)(7): ~~Information is made available to the public on a periodic basis on how they will be notified and what their initial actions should be in an emergency (e.g., listening to a local broadcast station and remaining indoors),~~ [T]he principal points of contact with the news media for dissemination of information during an emergency~~ (including the physical location or locations)~~ are established in advance, and procedures for coordinated dissemination of information to the public are established.

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
NRC Staff's Evaluation: Considering the very low probability of beyond-design-basis events affecting the SFP and the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel and the time before the onset of a postulated zirconium cladding fire), offsite REP plans (in accordance with 44 CFR Part 350) are not needed. Therefore, the requirement to provide periodic information to the public within a designated plume exposure EPZ on how they will be notified and what their initial or predetermined protective actions should be in an emergency is not needed.
10 CFR 50.47(b)(9): Adequate methods, systems, and equipment for assessing and monitoring actual or potential ~~offsite~~ consequences of a radiological emergency condition are in use.
NRC Staff's Evaluation: Considering the very low probability of beyond-design-basis events affecting the SFP and the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel and the time before the onset of a postulated zirconium cladding fire), offsite REP plans (in accordance with 44 CFR Part 350) are not needed. Therefore, the requirement for assessing or monitoring offsite consequences beyond the EAB is not needed.
10 CFR 50.47(b)(10): A range of protective actions has been developed for ~~the plume exposure pathway EPZ for~~ emergency workers and the public. ~~In developing this range of actions, consideration has been given to evacuation, sheltering, and, as a supplement to these, the prophylactic use of potassium iodide (KI), as appropriate. Evacuation time estimates have been developed by applicants and licensees. Licensees shall update the evacuation time estimates on a periodic basis. Guidelines for the choice of protective actions during an emergency, consistent with Federal guidance, are developed and in place, and protective actions for the ingestion exposure pathway EPZ appropriate to the locale have been developed.~~
NRC Staff's Evaluation: Exelon's analysis demonstrated that, as of 365 days after the permanent cessation of power operations, no credible events within the design basis would result in doses to the public that would exceed the EPA early phase PAGs at the EAB. Therefore, EPZs beyond the EAB and the associated protective actions developed from evacuation time estimates are no longer required. Additionally, in the unlikely event of an SFP accident, the iodine isotopes, which contribute to an off-site dose from an operating reactor power accident, are not present, so potassium iodide distribution would no longer serve as an effective or necessary supplemental protective action. As such, the NRC staff concludes that Exelon provides for an acceptable level of EP at TMI in its permanently shutdown and defueled condition, and also provides reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency at TMI. Although formal offsite REP plans (in accordance with 44 CFR Part 350) have 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. The licensee is responsible for providing protective measures for any emergency workers responding onsite. Additionally, the licensee is responsible for control of activities within the EAB, including public access.

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
The licensee actions that are necessary to protect the health and safety of members of the public who are in the EAB may include, but are not limited to, evacuation, sheltering, and decontamination in the unlikely event of a release of radioactive materials.
10 CFR 50.47(c)(2): ~~Generally, the plume exposure pathway EPZ for nuclear power plants shall consist of an area about 10 miles (16 km) in radius and the ingestion pathway EPZ shall consist of an area about 50 miles (80 km) in radius. The exact size and configuration of the EPZs surrounding a particular nuclear power reactor shall be determined in relation to local emergency response needs and capabilities as they are affected by such conditions as demography, topography, land characteristics, access routes, and jurisdictional boundaries.~~ The size of the EPZs ~~also~~ may be determined on a case-by-case basis for gas-cooled nuclear reactors and for reactors with an authorized power level less than 250 MW thermal. ~~The plans for the ingestion pathway shall focus on such actions as are appropriate to protect the food ingestion pathway.~~
NRC Staff's Evaluation: Considering the very low probability of beyond-design-basis events affecting the SFP and the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel and the time before the onset of a postulated zirconium cladding fire), offsite REP plans (in accordance with 44 CFR Part 350) are not needed. Therefore, an EPZ is not required. Section 50.47(c)(2) and footnote 1 to Appendix E to 10 CFR Part 50 both state: "The size of the EPZs also may be determined on a case-by-case basis for gas-cooled nuclear reactors and for reactors with an authorized power level less than 250 MW [megawatt] thermal." This provision is not applicable to TMI because it is not a gas-cooled nuclear reactor and has permanently ceased power operations. Therefore, no exemption is required.
10 CFR Part 50, Appendix E, Section IV.1: The applicant's emergency plans shall contain, but not necessarily be limited to, information needed to demonstrate compliance with the elements set forth below, i.e., organization for coping with radiological emergencies, assessment actions, activation of emergency organization, notification procedures, emergency facilities and equipment, training, maintaining emergency preparedness, and recovery~~, and onsite protective actions during hostile action~~. In addition, the emergency response plans submitted by an applicant for a nuclear power reactor operating license under this Part, or for an early site permit (as applicable) or combined license under 10 CFR Part 52, shall contain information needed to demonstrate compliance with the standards described in § 50.47(b), and they will be evaluated against those standards.
NRC Staff's Evaluation: The 2011 EP Final Rule (76 *Federal Register* 72560; November 23, 2011) made generically applicable the security-based response elements of NRC Bulletin 2005-02, "Emergency Preparedness and Response Actions for Security-Based Events," dated July 18, 2005 (ADAMS Accession No. ML051740058). The enhancements of NRC Bulletin 2005-02 were not applicable to holders of operating licenses for power reactors that had permanently ceased operations and had certified that fuel had been removed from the reactor vessel. Exelon has certified that it has permanently ceased operations at TMI and that all fuel has been removed from the reactor vessel. Therefore, the requirement for onsite protective actions during hostile action is not necessary for TMI.

