



July 6, 2015

ULNRC-06227

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

10 CFR 50.47
10 CFR 50.54(q)
10 CFR 50 Appendix E, IV.B.2
10 CFR 50.90

Ladies and Gentlemen:

**DOCKET NUMBERS 50-483 AND 72-1045
CALLAWAY PLANT UNIT 1
UNION ELECTRIC CO.
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI)
RELATED TO LICENSE AMENDMENT REQUEST FOR
EMERGENCY ACTION LEVEL (EAL) UPGRADE
ADOPTING NRC-ENDORSED NEI 99-01, REVISION 6 (TAC NO. MF4945)**

By letter dated October 2, 2014 (ADAMS Accession Number ML14275A435) Ameren Missouri submitted a license amendment request to upgrade the Emergency Action Level scheme associated with the Radiological Emergency Response Plan (RERP) for Callaway Unit 1 by adopting NRC-endorsed Nuclear Energy Institute (NEI) 99-01, Revision 6, "Development of Emergency Action Levels for Non-Passive Reactors." During its review, the NRC staff determined that requests for additional information (RAIs) were needed to complete its review. Pursuant to electronic correspondence dated May 14, 2015 and a clarification teleconference on May 21, 2015, the NRC transmitted a list of RAIs to Ameren Missouri in electronic form on May 22, 2015, and requested that responses be provided within 45 days.

The responses to the RAIs are provided in Attachment 1 to this letter, and supporting documentation is provided in Attachments 3, 4 and 5. Additional proposed changes to the EAL Bases document are listed in Attachment 2. For information, a revised copy of the proposed EAL wall charts is provided in Attachment 6.

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The Callaway Onsite Review Committee has approved the proposed changes to the RERP and its Bases. In addition, in accordance with 10 CFR 50.91, "Notice for public comment; State consultation," Section (b)(1), a copy of this letter is being provided to the designated Missouri State official.

This submittal does not contain new commitments. For any questions concerning this letter, contact Gene Juricic at 573-676-4489 or Pat McKenna at 573-676-8504.

I declare under penalty of perjury that the foregoing is true and correct.

Sincerely,

Executed on: July 6, 2015



Scott A. Maglio
Manager, Regulatory Affairs

JPK/nls

Attachments:

- 1) Response to Request for Additional Information (RAI) Emergency Action Level (EAL) Scheme Change
- 2) Summary of EAL Changes NOT Associated with RAI Responses
- 3) Basis for Spent Fuel Storage Cask Dose Rate Limits (Excerpt from Certificate of Compliance No 1040 Amendment No. 0, Appendix A)
- 4) Basis for Difference in NEI 99-01 Revision 6 and Revision 5 Emergency Action Level Table R-1, "Effluent Monitor Classification Threshold Values"
- 5) Calculation EPCI-08-01 Rev. 1, "Dose Projection Calculations to Support NEI 99-01 Rev.5 Emergency Action Levels"
- 6) Callaway NEI 99-01 Revision 6 EAL Wall Charts (Information Only)

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**Attachment 1 to
ULNRC-06227**

**Response to Request for Additional Information (RAI)
Emergency Action Level (EAL) Scheme Change
19 Pages**

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI)
EMERGENCY ACTION LEVEL (EAL) SCHEME CHANGE
Callaway Plant, Unit 1 (CP)
DOCKET NO. 50-483

RAI-CP	SECTION/EAL	Question	CP Response
01	4.3	<p>Section 4.3, "Instrumentation Used for EALs," to NEI 99-01, Revision 6, states "Scheme developers should ensure that specific values used as EAL setpoints are within the calibrated range of the referenced instrumentation." Please confirm that all setpoints and indications used in the CP EAL scheme are within the calibrated range(s) of the stated instrumentation and that the resolution of the instrumentation is appropriate for the setpoint/indication.</p>	<p>CP has confirmed that all setpoints and indications used in the CP EAL scheme are within the calibrated range(s) of the stated instrumentation and that the resolution of the instrumentation is appropriate for the setpoint/indication.</p>
02	1.0	<p>In regards to Section 1, "Purpose," of the proposed EAL Technical Basis:</p> <p>a. Section 4.6, "Basis Document," to NEI 99-01, Revision 6, states "A basis document is an integral part of an emergency classification scheme. The material in this document supports proper emergency classification decision-making by providing informing background and development information in a readily accessible format. It can be referred to in training situations and when making an actual emergency classification, if necessary." Please revise Section 1 of the proposed EAL Technical Basis to reflect the intent of the EAL Basis Document, as provided in NEI 99-01, Revision 6, and remove the proposed purpose discussion, "to facilitate a review of the Callaway EALs," or provide justification for failure to align with NRC endorsed guidance.</p>	<p>a. Deleted: <i>"It should be used to facilitate review of the Callaway EALs and provide historical documentation for future reference."</i></p>

