



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

March 12, 2019

Vice President, Operations
Entergy Operations, Inc.
Grand Gulf Nuclear Station
P.O. Box 756
Port Gibson, MS 39150

SUBJECT: GRAND GULF NUCLEAR STATION, UNIT 1 – ISSUANCE OF AMENDMENT TO REVISE EMERGENCY ACTION LEVELS TO A SCHEME BASED ON NEI 99-01, REVISION 6, “DEVELOPMENT OF EMERGENCY ACTION LEVELS FOR NON-PASSIVE REACTORS” (EPID L-2018-LLA-0116)

Dear Sir or Madam:

The U.S. Nuclear Regulatory Commission (NRC, the Commission) has issued the enclosed Amendment No. 216 to Renewed Facility Operating License No. NPF-29 for Grand Gulf Nuclear Station, Unit 1. This amendment consists of changes to the emergency action level scheme in response to your application dated April 27, 2018, as supplemented by letter dated October 10, 2018.

The amendment revises the current emergency action level scheme to one based on Nuclear Energy Institute (NEI) guidance in NEI 99-01, Revision 6, “Development of Emergency Action Levels for Non-Passive Reactors,” dated November 2012. Revision 6 of NEI 99-01 was endorsed by the NRC in a letter dated March 28, 2013.

A copy of the related Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission’s biweekly *Federal Register* notice.

Sincerely,

A handwritten signature in cursive script that reads "Siva P. Lingam".

Siva P. Lingam, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-416

Enclosures:

1. Amendment No. 216 to NPF-29
2. Safety Evaluation

cc: Listserv



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ENERGY OPERATIONS, INC.
SYSTEM ENERGY RESOURCES, INC.
COOPERATIVE ENERGY, A MISSISSIPPI ELECTRIC COOPERATIVE
ENERGY MISSISSIPPI, LLC
DOCKET NO. 50-416
GRAND GULF NUCLEAR STATION, UNIT 1
AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 216
Renewed License No. NPF-29

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Entergy Operations, Inc. (the licensee), dated April 27, 2018, as supplemented by letter dated October 10, 2018, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, by Amendment No. 216, Renewed Facility Operating License No. NPF-29 is hereby amended to authorize revision to the Emergency Action Level Technical Bases Document as set forth in the licensee's application dated April 27, 2018, as supplemented by letter dated October 10, 2018, and evaluated in the NRC staff's safety evaluation enclosed with this amendment.
3. This license amendment is effective as of its date of issuance and shall be implemented within 365 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Michelle B Evans for

Ho K. Nieh, Director
Office of Nuclear Reactor Regulation

Date of Issuance: March 12, 2019



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 216 TO

RENEWED FACILITY OPERATING LICENSE NO. NPF-29

ENERGY OPERATIONS, INC., ET AL.

GRAND GULF NUCLEAR STATION, UNIT 1

DOCKET NO. 50-416

1.0 INTRODUCTION

By application dated April 27, 2018 (Reference 1), as supplemented by letter dated October 10, 2018 (Reference 2), Entergy Operations, Inc. (the licensee) requested U.S. Nuclear Regulatory Commission (NRC, the Commission) approval of changes to revise the emergency plan for Grand Gulf Nuclear Station, Unit 1 (GGNS). The proposed amendment would revise the current emergency action level (EAL) scheme to one based on Nuclear Energy Institute (NEI) guidance in NEI 99-01, Revision 6, "Development of Emergency Action Levels for Non-Passive Reactors," dated November 2012 (Reference 3). Revision 6 of NEI 99-01 was endorsed by the NRC in a letter dated March 28, 2013 (Reference 4).

The supplemental letter dated October 10, 2018, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the NRC staff's proposed no significant hazards consideration determination as published in the *Federal Register* on June 5, 2018 (83 FR 26104).

2.0 REGULATORY EVALUATION

2.1 Regulations

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.47, "Emergency plans," sets forth emergency plan requirements for nuclear power reactors. Section 50.47(b) of 10 CFR establishes the planning standards that the onsite and offsite emergency response plans must meet for the NRC staff to make a finding that there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. Planning Standard (4) of this section requires that onsite and offsite emergency response plans meet the following standard:

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.

Section 50.47(b)(4) of 10 CFR requires the use of a standard emergency classification and action level scheme, ensuring that implementation methods are relatively consistent throughout the industry for a given reactor and containment design, but permit site-specific design considerations and preferences.

Section IV.B.1 of Appendix E, "Emergency Planning and Preparedness for Production and Utilization Facilities," to 10 CFR Part 50, states, in part:

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.

Section IV.B.2 of Appendix E to 10 CFR Part 50 states:

A licensee desiring to change its entire emergency action level scheme shall submit an application for an amendment to its license and receive NRC approval before implementing the change. Licensees shall follow the change process in § 50.54(q) for all other emergency action level changes.

2.2 Guidance

The EAL development guidance was initially established in Generic Letter 79-50, dated October 10, 1979 (Reference 5). This guidance was subsequently revised in NUREG-0654/FEMA-REP-1, Revision 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," dated November 1980 (Reference 6), which was endorsed by NRC Regulatory Guide (RG) 1.101, Revision 2, "Emergency Planning and Preparedness for Nuclear Power Reactors," dated October 1981 (Reference 7),¹ as an approach acceptable to the NRC for the development of an EAL scheme.

As industry and regulatory experience was gained with the implementation and use of EAL schemes, the industry issued revised EAL scheme development guidance to reflect lessons learned, numerous of which have been provided to the NRC for review and endorsement as generic (i.e., non-site-specific) EAL development guidance. Most recently, the industry developed NEI 99-01, Revision 6, which was endorsed by the NRC in a letter dated March 28, 2013, as acceptable generic EAL scheme development guidance.