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
Additionally, the NRC excluded non-power reactors from the definition of "hostile action" at the time of the 2011 EP Final Rule because, as defined in 10 CFR 50.2, a non-power reactor is not considered a nuclear power reactor and a regulatory basis had not been developed to support the inclusion of non-power reactors in the definition of "hostile action." Similarly, a decommissioning power reactor or ISFSI is not a "nuclear reactor" as defined in the NRC's regulations. Like a non-power reactor, a decommissioning power reactor also has a lower likelihood of a credible accident resulting in radiological releases requiring offsite protective measures than does an operating power reactor. For all of the above reasons, the NRC staff concludes that a decommissioning power reactor is not a facility that falls within the definition of "hostile action." Although this analysis provides a justification for exempting TMI from "hostile action" related requirements, some EP requirements for security-based events are maintained. The classification of security-based events, notification of offsite authorities, and coordination with offsite agencies are still required.
10 CFR Part 50, Appendix E, Section IV.2: ~~This nuclear power reactor license applicant shall also provide an analysis of the time required to evacuate various sectors and distances within the plume exposure pathway EPZ for transient and permanent populations, using the most recent U.S. Census Bureau data as of the date the applicant submits its application to the NRC.~~
NRC Staff's Evaluation: Refer to basis for exemption from 10 CFR 50.47(b)(10).
10 CFR Part 50, Appendix E, Section IV.3: ~~Nuclear power reactor licensees shall use NRC approved evacuation time estimates (ETEs) and updates to the ETEs in the formulation of protective action recommendations and shall provide the ETEs and ETE updates to State and local governmental authorities for use in developing offsite protective action strategies.~~
NRC Staff's Evaluation: Refer to basis for exemption from 10 CFR Part 50, Appendix E, Section IV.2.
10 CFR Part 50, Appendix E, Section IV.4: ~~Within 365 days of the later of the date of the availability of the most recent decennial census data from the U.S. Census Bureau or December 23, 2011, nuclear power reactor licensees shall develop an ETE analysis using this decennial data and submit it under § 50.4 to the NRC. These licensees shall submit this ETE analysis to the NRC at least 180 days before using it to form protective action recommendations and providing it to State and local governmental authorities for use in developing offsite protective action strategies.~~
NRC Staff's Evaluation: Refer to basis for exemption from 10 CFR Part 50, Appendix E, Section IV.2
10 CFR Part 50, Appendix E, Section IV.5: ~~During the years between decennial censuses, nuclear power reactor licensees shall estimate EPZ permanent resident population changes once a year, but no later than 365 days from the date of the previous estimate, using the most recent U.S. Census Bureau annual resident population estimate and State/local government population data, if available. These licensees shall maintain these estimates so that they are available for NRC inspection during the period~~

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
~~between decennial censuses and shall submit these estimates to the NRC with any updated ETE analysis.~~
NRC Staff's Evaluation: Refer to basis for exemption from 10 CFR Part 50, Appendix E, Section IV.2.
10 CFR Part 50, Appendix E, Section IV.6: ~~If at any time during the decennial period, the EPZ permanent resident population increases such that it causes the longest ETE value for the 2-mile zone or 5-mile zone, including all affected Emergency Response Planning Areas, or for the entire 10-mile EPZ to increase by 25 percent or 30 minutes, whichever is less, from the nuclear power reactor licensee's currently NRC approved or updated ETE, the licensee shall update the ETE analysis to reflect the impact of that population increase. The licensee shall submit the updated ETE analysis to the NRC under § 50.4 no later than 365 days after the licensee's determination that the criteria for updating the ETE have been met and at least 180 days before using it to form protective action recommendations and providing it to State and local governmental authorities for use in developing offsite protective action strategies.~~
NRC Staff's Evaluation: Refer to basis for exemption from 10 CFR Part 50, Appendix E, Section IV.2.
10 CFR Part 50, Appendix E, Section IV.A.1: A description of the normal plant ~~operating~~ organization.
Staff's Evaluation: Because the NRC docketed the certifications of permanent cessation of operations and permanent removal of fuel from the reactor vessel, the 10 CFR Part 50 license for TMI-1 no longer authorizes operation of the reactor or emplacement or retention of fuel in the reactor vessel, as specified in 10 CFR 50.82(a)(2). Because Exelon is no longer authorized to operate the reactor, TMI does not have a plant "operating" organization. A description of the plant organization, as it relates to the requirements in 10 CFR Part 50, Appendix E, Section IV.A.1, is still required.
10 CFR Part 50, Appendix E, Section IV.A.3: ~~A description, by position and function to be performed, of the licensee's headquarters personnel who will be sent to the plant site to augment the onsite emergency organization.~~
NRC Staff's Evaluation: The number of staff at decommissioning sites is generally small but is commensurate with the need to safely store spent fuel at the facility in a manner that is protective of public health and safety. Exelon furnished information concerning its SFP inventory makeup strategies that could be used in the event of a catastrophic loss of SFP water inventory and states that designated on-shift personnel will be trained to implement such strategies with equipment maintained onsite. TMI will have site personnel designated to respond within 2 hours of the Alert classification to assist the on-shift staff. As such, designation of specific licensee headquarters personnel is not necessary for the augmentation of the on-shift staffing and, therefore, is not described.
10 CFR Part 50, Appendix E, Section IV.A.4: Identification, by position and function to be performed, of persons within the licensee organization who will be responsible for making ~~offsite~~ dose projections, and a description of how these projections will be made and the results transmitted to State and local authorities, NRC, and other appropriate governmental entities.

