



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 13, 2021

Mr. Don Moul
Executive Vice President, Nuclear
Division, and Chief Nuclear Officer
Florida Power & Light Company
Mail Stop: EX/JB
700 Universe Boulevard
Juno Beach, FL 33408

SUBJECT: DUANE ARNOLD ENERGY CENTER – EXEMPTIONS FROM CERTAIN
EMERGENCY PLANNING REQUIREMENTS AND RELATED SAFETY
EVALUATION (EPID L-2020-LLE-0023)

Dear Mr. Moul:

The U.S. Nuclear Regulatory Commission (NRC) has approved the enclosed exemptions from specific requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.47, "Emergency plans," and Appendix E, "Emergency Planning and Preparedness for Production and Utilization Facilities," to 10 CFR Part 50, for the Duane Arnold Energy Center. This action is in response to the application for exemptions dated April 2, 2020, as supplemented on October 7, 2020 (Agencywide Documents Access and Management System Accession [ADAMS] Nos. ML20101M779 and ML20282A595, respectively).

A copy of the NRC staff's safety evaluation is also enclosed. The exemptions will be forwarded to the Office of the Federal Register for publication.

In accordance with 10 CFR 2.390 of the NRC's "Agency Rules of Practice and Procedure," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

D. Moul

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If you have any questions concerning the above, please contact me at (301) 415-3178 or via email at marlayna.doell@nrc.gov.

Sincerely,

Marlayna V. Doell, Project Manager
Reactor Decommissioning Branch
Division of Decommissioning, Uranium Recovery
and Waste Programs
Office of Nuclear Material Safety and Safeguards

Docket No. 50-331

Enclosures:

1. Exemptions
2. Safety Evaluation

cc: Duane Arnold Listserv

SUBJECT: DUANE ARNOLD ENERGY CENTER – EXEMPTIONS FROM CERTAIN EMERGENCY PLANNING REQUIREMENTS AND RELATED SAFETY EVALUATION (EPID L-2020-LLE-0023) Dated: April 13, 2021

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DHills, RIII

**ADAMS Accession Nos.: EP EXEMPTION PKG W/O FRN: ML21097A139
EP EXEMPTION: ML21097A142
EP EXEMPTION ISSUANCE LTR: ML21097A141**

EP EXEMPTION FRN: ML21097A148 *via e-mail **via memo

OFFICE	NMSS/DUWP/RDB/PM*	NMSS/DUWP/RDB/Peer*	NRR/DRA/ARCB/BC**
NAME	MDoell	MDoell	KHsueh
DATE	3/1/2020	3/15/2021	10/9/2020
OFFICE	NRR/DSS/SCP/BC**	NSIR/DPR/RLB/BC(A)**	NMSS/DUWP/RDB/BC*
NAME	BWittick	JQuichocho	BWatson
DATE	10/15/2020	2/5/2021	3/17/2021
OFFICE	OGC – NLO*	NMSS/DUWP/D*	NMSS/DUWP/RDB/PM*
NAME	TJones	PHolahan	MDoell
DATE	3/29/2021	4/13/2021	4/13/2021

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ENCLOSURE 1

EXEMPTIONS FROM PORTIONS OF
10 CFR 50.47 AND 10 CFR PART 50, APPENDIX E

NEXTERA ENERGY DUANE ARNOLD, LLC

DUANE ARNOLD ENERGY CENTER

DOCKET NO. 50-331

NUCLEAR REGULATORY COMMISSION

Docket No. 50-331

NextEra Energy Duane Arnold, LLC

Duane Arnold Energy Center

Exemption

I. Background.

By letter dated January 18, 2019 (Agencywide Documents Access and Management System [ADAMS] Accession No. ML19023A196), NextEra Energy Duane Arnold, LLC (NEDA, the licensee) certified to the U.S. Nuclear Regulatory Commission (NRC) that it planned to permanently cease power operations at the Duane Arnold Energy Center (DAEC) in the fourth quarter of 2020. By letter dated March 2, 2020 (ADAMS Accession No. ML20062E489), NEDA updated its timeline and certified to the NRC that it planned to permanently cease power operations at DAEC on October 30, 2020. By letter dated August 27, 2020 (ADAMS Accession No. ML20240A067), NEDA certified to the NRC that power operations permanently ceased at DAEC on August 10, 2020, and in a letter dated October 12, 2020 (ADAMS Accession No. ML20286A317), that the fuel was permanently removed from the DAEC reactor vessel and placed in the spent fuel pool (SFP) as of October 12, 2020. Based on the docketing of these certifications for permanent cessation of operations and permanent removal of fuel from the reactor vessel, as specified in Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.82(a)(2), the 10 CFR Part 50 renewed facility operating license (DPR-49) for DAEC no longer authorizes operation of the reactor or emplacement or retention of fuel in the reactor vessel. The facility is still authorized to possess and store irradiated (i.e., spent) nuclear fuel. Spent fuel is currently stored onsite at the DAEC facility in the SFP and in a dry cask independent spent fuel storage installation (ISFSI).

Many of the accident scenarios postulated in the updated safety analysis reports (USARs) for operating nuclear power reactors involve failures or malfunctions of systems, which could affect the fuel in the reactor core and, in the most severe postulated accidents, would involve the release of large quantities of fission products. With the permanent cessation of power operations at DAEC and permanent removal of fuel from the reactor vessel, many accidents are no longer possible. The reactor, reactor coolant system, and supporting systems are no longer in operation and have no function related to the storage of the spent fuel. Therefore, the emergency planning (EP) provisions for postulated accidents involving failure or malfunction of the reactor, reactor coolant system, or supporting systems are no longer applicable.

The EP requirements of 10 CFR 50.47, "Emergency plans," and Appendix E to 10 CFR Part 50, "Emergency Planning and Preparedness for Production and Utilization Facilities," continue to apply to nuclear power reactors that have permanently ceased operation and have permanently removed all fuel from the reactor vessel. There are no explicit regulatory provisions distinguishing EP requirements for a power reactor that is permanently shut down and defueled from those for a reactor that is authorized to operate. To reduce or eliminate EP requirements that are no longer necessary due to the decommissioning status of the facility, NEDA must obtain exemptions from those EP regulations. Only then can NEDA modify the DAEC emergency plan to reflect the reduced risk associated with the permanently shutdown and defueled condition of DAEC.

II. Request/Action.

By letter dated April 2, 2020, as supplemented by letter dated October 7, 2020 (ADAMS Accession Nos. ML20101M779 and ML20282A595, respectively), NEDA requested exemptions from certain EP requirements in 10 CFR Part 50 for DAEC. Specifically, NEDA requested exemptions from certain planning standards in 10 CFR 50.47(b) regarding onsite and offsite radiological emergency preparedness plans for nuclear power reactors; from certain

requirements in 10 CFR 50.47(c)(2) that require establishment of plume exposure and ingestion pathway EP zones for nuclear power reactors; and from certain requirements in 10 CFR Part 50, Appendix E, Section IV, which establish the elements that comprise the content of emergency plans. In the letter dated October 7, 2020, NEDA provided supplemental information and responses to the NRC staff's requests for additional information concerning the proposed exemptions.

The information provided by the licensee included justifications for each exemption requested. The exemptions requested by NEDA would eliminate the requirements to maintain formal offsite radiological emergency preparedness plans reviewed by the Federal Emergency Management Agency (FEMA) under the requirements of 44 CFR, "Emergency Management and Assistance," Part 350, "Review and Approval of State and Local Radiological Emergency Plans and Preparedness," and would reduce the scope of onsite EP activities at DAEC. The licensee stated that the application of all the standards and requirements in 10 CFR 50.47(b), 10 CFR 50.47(c), and 10 CFR Part 50, Appendix E, are not needed for adequate emergency response capability, based on the substantially lower onsite and offsite radiological consequences of accidents still possible at the permanently shutdown and defueled facility, as compared to an operating facility. If offsite protective actions were needed for a highly unlikely beyond-design-basis accident that could challenge the safe storage of spent fuel at DAEC, provisions exist for offsite agencies to take protective actions using a comprehensive emergency management plan (CEMP) under the National Preparedness System to protect the health and safety of the public. A CEMP in this context, also referred to as an emergency operations plan, is addressed in FEMA's Comprehensive Preparedness Guide 101, "Developing and Maintaining Emergency Operations Plans," which is publicly available at http://www.fema.gov/pdf/about/divisions/npd/CPG_101_V2.pdf. Comprehensive Preparedness Guide 101 is the foundation for State, territorial, Tribal, and local EP in the United States. It promotes a common understanding of the fundamentals of risk-informed planning and decision-

making and helps planners at all levels of government in their efforts to develop and maintain viable, all-hazards, all-threats emergency plans. An emergency operations plan is flexible enough for use in all emergencies. It describes how people and property will be protected; details who is responsible for carrying out specific actions; identifies the personnel, equipment, facilities, supplies and other resources available; and outlines how all actions will be coordinated. A CEMP is often referred to as a synonym for “all-hazards planning.”

III. Discussion.

In accordance with 10 CFR 50.12, “Specific exemptions,” the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of 10 CFR Part 50 when: (1) the exemptions are authorized by law, will not present an undue risk to public health and safety, and are consistent with the common defense and security; and (2) any of the special circumstances listed in 10 CFR 50.12(a)(2) are present. These special circumstances include, among other things, that the application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule.

As noted previously, the EP regulations contained in 10 CFR 50.47(b) and Appendix E to 10 CFR Part 50 apply to both operating and shutdown power reactors. The NRC has consistently acknowledged that the risk of an offsite radiological release at a power reactor that has permanently ceased operations and permanently removed fuel from the reactor vessel is significantly lower, and the types of possible accidents are significantly fewer, than at an operating power reactor. However, the EP regulations do not recognize that once a power reactor permanently ceases operation, the risk of a large radiological release from credible emergency accident scenarios is significantly reduced. The reduced risk for any significant offsite radiological release is based on two factors. One factor is the elimination of accidents applicable only to an operating power reactor, resulting in fewer credible accident scenarios. The second factor is the reduced short-lived radionuclide inventory and decay heat production

due to radioactive decay. Due to the permanently defueled status of the reactor, no new spent fuel will be added to the DAEC SFP and the radionuclides in the current spent fuel will continue to decay as the spent fuel ages. The spent fuel will produce less heat due to radioactive decay, increasing the available time to mitigate a loss of water inventory from the SFP. The NRC's NUREG/CR-6451, "A Safety and Regulatory Assessment of Generic BWR [Boiling Water Reactor] and PWR [Pressurized Water Reactor] Permanently Shutdown Nuclear Power Plants," dated August 1997 (ADAMS Accession No. ML082260098), and the NRC's NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants," dated February 2001 (ADAMS Accession No. ML010430066), confirmed that for permanently shutdown and defueled power reactors that are bounded by the assumptions and conditions in the report, the risk of offsite radiological release is significantly less than for an operating nuclear power reactor.

In the past, EP exemptions similar to those requested for DAEC, have been granted to permanently shutdown and defueled power reactor licensees. However, the exemptions did not relieve the licensees of all EP requirements. Rather, the exemptions allowed the licensees to modify their emergency plans commensurate with the credible site-specific risks that were consistent with a permanently shutdown and defueled status. Specifically, the NRC's approval of these prior exemptions was based on the licensee's demonstration that: (1) the radiological consequences of design-basis accidents would not exceed the limits of the U.S. Environmental Protection Agency (EPA) early phase Protective Action Guides (PAGs) of one roentgen equivalent man (rem) at the exclusion area boundary; and (2) in the highly unlikely event of a beyond-design-basis accident resulting in a loss of all modes of heat transfer from the fuel stored in the SFP, there is sufficient time to initiate appropriate mitigating actions, and if needed, for offsite authorities to implement offsite protective actions using a CEMP approach to protect the health and safety of the public.

With respect to design-basis accidents at DAEC, the licensee provided analysis demonstrating that 10 months following permanent cessation of power operations, the radiological consequences of the only remaining design-basis accident with potential for offsite radiological release (a fuel handling accident in the Reactor Building, where the SFP is located) will not exceed the limits of the EPA PAGs at the exclusion area boundary.

With respect to beyond-design-basis accidents at DAEC, the licensee analyzed a drain down of the SFP water that would effectively impede any decay heat removal. The analysis demonstrates that at 10 months after permanent cessation of power operations, there would be at least 10 hours after the assemblies have been uncovered until the limiting fuel assembly (for decay heat and adiabatic heatup analysis) reaches 900 degrees Celsius (°C), the temperature used to assess the potential onset of fission product release. The analysis conservatively assumed that the heat up time starts when the SFP has been completely drained, although it is likely that site personnel will start to respond to an incident when drain down starts. The analysis also does not consider the period of time from the initiating event causing loss of SFP water inventory until cooling is lost.

The NRC staff reviewed the licensee's justification for the requested exemptions against the criteria in 10 CFR 50.12(a) and determined, as described below, that the criteria in 10 CFR 50.12(a) will be met, and that the exemptions should be granted 10 months after DAEC has permanently ceased power operations. An assessment of the licensee's EP exemptions is described in SECY-21-0006, "Request by NextEra Energy Duane Arnold, LLC for Exemptions from Certain Emergency Planning Requirements for the Duane Arnold Energy Center," dated January 15, 2021 (ADAMS Package Accession No. ML20218A875). The Commission approved the NRC staff's recommendation to grant the exemptions in the staff requirements memorandum to SECY-21-0006, dated February 11, 2021 (ADAMS Accession No. ML21042A030). Descriptions of the specific exemptions requested by the licensee and the NRC staff's basis for granting each exemption are provided in SECY-21-0006. The NRC staff's

detailed review and technical basis for the approval of the specific EP exemptions requested by the licensee are provided in the NRC staff's safety evaluation dated April 13, 2021 (ADAMS Accession No. ML21097A141).

A. The Exemption is Authorized by Law.

The licensee has proposed exemptions from certain EP requirements in 10 CFR 50.47(b), 10 CFR 50.47(c)(2), and 10 CFR Part 50, Appendix E, Section IV, that would allow the licensee to revise the DAEC Emergency Plan to reflect the permanently shutdown and defueled condition of the facility. As stated above, in accordance with 10 CFR 50.12, the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of 10 CFR Part 50. The NRC staff has determined that granting of the licensee's proposed exemptions will not result in a violation of the Atomic Energy Act of 1954, as amended, or the NRC's regulations. Therefore, the exemptions are authorized by law.

B. The Exemption Presents no Undue Risk to Public Health and Safety.

As stated previously, the licensee provided analyses that show that the radiological consequences of design-basis accidents will not exceed the limits of the EPA early phase PAGs at the exclusion area boundary. Therefore, formal offsite radiological emergency preparedness plans required under 10 CFR Part 50 will no longer be needed for protection of the public beyond the exclusion area boundary, based on the radiological consequences of design-basis accidents still possible at DAEC 10 months after the plant has permanently ceased power operations.

Although highly unlikely, there is one postulated beyond-design-basis accident that might result in significant offsite radiological releases. However, NUREG-1738 confirms that the risk of beyond-design-basis accidents is greatly reduced at permanently shutdown and defueled reactors. The NRC staff's analyses in NUREG-1738 conclude that the event sequences important to risk at permanently shutdown and defueled power reactors are limited to large

earthquakes and cask drop events. For EP assessments, this is an important difference relative to operating power reactors, where typically a large number of different sequences make significant contributions to risk. As described in NUREG-1738, relaxation of offsite EP requirements in 10 CFR Part 50 a few months after shutdown resulted in only a small change in risk. The report further concludes that the change in risk due to relaxation of offsite EP requirements is small because the overall risk is low, and because even under current EP requirements for operating power reactors, EP was judged to have marginal impact on evacuation effectiveness in the severe earthquake event that dominates SFP risk. All other sequences including cask drops (for which offsite radiological emergency preparedness plans are expected to be more effective) are too low in likelihood to have a significant impact on risk.