¹ Subsequently issued as Revision 3 and Revision 4 in August 1992 and July 2003, respectively

Although the EAL development guidance contained in NEI 99-01, Revision 6, is generic and may not be entirely applicable for some non-passive, large light-water reactor designs, it bounds the most typical accident and event scenarios for which emergency response is necessary, in a format that allows for industry standardization and consistent regulatory oversight. Licensees may choose to develop site-specific EAL schemes using NEI 99-01, Revision 6, with appropriate site-specific alterations as applicable.

NRC Regulatory Issue Summary (RIS) 2003-18, Revision 4, "Use of NEI 99-01, 'Methodology for Development of Emergency Action Levels,'" dated October 8, 2003, including Supplements 1 and 2 (Reference 8), also provides guidance for developing or changing a standard EAL scheme. In addition, this RIS and its supplements provide recommendations to assist licensees, consistent with Section IV.B.2 of Appendix E to 10 CFR Part 50, in determining whether to seek prior NRC approval of deviations from the guidance.

In summary, the NRC staff considers NEI 99-01, Revision 6, as an acceptable method to develop site-specific EALs that meet the requirements of Section IV.B of Appendix E to 10 CFR Part 50 and planning standard 10 CFR 50.47(b)(4), with the understanding that licensees may want to develop EALs that differ from the guidance document as allowed in RG 1.101.

2.3 NRC Staff Review

In its application dated April 27, 2018, as supplemented by letter dated October 10, 2018, the licensee proposed to revise the current GGNS EAL scheme to one based on NEI 99-01, Revision 6. Additionally, the licensee submitted the proposed EAL scheme, the technical basis containing an evaluation and rationale for each proposed EAL change, and a comparison matrix providing a line-by-line comparison of the proposed initiating conditions, mode applicability, and EAL wording to that found in NEI 99-01, Revision 6. The comparison matrix also included a description of global changes applicable to the EAL scheme and a justification for any differences or deviations from NEI 99-01, Revision 6. The application states that the licensee used the terms "difference" and "deviation" as defined in RIS 2003-18, as supplemented, when comparing its proposed site-specific EALs to the generic EALs in NEI 99-01, Revision 6.

The NRC staff reviewed the application, as supplemented, and verified that the proposed EAL scheme is consistent with the guidance provided in NEI 99-01, Revision 6, to ensure that the proposed EAL scheme meets the requirements of Section IV.B of Appendix E to 10 CFR Part 50 and planning standard 10 CFR 50.47(b)(4). The NRC staff reviewed the proposed site-specific EAL scheme, technical basis, comparison matrix, and all additional information provided in the licensee's application and supplemental letter. The NRC staff found that both the current and proposed EALs have modifications from the NEI 99-01, Revision 6, guidance due to specific plant designs and licensee preference.

The NRC staff reviewed the application, as supplemented, and verified that the instrumentation and setpoints derived for this proposed EAL scheme are consistent with the overall EAL scheme development guidance, address the site-specific implementation strategies provided, and are consistent with a standard EAL scheme.

Although the EALs must be site-specific, the NRC staff reviewed the proposed EALs for the following key characteristics of an effective EAL scheme to ensure:

- Consistency, including standardization of intent, if not in actual wording (i.e., the EALs would lead to similar decisions under similar circumstances at different plants);
- Human factors engineering and user friendliness;
- Potential for emergency classification level upgrade only when there is an increasing threat to public health and safety;
- Ease of upgrading and downgrading the emergency classification level;
- Thoroughness in addressing issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654 (i.e., the EALs are unambiguous and are based on site-specific indicators);
- Technical completeness for each classification level;
- Logical progression in classification for multiple events; and
- The use of objective and observable values.

The NRC staff verified that the proposed EAL scheme uses objective and observable values, is worded in a manner that addresses human factors engineering and user friendliness concerns, follows logical progressions for escalating events, and allows for event downgrading and upgrading based upon the potential risk to the public health and safety. The NRC staff verified that risk assessments were appropriately used to set the boundaries of the emergency classification levels and ensure that all EALs that trigger the declaration of an emergency classification level are in the same range of relative risk. In addition, the NRC staff verified that the proposed EAL scheme is technically complete for each classification level, accurate and consistent with EAL schemes implemented at similarly designed plants.

To aid in understanding the nomenclature used in this safety evaluation, the following conventions are used: the first letter signifies the EAL recognition category, the second letter signifies the emergency classification level, and the number is the applicable number from the site-specific EAL scheme.

- The scheme's generic information is organized by Recognition Category in the following order:
 - A or R – Abnormal Radiation Levels/Radiological Effluent,
 - C – Cold Shutdown/Refueling System Malfunction,
 - E – Independent Spent Fuel Storage Installation,
 - F – Fission Product Barrier,
 - H – Hazards and Other Conditions Affecting Plant Safety, and
 - S or M – System Malfunction.

- The emergency classification levels are:
 - U = Notification of Unusual Event (UE),
 - A = Alert,
 - S = Site Area Emergency (SAE), and
 - G = General Emergency (GE).

An EAL set refers to EALs within an EAL Recognition Category that include an escalation path for one or more classification levels. Not all EAL Recognition Categories require an EAL set.

This safety evaluation uses the numbering system from the proposed site-specific EAL scheme; however, the numbering system from the generic EAL scheme development guidance contained in NEI 99-01, Revision 6, is annotated in [brackets] to aid in cross-referencing the site-specific EAL numbering convention with that of the guidance, where applicable.

3.0 TECHNICAL EVALUATION

3.1 Recognition Category 'A' – Abnormal Radiation Levels/Radiological Effluent

3.1.1 GGNS EAL Set AU1/AA1/AS1/AG1 [AU1/AA1/AS1/AG1]

The intent of this EAL set is to ensure that an emergency classification level is declared upon site-specific indications of a release of radioactivity (gaseous or liquid). In recognition of the lower possible radioactivity concentrations, the assessment of liquid releases is limited to the UE and Alert classification levels. This set provides for accident assessments using pre-calculated values based on assumed conditions, real-time parameters, and field monitoring results.