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
NRC Staff's Evaluation: Exelon's analysis demonstrated that, as of 365 days after the permanent cessation of power operations, no DBAs would result in doses in excess of the EPA early phase PAGs to the public beyond the EAB. While it is unlikely that a beyond-DBA would result in doses in excess of the EPA early phase PAGs to the public beyond the EAB, the licensee still must be able to determine whether a radiological release is occurring, thereby achieving the underlying purpose of this regulatory provision. If a release is occurring, then the licensee's staff should promptly communicate that information to offsite authorities for their consideration. The offsite authorities are responsible for deciding what, if any, protective actions should be taken. Considering the very low probability of beyond-design-basis events affecting the SFP and the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel and the time before the onset of a postulated zirconium cladding fire), offsite REP plans (in accordance with 44 CFR Part 350) are not needed. Therefore, offsite dose projections are not required.
10 CFR Part 50, Appendix E, Section IV.A.5: ~~Identification, by position and function to be performed, of other employees of the licensee with special qualifications for coping with emergency conditions that may arise. Other persons with special qualifications, such as consultants, who are not employees of the licensee and who may be called upon for assistance for emergencies shall also be identified. The special qualifications of these persons shall be described.~~
NRC Staff's Evaluation: Exelon furnished information concerning its SFP inventory makeup strategies that could be used in the event of a catastrophic loss of SFP water inventory and stated that designated on-shift personnel are trained to implement such strategies with equipment maintained onsite. Exelon will have site personnel designated to respond within 2 hours of the Alert classification to assist the on-shift staff. As such, additional employees or other persons with special qualifications are not anticipated. Considering the very low probability of beyond-design-basis events affecting the SFP and the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel and the time before the onset of a postulated zirconium cladding fire), offsite REP plans (in accordance with 44 CFR Part 350) are not needed. Therefore, personnel with special qualifications, as directed in 10 CFR Part 50, Appendix E, Section IV.A.5, are not required.
10 CFR Part 50, Appendix E, Section IV.A.7: ~~By June 23, 2014,~~ identification of~~, and a description of the~~ assistance expected from, appropriate State, local, and Federal agencies with responsibilities for coping with emergencies, including ~~hostile action at the site. For purposes of this appendix, "hostile action" is defined as~~ an act directed toward a nuclear power plant or its personnel that include the use of violent force to destroy equipment, take hostages, and/or intimidate the licensee to achieve an end. This includes attack by air, land, or water using guns, explosives, projectiles, vehicles, or other devices used to deliver destructive force.
NRC Staff's Evaluation: Refer to basis for exemption from 10 CFR Part 50, Appendix E, Section IV.1.

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
10 CFR Part 50, Appendix E, Section IV.A.8: ~~Identification of the State and/or local officials responsible for planning for, ordering and controlling appropriate protective actions, including evacuations when necessary.~~
NRC Staff's Evaluation: Considering the very low probability of beyond-design-basis events affecting the SFP and the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel and the time before the onset of a postulated zirconium cladding fire), offsite REP plans (in accordance with 44 CFR Part 350) are not needed. Therefore, identification of the State and/or local officials responsible for detailed pre-planning for, and ordering appropriate protective actions, including evacuations when necessary, is no longer required.
10 CFR Part 50, Appendix E, Section IV.A.9: ~~By December 24, 2012, for nuclear power reactor licensees, a detailed analysis demonstrating that on-shift personnel assigned emergency plan implementation functions are not assigned responsibilities that would prevent the timely performance of their assigned functions as specified in the emergency plan.~~
NRC Staff's Evaluation: As part of the 2011 EP Final Rule, the NRC concluded that the staffing analysis requirement was not necessary for non-power reactor licensees because staffing at non-power reactors is generally small, which is commensurate with operating the facility in a manner that is protective of the public health and safety. The similarities with regard to staffing between TMI and non-power reactors show that the TMI facility should be treated in a similar fashion as a non-power reactor for purposes of EP. Therefore, a detailed staffing analysis is not needed for a decommissioning reactor.
10 CFR Part 50, Appendix E, Section IV.B.1: The means to be used for determining the magnitude of, and for continually assessing the impact of, the release of radioactive materials shall be described, including emergency action levels that are to be used as criteria for determining the need for notification and participation of local and State agencies, the Commission, and other Federal agencies, and the emergency action levels that are to be used for determining when and what type of protective measures should be considered within ~~and outside~~ the site boundary to protect health and safety. The emergency action levels shall be based on in-plant conditions and instrumentation in addition to onsite ~~and offsite~~ monitoring. ~~By June 20, 2012, for nuclear power reactor licensees, these action levels must include hostile action that may adversely affect the nuclear power plant.~~ The initial emergency action levels shall be discussed and agreed on by the applicant or licensee and State and local governmental authorities and approved by the NRC. Thereafter, emergency action levels shall be reviewed with the State and local governmental authorities on an annual basis.
NRC Staff's Evaluation: Considering the very low probability of beyond-design-basis events affecting the SFP and the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel and the time before the onset of a postulated zirconium cladding fire), offsite REP plans (in accordance with 44 CFR Part 350) are not needed. Therefore, a decommissioning reactor is not required to have EALs to determine protective measures offsite. With respect to EALs for hostile action, refer to basis for exemption from 10 CFR Part 50, Appendix E, Section IV.1.