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RAI-CP	SECTION/EAL	Question	CP Response
		<p>b. Section 4.6, "Basis Document," to NEI 99-01, Revision 6, states "Because the information in a basis document can affect emergency classification decision-making..." Therefore, the NRC staff expects that changes to the basis document will be evaluated in accordance with the provisions of 10 CFR 50.54(q). Please incorporate information related to maintaining the technical basis document in accordance with 10 CFR 50.54(q) or provide justification for failure to align with NRC endorsed guidance.</p> <p>c. Section 4.7, "EAL/Threshold References to AOP [Abnormal Operating Procedure] and EOP [Emergency Operating Procedure] Setpoints/Criteria," to NEI 99-01, Revision 6, states "As reflected in the generic guidance, the criteria/values used in several EALs and fission product barrier thresholds may be drawn from a plant's AOPs and EOPs." The NRC staff expects that changes to AOPs and EOPs will be evaluated in accordance with the provisions of 10 CFR 50.54(q). Please incorporate information related to screening changes to AOPs or EOPs to determine if an evaluation pursuant to 10 CFR 50.54(q) is required or provide justification for failure to align with NRC endorsed guidance.</p>	<p>b. The following has been added to Section 1.0 Introduction of the Technical Bases document: <i>"Because the information in a basis document can affect emergency classification decision-making (e.g., the Emergency Coordinator refers to it during an event), the NRC staff expects that changes to the basis document will be evaluated in accordance with the provisions of 10 CFR 50.54(q)."</i></p> <p>c. The following has been added to Section 1.0 Introduction of the Technical Bases document: <i>"Additionally, changes to plant AOPs and EOPs that may impact EAL bases shall be evaluated in accordance with the provisions of 10 CFR 50.54(q)."</i></p>

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RAI-CP	SECTION/EAL	Question	CP Response
03	2.1	Sections 2.1, "Background," and 4.0, "References," of the proposed EAL Technical Basis reference an incorrect ADAMS Accession Number (ML110240324). Please verify that the proposed EAL Technical Basis is consistent with NRC endorsed guidance and appropriate ADAMS Accession number is referenced.	Revised the referenced ADAMS Accession No. to ML12326A805.
04	2.1	For Sections 2.1, "Background," and 4.0, "References," of the proposed EAL Technical Basis, please provide ADAMS Accession Number that references the endorsed version of NEI 99-01, Revision 6 (ML12326A805).	Revised the referenced ADAMS Accession No. to ML12326A805.
05	2.5	Section 2.5, "Technical Basis Information," of the proposed EAL Technical Basis includes a Plant-Specific basis section, in addition to a Generic basis section. Considering that the EAL Technical Basis is provided to support proper emergency classification decision making, please explain why a Generic basis section is provided or revise accordingly.	Separate site-specific and generic bases were identified within the EAL bases to facilitate NRC review. These bases sections have now been combined into a single bases section for each EAL. (Throughout document)

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RAI-CP	SECTION/EAL	Question	CP Response
06	2.6	<p>Section 2.6, "Operating Mode Applicability," of the proposed EAL Technical Basis contains a brief discussion concerning EAL classification during mode changes. However, this discussion is not as clear as that provided in NRC endorsed guidance. Please justify the omission of significant portions of Section 5.4, "Consideration of Mode Changes During Classification," of NEI 99-01, Revision 6, or revise accordingly.</p>	<p>Revised the cited section to read consistent with Section 5.4 of the generic guidance:</p> <p><i>"The mode in effect at the time that an event or condition occurred, and prior to any plant or operator response, is the mode that determines whether or not an IC is applicable. If an event or condition occurs, and results in a mode change before the emergency is declared, the emergency classification level is still based on the mode that existed at the time that the event or condition was initiated (and not when it was declared). Once a different mode is reached, any new event or condition, not related to the original event or condition, requiring emergency classification should be evaluated against the ICs and EALs applicable to the operating mode at the time of the new event or condition. For events that occur in Cold Shutdown or Refueling, escalation is via EALs that are applicable in the Cold Shutdown or Refueling modes, even if Hot Shutdown (or a higher mode) is entered during the subsequent plant response. In particular, the fission product barrier EALs are applicable only to events that initiate in the Hot Shutdown mode or higher."</i></p>