Therefore, granting exemptions to eliminate the requirements of 10 CFR Part 50 to maintain offsite radiological emergency preparedness plans and to reduce the scope of onsite EP activities will not present an undue risk to the public health and safety.

C. The Exemption is Consistent with the Common Defense and Security.

The requested exemptions by the licensee only involve EP requirements under 10 CFR Part 50 and will allow the licensee to revise the DAEC Emergency Plan to reflect the permanently shutdown and defueled condition of the facility. Physical security measures at DAEC are not affected by the requested EP exemptions. The discontinuation of formal offsite radiological emergency preparedness plans and the reduction in scope of the onsite EP activities at DAEC will not adversely affect the licensee's ability to physically secure the site or protect special nuclear material. Therefore, the proposed exemptions are consistent with common defense and security.

D. Special Circumstances.

Special circumstances, in accordance with 10 CFR 50.12(a)(2)(ii), are present whenever application of the regulation in the particular circumstances is not necessary to achieve the underlying purpose of the rule. The underlying purpose of 10 CFR 50.47(b),

10 CFR 50.47(c)(2), and 10 CFR Part 50, Appendix E, Section IV, is to provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency, to establish plume exposure and ingestion pathway emergency planning zones for nuclear power plants, and to ensure that licensees maintain effective offsite and onsite radiological emergency preparedness plans. The standards and requirements in these regulations were developed by considering the risks associated with operation of a nuclear power reactor at its licensed full-power level. These risks include the potential for a reactor accident with offsite radiological dose consequences.

As discussed previously in Section III, because DAEC is permanently shut down and defueled, there will no longer be a risk of a significant offsite radiological release from a design-basis accident exceeding EPA early phase PAGs at the exclusion area boundary, and the risk of a significant offsite radiological release from a beyond-design-basis accident is greatly reduced when compared to an operating power reactor. The NRC staff has confirmed the reduced risks at DAEC by comparing the generic risk assumptions in the analyses in NUREG-1738 to site-specific conditions at DAEC and determined that the risk values in NUREG-1738 bound the risks presented for DAEC. As indicated by the results of the research conducted for NUREG-1738, and more recently for NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor," dated September 2014 (ADAMS Accession No. ML14255A365), while other consequences can be extensive, accidents from SFPs with significant decay time have little potential to cause offsite early fatalities, even if the formal offsite radiological EP requirements were relaxed. The licensee's analysis of a beyond-design-basis accident involving a complete loss of SFP water inventory, based on an adiabatic heatup analysis of the limiting fuel assembly for decay heat, shows that 10 months after permanent cessation of power operations at DAEC, the time for the limiting fuel assembly to reach 900 °C is at least 10 hours after the assemblies have been uncovered assuming a loss of all cooling means.

The only analyzed beyond-design-basis accident scenario that progresses to a condition where a significant offsite release might occur, involves the highly unlikely event where the SFP drains in such a way that all modes of cooling or heat transfer are assumed to be unavailable, which is referred to as an adiabatic heatup of the spent fuel. The licensee's analysis of this beyond-design-basis accident shows that 10 months after permanent cessation of power operations, at least 10 hours would be available between the time the fuel is initially uncovered (at which time adiabatic heatup is conservatively assumed to begin), until the fuel cladding reaches a temperature of 900 °C, which is the temperature associated with rapid cladding oxidation and the potential for a significant radiological release. This analysis conservatively does not include the period of time from the initiating event causing a loss of SFP water inventory until all cooling means are lost.

The NRC staff has verified the licensee's analyses and its calculations. The analyses provide reasonable assurance that in granting the requested exemptions to the licensee, there is no design-basis accident that will result in an offsite radiological release exceeding the EPA early phase PAGs at the exclusion area boundary. In the highly unlikely event of a beyond-design-basis accident affecting the SFP that results in a complete loss of heat removal via all modes of heat transfer, there will be at least 10 hours available before an offsite release might occur and, therefore, at least 10 hours to initiate appropriate mitigating actions to restore a means of heat removal to the spent fuel. If a radiological release were projected to occur under this highly unlikely scenario, a minimum of 10 hours is considered sufficient time for offsite authorities to implement protective actions using a CEMP approach to protect the health and safety of the public.

Exemptions from the offsite EP requirements in 10 CFR Part 50 have previously been approved by the NRC when the site-specific analyses show that at least 10 hours is available following a loss of SFP coolant inventory with no air cooling (or other methods of removing decay heat) until cladding of the hottest fuel assembly reaches the rapid oxidation temperature.

The NRC staff concluded in its previously granted exemptions, as it does with the licensee's requested EP exemptions, that if a minimum of 10 hours is available to initiate mitigative actions consistent with plant conditions or, if needed, for offsite authorities to implement protective actions using a CEMP approach, then formal offsite radiological emergency preparedness plans, required under 10 CFR Part 50, are not necessary at permanently shutdown and defueled facilities.

Additionally, DAEC committed to maintaining SFP makeup strategies in its letters to the NRC dated April 2 and October 7, 2020. The multiple strategies for providing makeup to the SFP include: using various existing plant systems for inventory makeup and an internal strategy that relies on the fire protection system with redundant pumps (one diesel-driven and one electric motor-driven) that can take suction from the Cedar River. These strategies will continue to be required as License Condition 2.C.(9), "Mitigation Strategy License Condition," of Renewed Facility License No. DPR-49 for DAEC. Considering the very low probability of beyond-design-basis accidents affecting the SFP, these diverse strategies provide multiple methods to obtain additional makeup or spray to the SFP before the onset of any postulated offsite radiological release.

For all of the reasons stated above, the NRC staff finds that the licensee's requested exemptions meet the underlying purpose of all of the standards in 10 CFR 50.47(b), as well as the requirements in 10 CFR 50.47(c)(2) and 10 CFR Part 50, Appendix E, and satisfy the special circumstances provision in 10 CFR 50.12(a)(2)(ii) in view of the greatly reduced risk of offsite radiological consequences associated with the permanently shutdown and defueled state of the DAEC facility 10 months after the facility permanently ceases operation.

The NRC staff has concluded that the exemptions being granted by this action will maintain an acceptable level of emergency preparedness at DAEC and, if needed, that there is reasonable assurance that adequate offsite protective measures can and will be taken by State and local government agencies using a CEMP approach in the highly unlikely event of a

radiological emergency at DAEC. Since the underlying purpose of the rules, as exempted, would continue to be achieved, even with the elimination of the requirements under 10 CFR Part 50 to maintain formal offsite radiological emergency preparedness plans and the reduction in the scope of the onsite EP activities at DAEC, the special circumstances required by 10 CFR 50.12(a)(2)(ii) exist.

E. Environmental Considerations.

In accordance with 10 CFR 51.31(a), the Commission has determined that the granting of this exemption will not have a significant effect on the quality of the human environment as discussed in the NRC staff's Finding of No Significant Impact and associated Environmental Assessment published in the *Federal Register* on March 19, 2021 (86 FR 14960).

IV. Conclusions.

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12, the licensee's request for exemptions from certain EP requirements in 10 CFR 50.47(b), 10 CFR 50.47(c)(2), and 10 CFR Part 50, Appendix E, Section IV, and as summarized in Enclosure 2 to SECY-21-0006, are authorized by law, will not present an undue risk to the public health and safety, and are consistent with the common defense and security. Also, special circumstances are present. Therefore, the Commission hereby grants NEDA's exemptions from certain EP requirements in 10 CFR 50.47(b), 10 CFR 50.47(c)(2), and 10 CFR Part 50, Appendix E, Section IV, as discussed and evaluated in detail in the NRC staff's safety

evaluation dated April 13, 2021. The exemptions are effective as of 10 months after permanent cessation of power operations at DAEC, which is June 10, 2021.

Dated this 13th day of April, 2021.

For the Nuclear Regulatory Commission.

/RA/

Patricia K. Holahan, Director,
Division of Decommissioning, Uranium Recovery,
and Waste Programs,
Office of Nuclear Material Safety and Safeguards

ENCLOSURE 2

SAFETY EVALUATION RELATED TO
NEXTERA ENERGY DUANE ARNOLD, LLC
DUANE ARNOLD ENERGY CENTER
REQUEST FOR EXEMPTIONS FROM
CERTAIN EMERGENCY PLANNING REQUIREMENTS



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY
THE OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
RELATED TO REQUEST FOR EXEMPTIONS FROM
PORTIONS OF 10 CFR 50.47 AND 10 CFR PART 50, APPENDIX E
NEXTERA ENERGY DUANE ARNOLD, LLC
DUANE ARNOLD ENERGY CENTER
DOCKET NO. 50-331

1.0 INTRODUCTION

By letter dated January 18, 2019 (Reference 1), in accordance with paragraph 50.82(a)(1)(i) of Title 10 of the *Code of Federal Regulations* (10 CFR), NextEra Energy Duane Arnold, LLC (NEDA, the licensee) certified to the U.S. Nuclear Regulatory Commission (NRC, the Commission) that it planned to permanently cease power operations at the Duane Arnold Energy Center (DAEC) in the fourth quarter of 2020. By letter dated March 2, 2020 (Reference 2), NEDA updated its timeline and certified to the NRC that it planned to permanently cease power operations at DAEC on October 30, 2020. Subsequently, by letter dated August 27, 2020 (Reference 3), NEDA certified, pursuant to 10 CFR 50.82(a)(1)(i), that DAEC permanently ceased power operations on August 10, 2020. By letter dated October 12, 2020 (Reference 4), NEDA certified, pursuant to 10 CFR 50.82(a)(1)(ii), that fuel had been permanently removed from the DAEC reactor vessel and placed in the spent fuel pool (SFP) as of October 12, 2020. Upon docketing of these certifications for permanent cessation of operations and permanent removal of fuel from the DAEC reactor vessel, as specified in 10 CFR 50.82(a)(2), the renewed facility operating license (DPR-49) for DAEC no longer authorizes operation of the reactor or emplacement or retention of fuel in the reactor vessel.

By letter dated April 2, 2020 (Reference 5), as supplemented by letter dated October 7, 2020 (Reference 6), NEDA requested exemptions from specific emergency planning and preparedness (EP) requirements in 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," for the DAEC site. More specifically, NEDA requested exemptions from certain planning standards in 10 CFR 50.47(b) regarding onsite and offsite radiological emergency preparedness (REP) plans for nuclear power reactors; from certain requirements in 10 CFR 50.47(c)(2) for establishment of plume exposure pathway and ingestion pathway emergency planning zones (EPZs) for nuclear power reactors; and from certain requirements in 10 CFR Part 50, Appendix E, Section IV, "Content of Emergency Plans."

NEDA's requested exemptions would eliminate the requirements to maintain formal offsite¹ REP plans in accordance with 44 CFR Part 350, "Review and Approval of State and Local Radiological Emergency Plans and Preparedness," and would reduce the scope of the onsite EP activities at DAEC, based on the reduced risks of an offsite radiological release at DAEC 10 months after permanent cessation of power operations. The exemptions would maintain the requirements for an onsite radiological emergency plan and would continue to ensure the capability to communicate and coordinate with offsite response authorities. The NRC staff found the application complete, and found that NEDA's associated technical justification provides a basis for the Commission's consideration of the requested exemptions.

In accordance with 10 CFR 50.12, "Specific exemptions," the licensee stated that this exemption request: (1) is authorized by law; (2) will not present an undue risk to the public health and safety; (3) is consistent with the common defense and security; and (4) meets the requirement for special circumstances in 10 CFR 50.12(a)(2).

2.0 DISCUSSION

The regulations governing EP for a nuclear power reactor are set forth in Section 50.47, "Emergency plans," Section 50.54(q), (s) and (t), and Appendix E, "Emergency Planning and Preparedness for Production and Utilization Facilities," to 10 CFR Part 50. Every nuclear power reactor licensee must establish and maintain emergency plans and preparedness in accordance with these regulations. The EP regulations for a nuclear power reactor include standards for both onsite and offsite emergency response plans. These regulations and the planning basis for EP are based upon an anticipated prompt response to a wide spectrum of events for an operating nuclear power reactor. However, for a nuclear power reactor that is no longer operating and is in decommissioning, the spectrum of accidents that can have significant offsite consequences is greatly reduced. At a decommissioning nuclear power reactor site, the only accident scenario that might lead to a significant radiological release is a highly unlikely, beyond-design-basis event resulting in a potential spent fuel zirconium cladding fire. This event involves a postulated major loss of water inventory from the SFP, where preplanned SFP mitigation measures were unsuccessful, generating a significant heatup of the spent fuel to the point where substantial zirconium cladding oxidation and fuel damage can occur.

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

Since there are no explicit regulatory provisions distinguishing EP requirements for a nuclear power reactor that has permanently ceased operating from those for an operating nuclear power reactor, licensees transitioning to or already in the decommissioning phase usually seek to establish a level of EP commensurate with the risk of a radiological emergency at a decommissioning site. Exemptions from certain EP requirements are typically requested early

1 The offsite standards are reproduced in the Federal Emergency Management Agency (FEMA) regulations at 44 CFR 350.5, "Criteria for review and approval of State and local radiological emergency plans and preparedness," and are based on the standards established by the Commission in 10 CFR 50.47.

in the decommissioning process. The NRC reviews each request on a case-by-case basis and grants exemptions only after conducting a thorough analysis of each request. Historically, given the significant reduction in radiological risk from a decommissioning site, the NRC has approved exemptions from EP requirements based on site-specific evaluations and considering the objectives of the regulations. Between 1987 and 1999, the NRC issued exemptions from certain EP requirements for ten licensees in decommissioning. More recently, exemptions from EP requirements during decommissioning have been granted for the Kewaunee Power Station, Crystal River Unit 3 Nuclear Generating Plant, San Onofre Nuclear Generating Station, Units 2 and 3, Vermont Yankee Nuclear Power Station, Fort Calhoun Station, Oyster Creek Nuclear Generating Station, Pilgrim Nuclear Power Station, and the Three Mile Island Nuclear Station (References 7, 8, 9, 10, 11, 12, 13, and 14 respectively).

Previously granted exemptions from EP regulations reduced the requirements for decommissioning power reactors to those consistent with these standards:

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

In evaluating the EP exemptions requested by NEDA, specifically in relation to relieving the licensee from the requirement to maintain formal offsite REP plans, the NRC staff considered the conclusions from recent SFP studies completed since the publication of NUREG-1738,

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

3 In the statement of considerations (SOC) for the Final Rule to 10 CFR Part 72, "Emergency Planning Licensing Requirements for Independent Spent Fuel Storage Facilities (ISFSI) and Monitored Retrievable Storage Facilities (MRS)" (60 *Federal Register* (FR) 32430; June 22, 1995), the Commission stated that "NUREG-1140 concluded that the postulated worst-case accident involving an ISFSI has insignificant consequences to public health and safety. Therefore, the final requirements to be imposed on most ISFSI licensees reflect this fact, and do not mandate formal offsite components to their onsite emergency plans." The Commission also stated, "[B]ased on the potential inventory of radioactive material, potential driving forces for distributing that amount of radioactive material, and the probability of the initiation of these events, the Commission concludes that the offsite consequences of potential accidents at an ISFSI or a [monitored retrieval storage facility] would not warrant establishing Emergency Planning Zones" (60 FR 32435).