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
10 CFR Part 50, Appendix E, Section IV.C.1: The entire spectrum of emergency conditions that involve the alerting or activating of progressively larger segments of the total emergency organization shall be described. The communication steps to be taken to alert or activate emergency personnel under each class of emergency shall be described. Emergency action levels (based not only on onsite ~~and offsite~~ radiation monitoring information but also on readings from a number of sensors that indicate a potential emergency, ~~such as the pressure in containment and the response of the Emergency Core Cooling System~~) for notification of offsite agencies shall be described. The existence, but not the details, of a message authentication scheme shall be noted for such agencies. The emergency classes defined shall include: (1) notification of unusual events, (2) alert, ~~(3) site area emergency, and (4) general emergency~~. These classes are further discussed in NUREG-0654/FEMA [Federal Emergency Management Agency]-REP-1.
NRC Staff's Evaluation: For a permanently shutdown and defueled power reactor, containment pressure and emergency core cooling system are no longer required. Therefore, they would have no parameters indicating a potential emergency. Other indications, such as SFP level, SFP temperature, and area radiation monitors indicate the conditions at TMI. Exelon's analysis demonstrated that, as of 365 days after the permanent cessation of power operations, no credible events within the DBA would reach the dose criteria for the declaration of a Site Area Emergency or a General Emergency. As discussed previously, the probability of a beyond-DBA condition that could reach emergency classifications of a Site Area Emergency or a General Emergency is very low. In the unlikely event of a severe beyond-DBA resulting in the loss of all cooling to the stored fuel, as of 488 days after the permanent cessation of power operations, it would take at least 10 hours from the time the fuel is uncovered until it reaches a temperature of 900˚C. During this time, TMI could initiate mitigative actions consistent with plant conditions. The need for offsite radiation monitoring systems in support of event classification above an Alert classification level is no longer required because of the very low probability of beyond-design-basis events occurring that would affect SFP structural integrity, as well as the time available to initiate SFP mitigative measures before the onset of a postulated zirconium cladding fire.
10 CFR Part 50, Appendix E, Section IV.C.2: ~~By June 20, 2012, nuclear power reactor~~ licensees shall establish and maintain the capability to assess, classify, and declare an emergency condition ~~within 15 minutes~~ after the availability of indications to plant operators that an emergency action level has been exceeded and shall promptly declare the emergency condition as soon as possible following identification of the appropriate emergency classification level. Licensees shall not construe these criteria as a grace period to attempt to restore plant conditions to avoid declaring an emergency action due to an emergency action level that has been exceeded. Licensees shall not construe these criteria as preventing implementation of response actions deemed by the licensee to be necessary to protect public health and safety provided that any delay in declaration does not deny the State and local authorities the opportunity to implement measures necessary to protect the public health and safety.

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
NRC Staff's Evaluation: In the 2011 EP Final Rule, non-power reactor licensees were not required to assess, classify, and declare an emergency condition within 15 minutes. An SFP and an ISFSI are also not nuclear power reactors as defined in the NRC's regulations. Like non-power reactors and ISFSIs, a decommissioning power reactor has a low likelihood of a credible accident resulting in radiological releases requiring offsite protective measures. For these reasons, the NRC staff concludes that a decommissioning power reactor should not be required to assess, classify, and declare an emergency condition within 15 minutes.
10 CFR Part 50, Appendix E, Section IV.D.1: Administrative and physical means for notifying local, State, and Federal officials and agencies ~~and agreements reached with these officials and agencies for the prompt notification of the public and for public evacuation or other protective measures, should they become necessary,~~ shall be described. This description shall include identification ~~of the appropriate officials, by title and agency,~~ of the State and local government agencies ~~within the EPZs~~.
NRC Staff's Evaluation: Refer to basis for exemption from 10 CFR 50.47(b) and 10 CFR 50.47(b)(10).
10 CFR Part 50, Appendix E, Section IV.D.2: ~~Provisions shall be described for yearly dissemination to the public within the plume exposure pathway EPZ of basic emergency planning information, such as the methods and times required for public notification and the protective actions planned if an accident occurs, general information as to the nature and effects of radiation, and a listing of local broadcast stations that will be used for dissemination of information during an emergency. Signs or other measures shall also be used to disseminate to any transient population within the plume exposure pathway EPZ appropriate information that would be helpful if an accident occurs.~~
NRC Staff's Evaluation: Refer to basis for exemption from 10 CFR Part 50, Appendix E, Section IV.D.1.
10 CFR Part 50, Appendix E, Section IV.D.3: A licensee shall have the capability to notify responsible State and local governmental agencies ~~within 15 minutes~~ after declaring an emergency. ~~The licensee shall demonstrate that the appropriate governmental authorities have the capability to make a public alerting and notification decision promptly on being informed by the licensee of an emergency condition. Prior to initial operation greater than 5 percent of rated thermal power of the first reactor at the site, each nuclear power reactor licensee shall demonstrate that administrative and physical means have been established for alerting and providing prompt instructions to the public with the plume exposure pathway EPZ. The design objective of the prompt public alert and notification system shall be to have the capability to essentially complete the initial alerting and notification of the public within the plume exposure pathway EPZ within about 15 minutes. The use of this alerting and notification capability will range from immediate alerting and notification of the public (within 15 minutes of the time that State and local officials are notified that a situation exists requiring urgent action) to the more likely events where there is substantial time available for the appropriate governmental authorities to make a judgment whether or not to activate the public alert and notification system. The alerting and notification capability shall additionally include administrative and physical means for a backup method of public alerting and notification capable of being used in the event the primary method of alerting and notification is unavailable during an emergency to alert or notify all or portions of the plume exposure pathway EPZ population. The backup method shall have the capability to~~