The NRC staff verified that the progression from a UE to a GE classification level is appropriate and consistent with EAL scheme development guidance.

- AU1 – This EAL addresses a potential decrease in the level of safety of the plant as indicated by a low-level radiological release that exceeds regulatory commitments for an extended period of time (e.g., an uncontrolled release).
- AA1 – This EAL addresses a release of gaseous or liquid radioactivity that results in projected or actual offsite doses greater than or equal to 1 percent of the U.S. Environmental Protection Agency (EPA) early phase protective action guides (PAGs) (Reference 9).
- AS1 – This EAL addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to 10 percent of the EPA early phase PAGs.
- AG1 – This EAL addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to the EPA early phase PAGs.

The licensee chose to modify this EAL set by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, logical progression, ease of upgrading/downgrading, and instrumentation and

setpoints for this EAL set are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL set is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for each emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL set is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL set acceptable.

3.1.2 GGNS EAL Set AU2/AA2/AS2/AG2 [AU2/AA2/AS2/AG2]

The intent of this EAL set is to ensure that an emergency classification is declared upon site-specific indications of potential or actual damage to an irradiated fuel assembly or multiple assemblies. It addresses a lowering of water level over irradiated fuel or fuel uncover (i.e., level below the top of the fuel), a spectrum of fuel handling accidents that result in mechanical damage to irradiated fuel (e.g., a dropped fuel assembly). Some of these EALs rely on the spent fuel pool (SFP) water level instrumentation required by NRC Order EA-12-051, "Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," dated March 12, 2012 (Reference 10).

The NRC staff has verified that the progression from a UE to a GE classification level is appropriate and consistent with EAL scheme development guidance.

- AU2 – This EAL addresses a decrease in water level above irradiated fuel sufficient to cause elevated radiation levels.
- AA2 – This EAL addresses events that have caused imminent or actual damage to an irradiated fuel assembly or a significant lowering of water level within the SFP.
- AS2 – This EAL addresses a significant loss of SFP water inventory control and makeup capability leading to imminent fuel damage and addresses NRC Order EA-12-051.
- AG2 – This EAL addresses a significant loss of SFP water inventory control and makeup capability leading to a prolonged uncover of irradiated fuel, and addresses NRC Order EA-12-051.

The licensee chose to modify this EAL set by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, logical progression, ease of upgrading/downgrading, and instrumentation and setpoints for this EAL set are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified

that the EAL set is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for each emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL set is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL set acceptable.

3.1.3 GGNS EAL AA3 [AA3]

The intent of this EAL is to ensure that an emergency classification level is declared when elevated radiation levels in certain plant rooms and areas are sufficient enough to preclude or impede personnel from performing actions necessary to maintain normal plant operation or to perform a normal plant cooldown and shutdown. This includes equipment in the control room and the central alarm station. The Alert classification level is primarily intended to ensure that the plant emergency response organization (ERO) is activated to support the control room in removing the impediment to normal access, as well as assisting in quantifying potential damage to the fuel. Indications of increasing radiation levels in the plant are bounded by Recognition Category 'F,' as well as EALs AS1 and AG1.

The licensee chose to modify this EAL by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, logical progression, and instrumentation and setpoints for this EAL are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for this emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL acceptable.

3.2 Recognition Category 'C' – Cold Shutdown/Refueling System Malfunction

3.2.1 GGNS EAL Set CU1/CA1/CS1/CG1 [CU1/CA1/CS1/CG1]

The intent of this EAL set is to ensure an emergency classification level is declared upon a loss of reactor pressure vessel (RPV) inventory and/or reactor coolant system (RCS) leakage.

The NRC staff verified that the progression from a UE to a GE classification level is appropriate and consistent with EAL scheme development guidance.

- CU1 – This EAL addresses the inability to restore and maintain water level to a required minimum level (or the lower limit of a level band) or a loss of the ability to monitor RPV/RCS level concurrent with indications of reactor coolant leakage.
- CA1 – This EAL addresses conditions that are precursors to a loss of the ability to adequately cool irradiated fuel in the RPV/RCS (i.e., a precursor to a challenge to the fuel clad barrier).
- CS1 – This EAL addresses a significant and prolonged loss of RPV/RCS inventory control and makeup capability leading to imminent fuel damage.
- CG1 – This EAL addresses the inability to restore and maintain RPV/RCS level above the top of active fuel with containment challenged.

The licensee chose to modify this EAL set by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, logical progression, ease of upgrading/downgrading, and instrumentation and setpoints for this EAL set are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL set is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for each emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL set is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL set acceptable.

3.2.2 GGNS EAL Set CU2/CA2 [CU2/CA2]

The intent of this EAL set is to ensure that an emergency classification level is declared upon a loss of available alternating current (AC) power to emergency power electrical busses.

The NRC staff verified that the progression from a UE to an Alert classification level is appropriate and consistent with EAL scheme development guidance. The SAE and GE classification levels for this specific accident progression are bounded by EALs AS1 and AG1.

- CU2 – This EAL describes a significant degradation of offsite and onsite AC power sources such that any additional single failure would result in a loss of all AC power to safety systems.
- CA2 – This EAL addresses a loss of all AC power that compromises the performance of all safety systems requiring electric power, including those necessary for emergency core cooling, containment heat removal/pressure control, irradiated fuel heat removal, and the ultimate heat sink.

The licensee chose to modify this EAL set by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, logical progression, and ease of upgrading/downgrading for this EAL set are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL set is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for each emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL set is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL set acceptable.

3.2.3 GGNS EAL Set CU3/CA3 [CU3/CA3]

The intent of this EAL set is to ensure that an emergency classification level is declared based on the inability to maintain control of decay heat removal.