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

“Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants,” dated February 2001 (Reference 15), which served as the technical basis for SECY-01-0100, “Policy Issues Related to Safeguards, Insurance, and Emergency Preparedness Regulations at Decommissioning Nuclear Power Plants Storing Fuel in Spent Fuel Pools” (Reference 16). In addition, the NRC staff considered enhancements put into place as a result of the events of September 11, 2001, and the accident at the Fukushima Dai-ichi site on March 11, 2011.

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

2.1 Spent Fuel Pool Study Considerations

Following the permanent removal of spent fuel from the reactor vessel, the principal radiological risks are associated with the storage of spent fuel onsite. Generally, a few months after the reactor has been permanently shutdown there are no possible design-basis events that could result in a radiological release exceeding the U.S. Environmental Protection Agency (EPA), EPA-400/R-17/001, “PAG Manual: Protective Action Guides and Planning Guidance for Radiological Incidents,” dated January 2017 (Reference 18), early phase protective action guide (PAG) limit of one roentgen equivalent man (rem) at the exclusion area boundary of the site.

The only potential accident that might lead to a significant radiological release at a decommissioning power reactor is a zirconium cladding fire. The zirconium cladding fire scenario is a postulated, but highly unlikely, beyond-design-basis accident (DBA) scenario that involves a major loss of water inventory from the SFP, resulting in a significant heatup of the spent fuel due to the loss of all cooling, and culminating in substantial zirconium cladding oxidation and fuel damage. The significance of spent fuel heatup scenarios that might result in a zirconium cladding fire depends on the decay heat of the irradiated fuel stored in the SFP. The amount of decay heat in the spent fuel is directly associated with the amount of time since the reactor permanently ceased power operations. Therefore, the probability of a zirconium cladding fire scenario continues to decrease as a function of the time that the decommissioning power reactor has been permanently shutdown and defueled.

The NRC staff assessed the risk of an SFP accident at decommissioning nuclear power plants in the late 1990s to support development of a risk-informed technical basis for review of exemption requests and creation of a regulatory framework for integrated rulemaking. The NRC’s NUREG/CR-6451, “A Safety and Regulatory Assessment of Generic BWR [Boiling Water

5 A CEMP or “all-hazards” approach in this context, also referred to as an emergency operations plan, is addressed in FEMA’s Comprehensive Preparedness Guide (CPG) 101, “Developing and Maintaining Emergency Operations Plans,” Version 2.0, dated November 2010 (Reference 17).

Reactor] and PWR [Pressurized Water Reactor] Permanently Shutdown Nuclear Power Plants,” dated August 1997 (Reference 19), and NUREG-1738 confirmed that for permanently shutdown and defueled power reactors that are bounded by the assumptions and conditions in the report, the risk of an offsite radiological release is significantly less than for an operating power reactor.

The NRC staff’s assessment, published in NUREG-1738, conservatively assumed that if the water level in the SFP did drop below the top of the spent fuel, a zirconium cladding fire involving the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial draindown scenarios) and fire propagation. The study used simplified and sometimes bounding assumptions and models to characterize the likelihood and consequences of beyond-design-basis SFP accidents. Even with these conservative assumptions, the study found the risk of an SFP fire to be low and well within the Commission’s safety goals. The amount of time available after the fuel is completely uncovered, but before a zirconium cladding fire, depends on various factors, including decay heat rate, fuel burnup, fuel storage configuration, building ventilation rates and air flow paths, and fuel cladding oxidation rates. Although the NUREG-1738 assessment did not completely rule out the possibility of a zirconium fire, it did demonstrate that storage of spent fuel in a high-density configuration in SFPs is safe, and that the risk of accidental release of a significant amount of radioactive material to the environment is low.

After the events of September 11, 2001, Sandia National Laboratories conducted studies (collectively referred to as the “Sandia studies”), which considered spent fuel loading patterns and other aspects for an SFP at a PWR and a BWR, including the role that the circulation of air plays in the cooling of spent fuel in the SFP. The Sandia studies indicated that there is a significant amount of time between the initiating event and the spent fuel assemblies becoming partially or completely uncovered. In addition, the Sandia studies indicated that for those hypothetical conditions where air cooling may not be effective in preventing a zirconium cladding fire, there is a significant amount of time between the spent fuel becoming uncovered and the possible onset of such a zirconium cladding fire, thereby providing a substantial opportunity for event mitigation. The Sandia studies, which account for relevant heat transfer and fluid flow mechanisms, also indicated that air-cooling of spent fuel could be sufficient to prevent SFP zirconium fires at a point much earlier following fuel offload from the reactor than previously considered (e.g., in NUREG-1738). The findings of the Sandia studies are sensitive, security-related information and are not available to the public.⁶

In 2013, the NRC documented a regulatory analysis for expediting the transfer of spent fuel assemblies in COMSECY-13-0030, “Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel” (Reference 21). In this analysis, the NRC staff concluded that SFPs are robust structures with large safety margins and recommended to the Commission that possible regulatory actions to require the expedited transfer of spent fuel from SFPs to dry cask storage were not warranted. The Commission subsequently approved the NRC staff’s recommendation in the Staff Requirements Memorandum to COMSECY-13-0030 (Reference 22).

In NUREG-2161, “Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor,” dated September 2014 (Reference 23), the NRC evaluated the potential benefits of strategies required in

6 A redacted summary of the Sandia studies is publicly available (Reference 20).

10 CFR 50.54(hh)(2) (now 10 CFR 50.155(b)(2)).⁷ The study results for the analyzed severe earthquake at the reference plant are consistent with conclusions in past studies that SFPs are robust structures and likely to withstand severe earthquakes without leaking. The study showed the likelihood of a radiological release from the spent fuel, resulting from a severe earthquake at the reference plant, to be about one time in 10 million years or lower. If a radiological release were to occur, this study also shows that the individual cancer fatality risk for a member of the public is several orders of magnitude lower than the Commission's Quantitative Health Objective of 2 in 1 million (2×10^{-6} /year). As explained in NUREG-2161, successful implementation of mitigation strategies significantly reduces the likelihood of a release from the SFP in the event of a loss of cooling water. Additionally, the NRC found that the placement of spent fuel in a dispersed configuration in the SFP, such as the 1 x 4 pattern, more effectively used the heat capacity of the stored fuel and available cooling mechanisms to extend the heatup time and reduce the likelihood of a release from a completely drained SFP.

As part of informing its current integrated decommissioning rulemaking effort, the NRC staff conducted an applied research study, as documented in a memorandum entitled "Transmittal of Reports to Inform Decommissioning Plant Rulemaking for User Need Request NSIR-2015-001," dated May 31, 2016 (Reference 24), and concluded:

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

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

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

- There would be sufficient time between an initiating event and the possible onset of conditions that could result in a zirconium cladding fire, which would provide a substantial opportunity for successful mitigation measures; and
- Only a highly unlikely, beyond-design-basis event (e.g., extreme earthquake or large aircraft impact) could cause sufficient SFP structural damage to uncover

⁷ "Mitigation of Beyond-Design-Basis Events; Final Rule" (84 FR 39684; August 9, 2019).

the fuel and potentially support development of a zirconium cladding fire and, even in such cases, the fuel may be air coolable following a complete draindown.

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

2.2 Spent Fuel Pool Hostile Action-Based Event Considerations

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

Numerous NRC regulatory activities and studies have reaffirmed the safety and security of spent fuel stored in pools and showed that SFPs are effectively designed to prevent accidents and minimize damage from malevolent attacks. In the wake of the terrorist attacks of September 11, 2001, the NRC took several actions to further reduce the possibility of a zirconium cladding fire in an SFP. The NRC issued Order EA-02-026, "Order for Interim Safeguards and Security Compensatory Measures," dated February 25, 2002 (Reference 25), requiring licensees to immediately implement additional security measures, including increased patrols, augmented security forces and capabilities, and more restrictive site-access controls to, among other things, reduce the likelihood of an SFP accident resulting from a terrorist-initiated event. Through the NRC's issuance of the "Power Reactor Security Requirements" final rule on March 27, 2009 (74 FR 13926), the agency codified generically applicable security requirements that had been previously issued by orders. Subsequently, by letter dated November 28, 2011 (Reference 26), the NRC partially rescinded Order EA-02-026. However, the requirements of Order EA-02-026 that were addressed by Interim Compensatory Measure (ICM) B.1.a involved operator training for specific security-initiated events that were not covered by the proposed or existing regulations and remained in effect after the NRC rescinded other parts of the Order.

2.3 Spent Fuel Pool Mitigative Action Considerations

The NRC Order EA-02-026 also established new requirements for licensees to have mitigating strategies for the potential loss of SFP water inventory and for large fires or explosions at nuclear power plants. In response, the Nuclear Energy Institute (NEI) provided detailed guidance in NEI 06-12, "B.5.b Phase 2 and 3 Submittal Guideline," Revision 2, dated December 2006 (Reference 27), which the NRC endorsed on December 22, 2006 (Reference 28). The NRC found the NEI guidance to be an effective means for mitigating the

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

potential loss of large areas of the plant due to fires or explosions. In addition, these mitigative strategies enhanced the ability to cool the spent fuel and the potential to recover SFP water level and cooling prior to a potential SFP zirconium cladding fire, which further reduced the probability of a radiological release.

The 2009 security requirements final rule also added the requirement for licensees to implement mitigating measures to maintain or restore SFP cooling capability in the event of loss of large areas of the plant due to fires or explosions, which further decreases the probability of a zirconium cladding fire in an SFP. Specifically, under 10 CFR 50.155(b)(2), nuclear power reactor licensees are required to implement strategies such as those provided in NEI-06-12.⁹ The DAEC mitigative strategies will continue to be maintained to satisfy the applicable license conditions of the Renewed Facility Operating License.

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

In response to the Fukushima Dai-ichi Accident, the NRC implemented regulatory actions to further enhance reactor and SFP safety. On March 12, 2012, the NRC issued Order EA-12-049, “Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events” (Reference 29), which requires licensees to develop, implement, and maintain guidance and strategies to maintain or restore SFP cooling capabilities, independent of normal alternating current power systems, following a beyond-design-basis external event.

In addition, on March 12, 2012, the NRC also issued Order EA-12-051, “Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation” (Reference 30), which requires that licensees install reliable means of remotely monitoring wide-range SFP levels to support effective prioritization of event mitigation and recovery actions in the event of a beyond-design-basis external event. Although the primary purpose of the order was to ensure that operators were not distracted by uncertainties related to SFP conditions during accident response, the improved monitoring capabilities will likewise help in the diagnosis and response to potential losses of SFP integrity. These requirements ensure a more reliable and robust mitigation capability is in place to address degrading conditions in SFPs resulting from certain significant but highly unlikely events. Through the NRC’s issuance of the “Mitigation of Beyond-Design-Basis Events” final rule on August 9, 2019, the agency codified the generally applicable requirements in Order EA-12-049 and Order EA-12-051.

2.4 Spent Fuel Pool Offsite Radiological Emergency Preparedness Considerations

The NRC staff determined, based on the EP exemption evaluation criteria discussed in Section 3.0 of this safety evaluation, that in the event of a beyond-design-basis event impacting SFP integrity, or the ability to cool spent fuel, the licensee will maintain sufficient resources and adequately trained personnel available on-shift to promptly initiate mitigative actions without the

⁹ The guidance in NEI-06-12 specifies that portable, power-independent pumping capabilities must be able to provide at least 500 gallons per minute (gpm) of bulk water makeup to the SFP, and at least 200 gpm of water spray to the SFP. Recognizing that the SFP is more susceptible to a release when the spent fuel is in a non-dispersed configuration, the guidance also specifies that the portable equipment is to be capable of being deployed within two hours for a non-dispersed configuration.

support of OROs. In the highly unlikely event of a zirconium cladding fire in the SFP, due to a beyond-design-basis event that results in the loss of all spent fuel cooling, sufficient time would exist for offsite government officials to implement protective measures, if they deem warranted, using a CEMP approach. Therefore, the NRC staff concluded, consistent with previous similar exemption requests, that formal offsite REP plans, required under 10 CFR Part 50, are not necessary for permanently shutdown and defueled nuclear power reactor licensees once the evaluation criteria outlined in Section 5, "Evaluation of Exemptions to EP 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 11, 2015 (Reference 31), have been satisfied.

In addition, consistent with the December 7, 2015, "Memorandum of Understanding Between the Department of Homeland Security/Federal Emergency Management Agency and Nuclear Regulatory Commission Regarding Radiological Emergency Response, Planning and Preparedness" (Reference 32), by letter dated October 14, 2020 (Reference 33), the NRC staff documented the transmittal to FEMA, by electronic mail, a draft of the proposed SECY paper related to the Duane Arnold request and offered the opportunity for FEMA to ask questions, obtain clarification, and comment on the draft SECY paper before the Commission received it for review. In a letter dated November 5, 2020 (Reference 34), FEMA provided comments.

Under the proposed EP exemptions, NEDA would still be required to maintain an onsite emergency plan, which would provide for the notification of and coordination with OROs to an extent commensurate with the approved exemptions. Licensee requirements for offsite fire services and law enforcement responding onsite will continue to be maintained under the licensee's fire protection plan and physical security plan in accordance with 10 CFR 50.48 and 10 CFR Part 73, respectively. In the Staff Requirements Memorandum (SRM) to SECY-21-0006, "Request NextEra Energy Duane Arnold, LLC for Exemptions from Certain Emergency Planning Requirements for the Duane Arnold Energy Center," dated February 11, 2021 (Reference 35), the Commission approve NEDA's requested EP exemptions as recommended by the NRC staff in SECY-21-0006 (Reference 36).

3.0 REGULATORY EVALUATION

The regulations in 10 CFR 50.12(a)(2)(ii) provide that the NRC may, upon application by a licensee or on its own initiative, grant exemptions from the requirements of the regulations in 10 CFR Part 50 in circumstances for which application of the regulation would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule.¹⁰ As discussed in the Statement of Considerations (SOC) for the Final Rule for EP requirements for 10 CFR Part 50 and 10 CFR Part 70 (45 FR 55402; August 19, 1980), the underlying purposes of the planning standards in 10 CFR 50.47(b), the requirements in 10 CFR 50.47(c)(2), and certain requirements of Section IV of Appendix E to 10 CFR Part 50, are to: (1) ensure that there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency, and (2) ensure that licensees maintain effective offsite and onsite radiological emergency response plans.

¹⁰ Notwithstanding the special circumstances of the exemption request, 10 CFR 50.12(a)(1) requires that the exemption must be authorized by law, not present an undue risk to the public health and safety, and be consistent with the common defense and security.

The NRC staff relied on past precedent to assess whether the NEDA request for EP exemptions satisfied the underlying purposes of the EP regulations. As discussed previously, the exemptions requested by NEDA for DAEC that eliminate requirements for formal offsite REP plans are consistent with those recently approved by the NRC for the Kewaunee Power Station, Crystal River Unit 3 Nuclear Generating Plant, San Onofre Nuclear Generating Station, Units 2 and 3, Vermont Yankee Nuclear Power Station, Fort Calhoun Station, Oyster Creek Nuclear Generating Station, the Pilgrim Nuclear Power Station, and the Three Mile Island Nuclear Station. Prior to these sites, the last approved exemption that eliminated the requirements for formal offsite REP planning was for the Zion Nuclear Power Station in 1999 (Reference 37).