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
~~alert and notify the public within the plume exposure pathway EPZ, but does not need to meet the 15 minute design objective for the primary prompt public alert and notification system. When there is a decision to activate the alert and notification system, the appropriate governmental authorities will determine whether to activate the entire alert and notification system simultaneously or in a graduated or staged manner. The responsibility for activating such a public alert and notification system shall remain with the appropriate governmental authorities.~~
NRC Staff's Evaluation: Exelon proposes in its exemption requests to complete emergency notifications to the Pennsylvania Emergency Management Agency within 30 minutes after an emergency declaration or a change in classification. This timeframe is consistent with the 10 CFR 50.72(a)(3) notification time to the NRC and is appropriate because in the permanently defueled condition, the rapidly developing scenarios associated with events initiated during reactor operation are no longer credible. Also refer to basis for exemption from 10 CFR 50.47(b) and 10 CFR 50.47(b)(10).
10 CFR Part 50, Appendix E, Section IV.D.4: ~~If FEMA has approved a nuclear power reactor site's alert and notification design report, including the backup alert and notification capability, as of December 23, 2011, then the backup alert and notification capability requirements in Section IV.D.3 must be implemented by December 24, 2012. If the alert and notification design report does not include a backup alert and notification capability or needs revision to ensure adequate backup alert and notification capability, then a revision of the alert and notification design report must be submitted to FEMA for review by June 24, 2013, and the FEMA-approved backup alert and notification means must be implemented within 365 days after FEMA approval. However, the total time period to implement a FEMA-approved backup alert and notification means must not exceed June 22, 2015.~~
NRC Staff's Evaluation: Refer to the basis for exemption from 10 CFR Part 50, Appendix E, Section IV.D.3 regarding the alert and notification system requirements.
10 CFR Part 50, Appendix E, Section IV.E.8.a.(i): A licensee ~~onsite technical support center and an emergency operations~~ facility from which effective direction can be given and effective control can be exercised during an emergency;
NRC Staff's Evaluation: The Technical Support Center (TSC) is an area located close to the control room that provides plant management and technical support to the reactor operating personnel located in the control room during emergency conditions. It has technical data displays and plant records available to assist in the detailed analysis and diagnosis of abnormal plant conditions and any significant release of radioactivity to the environment. The TSC is also the primary communications center for the plant during an emergency. With the permanently shutdown and defueled status of the TMI-1 reactor and the storage of the spent nuclear fuel in the SFP and ISFSI (when built), the TSC and EOF will no longer be required to meet their original purpose during an emergency or support initial SFP mitigation actions if needed. The basis for the EOF exemption is provided in the basis for exemption from 10 CFR 50.47(b)(3).
10 CFR Part 50, Appendix E, Section IV.E.8.a.(ii): ~~For nuclear power reactor licensees, a licensee onsite operational support center;~~

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
NRC Staff's Evaluation: The Operations Support Center (OSC) is an onsite area separate from the control room and the TSC where licensee operations support personnel will assemble in an emergency. The OSC should provide a location where plant logistic support can be coordinated during an emergency and restrict control room access to those support personnel specifically requested by the shift supervisor. With the permanently shutdown and defueled status of the TMI reactor and the storage of the spent nuclear fuel in the SFP and ISFSI (when built), an OSC will no longer be required to meet its original purpose during an emergency or support initial SFP mitigation actions if needed. Exelon states that the TMI-1 control room will be the single onsite facility that provides support, emergency mitigation, radiation monitoring, and effective control that will be exercised during an emergency.
10 CFR Part 50, Appendix E, Section IV.E.8.b: ~~For a nuclear power reactor licensee's emergency operations facility required by paragraph 8.a of this section, either a facility located between 10 miles and 25 miles of the nuclear power reactor site(s), or a primary facility located less than 10 miles from the nuclear power reactor site(s) and a backup facility located between 10 miles and 25 miles of the nuclear power reactor site(s). An emergency operations facility may serve more than one nuclear power reactor site. A licensee desiring to locate an emergency operations facility more than 25 miles from a nuclear power reactor site shall request prior Commission approval by submitting an application for an amendment to its license. For an emergency operations facility located more than 25 miles from a nuclear power reactor site, provisions must be made for locating NRC and offsite responders closer to the nuclear power reactor site so that NRC and offsite responders can interact face-to-face with emergency response personnel entering and leaving the nuclear power reactor site. Provisions for locating NRC and offsite responders closer to a nuclear power reactor site that is more than 25 miles from the emergency operations facility must include the following:~~ (1) ~~Space for members of an NRC site team and Federal, State, and local responders;~~ (2) ~~Additional space for conducting briefings with emergency response personnel;~~ (3) ~~Communication with other licensee and offsite emergency response facilities;~~ (4) ~~Access to plant data and radiological information; and~~ (5) ~~Access to copying equipment and office supplies;~~
NRC Staff's Evaluation: Refer to basis for exemption from 10 CFR 50.47(b)(3).