The NRC staff verified that the progression from a UE to an Alert classification level is appropriate and consistent with EAL scheme development guidance. The progression to an SAE and/or a GE classification level is bounded by EALs AS1 and AG1.

- CU3 – This EAL addresses an unplanned increase in RCS temperature above the technical specification cold shutdown temperature limit or the inability to determine RCS temperature and level.
- CA3 – This EAL addresses conditions involving a loss of decay heat removal capability or an addition of heat to the RCS in excess of that which can currently be removed.

The licensee chose to modify this EAL set by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, logical progression, and ease of upgrading/downgrading for this EAL set are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL set is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for each emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL set is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL set acceptable.

3.2.4 GGNS EAL CU4 [CU4]

The intent of this EAL is to ensure that an emergency classification level is declared upon a loss of vital direct current (DC) power that compromises the ability to monitor and control operable safety systems. This EAL is primarily intended to ensure that key ERO members and offsite response organizations (OROs) are aware of the event, resources necessary to respond to the event are mobilized, and any necessary compensatory measures are promptly implemented. The Alert, SAE and GE classification levels for a protracted loss of vital DC power are bounded by EALs CA1, CA3, CS1, CG1, AA1, AS1 and AG1.

The licensee chose to modify this EAL by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, formatting, logical progression, and instrumentation and setpoints for this EAL are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for this emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL acceptable.

3.2.5 GGNS EAL CU5 [CU5]

The intent of this EAL is to highlight the importance of emergency communications by ensuring that an emergency classification level is declared if normal communication methods for onsite and offsite personnel, or with OROs, including the NRC, are lost. This EAL is primarily intended to ensure that key ERO members and OROs are aware of the loss of communications capabilities, the resources necessary to restore communications are mobilized, and compensatory measures are promptly implemented. Considering that a loss of emergency communications capability would not involve an actual or potential substantial degradation to the level of safety of the plant, no escalation path is necessary for this EAL.

The communication methods derived for this EAL are consistent with the overall EAL scheme development guidance.

The licensee chose to modify this EAL by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, and logical progression for this EAL are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for this emergency classification level, addresses issues regarding completeness and accuracy raised

in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL acceptable.

3.2.6 GGNS EAL CA6 [CA6]

The intent of this EAL is to ensure that an emergency classification level is declared when hazardous events lead to potential damage to safety systems. The hazardous events of interest include, but are not limited to, an earthquake, flooding, high winds, tornado strike, explosion, fire, or any other hazard applicable for the site. This EAL is primarily intended to ensure that the site ERO is activated to support the control room in understanding the event impacts and restoring affected safety system equipment to service. Indications of hazard-induced damage to components containing radioactive materials are bounded by EALs CS1, CG1, AS1 and AG1.

As described in NUREG-0654/FEMA-REP-1, Revision 1, and the NRC-endorsed guidance in NEI 99-01, Revision 6, an Alert classification level exists when “[e]vents are in process or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant. Any releases are expected to be limited to small fractions of the EPA PAG exposure levels.” The NRC-endorsed guidance in NEI 99-01, Revision 6, is intended to ensure that an Alert classification level should be declared only when an actual or potential substantial degradation of the level of safety of the plant has occurred as a result of a hazardous event. However, there may be cases where a hazardous event only causes damage to a single safety system component or a single safety system train. Additionally, an Alert classification level should not be declared if the damage from the hazardous event is limited to a safety system component or a safety system train that was inoperable or out of service prior to the event occurring.

The licensee proposed that an Alert classification level will be declared when a hazardous event results in indications of degraded performance to one train of a safety system with either indications of degraded performance on a second safety system train or visible damage to a second safety system train, such that the operability or reliability of the second safety system train is a concern. Although different from the NRC-endorsed guidance in NEI 99-01, Revision 6, this change is acceptable, considering that the NRC-endorsed guidance in NEI 99-01, Revision 6, is intended to ensure that an Alert classification level should be declared only when an actual or potential substantial degradation of the level of safety of the plant has occurred as a result of a hazardous event.

The licensee chose to modify this EAL by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, and logical progression for this EAL are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for this emergency classification level, addresses issues regarding completeness and accuracy raised

in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL acceptable.

3.3 Recognition Category 'E' – Independent Spent Fuel Storage Installation

3.3.1 GGNS EAL EU1 [E-HU1]

This EAL applies to an event that results in damage to the confinement boundary of a storage cask containing irradiated fuel. This EAL is primarily intended to ensure that key ERO members and OROs are aware of the cask damage, resources necessary to respond to the event are mobilized, and protective measures, if warranted, are promptly implemented.

The licensee chose to modify this EAL by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, and logical progression for this EAL are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for this emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL acceptable.

3.4 Recognition Category 'F' – Fission Product Barrier Matrix

3.4.1 GGNS EAL Set FA1/FS1/FG1 [FA1/FS1/FG1]

The intent of this EAL set is to ensure that an emergency classification level is declared upon a loss or potential loss of one or more fission product barriers.

This EAL set uses plant condition based thresholds as triggers within a particular logic configuration needed to reflect a loss or potential loss of a fission product barrier. Non-passive, large light-water reactors in the United States have three fission product barriers: fuel cladding, the RCS, and primary containment. Licensees are to develop thresholds that provide EAL decision makers input into making an event declaration based upon degradation of one or more of these fission product barriers.

There are numerous triggers used as logic inputs to decide on the appropriate emergency classification level based upon the number of loss and/or potential loss indicators that are met

for each barrier. These indicators are redundant with other similar indicators in Recognition Categories 'A' and 'S.'

The NRC staff verified that the logic used to determine the appropriate emergency classification level is consistent with the generic EAL scheme development guidance in NEI 99-01, Revision 6. The progression from an Alert to a GE classification level is appropriate and consistent with EAL scheme development guidance.