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07	3.1.1 3.1.2	<p>In regards to Section 3 of the proposed EAL Technical Basis:</p> <p>Section 3.1.1, "Classification Timeliness," includes a reference to NSIR/DPR-ISG-01, "Interim Staff Guidance, Emergency Planning for Nuclear Power Plants," but does not include a discussion, as provided by NEI 99-01, Revision 6, Section 5.2, Classification Methodology," addressing "[w]hen assessing an EAL that specifies a time duration for the off-normal condition, the 'clock' for the EAL time duration runs concurrently with the emergency classification process 'clock'." Please justify excluding this information or revise accordingly.</p> <p>Section 3.1.2, "Valid Indications," does not include statement, "[t]he validation of indications should be completed in a manner that supports timely emergency declaration," as provided by NEI 99-01, Revision 6, Section 5.1, "General Considerations." Please justify excluding this information or revise accordingly.</p>	<p>Added the cited wording to Section 3.1.1:</p> <p><i>"When assessing an EAL that specifies a time duration for the off-normal condition, the "clock" for the EAL time duration runs concurrently with the emergency classification process "clock."</i></p> <p>Added the cited statement to Section 3.1.2:</p> <p><i>"The validation of indications should be completed in a manner that supports timely emergency declaration,"</i></p>

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08	5.0	<p>Appendix B, "Definitions," to NEI 99-01, Revision 6, provides definitions for key terms necessary for overall understanding of the NEI 99-01 emergency classification scheme. For Section 5.1, "Definitions," please revise accordingly to add definitions for the following or justify excluding:</p> <ul style="list-style-type: none"> • CONFINEMENT BOUNDARY, • EMERGENCY ACTION LEVEL, • EMERGENCY CLASSIFICATION LEVEL, • FISSION PRODUCT BARRIER THRESHOLD, and • INITIATING CONDITION. <p>In addition, please consider removing one of the two provided definitions for INDEPENDENT SPENT FUEL STORAGE INSTALLATION to eliminate redundancy.</p>	<p>Added the following definitions to Section 5.1:</p> <ul style="list-style-type: none"> • Confinement Boundary, • Emergency Action Level • Emergency Classification Level • Fission Product Barrier Threshold • Initiating Condition. <p>Deleted the duplicate ISFSI definition from Section 5.1.</p>
09	6.0	<p>Section 6.0, "Callaway to NEI 99-01 Rev. 6 EAL Cross-Reference," contains the several apparent inconsistencies, as listed below. Please review the Callaway to NEI 99-01, Revision 6, EAL Cross-Reference for accuracy and make corrections as needed.</p> <p>a. Callaway emergency action level RA2.3 is not included in the Callaway to NEI 99-01, Revision 6, EAL Cross-Reference matrix.</p> <p>b. Callaway emergency action level CG1.1 corresponds to NEI 99-01 Rev. 6 EAL CG1 example 1. The Callaway to NEI 99-01, Revision 6, EAL Cross-Reference indicates example 2.</p> <p>c. Callaway emergency action level CG1.2 is not included in the Callaway to NEI 99-01, Revision 6, EAL Cross-Reference.</p>	<p>a. RA2.3 added to EAL Cross-Reference.</p> <p>b. Revised EAL Cross-Reference to cite correct reference.</p> <p>c. CG1.2 added to EAL Cross-Reference.</p>