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
10 CFR Part 50, Appendix E, Section IV.E.8.c: ~~By June 20, 2012, for a nuclear power reactor licensee's emergency operations facility required by paragraph 8.a of this section, a facility having the following capabilities:~~ (1)~~ The capability for obtaining and displaying plant data and radiological information for each reactor at a nuclear power reactor site and for each nuclear power reactor site that the facility serves;~~ (2)~~ The capability to analyze plant technical information and provide technical briefings on event conditions and prognosis to licensee and offsite response organizations for each reactor at a nuclear power reactor site and for each nuclear power reactor site that the facility serves; and~~ (3)~~ The capability to support response to events occurring simultaneously at more than one nuclear power reactor site if the emergency operations facility serves more than one site; and~~
NRC Staff's Evaluation: Refer to basis for exemption from 10 CFR 50.47(b)(3).
10 CFR Part 50, Appendix E, Section IV.E.8.d: ~~For nuclear power reactor licensees, an alternative facility (or facilities) that would be accessible even if the site is under threat of or experiencing hostile action, to function as a staging area for augmentation of emergency response staff and collectively having the following characteristics: the capability for communication with the emergency operations facility, control room, and plant security; the capability to perform offsite notifications; and the capability for engineering assessment activities, including damage control team planning and preparation, for use when onsite emergency facilities cannot be safely accessed during hostile action. The requirements in this paragraph 8.d must be implemented no later than December 23, 2014, with the exception of the capability for staging emergency response organization personnel at the alternative facility (or facilities) and the capability for communications with the emergency operations facility, control room, and plant security, which must be implemented no later than June 20, 2012.~~
NRC Staff's Evaluation: Refer to basis for exemption from 10 CFR Part 50, Appendix E, Section IV.1 regarding "hostile action."
10 CFR Part 50, Appendix E, Section IV.E.8.e: ~~A licensee shall not be subject to the requirements of paragraph 8.b of this section for an existing emergency operations facility approved as of December 23, 2011;~~
NRC Staff's Evaluation: Refer to basis for exemption from 10 CFR 50.47(b)(3).
10 CFR Part 50, Appendix E, Section IV.E.9.a: Provisions for communications with contiguous State/local governments ~~within the plume exposure pathway EPZ~~. Such communication shall be tested monthly.
NRC Staff's Evaluation: TMI will maintain communications with the Pennsylvania Emergency Management Agency and the NRC. Refer to basis for exemption from 10 CFR 50.47(b) and 10 CFR 50.47(b)(10).
10 CFR Part 50, Appendix E, Section IV.E.9.c: ~~Provision for communications among the nuclear power reactor control room, the onsite technical support center, and the emergency operations facility; and among the nuclear facility, the principal State and local emergency operations centers, and the field assessment teams. Such communications systems shall be tested annually.~~

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
NRC Staff's Evaluation: Considering the very low probability of beyond-design-basis events affecting the SFP and the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel and the time before the onset of a postulated zirconium cladding fire), offsite REP plans (in accordance with 44 CFR Part 350) are not needed. There is no need for a TSC, EOF, or offsite field assessment teams to meet the underlying purpose of the rule. With the elimination of the requirements for a TSC, EOF and the field assessment teams, performing annual testing of communication among them is no longer required. Communications with State and local governments will be through the commercial phone system. Due to its frequency of use, the testing of that system is not necessary.
10 CFR Part 50, Appendix E, Section IV.E.9.d: Provisions for communications by the licensee with NRC Headquarters and the appropriate NRC Regional Office Operations Center from the ~~nuclear power reactor control room, the onsite technical support center, and the emergency operations~~ facility. Such communications shall be tested monthly.
NRC Staff's Evaluation: Based on the smaller facility staff and the greatly reduced required interaction with State and local emergency response facilities, the NRC staff concludes that the functions of the control room, EOF, TSC, and the OSC may be combined into one or more locations. As discussed previously, there is no need for the TSC and EOF. As a result, communications between the EOF and TSC and the NRC, and monthly testing of these capabilities are no longer needed. The Emergency Notification System used to communicate with the NRC will continue to be tested monthly.
10 CFR Part 50, Appendix E, Section IV.F.1: The program to provide for: (a) The training of employees and exercising, by periodic drills, of radiation emergency plans to ensure that employees of the licensee are familiar with their specific emergency response duties, and (b) The participation in the training and drills by other persons whose assistance may be needed in the event of a radiation emergency shall be described. This shall include a description of specialized initial training and periodic retraining programs to be provided to each of the following categories of emergency personnel: i. Directors and/or coordinators of the plant emergency organization; ii. Personnel responsible for accident assessment, including control room shift personnel; iii. Radiological monitoring teams; iv. Fire control teams (fire brigades); v. Repair and damage control teams; vi. First aid and rescue teams; vii. Medical support personnel; viii. ~~Licensee's headquarters support personnel;~~ ix. Security personnel. In addition, a radiological orientation training program shall be made available to local services personnel; e.g., local emergency services~~/Civil Defense~~, local law enforcement personnel~~, local news media persons~~.