The NRC staff recognizes that the planning standards in 10 CFR 50.47(b), the requirements in 10 CFR 50.47(c)(2), and certain requirements in Section IV of Appendix E to 10 CFR 50 were developed taking into consideration the risks associated with accidents that have the potential for significant offsite radiological dose consequences during operation of a nuclear power reactor at its licensed full-power level. As discussed previously, the NRC staff has concluded that after a reactor has permanently ceased power operations and removed all fuel from the reactor vessel to the SFP, the risks associated with accidents that have a potential for offsite radiological release are significantly reduced for those licensees that are reasonably aligned with the analyses presented in NUREG-1738. This position has been further informed by the recent spent fuel pool studies provided in NUREG-2161.

Based on the highly unlikely nature of postulated beyond-design-basis events resulting in a loss of SFP integrity or all cooling to the spent fuel that may result in significant offsite radiological consequences, the NRC staff considers that the special circumstances condition of 10 CFR 50.12(a)(2)(ii) can be met by demonstrating that DAEC satisfies the two criteria provided below. Specifically, the planning standards in 10 CFR 50.47(b), the requirements in 10 CFR 50.47(c)(2), and certain requirements in Section IV of Appendix E to 10 CFR Part 50, from which NEDA has requested exemptions, would not serve, or be necessary to achieve, the underlying purpose of the EP regulations if the DAEC site specific-analyses demonstrate that:

1. An offsite radiological release from a design-basis accident will not exceed the EPA early phase PAGs of one rem at the exclusion area boundary (EAB)¹¹; and
2. In the highly unlikely event of a beyond-design-basis event, resulting in a loss of all modes of cooling for the spent fuel stored in the SFP, there is a minimum of 10 hours for the hottest fuel assembly to reach 900 degrees Celsius (°C), which is the critical temperature threshold for a self-sustained oxidation of zirconium cladding in air. 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.

Previously granted exemptions from EP regulations reduced the level of EP requirements consistent with the regulations for a licensee authorized for fuel loading and low power testing only, as specified in the standards of 10 CFR 50.47(d), and are consistent with the information requirements for an ISFSI emergency plan, as required by 10 CFR 72.32(a). Examples of the reduced EP requirements include: setting the highest emergency classification level as an

11 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," dated December 1978 (Reference 38), 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 FR 61123).

“Alert”; extending the timing requirements for notification of offsite authorities; requiring only onsite exercises with the opportunity for ORO participation; and only maintaining arrangements for the OROs (i.e., law enforcement, fire, and medical services) that may respond to onsite emergencies. No formal offsite REP plans, in accordance with 44 CFR Part 350, were required after the exemptions were granted for these licensees.

As part of the review of NEDA’s exemption request, the NRC staff used NSIR/DPR-ISG-02, the EP regulations in 10 CFR 72.32, and the Spent Fuel Project Office Interim Staff Guidance-16, “Emergency Planning,” dated June 14, 2000 (Reference 39), as references to ensure consistency between specific-licensed and general-licensed ISFSIs. Furthermore, the licensee addressed the Industry Decommissioning Commitments (IDCs) and Staff Decommissioning Assumptions (SDAs)¹² that formed the basis of the analyses presented in NUREG-1738.

4.0 TECHNICAL EVALUATION

The following NRC staff evaluation verifies that NEDA provided the analyses described in Section 5 of NSIR/DPR-ISG-02. These analyses meet the criteria in the ISG to justify elimination of the requirements on the licensee to maintain the 10-mile plume exposure pathway, the 50-mile ingestion pathway EPZs, and formal offsite REP plans. The discussion that follows lists each ISG criterion, followed by the NRC staff’s evaluation of the licensee’s consistency with that ISG criterion for DAEC.

1. The licensee has performed an analysis indicating that any radiological release from the applicable remaining DBA would be within the dose limits of 10 CFR 50.67, “Accident source term,” and dose acceptance criteria in Regulatory Guide 1.183, “Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors” (Reference 42). The licensee evaluated the maximum 2-hour total effective dose equivalent (TEDE) to an individual located at the EAB, and 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 EPA early phase PAGs recommendation for protection of the public.

Evaluation: NEDA states that the irradiated fuel will be stored in the DAEC SFP and ISFSI. NEDA further states, and the NRC staff agrees, that while spent fuel remains in the SFP, the only postulated DBA that would remain applicable to the permanently defueled DAEC facility that could contribute a significant dose would be a fuel handling accident (FHA) in the Reactor Building, where the SFP is located.

NEDA performed an analysis showing that 19 days after permanent cessation of power operations, the doses from a postulated 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, as well as the dose acceptance criteria contained in Regulatory Guide 1.183.

NEDA requested that the approved exemptions become effective 10 months following the permanent cessation of power operations at DAEC. Therefore, by the date of

12 NEI proposed IDCs in a letter to the NRC dated November 12, 1999 (Reference 40). The NRC identified several additional SDAs through the NRC staff’s risk assessment and 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,” Revision 2, dated May 2011 (Reference 41). The IDCs and SDAs are summarized in Table 4.2-1 and Table 4.2-2 to NUREG-1738.

implementation of the exemptions, the fuel will have decayed for 10 months. The NRC staff notes that the doses from an FHA are dominated by the isotope Iodine-131. After 10 months of decay, the thyroid dose from an FHA would be negligible and the only isotope remaining in significant amounts, among those postulated to be released in a DBA FHA, would be Krypton-85. Because 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.

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

Evaluation: The NRC staff evaluates the ability to mitigate beyond-design-basis events involving the SFP by considering the time available to implement measures to maintain the fuel cool or, if necessary, implement an appropriate emergency response. The NRC staff uses an assessment of the adiabatic heatup scenario to determine the available time because adiabatic heatup is generally the limiting condition. The heatup time calculated is the time to reach a temperature of 900°C, which correlates to 1652 degrees Fahrenheit (°F) and the temperature where “runaway oxidation” (zirconium cladding fire) is expected to occur, as defined in NUREG-1738.

The established 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 during 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 radiological 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.

NEDA performed an analysis showing that 10 months after shutdown, the spent fuel stored in the SFP will have decayed to the extent that the requested exemptions may be implemented at DAEC without any additional compensatory actions. Given the permanent shutdown date of August 10, 2020, and the proposed fuel decay time of 10 months, the period during which the spent fuel could heat up to clad ignition temperature within 10 hours under adiabatic conditions would end on June 10, 2021.

This analysis is contained in Attachment 2, “Calculation CAL-M19-001: Adiabatic Heatup Analysis of Drained Spent Fuel Pool (Zirconium Fire), Revision 1,” to NEDA’s application. The analysis determined the decay time necessary to ensure at least a 10-hour heatup time, considering the thermal capacity of the portion of the fuel assembly that heats uniformly and the decay heat rate of the fuel. The DAEC analysis shows that after the spent fuel has decayed for 10 months, 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 assembly reaches a temperature of 900°C. This 10-hour minimum threshold provides sufficient time for the licensee to take mitigative actions, or if governmental officials deem warranted, for offsite protective actions to be initiated using a comprehensive approach to emergency planning.

The NRC staff reviewed the DAEC calculation to verify that the values for important physical properties of materials were within acceptable ranges and the results were accurate. The NRC staff determined that the assumed physical properties were appropriate and completed independent confirmatory calculations that produced similar results. Therefore, the NRC staff found that after 10 months of decay, at least 10 hours would be available before a significant offsite radiological release could begin at DAEC. The NRC staff concluded that the adiabatic heatup 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: In Attachment 3, "Calculation CAL-R19-002: Dose at Site Exclusion Area Boundary and Main Control Room Due to Shine from Drained Spent Fuel Pool During SAFSTOR,¹³ Revision 0," NEDA 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 in the SFP for an event in which the spent fuel assemblies are uncovered following draindown. 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 dose rates determined by the 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 offsite and control room radiological impacts of a postulated complete loss of SFP water were assessed by DAEC. 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. NEDA's analysis (Attachment 2 of the exemption request) demonstrated that within 9 months after permanent cessation of power operations, the radiological consequences of the postulated accident will not exceed the limits of the EPA's early phase PAGs at the EAB.

The analysis provides that after 9 months of fuel decay: (1) a postulated complete loss of SFP water would result in a gamma radiation dose rate of 0.21 millirem per hour at the EAB and (2) the time to exceed the PAG limit of 1 roentgen equivalent man TEDE at the EAB following a SFP draindown is approximately 198 days, or about 6.5 months. Therefore, the potential offsite radiological impacts 10 months following reactor shutdown are bounded by the analysis.

The dose rate to the control room was determined by the licensee to be less than 0.03 millirem per hour. While there are no acceptance criteria for dose to personnel in

13 SAFSTOR is a method of decommissioning in which a nuclear facility is placed and maintained in a condition that allows the facility to be safely stored and subsequently decontaminated (i.e., deferred decontamination) to levels that permit release for unrestricted use.

the control room in NSIR/DPR-ISG-02, the dose rate values are considered reasonably low. The NRC staff reviewed the licensee's analysis 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 concluded 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 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: NEDA conducted a seismic evaluation of the DAEC SFP structure (Reference 43) in response to an NRC letter to all power reactor licensees, entitled "Request for Information Pursuant to Title 10 of the *Code of Federal Regulations* 50.54(f) 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 (Reference 44). This evaluation provided an assessment of earthquake probabilities at potentially damaging accelerations. The NRC accepted the results of this assessment indicating the low seismic hazard screening criteria had been satisfied at DAEC by letter dated February 18, 2016 (Reference 45).

The SFP is designed as a Seismic Category I structure. Additionally, NEDA has incorporated the Reactor Building structure, which includes the SFP structure, into the Maintenance Rule – Structures Monitoring Program. This program includes a validation by walkdown and drawing review that there are no changes or degradation to the structures and is completed every two years. Therefore, the NRC staff found reasonable assurance that Criterion 4 of NSIR/DPR-ISG-02 would be satisfied with respect to demonstrating a high confidence in a low probability of seismic failure for the DAEC Reactor Building, including the SFP structure.

5. If the licensee is storing fuel in an SFP for a decommissioning site, the licensee should address the risk reduction measures identified in NUREG-1738 as IDCs and SDAs. The IDCs and SDAs are a set of design characteristics and operational capabilities that either help prevent a substantial loss of SFP 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 and 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 DAEC 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 activity assumptions that were relied on to evaluate the likelihood of success in various event sequences. In Section 5.5, "Comparison to NUREG-1738 Industry Decommissioning Commitments and Staff Decommissioning

Assumptions,” of its exemption application, NEDA described the conformance of the DAEC facility and operations with the IDCs and the SDAs. In its discussion of the IDCs and SDAs, NEDA 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 (e.g., those IDCs and SDAs related to fuel cask handling activities and seismic events).

The NRC staff evaluation focused on the licensee’s conformance with IDCs and SDAs that are related to the design and operation of structures, systems, and components associated with the DAEC SFP. A summary of the NRC staff’s findings, which are based on an assessment of the licensee’s IDC and SDA items, is included below:

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 (Reference 46), will be implemented).

Evaluation: Heavy load lifts in and around the area of the SFP are performed by the Reactor Building crane. The design of the crane is single failure-proof. Therefore, the likelihood of dropping the spent fuel casks in and around the SFP is extremely low. The design meets the requirements of NUREG-0554, “Single-Failure-Proof Cranes for Nuclear Power Plants” (Reference 47), and Appendix C, “Control of Heavy Loads at Nuclear Power Plants,” of NUREG-0612. NEDA states that the DAEC procedures provide instructions for lifting activities to meet the guidance provided in NUREG-0612.

Because the DAEC Reactor Building crane is single failure-proof, an accidental load drop is considered not to be a credible event, such that condition 5.1.2(1) of NUREG-0612 is satisfied and an analysis of cask-drop accidents in accordance with condition 5.1.2(4) of NUREG-0612 is not required. Therefore, the NRC staff finds that NEDA satisfies the requirements of 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: NEDA states that DAEC has procedures in place to ensure onsite and offsite resources can be brought to bear during an event. Now that DAEC is permanently shutdown and defueled, the on-shift plant operators, including certified fuel handlers and non-certified operators, will be appropriately trained on the relevant procedures and on the various actions needed to provide makeup to the SFP.

NEDA also lists procedures that provide guidance for initiating and maintaining communications between offsite agencies and the onsite emergency response organization during severe weather and seismic events. NEDA states that the DAEC document FLEX-AB-100-1003, “SAFER Response Plan for Duane Arnold Energy

Center,” contains an offsite resource list which shows providers to supplement onsite resources, their capabilities, and a contact telephone number.

Therefore, the NRC staff concludes NEDA 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: Spent fuel pool 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: NEDA stated that SFP level instrumentation provides indication and alarm to the DAEC control room. This consists of two pool level instruments installed in accordance with NRC Order EA-12-051, with indication in the control room. By letter dated May 26, 2017 (Reference 48), the NRC staff concluded that NEDA’s proposed location and design of the SFP level instrumentation displays appear to be consistent with the guidance in NEI 12-02, “Industry Guidance for Compliance With NRC Order EA-12-051, to Modify Licenses With Regard to Reliable Spent Fuel Pool Instrumentation,” Revision 1 (Reference 49), as endorsed by the Japan Lessons-Learned Project Directorate (JLD) document JLD-ISG-2012-03, “Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation” (Reference 50), and should adequately address the SFP level instrumentation requirements of the order.

The SFP is also equipped with a local level indicator (ruler) for an alternate means of determining SFP level. The SFP system temperature is continuously monitored in the control room. There are four area radiation monitors on the DAEC refueling floor that provide remote indication and annunciation in the control room. A local alarm to notify personnel of high area radiation levels in the SFP area is also in place. In addition, each radiation monitor provides input to the plant process computer.

Therefore, the NRC staff concludes that NEDA will maintain adequate SFP monitoring instrumentation to satisfy the conditions assumed in the NUREG-1738 analysis regarding monitoring events affecting the SFP.

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

Evaluation: NEDA states that the DAEC SFP gate seals are static seals, and there is no credible catastrophic failure mechanism for these seals. In addition, if SFP inventory were to leak due to seal rupture or degradation, the SFP level would not go below the top of the spent fuel racks because the fixed elevation of the bottom of the refueling slot between the SFP and reactor vessel where the gates are located is above the top of the spent fuel. Therefore, leakage by the gates could not lead to fuel uncover. DAEC also has a flow indicating switch installed to monitor for any leakage past the SFP gates.

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 #7: Procedures or administrative controls to reduce the likelihood of rapid draindown 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: NEDA noted that the cask pool gate prevents cask evolutions from affecting the SFP level, and that DAEC procedure Dry Fuel Storage (DFS)-201, "Dry Shielded Canister/Transfer Cask Preparation for Fuel Loading Operations," meets the requirements of the IDC by controlling the potential draining methods to prevent affecting SFP level. In addition, there are no connections to the DAEC SFP that could allow the fuel pool to be drained below the pool gate between the reactor well and the fuel pool.

NEDA further described that the return cooling water supply piping terminates just below the surface of the SFP. The cooling water piping contains passive vacuum breaking vent pipes that prevent any SFP siphoning from occurring through the return lines. These vent pipes are easily observable to verify the absence of any obstructions, and they require no testing since there are no moving parts. In addition, the cooling water suction piping is routed from the skimmer surge tanks, which are connected to the fuel pool via SFP overflow weirs that maintain the SFP at the required level.