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	<p>d. Callaway emergency action level SU 4.1 corresponds to NEI 99-01, Revision 6, EAL SU3 example 2. Callaway to NEI 99-01, Revision 6, EAL Cross-Reference indicates example 1.</p> <p>e. The Callaway to NEI 99-01, Revision 6, EAL Cross-Reference includes Callaway EAL SU4.2. EAL SU4.2 could not be located in the Callaway EAL basis document.</p> <p>f. Callaway emergency action level SU8.1 is not included in the Callaway to NEI 99-01, Revision 6, EAL Cross-Reference matrix.</p> <p>g. The Callaway to NEI 99-01, Revision 6, EAL Cross-Reference includes Callaway EAL SA8.1. EAL SA8.1 could not be located in the Callaway EAL basis document.</p> <p>h. Callaway emergency action level SA9.1 is not included in the Callaway to NEI 99-01, Revision 6, EAL Cross-Reference matrix.</p> <p>i. Callaway EAL EU 1.1 shows as IU1.1 on the Callaway to NEI 99-01, Revision 6, EAL Cross-Reference. (Note: The "E" designation is correct.)</p>	<p>d. Corrected cited reference.</p> <p>e. Deleted SU4.2 from EAL Cross-Reference. Generic SU 3 example 1 is not implemented at Callaway.</p> <p>f. Added SU8.1 to EAL Cross-Reference</p> <p>g. Corrected to read "SA9.1"</p> <p>h. See "g" above.</p> <p>i. Corrected designation to read "E"</p>
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RAI-CP	SECTION/EAL	Question	CP Response
10	RU1.1	For EAL RU1.1, it is not clear how a determination can be made that a "2 X Hi – Hi alarm" condition exists. Please provide justification that a value of two times the alarms identified in Table R-1, "Effluent Monitor Classification Thresholds," can be accurately determined in a timely and accurate manner.	GT-RE-21B, GH-RE-10B & HB-RE18 alarms, Hi-Hi alarm setpoints, and monitor indications are displayed on the RM-11 in the Control Room. It is a simple matter of multiplying by the Hi-Hi alarm setpoint by 2 to get the EAL indicator value. If the RM-11 Hi-Hi alarm were to come in, the Control room Operator would monitor the parameter for EAL applicability.
11	RA1.2, RS1.2, RG1.2	For EALs RA1.2, RS1.2, and RG1.2, please explain why the proposed Note 3, which relates to "effluent flow past an effluent monitor," should be included for EALs that are based on dose assessments or revise accordingly.	Deleted Note 3 applicability to RA1.2, RS1.2 and RG1.2.
12	RA1.1, RS1.1, RG1.1	For EALS RA1.1, RS1.1, and RG1.1, there was a substantial change from the previous to the proposed Table R-1 values. The provided calculations did not contain information that could be used to justify this change. Please provide justification that supports the changes in the Table R-1 values from the previous values to the current values.	<p>The NEI 99-01 Revision 5 Table R-1 calculation is documented in EPCI-08-01 (refer to Attachment 5). The software program MAGNEM was used. Selection of source terms for MAGNEM is limited compared to the current Unified Rascal Interface (URI). A default mix from the FSAR was used. Fifteen-minute release duration was used.</p> <p>All other parameters were duplicated for the Revision 6 Table R-1 values. The NEI 99-01 Revision 6 Table R-1 calculation is documented in EPCI-14-02. URI software is the current dose assessment software used at the Callaway Energy Center. URI replaced MAGNEM to meet the requirement to calculate multiple release points. The URI source term of Clad Damage was selected based on this occurrence being more likely than a core melt down. The 1-hour release duration is based on NEI 99-01, "Methodology for the Development of Emergency Action Levels for Non-Passive Reactors." (For additional details, please refer to Attachment 4.)</p>
13	N/A	Omitted	N/A

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RAI-CP	SECTION/EAL	Question	CP Response
14	Generic AA3/HA5	<p>For NEI 99-01, Revision 6, EALs AA3 and HA5, CP is proposing two deviations. NEI Initiating Condition (IC) AA3 example 2, and HA5 example 1 will not be included because a review of CP normal operating and shutdown procedures by Operations Subject Matter Experts concluded that there are no areas external to the Main Control Room that require access to perform a normal plant shutdown and cooldown to Cold Shutdown conditions.</p> <ol style="list-style-type: none"> a. Please verify that all required manipulations to shut down the plant and enter shutdown cooling can be performed from the Main Control Room or revise accordingly. b. Please verify that no local breaker operations are required or revise accordingly. c. Please provide evidence that an assessment of Control Room availability was performed to support these deviations. 	<p>A review of all procedures associated with down power from 100% to Mode 5 (cold shutdown) reviewing field actions that have to be taken. After review, there are no rooms which need to be accessed to shut the plant down to Mode 5.</p> <p>RHR shutdown cooling does not have to be placed in service because CP can cool down to Mode 5 using ASD, steam dumps and MSIV bypasses.</p> <p>Closing the breakers for SI Accumulators and RHR loop suction valves would not be required.</p> <p>The end result was that a shutdown to cold shutdown can be accomplished from the Control Room alone, without additional actions being performed.</p> <p>The Control Room Ventilation System provides adequate protection from external hazardous gases.</p>