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
NRC Staff's Evaluation: Decommissioning power reactor sites typically have a level of emergency response that does not require additional response by the licensee's headquarters personnel. Therefore, the NRC staff considers exempting the licensee's headquarters personnel from training requirements to be reasonable. Due to the low probability of DBA or other credible events to exceed the EPA early phase PAGs, offsite emergency measures are limited to support provided by local police, fire departments, and ambulance and hospital services, as appropriate. Local news media personnel no longer need radiological orientation training since they will not be called upon to support the formal Joint Information Center. The term "Civil Defense" is no longer commonly used, so references to this term in the regulation are not needed.
10 CFR Part 50, Appendix E, Section IV.F.2: The plan shall describe provisions for the conduct of emergency preparedness exercises as follows: Exercises shall test the adequacy of timing and content of implementing procedures and methods, test emergency equipment and communications networks, ~~test the public alert and notification system,~~ and ensure that emergency organization personnel are familiar with their duties.
NRC Staff's Evaluation: Refer to basis for exemption from 10 CFR Part 50, Appendix E, Section IV.D.1.
10 CFR Part 50, Appendix E, Section IV.F.2.a: ~~A full participation exercise which tests as much of the licensee, State, and local emergency plans as is reasonably achievable without mandatory public participation shall be conducted for each site at which a power reactor is located. Nuclear power reactor licensees shall submit exercise scenarios under § 50.4 at least 60 days before use in a full participation exercise required by this paragraph 2.a.~~ [**F.2.a.(i), (ii), and (iii)** are not applicable.]
NRC Staff's Evaluation: Considering the very low probability of beyond-design-basis events affecting the SFP and the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel and the time before the onset of a postulated zirconium cladding fire), offsite REP plans (in accordance with 44 CFR Part 350) are not needed. Therefore, conducting a full participation exercise with State and local agencies is not required. The licensee would be exempt from 10 CFR Part 50, Appendix E, Section IV.F.2.a.(i)-(iii) because the licensee would be exempt from the umbrella provision of 10 CFR Part 50, Appendix E, Section IV.F.2.a.
10 CFR Part 50, Appendix E, Section IV.F.2.b: Each licensee at each site shall conduct a subsequent exercise of its onsite emergency plan every 2 years. ~~Nuclear power reactor licensees shall submit exercise scenarios under § 50.4 at least 60 days before use in an exercise required by this paragraph 2.b. The exercise may be included in the full participation biennial exercise required by paragraph 2.c. of this section.~~ In addition, the licensee shall take actions necessary to ensure that adequate emergency response capabilities are maintained during the interval between biennial exercises by conducting drills, including at least one drill involving a combination of some of the principal functional areas of the licensee's onsite emergency response

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
capabilities. The principal functional areas of emergency response include activities such as management and coordination of emergency response, accident assessment, event classification, notification of offsite authorities, and assessment of the onsite ~~and offsite~~ impact of radiological releases, ~~protective action recommendation development, protective action decision making, plant~~ system repair and mitigative action implementation. During these drills, activation of all of the licensee's emergency response facilities ~~(Technical Support Center (TSC), Operations Support Center (OSC), and the Emergency Operations Facility (EOF))~~ would not be necessary, licensees would have the opportunity to consider accident management strategies, supervised instruction would be permitted, operating staff in all participating facilities would have the opportunity to resolve problems (success paths) rather than have controllers intervene, and the drills may focus on the onsite exercise training objectives.
NRC Staff's Evaluation: Refer to basis for exemption from 10 CFR Part 50, Appendix E, Section IV.F.2.a for the basis for exemption from requirements related to offsite actions. The basis for the TSC exemption is provided in the basis for exemption from 10 CFR Part 50, Appendix E, Section IV.E.8.a.(i). The basis for the OSC exemption is provided in the basis for exemption from 10 CFR Part 50, Appendix E, Section IV.E.8.a.(ii). The basis for the EOF exemption is provided in the basis for exemption from 10 CFR 50.47(b)(3).
10 CFR Part 50, Appendix E, Section IV.F.2.c: ~~Offsite plans for each site shall be exercised biennially with full participation by each offsite authority having a role under the radiological response plan. Where the offsite authority has a role under a radiological response plan for more than one site, it shall fully participate in one exercise every two years and shall, at least, partially participate in other offsite plan exercises in this period. If two different licensees each have licensed facilities located either on the same site or on adjacent, contiguous sites, and share most of the elements defining co-located licensees, then each licensee shall:~~ (1) ~~Conduct an exercise biennially of its onsite emergency plan;~~ (2) ~~Participate quadrennially in an offsite biennial full or partial participation exercise;~~ (3) ~~Conduct emergency preparedness activities and interactions in the years between its participation in the offsite full or partial participation exercise with offsite authorities, to test and maintain interface among the affected State and local authorities and the licensee. Co-located licensees shall also participate in emergency preparedness activities and interaction with offsite authorities for the period between exercises;~~ (4) ~~Conduct a hostile action exercise of its onsite emergency plan in each exercise cycle; and~~ (5) ~~Participate in an offsite biennial full or partial participation hostile action exercise in alternating exercise cycles.~~
NRC Staff's Evaluation: Refer to basis for exemption from 10 CFR Part 50, Appendix E, Section IV.F.2.a.