The NRC staff concludes that the physical configuration of the SFP inlet and outlet connections, as well as the use of anti-siphon devices, provide adequate control to minimize the potential for rapid drainage through permanent systems, and are therefore 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: NEDA indicated that site procedures Abnormal Operating Procedure (AOP) 435, "Loss of Spent Fuel Pool Cooling (All Modes) / Inventory (Mode 4 and 5)," Supplemental Emergency Procedure (SEP) 312, "Loss of Spent Fuel Pool Inventory," SEP 314, "Loss of Spent Fuel Pool Cooling," and Severe Accident Management Procedure (SAMP) 712, "Spent Fuel Pool Makeup and Spray," all provide guidance for SFP makeup utilizing various water sources, with or without access to the refueling floor.

The NRC staff finds that DAEC's planned SFP cooling and makeup water capability, with access to numerous sources of makeup inventory, conforms to the capabilities assumed for the NRC staff 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: NEDA states that DAEC procedures DFS-201 and AOP 435 both require the cask pool gate be installed prior to draining inventory from the cask pool. The cask pool gate prevents cask evolutions from affecting SFP level, and the procedures meet the IDC requirements by controlling the draining methods to prevent affecting SFP level.

Movement of the dry storage casks and other heavy loads in the vicinity of the SFP is performed in accordance with DAEC procedure Administrative Control Procedure (ACP) 1408.19, "Control of Generic Heavy Loads," and DFS-201, which ensure the criteria of NUREG-0612 are met for heavy loads. 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.

The NRC staff finds the described procedures are consistent with the administrative controls considered in the NRC staff 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: NEDA refers to procedure AOP 435, which lists the makeup sources to use in the event of a loss of SFP inventory, with or without access to the refueling floor. Various systems used in that procedure are either routinely used or tested in accordance with the DAEC Technical Specification or other administrative requirements. For instance, makeup to the skimmer surge tanks via condensate service water is utilized on a daily basis to make up for evaporative losses from the SFP. In addition, SFP cooling risk and equipment out of service times are managed in accordance with DAEC Operating Procedure (OP)-AA-104-1010, "Spent Fuel pool Risk Management."

The NRC staff finds that the described administrative controls conform to those considered in the NRC staff analysis presented in NUREG-1738.

SDA #1: Spent fuel pool 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 9.1.2.3.3.1, "Design Requirements," of the DAEC Updated Final Safety Analysis Report (Reference 51) states that the SFP is designed as a Seismic Category I structure, i.e., designed to withstand a safe shutdown earthquake. The SFP cooling system remains as originally designed and does not include temporary configurations which would result in loss of margin or unanalyzed drain paths.

The SFP instrumentation includes dual, independent-level monitors with indicators and alarms in the control room. Temperature indication and alarms are also available.

The SFP cooling system has redundant pumps, redundant heat exchangers, and multiple makeup sources, including the fire protection system. NEDA states that DAEC's fire protection system includes an electric-driven fire pump and a diesel-driven fire pump, both of which will be maintained until all fuel is removed from the SFP. Each fire pump has the capability to deliver 500 gallons per minute of makeup water.

The NRC staff finds the described cooling and makeup capabilities comparable to the capabilities considered in the NRC staff 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: NEDA states that DAEC performs in-plant walk-downs of the refueling floor and SFP demineralizer instruments for system pressure and flow (which will indicate a system problem) each shift, as directed by operator rounds. In addition, in-plant skimmer surge tank level and SFP pump checks are performed once per day as directed by operator rounds. The daily monitoring of skimmer surge tank levels and the SFP pumps are adequate since the continuous indication of SFP level in the control room, as well as monitoring of the refueling floor and demineralizers during each shift, will indicate any problems with SFP system operation.

NEDA states that DAEC procedures meet the requirements of this SDA by providing guidance on the capability and availability of permanent and portable makeup sources. AOP 901 directs the inspection of the SFP and cooling systems following a seismic event. AOP 435 includes methods to diagnose the loss of SFP cooling and/or inventory and direction to establish makeup. SAMP 712, "Spent Fuel Pool Makeup and Spray," provides direction in a beyond-design-basis external event (BDBEE).

NEDA determined that for a loss of SFP cooling with no makeup capabilities, the total time to boil the SFP and reduce the SFP water inventory to a point 10 feet above the top of the highest point of the fuel assembly is calculated to be 2.8 days. The 2.8-day period is based on the expected decay heat load following a 90-day period after reactor shutdown. NEDA indicated that 90 days after permanent shutdown of DAEC, adequate time and water resources will be available to restore SFP cooling and maintain the SFP water level 10 feet above the top of the spent fuel; and that the low decay heat and long time period to boil off inventory provides sufficient time for DAEC to sustain the SFP cooling function indefinitely. Specifically, DAEC's standard portable fire pumps deliver adequate head and flow to provide the minimum required makeup to the SFP in this scenario. NEDA states that the equipment can be installed within two hours by the minimum on-shift operations personnel to deliver SFP makeup. The necessary equipment and installation procedures are required to be maintained per the DAEC Operating License, section 2.C.(9), "Mitigation Strategy License Condition," item (b)(7).

The NRC staff finds that the monitoring of the SFP systems are consistent with the NRC staff analysis presented in NUREG-1738, and furthermore are based on improvements in SFP monitoring capability and reliability implemented since 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: NEDA states that indication for SFP level is provided in the control room as well as locally in the plant. A control room annunciator will actuate when the SFP level is low, or level is high. Additionally, if a low- or high-level condition exists, an alarm light

(red) will illuminate on local panels in the plant. Two independent indicators for SFP level are also provided on the control room back panels for use during a BDBEE.

NEDA states that a temperature element on the common suction to the fuel pool cooling pumps provides SFP temperature indication to the recorder, Temperature Recorder Switch 1945, which is located in the DAEC control room.

NEDA also states that there are plant procedures in place to respond to an abnormally low level in the SFP and direct the plant staff to take appropriate actions to provide the necessary SFP makeup; first through normal means, then by utilizing all available onsite resources, including both design-basis and defense-in-depth capabilities (see also the NEDA responses for IDC #2 and IDC #4 for details associated with offsite resources).

The NRC staff finds that the SFP temperature and water level 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 initiates recovery using offsite sources.

Evaluation: NEDA states that the DAEC SFP Cooling System has not been modified from the original design in order to enter into the decommissioning process.

The normal pool operating level is elevation (EL) 853 feet (') – 8 inches ("). The top of active fuel installed in the fuel storage racks is at EL 830'-3". The water in the SFP returns to the SFP cooling system via a skimmer weir that can be set to maintain SFP level as low as EL 853'-6.5". There are no lower elevation piping penetrations in the DAEC SFP. The bottom of the fuel transfer gate connecting the SFP to the reactor cavity is at EL 831'-2.75". The bottom of the cask pool gate opening is at EL 832'-3". The SFP cooling inventory is normally supplied through two 6" pipes that discharge into the SFP at EL 850'. These discharge lines each include a ¾" highpoint vent (welded at EL 852'-6" and open to atmosphere at EL 853'-3"), which act as vacuum breakers to prevent siphoning of the pool through the primary makeup piping. Therefore, although draining of more than 15 feet below normal pool operating level could occur, there is no drain path that would drain the water level to below the top of the fuel.

NEDA maintains procedures and guidelines in place to obtain offsite assistance, if necessary, for mitigation of events that result in significant loss of SFP inventory. These mitigating strategies are implemented as part of AOP 435 and are also included in DAEC's Mitigation Strategy License Condition requirements.

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: NEDA states that heavy load lifts in and around the area of the SFP are performed by the Reactor Building crane. NEDA has procedures directing the use of the installed single-failure-proof crane and lifting devices, as specified in NUREG-0612 for such loads. Therefore, performance of load drop consequence analyses is not required.

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 the potential for 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: NEDA conducted a seismic evaluation of the DAEC facility in response to Recommendation 2.1 of the Near-Term Task Force review of the accident at the Fukushima Dai-ichi nuclear facility. This evaluation included the SFP and was submitted to the NRC for review. The evaluation provides a specific assessment of earthquake probabilities versus acceleration for DAEC, and concludes, regardless of response spectral frequency, that the probability of an earthquake event is less than 2×10^{-6} /year. The NRC staff's review of this evaluation is included as one of the references in Attachment 1, "Request for Exemptions from Portions of 10 CFR 50.47(b), 10 CFR 50.47(c)(2) and 10 CFR Part 50, Appendix E," to the NEDA exemption request.

Additionally, NEDA has included the Reactor Building structure (and SFP) into the Maintenance Rule - Structures Monitoring Program. This program requires a validation by walkdown and drawing review that there are no changes or degradation to the associated equipment, structures, and components and is completed every two years. This SFP monitoring will continue until all fuel is removed from the pool.

In addition, as documented in the Enhanced Seismic Checklist (NUREG-1738, Appendix 2B, Attachment 1), the risks associated with a seismic event are mitigated by delaying any licensing waivers (e.g., emergency plan reductions, onsite and offsite insurance decreases, etc.) until after the zirconium cladding fire time period has elapsed. As NEDA's proposed exemptions will not be implemented until after the zirconium cladding fire period (10 months), the overall risk at DAEC is reduced even further.

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: The DAEC spent fuel racks utilize Boral, rather than Boraflex, as the neutron absorbing material. As required by DAEC Technical Specification 5.5.15, "Spent Fuel Pool Neutron Absorber Monitoring Program," a program is in place to manage loss of material and reduction of the neutron absorption capacity of the Boral panels in the spent fuel racks. The loss of material and the reduction of the neutron-absorbing capacity will be determined through coupon testing for the Holtec spent fuel racks, and by in situ testing for the Programmed and Remote Systems Corporation spent fuel racks. Such testing will include periodic verification of boron loss through areal density measurement of coupons or through direct in situ techniques, such as measurement of boron areal density and measurement of geometric changes in the material, as well as detection of gaps through blackness testing.

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

5.0 EXEMPTIONS

Pursuant to 10 CFR 50.12, the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of 10 CFR Part 50: (1) when the exemptions are authorized by law, will not present an undue risk to public health and safety, and are consistent with the common defense and security, and (2) when special circumstances are present. Special circumstances exist, in part, when application of the regulation in the particular circumstance would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule (10 CFR 50.12(a)(2)(ii)).

The underlying purpose of the planning standards in 10 CFR 50.47(b), the requirements in 10 CFR 50.47(c)(2), and certain requirements of Section IV of Appendix E to 10 CFR Part 50 are to ensure that there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency, and that licensees maintain effective offsite and onsite radiological emergency response plans. This section reflects the NRC staff's technical evaluation of the licensee's exemption requests, as provided to the Commission in SECY-21-0006, which was approved by the Commission in the SRM to SECY-21-0006.

5.1 **Specific Exemptions for 10 CFR 50.47**

NEDA's letter dated April 2, 2020, as supplemented on October 7, 2020, requested exemptions from certain sections (as indicated by strikeout and bolded text) of 10 CFR 50.47 for DAEC.

5.1.1 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:

The NRC requires a level of licensee EP commensurate with the potential consequences to public health and safety and common defense and security at the licensee's site. NEDA's exemption request included radiological analyses to show that, as of 9 months after the permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. NEDA also concluded, and the NRC staff confirmed, that as of 10 months 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, as well as enhancements put into place as a result of the events of September 11, 2001, and the Fukushima Dai-ichi accident, 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 zirconium cladding fire. This time provides a substantial opportunity for event mitigation. Licensees are required to maintain effective strategies, sufficient resources, and adequately

trained personnel to mitigate such an event. If State or local governmental officials determine that offsite protective actions are warranted, then sufficient time and capability would be available for OROs to implement these measures using a CEMP or “all hazards” approach.

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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor.

Based on the above analysis, the NRC staff concludes that the exempted language from 10 CFR 50.47(b), above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.1.2 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.

NUREG-0396 provides 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, which would result in dose savings in the environs of nuclear facilities in the event of a serious power reactor accident. As previously discussed, NEDA has provided radiological analyses which show that, as of 9 months after permanent cessation of power operations, the radiological consequences to the public for the only remaining applicable DBA at DAEC will not exceed the limits of the EPA early phase PAGs beyond the EAB. In addition, reactor core melt (Class 9) scenarios, which were also considered in NUREG-0396, are no longer applicable to a permanently shutdown 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, designated 10-mile plume exposure and 50-mile ingestion pathway emergency planning zones are no longer needed for DAEC.

In addition, in the SOC for the Final Rule for EP requirements for ISFSIs and monitored retrievable storage facilities (MRS) (60 FR 32430; June 22, 1995), the Commission responded to comments concerning EPZs for an ISFSI and MRS and concluded that “based on the potential inventory of radioactive material, potential driving forces for distributing that amount of radioactive material, and the probability of the initiation of these events, the Commission concludes that the offsite consequences of potential accidents at an ISFSI or a MRS would not warrant establishing Emergency Planning Zones.”

Based on the above analysis, the NRC staff concludes that the exempted language from 10 CFR 50.47(b)(1), above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.1.3 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.

With the termination of power reactor operations at DAEC and the permanent removal of the fuel from the reactor vessel to the SFP, most of the accident scenarios postulated for operating power reactors are no longer possible. The spent fuel will be stored in the SFP and the ISFSI, 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 are no longer 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 supporting systems are no longer applicable. During decommissioning, the principal public safety concerns involve the radiological risks associated with decontamination and demolition, as well as onsite storage of spent fuel.

The emergency operations facility (EOF) is a support facility for the purpose of managing 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, an EOF would not be needed to coordinate these types of assessments for determining public protective actions. Onsite staff will continue to maintain and provide for communication and coordination capabilities with offsite authorities for the purpose of notification, as well as provide the level of support required for the only remaining applicable DBA and the prompt implementation of mitigative actions in response to an event affecting the SFP.

Based on the above analysis and the analysis provided in Section 5.1.1 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR 50.47(b)(3), above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.1.4 10 CFR 50.47(b)(4)

A standard emergency classification and action level scheme, the bases 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.~~

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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. The DAEC Permanently Defueled Emergency Plan will continue to maintain arrangements for requesting and using assistance resources from offsite support organizations. Therefore, minimum initial offsite response measures are no longer required.

Based on the above analysis and the analysis provided in Section 5.1.1 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR 50.47(b)(4), above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.1.5 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.~~

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, a means to provide early notification and clear instruction to the populace within a designated 10-mile plume exposure pathway EPZ is no longer required.

Based on the above analysis, as well as the analyses provided in Sections 5.1.1 and 5.1.2 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR 50.47(b)(5), above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.1.6 10 CFR 50.47(b)(6)

Provisions exist for prompt communications among principal response organizations to emergency personnel ~~and to the public.~~

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, the requirement to provide prompt communication to the public within a designated 10-mile plume exposure pathway EPZ regarding initial or pre-determined protective actions is no longer needed.

Based on the above analysis, as well as the analyses provided in Sections 5.1.1 and 5.1.2 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR 50.47(b)(6), above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.1.7 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.

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, the requirement to provide periodic information to the public within a designated plume exposure pathway EPZ on how they will be notified and what their initial or predetermined protective actions should be in an emergency is not needed.

Based on the above analysis, as well as the analyses provided in Sections 5.1.1 and 5.1.2 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR 50.47(b)(7), above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.1.8 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.