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RAI-CP	SECTION/EAL	Question	CP Response
15	RU2.1 RA2.1 RA2.2 RA2.3	<p>For EAL RU2.1, site-specific refueling pathway level indications are not provided per guidance in NEI 99-01, Revision 6. Additionally, the NEI 99-01 Basis discussion does not include the NEI 99-01, Revision 6, EAL AA2 guidance that “This IC applies to irradiated fuel that is licensed for dry storage up to the point that the loaded storage cask is sealed. Once sealed, damage to a loaded cask causing loss of the CONFINEMENT BOUNDARY is classified in accordance with IC E-HU1.”</p> <p>a. Please provide site-specific level indications for EAL RU2.1 that could be used to support timely and accurate assessments; include applicable mode availability for this level instrumentation.</p> <p>b. Please justify excluding the NEI 99-01, Revision 6, EAL AA2 guidance that relates to RA2.1, RA2.2, and RA2.3 applicability or revise accordingly.</p> <p>c. Please verify that RA2.1 should be an Alert and revise accordingly.</p>	<p>a. Added “(EC LI-0039A, EC LI-0039B, local observation of SFP level)” as site-specific SFP level indication to RU2.1.</p> <p>b. Added the cited applicability statement to the RA2.1 and RA2.2 bases: <i>“This EAL applies to irradiated fuel that is licensed for dry storage up to the point that the loaded storage cask is sealed. Once sealed, damage to a loaded cask causing loss of the CONFINEMENT BOUNDARY is classified in accordance with EU1.1.”</i></p> <p>c. Corrected typo to read “Alert.”</p>

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RAI-CP	SECTION/EAL	Question	CP Response
16	RA2.2	For EAL RA2.2, the logic was changed from NEI 99-01, Revision 6, guidance that uses an increase in radiation monitor readings to determine that irradiated fuel has been damaged to a proposed logic that requires the operator to know that damage has occurred to irradiated fuel AND an there is an increase in radiation monitor indications. Please develop EAL RA2.2 per NEI 99-01, Revision 6, as endorsed or provide further justification for this deviation.	<p>RA2.2 has been revised to read:</p> <p>“Damage to irradiated fuel resulting in a release of radioactivity from the fuel as indicated by any of the following:</p> <ul style="list-style-type: none"> • Hi-Hi Alarm on Fuel Building exhaust monitors (GG-RE-27 or 28) • Manipulator crane radiation monitor (SD-RE-41) >100 mR/hr • Fuel Pool Bridge Crane OR Spent Fuel Pool Area radiation monitor (SD-RE-37 or 38) > 30 mR/hr”
17	EU1.1	For EAL EU1.1, please explain why symbols were used rather than spelling out “gamma” and “neutron” or revise accordingly.	<p>Revised EU1.1 by replacing the gamma and neutron symbols with the terms “gamma” and “neutron.”</p> <p>Reworded the EAL as follows:</p> <p>Damage to a loaded cask CONFINEMENT BOUNDARY as indicated by an on-contact radiation reading > EITHER of the following:</p> <ul style="list-style-type: none"> • 60 mrem/hr (gamma + neutron) on the top of the closure lid of the overpack • 7,000 mrem/hr (gamma + neutron) on the side of the transfer cask <p>This allows for this EAL to cover an accident while moving the spent fuel from the SFP to ISFSI. These numbers are 2x the TS limit. Refer to Certificate of Compliance No.1040, Appendix A, Section 5.3.4 (see Attachment 3). Technical bases were revised to support this change.</p>
18	CA1.1	For EAL CA1.1, a BBLI-53 A/B level of 0 inches is provided as an indication that RCS level is lower than the bottom of the RCS hot leg. The Callaway Basis provides that BBLI-53A/B cannot sense level changes in the Reactor Vessel below the elevation of the RCS loop hot leg penetration. Please provide justification that supports using the minimum value of BBLI-53 A/B for EAL classification as this reading may not be readily differentiated from an instrument failure or revise accordingly.	<p>BBLI-53 A/B indications are trended and displayed when providing RCS level indication. Comparison between BBLI-53A and BBLI-53B, along with their trending together, provides adequate indication of failure of a channel.</p> <p>(No document change)</p>