- FA1 – This EAL addresses any loss or any potential loss of either the fuel clad or RCS barrier.
- FS1 – This EAL addresses loss or potential loss of any two barriers.
- FG1 – This EAL addresses loss of any two barriers and loss or potential loss of the third barrier.

The licensee chose to modify this EAL set by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, logical progression, ease of upgrading/downgrading, and instrumentation and setpoints for this EAL set are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL set is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for each emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL set is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL set acceptable.

3.5 Recognition Category 'H' – Hazards and Other Conditions Affecting Plant Safety

3.5.1 GGNS EAL Set HU1/HA1/HS1 [HU1/HA1/HS1/HG1]

The intent of this EAL set is to ensure that an emergency classification level is declared based upon a security-related event.

This EAL set was developed in accordance with the guidance from NRC Bulletin 2005-02, "Emergency Preparedness and Response Actions for Security-Based Events," dated July 18, 2005 (Reference 11), and RIS 2006-12, "Endorsement of Nuclear Energy Institute Guidance 'Enhancements to Emergency Preparedness Programs for Hostile Action,'" July 19, 2006 (Reference 12), for licensees to implement, regardless of the specific version of the generic EAL scheme development guidance used, or if the particular licensee developed its EAL scheme using an alternative approach. Based upon lessons learned from the implementation and use of this EAL set, particularly the insights gained from combined security and emergency preparedness drills, GGNS proposed to not develop EAL HG1, as provided in NEI 99-01, Revision 6.

EAL HG1 of NEI 99-01, Revision 6, addresses a hostile action that results in the loss of physical control of the facility. Such an action can reasonably be expected to exceed EPA early phase PAG exposure levels offsite for more than the immediate site area, which is the criteria for EAL HG7 in NEI 99-01, Revision 6. Therefore, in NEI 99-01, Revision 6, EAL HG1 is bounded by EAL HG7. Additionally, any event that could result in a radiological release in excess of EPA early phase PAGs would be bounded by EALs AG1 or AG2 in NEI 99-01, Revision 6. The NRC staff verified that the GGNS EALs AG1, AG2, and HG7 bound the events addressed by EAL HG1 in NEI 99-01, Revision 6.

The NRC staff also verified that the progression from a UE to an SAE classification level is appropriate and consistent with EAL scheme development guidance.

- HU1 – This EAL addresses events that pose a threat to plant personnel or safety system equipment.
- HA1 – This EAL addresses the occurrence of a hostile action within the Owner Controlled Area or notification of an aircraft attack threat.
- HS1 – This EAL addresses the occurrence of a hostile action within the Protected Area.

The licensee chose to modify this EAL set by using a site-specific implementation method that uses a modified numbering format other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, logical progression, and ease of upgrading/downgrading for this EAL set are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL set is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for each emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL set is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL set acceptable.

3.5.2 GGNS EAL HU2 [HU2]

The intent of this EAL is to ensure that an emergency classification level is declared based upon a seismic event that results in accelerations at the site greater than specified for an operating basis earthquake. This EAL is primarily intended to ensure that key ERO members and OROs are aware of the earthquake magnitude at the site and that post-event damage assessments are promptly implemented. This EAL is considered part of an EAL set containing EALs CA6 and SA8, depending on the operating mode applicable at the time of the event. Indications of earthquake-induced damage to components containing radioactive materials are bounded by Recognition Category 'F,' as well as EALs AA1, AS1, or AG1.

The licensee chose to modify this EAL by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL

scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, logical progression, and instrumentation and setpoints for this EAL are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for this emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL acceptable.

3.5.3 GGNS EAL HU3 [HU3]

The intent of this EAL is to ensure that an emergency classification level is declared based upon the effects that natural or technological hazard events may have on the facility that are considered to be precursors to a more significant event or condition or have potential impacts that warrant emergency notification to local, State, and Federal authorities. Specific hazards addressed include:

- Tornado striking within the protected area;
- Internal room or area flooding requiring the electrical isolation of a safety system component;
- Movement of personnel within the protected area that is impeded due to an offsite event involving hazardous materials;
- A hazardous event that results in onsite conditions that are sufficient to prohibit the plant staff from accessing the site via personal vehicles; and
- Other site-specific events.

This EAL is primarily intended to ensure that key ERO members and OROs are aware of the hazardous event affecting the site, and post-event damage assessments are promptly implemented. In addition, other site-specific events that may impact the effective implementation of the site emergency plan are considered.

This EAL is considered part of an EAL set containing EALs CA6 and SA8, depending on the operating mode applicable at the time of the event. Indications of hazard-induced damage to components containing radioactive materials are bounded by Recognition Category 'F,' as well as EALs AA1, AS1, or AG1.

The licensee chose to modify this EAL by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, and logical progression for this EAL are consistent with the overall EAL scheme

development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for this emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL acceptable.

3.5.4 GGNS EAL HU4 [HU4]

The intent of this EAL is to ensure that an emergency classification level is declared based upon the effect that a fire may have on the facility, which would be indicative of a potential degradation of the level of safety of the plant. This EAL is primarily intended to ensure that key ERO members and OROs are aware of the fire, and post-event damage assessments are promptly implemented. This EAL is considered part of an EAL set containing EALs CA6 and SA8, depending on the operating mode applicable at the time of the event. Indications of a protracted fire involving radioactive materials are bounded by Recognition Category 'F,' as well as EALs AS1 and AG1.

The licensee chose to modify this EAL by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, and logical progression for this EAL are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for this emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL acceptable.