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, the requirement for assessing or monitoring offsite consequences beyond the EAB is not needed. NEDA maintains and operates the onsite monitoring systems needed to provide data that is essential for initiating emergency measures and performing accident assessment, including dose assessment and assessing the magnitude of a release.

Based on the above analysis and the analysis provided in Section 5.1.1 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR 50.47(b)(9), above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.1.9 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.~~

NEDA's analyses demonstrated that, as of 9 months after the permanent cessation of power operations at DAEC, 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, as well as the associated protective actions developed based on evacuation time estimates, are no longer required. Additionally, in the unlikely event of an SFP accident, the iodine isotopes, which contribute to offsite dose from an operating power reactor 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 NEDA provides for an acceptable level of EP at DAEC 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 DAEC.

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. The licensee actions 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.

Based on the above analysis, as well as the analyses provided in Sections 5.1.1 and 5.1.2 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR 50.47(b)(10), above, is not necessary to achieve the underlying purpose of this

requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.1.10 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.~~

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, an EPZ is no longer required.

Section 50.47(c)(2) and footnote 1 to Appendix E of 10 CFR Part 50 both state, in part: "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 DAEC because it is not a gas-cooled reactor and has permanently ceased power operations. Therefore, no exemption is required.

Based on the above analysis and the analysis provided in Section 5.1.9 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR 50.47(c)(2), above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2 Specific Exemptions for 10 CFR Part 50, Appendix E, Section IV

NEDA's letter dated April 2, 2020, as supplemented on October 7, 2020, requested exemptions from certain sections (as indicated by strikeout and bolded text) of Appendix E to 10 CFR Part 50 for DAEC.

5.2.1 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, 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.

After the terrorist attacks of September 11, 2001, the NRC evaluated the EP planning basis to ensure that it continued to protect the public health and safety in the current threat environment. In 2002, the NRC issued Orders requiring compensatory measures, which include nuclear security and EP. The NRC staff determined that the EP planning basis continues to protect public health and safety; however, the NRC staff recognized that enhancements were desirable to ensure effective plan implementation during security-related events at nuclear power reactors (e.g., more timely NRC notification, additional onsite protective action considerations, and revision of emergency action levels to identify security-related emergencies more succinctly).

The agency issued NRC Bulletin (BL) 2005-02, "Emergency Preparedness and Response Actions for Security-Based Events," dated July 18, 2005 (Reference 52), to obtain information from licensees on progress in implementing security-event-related EP program enhancements. The 2011 EP Final Rule, "Enhancements to Emergency Preparedness Regulations" (76 FR 72560; November 23, 2011), made generically applicable the security-based response elements of NRC BL 2005-02. The enhancements of NRC BL 2005-02 were not applicable to holders of operating licenses for power reactors that had permanently ceased operations and certified that fuel had been removed from the reactor vessel. Therefore, the requirement for onsite protective actions during hostile action is not necessary for DAEC.

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, "Definitions," 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 nuclear power reactor or ISFSI is not a "nuclear reactor" as defined in the NRC's regulations. Like a non-power reactor, a decommissioning nuclear power reactor also has a lower likelihood of a credible accident resulting in radiological releases requiring offsite protective measures than does an operating nuclear power reactor. For all the above reasons, the NRC staff concludes that a decommissioning nuclear power reactor is not a facility that falls within the definition of "hostile action." However, although this analysis provides a justification for exempting DAEC 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.

Based on the above analysis, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.1, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.2 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.~~

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, the requirements for emergency planning zones and the associated evacuation time estimates (ETEs) are no longer required.

Based on the above analysis and the analysis provided in Section 5.1.9 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.2, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.3 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.~~

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Since formal offsite REP plans are not needed, the requirement to have an ETE and to perform an update to the ETE is not needed.

Based on the above analysis and the analysis provided in Section 5.2.2 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.3, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.4 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.~~

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Since formal offsite REP plans are not needed, the requirement to have an ETE and to perform an update to the ETE is not needed.

Based on the above analysis and the analysis provided in Section 5.2.2 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.4, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.5 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 between decennial censuses and shall submit these estimates to the NRC with any updated ETE analysis.~~

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Since formal offsite REP plans are not needed, the requirement to have an ETE and to perform an update to the ETE is not needed.

Based on the above analysis and the analysis provided in Section 5.2.2 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.5, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.6 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.~~

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Since formal offsite REP plans are not needed, the requirement to have an ETE and to perform an update to the ETE is not needed.

Based on the above analysis and the analysis provided in Section 5.2.2 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.6, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.7 10 CFR Part 50, Appendix E, Section IV.A.1

A description of the normal plant ~~operating~~ organization.

Because the NRC docketed the certifications of permanent cessation of operations and removal of fuel from the reactor vessel, the 10 CFR Part 50 license for DAEC no longer authorizes operation of the reactor, or emplacement or retention of fuel into the reactor vessel, as specified in 10 CFR 50.82(a)(2). Because NEDA is no longer authorized to operate the reactor, DAEC does not have a plant "operating" organization. A description of the plant organization, as it relates to the requirements in Section IV.A.1 of Appendix E to 10 CFR Part 50 is still required.

Based on the above analysis, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.A.1, above, is not necessary to achieve the underlying

purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.8 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.~~

The number of staff at a decommissioning power reactor site is smaller than that at an operating power reactor, 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. NEDA furnished information concerning the DAEC 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. NEDA has site personnel designated to respond within two hours of the declaration of an Alert classification level 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.

Based on the above analysis and the analysis provided in Section 5.1.1 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.A.3, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.9 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.~~

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. While it is unlikely that a beyond-design-basis event 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 if a radiological release is occurring, thereby achieving the underlying purpose of this regulatory provision. If a radiological release is occurring, then the licensee's staff is still required to communicate that information to offsite authorities for their consideration. The offsite authorities are responsible for deciding what, if any, protective actions should be taken that they consider appropriate to protect public health and safety.

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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, offsite dose projections are not required. NEDA maintains and operates the onsite

monitoring systems needed to provide data that is essential for initiating emergency measures and performing accident assessment, including dose assessment and assessing the magnitude of a radiological release.

Based on the above analysis and the analysis provided in Section 5.1.1 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.A.4, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.10 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.**~~

The number of licensee staff at a decommissioning nuclear power reactor site is smaller than that at an operating power reactor, but is commensurate with the need to operate the facility and store spent fuel in a manner that is protective of public health and safety. The NRC staff considered the staffing levels at a permanently shutdown and defueled reactor and at an operating power reactor site. The spectrum of accidents at a decommissioning facility is greatly reduced, and requires less specialized qualifications to address. The limited number of systems and equipment needed to maintain the spent fuel in a safe condition in the SFP or in an ISFSI requires only minimal personnel, which is governed by the DAEC Technical Specifications.

NEDA furnished information concerning the DAEC 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. NEDA has site personnel designated to respond within two hours of the declaration of an Alert classification level 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, licensee and other personnel with special qualifications, as directed in 10 CFR Part 50, Appendix E, Section IV.A.5, are not required.

Based on the above analysis, as well as the analyses provided in Sections 5.1.1 and 5.2.8 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.A.5, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.11 10 CFR Part 50, Appendix E, Section IV.A.7

~~By June 23, 2014, [I]dentification 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 includes 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.

In the 2011 EP Final Rule, the Commission defined a “hostile action” as, in part, “an act directed toward a nuclear power plant or its personnel.” The 2011 EP Final Rule made generically applicable the security-based response elements of NRC BL 2005-02. The enhancements of NRC BL 2005-02 were applicable to all holders of operating licenses for nuclear power reactors, except those who have permanently ceased operation and have certified that fuel has been permanently removed from the reactor vessel.

Because the NRC docketed the certifications of permanent cessation of operations and removal of fuel from the reactor vessel, the 10 CFR Part 50 license for DAEC no longer authorizes operation of the reactor, or emplacement or retention of fuel into the reactor vessel, as specified in 10 CFR 50.82(a)(2). Therefore, the enhancements for hostile actions required by the 2011 EP Final Rule are not applicable for DAEC in a permanently shutdown and defueled status.

Although the “hostile action” enhancements in the 2011 EP Final Rule are not applicable to a decommissioning power reactor, the licensee’s physical security plan must continue to provide high assurance against a potential security event impacting a designated target set. Therefore, some EP requirements for security-based events are maintained, such as the classification of security-based events, notification of offsite authorities, and coordination for the response of OROs (i.e., law enforcement, firefighting, medical assistance) onsite.

Based on the above analysis, as well as the analyses provided in Sections 5.1.1 and 5.2.1 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.A.7, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.12 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.~~

NEDA’s exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear

power reactor. Therefore, identification of the State and/or local officials responsible for detailed pre-planning, ordering, and controlling appropriate offsite protective actions, including evacuations when necessary, is no longer required as part of the DAEC Permanently Defueled Emergency Plan. If State or local governmental officials determine that offsite protective actions are warranted, then sufficient time and capability would be available for OROs to implement these measures using a CEMP or “all-hazards” approach.

Based on the above analysis, as well as and the analyses provided in Sections 5.1.1 and 5.1.2 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.A.8, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.13 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.**~~

The number of staff required at decommissioning sites is significantly reduced commensurate with the need to safely store spent fuel at the facility in a manner that is protective of public health and safety. The duties of the on-shift personnel at a decommissioning power reactor facility are not as complicated and diverse as those for an operating power reactor. The number of systems and equipment needed to maintain the spent fuel in a safe condition in the SFP or in an ISFSI requires minimal personnel, which is governed by the DAEC Technical Specifications.

In the 2011 EP Final Rule, the NRC required nuclear power plant licensees to provide a detailed analysis to show that on-shift personnel assigned emergency plan implementation functions were not assigned any responsibilities that would prevent them from performing their assigned emergency plan functions in a timely manner. As part of the 2011 EP Final Rule, the NRC concluded that the staffing analysis requirement was not necessary for non-power reactor licensees due to the significantly smaller staffing levels required to operate the facility. Therefore, based on the similarities of non-power reactors and decommissioning power reactors with regard to staffing, and as discussed in Section 5.2.1 of this safety evaluation, a detailed staffing analysis is not needed for a decommissioning power reactor.

Based on the above analysis, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.A.9, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.14 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.

NEI 99-01, "Development of Emergency Action Levels for Non-Passive Reactors," Revision 6 (Reference 53), is an acceptable method for development of an emergency action level (EAL) scheme for non-passive operating nuclear power reactors, permanently defueled power reactors, and ISFSIs. Since a radiological release from any remaining applicable DBA at DAEC is not estimated to exceed the limits of the EPA early phase PAGs beyond the EAB, event classification above the Alert classification level is no longer required, which is consistent with emergency planning exemptions granted by the NRC for previous decommissioning power reactors. The licensee will still be required to maintain EALs for the classification of security-based events to the Alert classification level, which was provided in the proposed Permanently Defueled Emergency Action Level Scheme, dated May 15, 2020, as supplemented by letters dated October 29 and December 1, 2020 (References 54, 55, and 56).

In the 2011 EP Final Rule, the Commission defined a "hostile action" as, in part, "an act directed toward a nuclear power plant or its personnel." The 2011 EP Final Rule made generically applicable the security-based response elements of NRC BL 2005-02, which provided numerous enhancements to licensee emergency plans, including security-based EALs. The NRC staff is maintaining the requirement for security-based EALs at decommissioning power reactors as described by the 2002 NRC Orders requiring compensatory measures. Exemption from the NRC BL 2005-02 hostile action enhancements for decommissioning power reactors was previously discussed in Section 5.2.1 of this safety evaluation.

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, a decommissioning power reactor is not required to have EALs to determine protective measures offsite. In addition, NEDA maintains and operates the onsite monitoring systems needed to provide data that is essential for initiating emergency measures and performing accident assessment, including dose assessment and assessing the magnitude of a radiological release, which would inform State or local governmental officials in making any determination that offsite protective actions are warranted.

Based on the above analysis, as well as the analyses provided in Sections 5.1.1 and 5.2.1 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.B.1, above, is not necessary to achieve the underlying purpose

of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.15 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-REP-1.

For a permanently shutdown and defueled power reactor, containment pressure measurements and emergency core cooling systems are no longer required. Therefore, they would have no parameters indicating a potential emergency. Other available indications of a potential emergency, such as SFP level, SFP temperature, and area radiation monitors will remain at DAEC and continue to indicate the condition of spent fuel stored in the SFP.

In the SOC for the Final Rule for EP requirements for ISFSIs and MRS facilities, the Commission responded to comments concerning a General Emergency classification level at an ISFSI and MRS and concluded: "An essential element of a General Emergency is that [a] release can be reasonably expected to exceed EPA Protective Action Guidelines exposure levels off site for more than the immediate site area. As previously discussed, NRC studies have concluded that the maximum offsite dose would be less than 1 rem [roentgen equivalent man] which is within the EPA Protective Action Guides." The SOC further provides a response to comments concerning EPZs for an ISFSI and MRS and concluded that "based on the potential inventory of radioactive material, potential driving forces for distributing that amount of radioactive material, and the probability of the initiation of these events, the Commission concludes that the offsite consequences of potential accidents at an ISFSI or a MRS would not warrant establishing Emergency Planning Zones."

NEDA's exemption request provided an analysis that demonstrates there are no remaining applicable DBAs that would reach the dose criteria for declaration of a Site Area Emergency or a General Emergency classification level. As discussed previously, the probability of a beyond DBA condition that could reach a Site Area Emergency or a General Emergency classification level is very low. In the highly unlikely event of a beyond-design-basis event resulting in the loss of all cooling to the spent fuel stored in the SFP, as of 10 months after 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. The licensee is required to maintain the capability to initiate prompt mitigative actions consistent with plant conditions. Considering 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, the need for an event classification level above an Alert is no longer required.

Based on the above analysis and the analysis provided in Section 5.1.1 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.C.1, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.16 10 CFR Part 50, Appendix E, Section IV.C.2

~~By June 20, 2012, nuclear power reactor~~ [L]icensees 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.

As part of the 2011 EP Final Rule, nuclear power reactor licensees were required to assess, classify, and declare an emergency condition within 15 minutes. Non-power reactors do not have the same potential to impact public health and safety as operating power reactors. As such, non-power reactor licensees are not required to establish or maintain complex offsite emergency response activities, nor to assess, classify, and declare an emergency condition within 15 minutes. Similarly, a decommissioning power reactor has a lower likelihood of a credible accident resulting in radiological releases requiring offsite protective measures than does an operating power reactor.

Unlike operating power reactor accident sequences potentially leading to large early releases, accident scenarios at decommissioning plants' SFPs evolve much more slowly and provide a longer time period to initiate SFP mitigative actions or, if deemed warranted by governmental officials, initiate appropriate offsite protective actions for the public. Because a decommissioning power reactor, like a non-power reactor, does not have the same potential radiological impact on public health and safety as an operating power reactor, the NRC staff concludes that it is not necessary for a decommissioning power reactor licensee to assess, classify, and declare an emergency condition within 15 minutes. NEDA proposed in its exemption request to assess, classify, and declare an emergency condition within 30 minutes. The NRC staff finds that 30 minutes to assess, classify, and declare an emergency condition is reasonable given the slower progression of a credible event resulting in a radiological release.

Based on the above analysis, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.C.2, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.17 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.~~

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, the requirements for prompt notification of the public and maintenance of emergency planning zones are not needed.

Based on the above analysis, as well as the analyses provided in Sections 5.1.1, 5.1.2, and 5.1.5 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.D.1, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.18 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.~~

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, the requirements for dissemination of emergency planning information to the public and maintenance of emergency planning zones are not needed.