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
10 CFR Part 50, Appendix E, Section IV.F.2.d: ~~Each State with responsibility for nuclear power reactor emergency preparedness should fully participate in the ingestion pathway portion of exercises at least once every exercise cycle. In States with more than one nuclear power reactor plume exposure pathway EPZ, the State should rotate this participation from site to site. Each State with responsibility for nuclear power reactor emergency preparedness should fully participate in a hostile action exercise at least once every cycle and should fully participate in one hostile action exercise by December 31, 2015. States with more than one nuclear power reactor plume exposure pathway EPZ should rotate this participation from site to site.~~
NRC Staff's Evaluation: Refer to basis for exemption from 10 CFR Part 50, Appendix E, Section IV.2.
10 CFR Part 50, Appendix E, Section IV.F.2.e: Licensees shall enable any State or local Government ~~located within the plume exposure pathway EPZ~~ to participate in the licensee's drills when requested by such State or local government.
NRC Staff's Evaluation: Exelon should provide the opportunity for any State and local Government agencies identified in the permanently defueled emergency plan to participate in licensee's drills and exercises upon request. Also see the basis for exemption from 10 CFR Part 50, Appendix E, Section IV.2.
10 CFR Part 50, Appendix E, Section IV.F.2.f: Remedial exercises will be required if the emergency plan is not satisfactorily tested during the biennial exercise, such that NRC, ~~in consultation with FEMA,~~ cannot (1) find reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency or (2) determine that the Emergency Response Organization (ERO) has maintained key skills specific to emergency response. ~~The extent of State and local participation in remedial exercises must be sufficient to show that appropriate corrective measures have been taken regarding the elements of the plan not properly tested in the previous exercises.~~
NRC Staff's Evaluation: Considering the very low probability of beyond-design-basis events affecting the SFP and the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel and the time before the onset of a postulated zirconium cladding fire), offsite REP plans (in accordance with 44 CFR Part 350) are not needed. Therefore, the requirement to conduct a full participation exercise with State and local agencies is not needed. Because the NRC staff previously concluded that full participation emergency plan exercises are not required, and FEMA does not have responsibilities related to onsite EP, NRC consultation with FEMA is not necessary.
10 CFR Part 50, Appendix E, Section IV.F.2.i: Licensees shall use drill and exercise scenarios that provide reasonable assurance that anticipatory responses will not result from preconditioning of participants. ~~Such scenarios for nuclear power reactor licensees must include a wide spectrum of radiological releases and events, including hostile action.~~ Exercise and drill scenarios as appropriate must emphasize coordination among onsite and offsite response organizations.
NRC Staff's Evaluation: For decommissioning power reactor sites, there are limited events that could occur and, as such, the purpose of ensuring that responders do not get preconditioned to certain scenarios is not necessary to achieve the underlying

Table 1 **Evaluation of Specific Exemptions to Emergency Planning Requirements**
purpose of this rule provision. Considering the very low probability of beyond-design-basis events affecting the SFP and the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel and the time before the onset of a postulated zirconium cladding fire), offsite REP plans (in accordance with 44 CFR Part 350) are not needed. Therefore, drills involving principle functional areas associated with formal offsite REP are not needed.
10 CFR Part 50, Appendix E, Section IV.F.2.j: ~~The exercises conducted under paragraph 2 of this section by nuclear power reactor licensees must provide the opportunity for the ERO to demonstrate proficiency in the key skills necessary to implement the principal functional areas of emergency response identified in paragraph 2.b of this section. Each exercise must provide the opportunity for the ERO to demonstrate key skills specific to emergency response duties in the control room, TSC, OSC, EOF, and joint information center. Additionally, in each 8-calendar year exercise cycle, nuclear power reactor licensees shall vary the content of scenarios during exercises conducted under paragraph 2 of this section to provide the opportunity for the ERO to demonstrate proficiency in the key skills necessary to respond to the following scenario elements: hostile action directed at the plant site, no radiological release or an unplanned minimal radiological release that does not require public protective actions, an initial classification of or rapid escalation to a Site Area Emergency or General Emergency, implementation of strategies, procedures, and guidance under § 50.155(b)(2), and integration of offsite resources with onsite~~ justification~~. The licensee shall maintain a record of exercises conducted during each 8-year exercise cycle that documents the content of scenarios used to comply with the requirements of this paragraph. Each licensee shall conduct a hostile action exercise for each of its sites no later than December 31, 2015. The first 8-year exercise cycle for a site will begin in the calendar year in which the first hostile action exercise is conducted. For a site licensed under 10 CFR part 52, the first 8-year exercise cycle begins in the calendar year of the initial exercise required by section IV.F.2.a of this appendix.~~
NRC Staff's Evaluation: For decommissioning power reactor sites, there are limited events that could occur and, as such, the purpose of ensuring that responders do not get preconditioned to certain scenarios is not necessary to achieve the underlying purpose of this provision. Considering the very low probability of beyond-design-basis events affecting the SFP and the time available to initiate mitigative actions consistent with plant conditions (i.e., the time between the loss of both water and air cooling to the spent fuel and the time before the onset of a postulated zirconium cladding fire), offsite REP plans (in accordance with 44 CFR Part 350) are not needed. Therefore, drills involving principle functional areas associated with formal offsite REP are not needed.
10 CFR Part 50, Appendix E, Section IV.I: ~~By June 20, 2012, for nuclear power reactor licensees, a range of protective actions to protect onsite personnel during hostile action must be developed to ensure the continued ability of the licensee to safely shut down the reactor and perform the functions of the licensee's emergency plan.~~
NRC Staff's Evaluation: Refer to basis for exemption from 10 CFR Part 50, Appendix E, Section IV.E.8.d.