3.5.5 GGNS EAL HA5 [HA5]

The intent of this EAL is to ensure that an emergency classification level is declared based upon the effect that toxic, corrosive, asphyxiating, or flammable gases may have on the facility, which precludes or impedes access to equipment necessary to maintain normal plant operation or is required for a normal plant cooldown and shutdown. This EAL is primarily intended to ensure that the site ERO is activated to support the control room in removing the impediment to normal access to the affected area or room. Indications of a protracted loss of access to equipment necessary for normal plant operations, cooldown, or shutdown are bounded by Recognition Category 'F,' as well as EALs AS1 and AG1.

The licensee chose to modify this EAL by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, and formatting for this EAL are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for this emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL acceptable.

3.5.6 GGNS EAL Set HA6/HS6 [HA6/HS6]

The intent of this EAL set is to ensure that an emergency classification level is declared based upon a control room evacuation with the inability to control critical plant systems remotely.

The NRC staff verified that the progression from an Alert to an SAE classification level is appropriate and consistent with EAL scheme development guidance. A GE classification level for this specific accident progression is bounded by Recognition Category 'F,' as well as EAL AG1.

- HA6 – This EAL addresses an evacuation of the control room that results in transfer of plant control to alternate locations outside the control room.
- HS6 – This EAL addresses an evacuation of the control room that results in transfer of plant control to alternate locations, and the control of a key safety function cannot be reestablished in a timely manner.

The licensee chose to modify this EAL set by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, and ease of upgrading/downgrading for this EAL set are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL set is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for each emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL set is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL set acceptable.

3.5.7 GGNS EAL Set HU7/HA7/HS7/HG7 [HU7/HA7/HS7/HG7]

The intent of this EAL set is to provide decision-makers with an escalating emergency classification level path to consider when, in their judgment, entry into the site's emergency plan and mobilization of the ERO and ORO is warranted.

The NRC staff verified that the progression from a UE to a GE classification level is appropriate and consistent with EAL scheme development guidance.

- HU7 – This EAL addresses unanticipated conditions not addressed explicitly elsewhere but, in the judgement of the Emergency Director, warrant declaration of an emergency due to conditions existing that are believed to fall under the emergency classification level description for a UE.
- HA7 – This EAL addresses unanticipated conditions not addressed explicitly elsewhere but, in the judgement of the Emergency Director, warrant declaration of an emergency due to conditions existing that are believed to fall under the emergency classification level description for an Alert.
- HS7 – This EAL addresses unanticipated conditions not addressed explicitly elsewhere but, in the judgement of the Emergency Director, warrant declaration of an emergency due to conditions existing that are believed to fall under the emergency classification level description for an SAE.
- HG7 – This EAL addresses unanticipated conditions not addressed explicitly elsewhere but, in the judgement of the Emergency Director, warrant declaration of an emergency due to conditions existing that are believed to fall under the emergency classification level description for a GE.

The licensee chose to modify this EAL set by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, and ease of upgrading/downgrading for this EAL set are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL set is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for each emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL set is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL set acceptable.

3.6 Recognition Category 'S' – System Malfunction

3.6.1 GGNS EAL Set SU1/SA1/SS1/SG1 [SU1/SA1/SS1/SG1]

The intent of this EAL set is to ensure that an emergency classification level is declared based upon a loss of available AC power sources to the emergency busses.

The NRC staff reviewed the licensee's evaluation and justification for site-specific changes associated with this EAL set and verified that the progression from a UE to a GE classification level is appropriate and consistent with EAL scheme development guidance.

- SU1 – This EAL addresses a prolonged loss of offsite AC power.
- SA1 – This EAL describes a significant degradation of offsite and onsite AC power sources such that any additional single failure would result in a loss of all AC power to safety systems.
- SS1 – This EAL addresses a loss of all AC power that compromises the performance of all safety systems requiring electric power, including those necessary for emergency core cooling, containment heat removal/pressure control, irradiated fuel heat removal, and the ultimate heat sink.
- SG1 – This EAL addresses a prolonged loss of all power sources to AC emergency busses.

The licensee chose to modify this EAL set by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, logical progression, ease of upgrading/downgrading, and instrumentation and setpoints for this EAL set are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL set is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for each emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL set is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL set acceptable.

3.6.2 GGNS EAL Set SU3/SA3 [SU2/SA2]

The intent of this EAL set is to ensure that an emergency classification level is declared based upon the effect that a loss of available indicators in the control room has on the facility.

The NRC staff verified that the progression from a UE to an Alert classification level is appropriate and consistent with EAL scheme development guidance. The SAE and GE

classification levels for this specific accident progression are bounded by Recognition Category 'F,' as well as EALs AS1 and AG1.

- SU3 – This EAL addresses the difficulty associated with monitoring normal plant conditions without the ability to obtain safety system parameters from within the control room.
- SA3 – This EAL addresses the difficulty associated with monitoring rapidly changing plant conditions during a transient without the ability to obtain safety system parameters from within the control room.

The licensee chose to modify this EAL set by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, logical progression, ease of upgrading/downgrading, and instrumentation and setpoints for this EAL set are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL set is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for each emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL set is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL set acceptable.

3.6.3 GGNS EAL SU4 [SU3]

The intent of this EAL is to ensure that an emergency classification level is declared when RCS activity is greater than technical specification allowable limits. This EAL is primarily intended to ensure that key ERO members are aware of the elevated reactor coolant activity and support the control room in implementation of appropriate response measures. Escalation from this emergency classification level is bounded by Recognition Category 'F,' as well as EALs AA1, AS1, and AG1.

The licensee chose to modify this EAL by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, logical progression, and instrumentation and setpoints for this EAL are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for this emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL acceptable.

3.6.4 GGNS EAL SU5 [SU4]

The intent of this EAL is to ensure that an emergency classification is declared when the plant has indications of RCS leakage. By design, the indications for this EAL are redundant to corresponding indicators for a loss or potential loss of fission product barriers, as well as radiation monitoring, to ensure reactor and/or fission product barrier events are recognized. This EAL is primarily intended to ensure that key ERO members are aware of the RCS leakage and support the control room in implementation of appropriate response measures. Escalation from this emergency classification level is bounded by Recognition Category 'F,' as well as EALs AA1, AS1, and AG1.