Based on the above analysis, as well as the analyses provided in Sections 5.1.1, 5.1.2, and 5.1.5 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.D.2, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.19 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 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.~~

In the permanently shutdown and defueled condition of a decommissioning power reactor, the rapidly developing accident scenarios associated with events initiated during reactor power operations are no longer credible. The slow progression of SFP events allows greater time for the licensee to successfully mitigate the accidents and, if deemed warranted by governmental officials or other offsite authorities, to implement appropriate offsite protective measures using a CEMP or "all-hazards" approach.

In the SOC for the Final Rule for EP requirements for ISFSIs and MRS facilities, the Commission responded to comments concerning a notification time of 15 minutes, and

concluded that, “[t]he Commission has established a reasonable time limit for notification which has proven to be adequate in the past. ‘The licensee shall also commit to notify the NRC Operations Center immediately after notifications of the appropriate offsite response organizations and not later than one hour after the licensee declares an emergency.’” NEDA proposed in its exemption request to complete emergency notifications within 60 minutes after an emergency declaration or a change in emergency classification level. The 60-minute notification timeliness is consistent with the notification time requirements for emergency plans based on the requirements in 10 CFR 50.72(a)(3).

NEDA’s exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. The NRC’s research and analysis shows that a decommissioning power reactor licensee would have sufficient time to implement mitigation measures consistent with plant conditions and, if deemed warranted, for OROs to initiate protective actions offsite. The NRC staff concludes that notifying OROs as soon as possible, and within 60 minutes, would not significantly impact the time available for OROs to initiate appropriate response actions.

Decommissioning-related EP submittals for DAEC have been discussed with cognizant OROs. These meetings have included discussion of the regulatory exemption requests. These discussions have addressed the changes to onsite and offsite emergency preparedness throughout the decommissioning process, including the proposed 30-minute declaration time and 60-minute notification time. Emergency management officials have not objected to the proposed changes. Based on the above analysis, the NRC staff agrees that 60 minutes to notify the OROs of an emergency condition is reasonable. Additionally, the NRC staff agrees that the requirements for prompt notification of the public and an EPZ are not needed.

Based on the above analysis, as well as the analyses provided in Sections 5.1.1 and 5.1.2 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.D.3, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.20 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.~~

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, the requirements for prompt notification of the public and an EPZ, including backup alert and notification capabilities, are not needed.

Based on the above analysis and the analysis provided in Section 5.2.19 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.D.4, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.21 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;

The guidance in NUREG-0696, "Functional Criteria for Emergency Response Facilities," dated February 1981 (Reference 57), provides that the technical support center (TSC) is an onsite facility 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. For a permanently shutdown power reactor facility, onsite actions may be directed from the control room or other onsite location, without the requirements imposed on a TSC.

In addition, as there are no remaining applicable DBAs that would exceed the EPA early phase PAGs at the EAB, and there would be time available to initiate mitigative actions consistent with plant conditions between the loss of both water and air cooling to the spent fuel and the onset of a postulated zirconium cladding fire, an EOF would not be required to support interface with offsite agencies. If needed, coordination with offsite authorities and response organizations can occur from the control room or another onsite location. In addition, due to the reduced size of on-shift and ERO staff for a permanently shutdown and defueled power reactor, separate facilities to accommodate emergency response staff are no longer required. As such, greater efficiency and coordination is gained by locating staff in a central onsite facility.

Based on the above analysis, as well as the analyses provided in Sections 5.1.1 and 5.1.3 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.E.8.a.(i), above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.22 10 CFR Part 50, Appendix E, Section IV.E.8.a.(ii)

~~For nuclear power reactor licensees, a licensee onsite operational support center;~~

The operational support center (OSC) is an onsite area separate from the control room and the TSC where licensee support personnel will assemble in an emergency. The OSC should provide a location where plant logistic support can be coordinated during an emergency and thereby restrict control room access to those support personnel specifically requested by the control room supervisor. NEDA states that the DAEC control room will be the single onsite facility where plant systems and equipment parameters are monitored, and will serve as the onsite center for emergency command and control. Control room personnel have the ability to assess plant conditions and evaluate the magnitude and potential consequences of abnormal conditions, including radiation monitoring, as well as initiate preventative, mitigating, and corrective actions and perform notifications as appropriate.

Given the permanently shutdown and defueled status of the DAEC reactor and storage of the spent fuel in the SFP and ISFSI, an OSC will no longer be required to meet its original purpose during an emergency or to support initial SFP mitigation actions if needed. When activated, the ERO reports to the Emergency Director to assist the on-shift staff in the assessment, mitigation, and response to an emergency, as well as to support the dispatch of emergency teams. Due to the reduced size of on-shift and ERO staff for a permanently shutdown and defueled power reactor, separate facilities to accommodate emergency response staff are no longer required. As such, greater efficiency and coordination is gained by locating staff in a central onsite facility. An onsite facility will continue to be maintained at DAEC, from which effective direction can be given and effective control may be exercised during an emergency.

Based on the above analysis and the analysis provided in Section 5.2.21 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.A.8.a.(ii), above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.23 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;~~

Based on the analyses provided in Sections 5.1.1, 5.1.3, and 5.2.21 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.E.8.b, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.24 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~~

Based on the analyses provided in Sections 5.1.1, 5.1.3, and 5.2.21 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.E.8.c, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.25 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.~~

Based on the analyses provided in Sections 5.1.1, 5.2.1, and 5.2.11 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.E.8.d, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.26 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;~~

Based on the analyses provided in Sections 5.1.1, 5.1.3, and 5.2.21 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.E.8.e, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.27 10 CFR Part 50, Appendix E, Section IV.E.9.a

~~Provision for communications with contiguous State/local governments **within the plume exposure pathway EPZ**. Such communications shall be tested monthly.~~

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, provisions for communications with contiguous State/local governments within the plume exposure pathway EPZ are not needed. NEDA proposed in its

exemption request to continue to complete emergency notifications to designated State/local governments contiguous to the site within 60 minutes after an emergency declaration or a change in emergency classification level. A description of the communications systems and the testing frequencies is included in the DAEC Permanently Defueled Emergency Plan.

Based on the above analysis, as well as the analyses provided in Sections 5.1.1 and 5.1.2 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.E.9.a, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.28 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.~~

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, as discussed in Sections 5.2.21 and 5.2.22 of this safety evaluation, 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, additional testing of that system is not necessary.

Based on the above analysis, as well as the analyses provided in Sections 5.2.21 and 5.2.22 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.E.9.c, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.29 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 near-site emergency operations~~ facility. Such communications shall be tested monthly.

As discussed in Sections 5.2.21 and 5.2.22 of this safety evaluation, the need for a separate TSC and EOF no longer exists, given the smaller facility staffing and the greatly reduced

required interaction with State and local emergency response facilities. The NRC staff concludes that the emergency functions of the control room, EOF, TSC, and OSC may be combined into one or more locations. As a result, communications between the EOF and TSC, and the NRC, as well as monthly testing of these capabilities, are no longer needed. The Emergency Notification System used to communicate with the NRC will be tested monthly.

Based on the above analysis, as well as the analyses provided in Sections 5.2.21 and 5.2.22 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.E.9.d, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent operations of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.30 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~~.

The number of staff required 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. Decommissioning power reactors typically have a level of emergency response that does not require additional support by licensee headquarters personnel.

Therefore, the NRC staff considers exempting a licensee's headquarters personnel from the decommissioning site-specific emergency response training requirements to be reasonable. Training for licensee personnel responding from company locations offsite will still be required based on the ERO positions specified above.

"Civil Defense" is an outdated term that is no longer used. This category of offsite responders, which could be expected to respond onsite, is captured under "local emergency services" and "local law enforcement." Local news media are not included in the category of local services personnel requiring periodic radiological orientation training for the facility since they will not be called upon to support a formal Joint Information Center (JIC).

Based on the above analysis, as well as the analyses provided in Sections 5.1.1 and 5.2.8 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.F.1, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.31 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.

Based on the analyses provided in Sections 5.1.1 and 5.2.19 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.F.2, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.32 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.~~

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, conducting a full participation exercise with State and local agencies is not needed for a decommissioning power reactor site.

Based on above analysis and the analysis provided in Section 5.1.1 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.F.2.a, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.33 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 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, 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.

The intent of submitting emergency exercise scenarios in advance at an operating power reactor site is to ensure that licensees utilize different scenarios in order to prevent the preconditioning of responders at operating power reactors. For decommissioning power reactor sites, there are limited event scenarios that could occur, and as such, the submittal of exercise scenarios for the purpose of ensuring that responders do not get preconditioned to certain scenarios is not necessary to achieve the underlying purpose of the rule.

DAEC will continue to conduct biennial emergency response exercises and will invite the State of Iowa and local support organizations (firefighting, law enforcement, and ambulance and medical services) to participate in periodic drills and exercises to assess their ability to perform responsibilities related to an emergency at the site to the extent defined by the DAEC Permanently Defueled Emergency Plan.

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR

Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, drills involving principle functional areas associated with offsite REP are not needed. As discussed previously in Sections 5.2.21 and 5.2.22 of this safety evaluation, there is no need for an OSC, TSC, or EOF to meet the underlying purpose of the rule.

Based on the above analysis, as well as the analyses provided in Sections 5.1.1, 5.2.21, 5.2.22, and 5.2.32 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.F.2.b, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.34 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.~~

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear

power reactor. Therefore, conducting a full participation exercise with State and local agencies is not needed for a decommissioning power reactor site.

Based on the above analysis, as well as the analyses provided in Sections 5.2.1 and 5.2.32 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.F.2.c, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.35 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.~~

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, the requirement to ensure the State fully participate in the ingestion pathway portion of an exercise is not needed. As noted in Section 5.1.2 of this safety evaluation, designated plume exposure and ingestion pathway EPZs are no longer needed.

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 nuclear power reactor or ISFSI is not a "nuclear reactor" as defined in the NRC's regulations. Like a non-power reactor, a decommissioning nuclear power reactor also has a lower likelihood of a credible accident resulting in radiological releases requiring offsite protective measures than does an operating nuclear power reactor. For all the above reasons, the NRC staff concludes that a decommissioning nuclear power reactor is not a facility that falls within the definition of "hostile action."

Based on the above analysis, as well as the analyses provided in Sections 5.1.1, 5.1.2, 5.2.1, and 5.2.32 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.F.2.d, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent

cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.36 10 CFR Part 50, Appendix E, Section IV.F.2.e

Licenses 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.

NEDA's exemption request provided radiological analyses to show that, as of 9 months after permanent cessation of power operations at DAEC, the radiological consequences to the public of the only remaining applicable DBA would not exceed the limits of the EPA early phase PAGs beyond the EAB. 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 onset of a postulated zirconium cladding fire), formal offsite REP plans (in accordance with 44 CFR Part 350) are not considered necessary for a permanently shutdown and defueled nuclear power reactor. Therefore, identifying State and local governments in relation to a plume exposure pathway EPZ that is no longer required is not needed. DAEC will continue to conduct biennial emergency response exercises and will invite the State of Iowa and local support organizations (firefighting, law enforcement, and ambulance and medical services) to participate in periodic drills and exercises to assess their ability to perform responsibilities related to an emergency at the site to the extent defined by the Permanently Defueled Emergency Plan.

Based on the above analysis, as well as the analyses provided in Sections 5.1.1 and 5.1.2 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.F.2.e, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.37 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.~~

As discussed previously in Section 5.2.32 of this safety evaluation, the requirement to conduct a full participation exercise with State and local agencies is not needed. Since full participation emergency plan exercises are not required, and FEMA does not have responsibilities related to onsite emergency preparedness, NRC consultation with FEMA is no longer necessary.

Based on the above analysis, as well as the analyses provided in Sections 5.1.1 and 5.2.32 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.F.2.f, above, is not necessary to achieve the underlying

purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.38 10 CFR Part 50, Appendix E, Section IV.F.2.i

Licenses 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.

The NRC staff previously evaluated the issues surrounding preconditioning for emergency drill scenarios, including hostile action scenarios, at decommissioning power reactors in Sections 5.2.1, 5.2.33, and 5.2.34 of this safety evaluation. In each instance, the NRC staff concluded that the exempted language from 10 CFR Part 50, Appendix E, Section IV.F.2.i, above, was not needed to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.39 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 response. 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.~~

In the SOC for the 2011 EP Final Rule, the NRC discussed the addition of a new Section IV.F.2.j to Appendix E of 10 CFR Part 50, which requires all operating nuclear power reactor licensees to provide an opportunity for the ERO to demonstrate proficiency in response to a wide spectrum of scenarios, including a “hostile action” and a loss of large areas of the plant due to fire or explosion. The NRC staff previously evaluated the need for hostile action enhancements at decommissioning power reactors in Section 5.2.1 of this safety evaluation. Section IV.F.2.j of Appendix E to 10 CFR Part 50 further provides that the ERO must demonstrate key skills specific to emergency response duties in the reactor control room, TSC, OSC, EOF, and JIC. The NRC staff previously concluded that the functions of the DAEC control room, EOF, TSC, and OSC may be combined into one or more locations in Sections 5.2.21, 5.2.22, and 5.2.29 of this safety evaluation. A dedicated JIC is also not needed based on the analysis in Section 5.2.30 of this safety evaluation. At a decommissioning site, where only the SFP and its related support systems, structures, and components remain, there are no other facilities in which ERO personnel could demonstrate proficiency.

Based on the above analysis, as well as the analyses provided in Sections 5.1.1, 5.2.1, 5.2.30, and 5.2.33 of this safety evaluation, the NRC staff concludes that the exempted language from 10 CFR Part 50, Appendix E, Section IV.F.2.j, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

5.2.40 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.**~~

Based on the analysis provided in Section 5.2.1 of this safety evaluation, the NRC staff concludes that the enhancements for hostile actions, as required by the 2011 EP Final Rule, are not necessary for DAEC given its permanently shutdown and defueled status. Therefore, the exempted language from 10 CFR Part 50, Appendix E, Section IV.I, above, is not necessary to achieve the underlying purpose of this requirement as it applies to DAEC 10 months after permanent cessation of power operations and, therefore, meets the special circumstances provisions of 10 CFR 50.12(a)(2)(ii).

6.0 ENVIRONMENTAL CONSIDERATIONS

In accordance with 10 CFR 51.31(a), the Commission has determined that the granting of these exemptions will not have a significant effect on the quality of the human environment as discussed in the NRC staff’s Finding of No Significant Impact and associated Environmental Assessment published in the *Federal Register* on March 19, 2021 (86 FR 14960).

7.0 CONCLUSION

The NRC staff has completed its review of the licensee’s request for exemptions from certain requirements of 10 CFR 50.47(b), 10 CFR 50.47(c), and Appendix E to 10 CFR Part 50, as specified in this safety evaluation. On the basis of its review, the NRC staff concludes that (1) the postulated dose from any remaining applicable DBA would not exceed the EPA early phase PAG limits to the public at the EAB and, (2) for any highly unlikely beyond-design-basis

events impacting SFP integrity or the ability to cool spent fuel, the length of time available to implement pre-planned mitigation measures consistent with plant conditions and, should offsite authorities deem warranted, to implement protective actions using a CEMP approach, is adequate to ensure public health and safety. These conclusions are consistent with the NRC staff's evaluation, as provided to the Commission in SECY-21-0006, which was approved by the Commission in the SRM to SECY-21-0006.