The licensee chose to modify this EAL by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, logical progression, and instrumentation and setpoints for this EAL are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for this emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL acceptable.

3.6.5 GGNS EAL Set SU6/SA6/SS6 [SU5/SA5/SS5]

The intent of this EAL set is to ensure that an emergency classification level is declared based upon the effect that a failure of the reactor protection system (RPS) may have on the plant.

The NRC staff verified that the progression from a UE to an SAE classification level is appropriate and consistent with EAL scheme development guidance. A GE classification level for this event is bounded by Recognition Category 'F,' as well as EAL AG1.

- SU6 – This EAL addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, and either a subsequent operator manual action taken at the reactor control consoles or a subsequent automatic trip is successful in shutting down the reactor.
- SA6 – This EAL addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, and subsequent operator manual actions taken at the reactor control consoles to shut down the reactor are also unsuccessful.

- SS6 – This EAL addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, all subsequent operator actions to manually shut down the reactor are unsuccessful, and continued power generation is challenging the capability to adequately remove heat from the core and/or the RCS.

The licensee chose to modify this EAL set by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, logical progression, ease of upgrading/downgrading, and instrumentation and setpoints for this EAL set are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL set is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for each emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL set is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL set acceptable.

3.6.6 GGNS EAL SU7 [SU6]

The intent of this EAL is to highlight the importance of emergency communications by ensuring that an emergency classification level is declared if normal communication methods for onsite and offsite personnel, or with OROs, including the NRC, are lost. This EAL is primarily intended to ensure that key ERO members, OROs, and the NRC are aware of the loss of communications capabilities, the resources necessary to restore communications are mobilized, and compensatory measures are promptly implemented. Considering that a loss of emergency communications capability would not involve an actual or potential substantial degradation to the level of safety of the plant, no escalation path is necessary for this EAL.

The communication methods derived for this EAL are consistent with the overall EAL scheme development guidance.

The licensee chose to modify this EAL by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, and logical progression for this EAL are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for this emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL acceptable.

3.6.7 GGNS EAL Set SS2/SG1 [SS8/SG8]

The intent of this EAL set is to ensure that an emergency classification level is declared when a loss of DC power occurs, as this condition compromises the ability of the licensee to monitor and control safety systems.

The NRC staff verified that the progression from an SAE to a GE classification level is appropriate and consistent with EAL scheme development guidance.

- SS2 – This EAL addresses a loss of vital DC power that compromises the ability to monitor and control safety systems.
- SG1 – This EAL addresses a concurrent and prolonged loss of both AC and vital DC power.

The licensee chose to modify this EAL set by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, logical progression, ease of upgrading/downgrading, and instrumentation and setpoints for this EAL set are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL set is worded in an unambiguous manner that addresses human factors engineering and user-friendliness concerns, is technically complete for each emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG-0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL set is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL set acceptable.

3.6.8 GGNS EAL SA8 [SA9]

The intent of this EAL is to ensure that an emergency classification level is declared when hazardous events lead to potential damage to safety systems needed for the current operating mode. The hazardous events of interest include, but are not limited to, an earthquake, flooding, high winds, tornado strike, explosion, fire, or any other hazard applicable for GGNS. This EAL is primarily intended to ensure that the site ERO is activated to support the control room in understanding the event impacts and restoring affected safety system equipment to service. Indications of hazard-induced damage to components containing radioactive materials are bounded by Recognition Category 'F,' as well as EALs AS1 and AG1.

As described in NUREG 0654/FEMA REP-1, Revision 1, and the NRC-endorsed guidance in NEI 99-01, Revision 6, an Alert classification level exists when "Events are in process or have

occurred which involve an actual or potential substantial degradation of the level of safety of the plant. Any releases are expected to be limited to small fractions of the EPA PAG exposure levels." The NRC-endorsed guidance in NEI 99-01, Revision 6, is intended to ensure that an Alert classification level should be declared only when an actual or potential substantial degradation of the level of safety of the plant has occurred as a result of a hazardous event. However, there may be cases where a hazardous event only causes damage to a single safety system component or a single safety system train. Additionally, an Alert classification level should not be declared if the damage from the hazardous event is limited to a safety system component or a safety system train that was inoperable or out of service prior to the event occurring.

The licensee proposed that an Alert classification level be declared when a hazardous event results in indications of degraded performance to one train of a safety system with either indications of degraded performance on a second safety system train or visible damage to a second safety system train, such that the operability or reliability of the second safety system train is a concern. Although different from the NRC-endorsed guidance in NEI 99-01, Revision 6, this change is acceptable, considering that the NRC-endorsed guidance in NEI 99-01, Revision 6, is intended to ensure that an Alert classification level should be declared only when an actual or potential substantial degradation of the level of safety of the plant has occurred as a result of a hazardous event.

The licensee chose to modify this EAL by using a site-specific implementation method that uses a modified numbering format and EAL sequence other than that provided in the generic EAL scheme development guidance. The NRC staff verified that the numbering, sequencing, formatting, logical progression, and instrumentation and setpoints for this EAL are consistent with the overall EAL scheme development guidance and address the site-specific implementation strategies provided, and are, therefore, consistent with a standard EAL scheme, as required by 10 CFR 50.47(b)(4). The NRC staff also verified that the EAL is worded in an unambiguous manner that addresses human factors engineering and user friendliness concerns, is technically complete for this emergency classification level, addresses issues regarding completeness and accuracy raised in Appendix 1 to NUREG 0654, and uses objective and observable values based on site-specific indications.

Based on the above, the NRC staff concludes that the site-specific implementation method for this EAL is consistent with the key characteristics of an effective EAL scheme (identified in Section 2.3 above), and meets the requirements of 10 CFR 50.47(b)(4) and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, the NRC staff finds this EAL acceptable.