Accordingly, the NRC staff has determined that, pursuant to 10 CFR 50.12(a), the exemptions evaluated above are authorized by law, will not present an undue risk to the public health and safety, and are consistent with the common defense and security. In addition, special circumstances are present. Specifically, the NRC staff finds that the licensee's requested exemptions continue to meet the underlying purpose of the planning standards in 10 CFR 50.47 and the requirements in Appendix E to 10 CFR Part 50. In addition, given the reduced risk of offsite radiological consequences associated with the permanently shutdown and defueled condition at DAEC, these exemptions satisfy the special circumstances in 10 CFR 50.12(a)(2)(ii) and can be implemented 10 months after permanent cessation of power operations.

8.0 REFERENCES

1. Nazar, M., NextEra Energy Duane Arnold, LLC, letter to U.S. Nuclear Regulatory Commission, "Certification of Permanent Cessation of Power Operations," dated January 18, 2019 (Agencywide Documents Access and Management System [ADAMS] Accession No. ML19023A196).
2. Curtland, D., NextEra Energy Duane Arnold, LLC, letter to U.S. Nuclear Regulatory Commission, "Certification of Permanent Cessation of Power Operations," dated March 2, 2020 (ADAMS Accession No. ML20062E489).
3. Curtland, D., NextEra Energy Duane Arnold, LLC, letter to U.S. Nuclear Regulatory Commission, "Certification of Permanent Cessation of Power Operations," dated August 27, 2020 (ADAMS Accession No. ML20240A067).
4. Curtland, D., NextEra Energy Duane Arnold, LLC, letter to U.S. Nuclear Regulatory Commission, "Certification of Permanent Removal of Fuel from the Reactor Vessel for Duane Arnold Energy Center," dated October 12, 2020 (ADAMS Accession No. ML20286A317).
5. Curtland, D., NextEra Energy Duane Arnold, LLC, "Request for Exemption from Portions of 10 CFR 50.47 and 10 CFR Part 50, Appendix E," dated April 2, 2020 (ADAMS Accession No. ML20101M779).
6. Curtland, D., NextEra Energy Duane Arnold, LLC, letter to U.S. Nuclear Regulatory Commission, "Response to Request for Additional Information Relating to Request for Exemption from Portions of 10 CFR 50.47 and 10 CFR 50, Appendix E," dated October 7, 2020 (ADAMS Accession No. ML20282A595).
7. Wengert, T., U.S. Nuclear Regulatory Commission, letter to David Heacock, Dominion Energy Kewaunee, Inc., "Kewaunee Power Station – Exemptions from Certain Emergency Planning Requirements and Related Safety Evaluation (TAC No. MF2567)," dated October 27, 2014 (ADAMS Accession No. ML14261A223).

8. Orenak, M., U.S. Nuclear Regulatory Commission, letter to Terry D. Hobbs, Crystal River Nuclear Plant, "Crystal River Unit 3 – Exemptions from Certain Emergency Planning Requirements and Related Safety Evaluation (TAC No. MF2981)," dated March 30, 2015 (ADAMS Accession No. ML15058A906).
9. Wengert, T., U.S. Nuclear Regulatory Commission, letter to Thomas J. Palmisano, Southern California Edison Company, "San Onofre Nuclear Generating Station, Units 1, 2, and 3 and Independent Spent Fuel Storage Installation – Exemptions from Certain Emergency Planning Requirements and Related Safety Evaluation (TAC Nos. MF3835, MF3836, and MF3837)," dated June 4, 2015 (ADAMS Accession No. ML15082A204).
10. Kim, J., U.S. Nuclear Regulatory Commission, letter to Site Vice President, Entergy Nuclear Operations, Inc., "Vermont Yankee Nuclear Power Station - Exemptions from Certain Emergency Planning Requirements and Related Safety Evaluation (CAC No. MF3614)," dated December 10, 2015 (ADAMS Accession No. ML15180A054).
11. Kim, J., U.S. Nuclear Regulatory Commission, letter to Mary J. Fisher, Omaha Public Power District, "Fort Calhoun Station, Unit No. 1 – Exemptions from Certain Emergency Planning Requirements and Related Safety Evaluation (CAC No. MF9067; EPID L-2016-LLE-0003)," dated December 11, 2017 (ADAMS Accession No. ML17263B198).
12. Lamb, J., U.S. Nuclear Regulatory Commission, letter to Bryan C. Hanson, Exelon Generation Company, LLC, "Oyster Creek Nuclear Generating Station – Exemptions from Certain Emergency Planning Requirements and Related Safety Evaluation (CAC No. MG0153; EPID L-2017-LLE-0020)," dated October 16, 2018 (ADAMS Accession No. ML18220A980).
13. Wall, S., U.S. Nuclear Regulatory Commission, letter to Pamela B. Cohan, Holtec International Decommissioning, LLC, "Pilgrim Nuclear Power Station – Exemptions from Certain Emergency Planning Requirements and Related Safety Evaluation (EPID L-2018-LLE-0011)," dated December 18, 2019 (ADAMS Accession No. ML19142A043).
14. Smith, T., U.S. Nuclear Regulatory Commission, letter to Bryan C. Hanson, Exelon Generation Company, LLC, "Three Mile Island Nuclear Station, Units 1 and 2 – Exemptions from Certain Emergency Planning Requirements and Related Safety Evaluation (EPID L-2019-LLE-0016)," dated December 1, 2020 (ADAMS Accession No. ML20244A292).
15. U.S. Nuclear Regulatory Commission, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants," dated February 2001 (ADAMS Accession No. ML010430066).
16. U.S. Nuclear Regulatory Commission, SECY-01-0100, "Policy Issues Related to Safeguards, Insurance, and Emergency Preparedness Regulations at Decommissioning Nuclear Power Plants Storing Fuel in Spent Fuel Pools (WITS 200000126)," dated June 4, 2001 (ADAMS Accession No. ML011450420).
17. Federal Emergency Management Agency, Comprehensive Preparedness Guide 101, "Developing and Maintaining Emergency Operations Plans," Version 2.0, dated November 2010 (http://www.fema.gov/pdf/about/divisions/npd/CPG_101_V2.pdf).

18. U.S. Environmental Protection Agency (EPA), EPA-400/R-17/001, "PAG Manual: Protective Action Guides and Planning Guidance for Radiological Incidents," dated January 2017 (ADAMS Accession No. ML17044A073).
19. U.S. Nuclear Regulatory Commission, NUREG/CR-6451, "A Safety and Regulatory Assessment of Generic BWR and PWR Permanently Shutdown Nuclear Power Plants," dated August 1997 (ADAMS Accession No. ML082260098).
20. "Mitigation of Spent Fuel Pool Loss-of-Coolant Inventory Accidents and Extension of Reference Plant Analyses to Other Spent Fuel Pools," Sandia Letter Report, Revision 2, dated November 2006 (ADAMS Accession No. ML120970086).
21. U.S. Nuclear Regulatory Commission, COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel," dated November 12, 2013 (ADAMS Package Accession No. ML13329A918).
22. U.S. Nuclear Regulatory Commission, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel," dated May 23, 2014 (ADAMS Accession No. ML14143A360).
23. U.S. Nuclear Regulatory Commission, NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor," dated September 2014 (ADAMS Accession No. ML14255A365).
24. Weber, M., memorandum to Brian E. Holian, U.S. Nuclear Regulatory Commission, "Transmittal of Reports to Inform Decommissioning Plant Rulemaking for User Need Request NSIR-2015-001," dated May 31, 2016 (ADAMS Accession No. ML16110A417).
25. U.S. Nuclear Regulatory Commission, Order EA-02-026, "Order Modifying Licenses," dated February 25, 2002 (ADAMS Accession No. ML020510635).
26. Boger, R., U.S. Nuclear Regulatory Commission, "Rescission or Partial Rescission of Certain Power Reactor Security Orders Applicable to Nuclear Power Plants," dated November 28, 2011 (ADAMS Accession No. ML111220447).
27. Nuclear Energy Institute, NEI 06-12, "B.5.b Phase 2 & 3 Submittal Guideline," Revision 2, dated December 2006 (ADAMS Accession No. ML070090060).
28. Dyer, J., U.S. Nuclear Regulatory Commission, letter to Anthony Pietrangelo, Nuclear Energy Institute, endorsing NEI 06-12, "B5.b Phases 2 & 3 Submittal Guideline," dated December 22, 2006 (not publicly available; security-related information).
29. U.S. Nuclear Regulatory Commission, Order EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated March 12, 2012 (ADAMS Accession No. ML12054A735).

30. U.S. Nuclear Regulatory Commission, Order EA-12-051, "Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," dated March 12, 2012 (ADAMS Accession No. ML12054A679).
31. U.S. Nuclear Regulatory Commission, 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 11, 2015 (ADAMS Accession No. ML14106A057).
32. U.S. Department of Homeland Security/Federal Emergency Management Agency and U.S. Nuclear Regulatory Commission, "Memorandum of Understanding Between the Department of Homeland Security/Federal Emergency Management Agency and Nuclear Regulatory Commission Regarding Radiological Emergency Response, Planning, and Preparedness," dated December 7, 2015 (ADAMS Accession No. ML15344A371).
33. Brock, K., U.S. Nuclear Regulatory Commission, letter to Michael S. Casey, PhD, Federal Emergency Management Agency (FEMA), "Proposed Commission Paper Language for the Duane Arnold Energy Center Emergency Plan Decommissioning Exemption Request," dated October 14, 2020 (ADAMS Accession No. ML20218A355).
34. Casey, M., Federal Emergency Management Agency, letter to Kathryn Brock, U.S. Nuclear Regulatory Commission, "Proposed Commission Paper Language for the Duane Arnold Energy Center Emergency Plan Decommissioning Exemption Request," dated November 5, 2020 (ADAMS Accession No. ML20311A029).
35. U.S. Nuclear Regulatory Commission, "Staff Requirements – SECY-21-0006, 'Request by NextEra Energy Duane Arnold, LLC for Exemptions from Certain Emergency Planning Requirements for the Duane Arnold Energy Center,'" dated February 11, 2021 (ADAMS Accession No. ML21042A030).
36. U.S. Nuclear Regulatory Commission, SECY-21-0006, "Request by NextEra Energy Duane Arnold, LLC, for Exemptions from Certain Emergency Planning Requirements for the Duane Arnold Energy Center," dated January 15, 2021 (ADAMS Package Accession No. ML20218A875).
37. Scaletti, D., U.S. Nuclear Regulatory Commission, letter to Oliver D. Kingsley, Commonwealth Edison Company, "Request for Approval of Defueled Station Emergency Plan and Exemption from Certain Requirements of 10 CFR 50.47, 'Emergency Plans' - Zion Nuclear Power Station, Unit Nos. 1 and 2 (TAC Nos. MA5253 and MA5254)," dated August 31, 1999 (ADAMS Accession No. ML17227A235).
38. U.S. Nuclear Regulatory Commission, 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," dated December 1978 (ADAMS Accession No. ML051390356).
39. U.S. Nuclear Regulatory Commission, "Spent Fuel Project Office Interim Staff Guidance – 16, Emergency Planning," dated June 14, 2000 (ADAMS Accession No. ML003724570).

40. Hendricks, L., Nuclear Energy Institute, letter to Richard J. Barrett, U.S. Nuclear Regulatory Commission, transmitting industry commitments, dated November 12, 1999 (ADAMS Accession No. ML993340413).
41. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Revision 2, dated May 2011 (ADAMS Accession No. ML100910006).
42. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," dated July 2000 (ADAMS Accession No. ML003716792).
43. Anderson, R., NextEra Duane Arnold, LLC, "NextEra Energy Duane Arnold, LLC Seismic Hazard and Screening Report (CEUS Sites), Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated March 28, 2014 (ADAMS Accession No. ML14092A331).
44. Leeds, E. and Johnson, M., U.S. Nuclear Regulatory Commission, letter to All Power Reactor Licensees and Holders of Construction Permits in Active or Deferred Status, "Request for Information Pursuant to Title 10 of the *Code of Federal Regulations* 50.54(f) 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. ML12053A340).
45. U.S. Nuclear Regulatory Commission, "Staff Review of High Frequency Confirmation Associated with Reevaluated Seismic Hazard in Response to March 12, 2012 50.54(f) Request for Information," dated February 18, 2016 (ADAMS Accession No. ML15364A544).
46. U.S. Nuclear Regulatory Commission, NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants: Resolution of Generic Technical Activity A-36," dated July 1980 (ADAMS Accession No. ML070250180).
47. U.S. Nuclear Regulatory Commission, NUREG-0554, "Single-Failure-Proof Cranes for Nuclear Power Plants," dated May 1979 (ADAMS Accession No. ML110450636).
48. U.S. Nuclear Regulatory Commission, "Duane Arnold Energy Center - Safety Evaluation Regarding Implementation of Mitigation Strategies and Reliable Spent Fuel Pool Instrumentation Related to Orders EA-12-049 and EA-12-051 (CAC Nos. MF1000 and MF1001)," dated May 26, 2017 (ADAMS Accession No. ML17129A037).
49. Nuclear Energy Institute, NEI 12-02, "Industry Guidance for Compliance with NRC Order EA-12-051, 'To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation,'" Revision 1, dated August 2012 (ADAMS Accession No. ML12240A307).
50. U.S. Nuclear Regulatory Commission, JLD-ISG-2012-03, "Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation," dated August 29, 2012 (ADAMS Accession No. ML12221A339).

51. Curtland, D., NextEra Energy Duane Arnold, LLC, letter to U.S. Nuclear Regulatory Commission, "Transmittal of Revision 25 of the DAEC Updated Final Safety Analysis Report and the Current DAEC Technical Specifications Bases," dated March 21, 2019 (ADAMS Package Accession No. ML19100A055).
52. U.S. Nuclear Regulatory Commission Bulletin 2005-02, "Emergency Preparedness and Response Actions for Security-Based Events," dated July 18, 2005 (ADAMS Accession No. ML051740058).
53. Nuclear Energy Institute, NEI 99-01, "Development of Emergency Action Levels for Non-Passive Reactors," Revision 6, dated November 2012 (ADAMS Accession No. ML12326A805).
54. Curtland, D., NextEra Energy Duane Arnold, LLC, letter to U.S. Nuclear Regulatory Commission, "License Amendment Request (TSCR-187): Proposed Permanently Defueled Emergency Plan and Permanently Defueled Emergency Action Level Scheme," dated May 15, 2020 (ADAMS Accession No. ML20136A438).
55. Curtland, D., NextEra Energy Duane Arnold, LLC, letter to U.S. Nuclear Regulatory Commission, "Supplement to License Amendment Request (TSCR-187): Proposed Permanently Defueled Emergency Plan and Permanently Defueled Emergency Action Level Scheme," dated October 29, 2020 (ADAMS Accession No. ML20303A073).
56. Hansen, P., NextEra Energy Duane Arnold, LLC, letter to U.S. Nuclear Regulatory Commission, "Response to Request for Additional Information Relating to License Amendment Request (TSCR-187): Proposed Permanently Defueled Emergency Plan and Permanently Defueled Emergency Action Level Scheme," dated December 1, 2020 (ADAMS Accession No. ML20337A147).
57. U.S. Nuclear Regulatory Commission, NUREG-0696, "Functional Criteria for Emergency Response Facilities: Final Report," dated February 1981 (ADAMS Accession No. ML051390358).

Principal Contributors: J. Arce, NSIR
M. Norris, NSIR
G. Curran, NRR
E. Dickson, NRR

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