3.7 Review Summary

The NRC staff has reviewed the technical bases for the proposed EAL scheme; the modifications from NEI 99-01, Revision 6; and the licensee's evaluation of the proposed changes. The licensee chose to modify its proposed EAL scheme from the generic EAL scheme development guidance provided in NEI 99-01, Revision 6, in order to adopt a format that is better aligned with how it currently implements its EALs, as well as with site-specific writer's guides and preferences. The NRC staff verified that these modifications do not alter the intent of any specific EAL within a set, recognition category, or within the entire EAL scheme described in NEI 99-01, Revision 6. Thus, the proposed changes meet the requirements in Appendix E to 10 CFR Part 50 and planning standard 10 CFR 50.47(b)(4).

The NRC staff determined that the proposed EAL scheme uses objective and observable values, is worded in a manner that addresses human factors engineering and user friendliness concerns, follows logical progressions for escalating events, and allows for event downgrading and upgrading based upon the potential risk to the public health and safety. Risk assessments were appropriately used to set the boundaries of the emergency classification levels and ensure that all EALs that trigger an emergency classification are in the same range of relative risk. In addition, the NRC staff determined that the proposed EAL scheme is technically complete and consistent with EAL schemes implemented at similarly designed plants.

The NRC staff verified that the instrumentation and setpoints derived for this proposed EAL scheme are consistent with the overall EAL scheme development guidance, address the site-specific implementation strategies provided, and are consistent with a standard EAL scheme.

Based on its review, the NRC staff finds that the licensee's proposed EAL scheme is acceptable and provides reasonable assurance that the licensee can and will take adequate protective measures in the event of a radiological emergency. Specifically, the staff concludes that the licensee's proposed EAL scheme and site-specific EAL technical basis document provided by letter dated April 27, 2018, as supplemented by the letter dated October 10, 2018, is acceptable for implementation.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Mississippi State official was notified of the proposed issuance of the amendment on January 28, 2019. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes requirements with respect to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20 because the amendment approves an acceptable EAL scheme that is required for operation of the facility. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding published in the *Federal Register* on June 5, 2018 (83 FR 26104). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

7.0 REFERENCES

1. Larson, E., Entergy Operations, Inc., letter to U.S. Nuclear Regulatory Commission, "License Amendment Request, Adoption of Emergency Action Level Schemes Pursuant to NEI 99-01, Revision 6," dated April 27, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18117A514).
2. Larson, E., Entergy Operations, Inc., letter to U.S. Nuclear Regulatory Commission, "Response to Request for Additional Information License Amendment Request, Adoption of Emergency Action Level Scheme Pursuant to NEI 99-01, Revision 6," dated October 10, 2018 (ADAMS Accession No. ML18284A041).
3. NEI 99-01, Revision 6, "Development of Emergency Action Levels for Non-Passive Reactors," dated November 2012 (ADAMS Package Accession No. ML13091A209).
4. Thaggard, M., U.S. Nuclear Regulatory Commission, letter to Ms. Susan Perkins-Grew, Nuclear Energy Institute, "U.S. Nuclear Regulatory Commission Review and Endorsement of NEI 99-01, Revision 6, dated November, 2012 (TAC No. D92368)," dated March 28, 2013 (ADAMS Accession No. ML12346A463).
5. U.S. Nuclear Regulatory Commission, Generic Letter 79-50, dated October 10, 1979 (ADAMS Accession No. ML031320278).
6. U.S. Nuclear Regulatory Commission and Federal Emergency Management Agency, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," NUREG-0654/FEMA-REP-1, Revision 1, dated November 1980 (ADAMS Accession No. ML040420012).
7. U.S. Nuclear Regulatory Commission, "Emergency Planning and Preparedness for Nuclear Power Reactors," Regulatory Guide 1.101, Revision 2, dated October 1981 (ADAMS Accession No. ML090440294); Revision 3, dated August 1992 (ADAMS Accession No. ML003740302); and Revision 4, dated July 2003 (ADAMS Accession No. ML032020276).
8. U.S. Nuclear Regulatory Commission, Regulatory Issue Summary 2003-18, "Use of NEI 99-01, 'Methodology for Development of Emergency Action Levels,' Revision 4, dated January 2003," dated October 8, 2003, including Supplement 1, dated July 13, 2004, and Supplement 2, dated December 12, 2005 (ADAMS Accession Nos. ML032580518, ML041550395, and ML051450482, respectively).
9. U.S. Environmental Protection Agency, "PAG Manual: Protective Action Guides and Planning Guidance for Radiological Incidents," dated January 2017 (ADAMS Accession No. ML17044A073).
10. U.S. Nuclear Regulatory Commission, "Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Effective Immediately)," dated March 12, 2012 (ADAMS Accession No. ML12056A044).
11. 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).

12. U.S. Nuclear Regulatory Commission, Regulatory Issue Summary 2006-12, "Endorsement of Nuclear Energy Institute Guidance, 'Enhancements to Emergency Preparedness Programs for Hostile Action,'" dated July 19, 2006 (ADAMS Accession No. ML061530290).

Principal Contributor: Raymond Hoffman

Date: March 12, 2019

SUBJECT: GRAND GULF NUCLEAR STATION, UNIT 1 – ISSUANCE OF AMENDMENT TO REVISE EMERGENCY ACTION LEVELS TO A SCHEME BASED ON NEI 99-01, REVISION 6, “DEVELOPMENT OF EMERGENCY ACTION LEVELS FOR NON-PASSIVE REACTORS” (EPID L-2018-LLA-0116) DATED MARCH 12, 2019

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ADAMS Accession No.: ML19025A023 *by memorandum **by e-mail

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DATE	1/28/19	1/28/19	1/22/19	2/07/19
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