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RAI-CP	SECTION/EAL	Question	CP Response
19	N/A	Omitted	N/A
20	CS1.1 CS1.2	For EAL CS1.1 and CS1.2, the logic was changed from NEI 99-01, Revision 6, guidance without justification. As changed, the EAL appears vague and interpretive. Please develop EAL CS1.1 and CS1.2 per NEI 99-01, Revision 6, as endorsed, or provide further justification for deviation.	Both CS1.1 and CS1.2 wording is consistent with the generic guidance intent. The status of containment closure modifies the level threshold consistent with the generic guidance. (No document change)
21	CS1.3 CG1.2	For EALs CS1.3 and CG1.2, CP did not include “of sufficient magnitude to indicate core uncover” to the unplanned increase in any sump/tank level to the IC wording. Additionally, CP added “Visual observation of UNISOLABLE RCS leakage” to the IC wording. As proposed, EALs CS1.3 and CG1.2 could result in unnecessary Site and General Emergency declarations. Please provide further justification or revise EAL CS1.3 and CG1.2 accordingly consistent with NEI 99-01, Revision 6, as endorsed.	Added “of sufficient magnitude to indicate core uncover” to sump/tank level increases in CS1.3 and CG1.2. Deleted visual observation of unisolable RCS leakage from CS1.3 and CG1.2.
22	CG1.2	For EAL CG1.2 and the Containment Fission Product Barrier Potential Loss D.2, it is not clear how CA-3, “Hydrogen Flammability in Containment,” can be used to estimate containment atmosphere hydrogen concentration. Please explain how a procedure to determine hydrogen flammability in containment can be used to estimate containment atmosphere hydrogen concentration or remove the reference to CA-3 from Technical Basis.	Deleted reference to CA-3 in CG1.2.

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RAI-CP	SECTION/EAL	Question	CP Response
23	CU2.1, CA2.1, SA1.1, SS1.1, SG1.1, SG1.2	<p>For EALs CU2.1, CA2.1, SU1.1, SA1.1, SS1.1, SG1.1, and SG1.2, AC power sources are provided by Table C-3. Additionally, the Callaway Basis provides that “credit can be taken” for additional sources of power “if they are capable of carrying” an emergency bus.</p> <p>a. Omitted</p> <p>b. Please justify the addition of “Additional sources of offsite power are available from diesel generators such as the Alternate Emergency Power Supply (AEPS) or portable generation sources. Credit can be taken for these sources if they are capable of carrying an NB bus and are aligned within 15 minutes” to the Callaway Basis as this statement could potentially be applied to power supplies not listed on Table C-3 or revise according to NRC endorsed guidance.</p>	<p>a. N/A</p> <p>b. Per the developer notes:</p> <p><u>“The EAL and/or Basis section may specify use of a non-safety-related power source provided that operation of this source is controlled in accordance with abnormal or emergency operating procedures, or beyond design basis accident response guidelines (e.g., FLEX support guidelines). Such power sources should generally meet the “Alternate ac source” definition provided in 10 CFR 50.2”</u></p> <p>The Alternate Emergency Power Supply (AEPS) was built for, and has been demonstrated to be capable of carrying one of the two Safety Related Emergency Buses. Thus, it would be able to energize and maintain a Safety Related bus and provide the electric power needed to mitigate the consequences of an accident from this non-safety related power supply. In practice, without some initial setup it takes more than 15 minutes to line-up AEPS to a safety related bus. Thus the wording in Callaway's current EAL basis for SA1.1 stating "...if they are capable of carrying an NB bus and are aligned within 15 minutes".</p> <p>The second half of this question concerning "or portable generation sources" has been put in place based on the future actions we intend to perform to comply with the FLEX requirements. This capability has not been put in place, but is anticipated that it will meet the requirements needed to energize a Safety Related 4.160 kV bus. It is not anticipated that Callaway will be able to meet the 15 minute requirement with the portable generator, but if already lined up it would maintain the bus energized and allow for mitigating the accident.</p> <p>(No document change)</p>

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI)
EMERGENCY ACTION LEVEL (EAL) SCHEME CHANGE
Callaway Plant, Unit 1 (CP)
DOCKET NO. 50-483

RAI-CP	SECTION/EAL	Question	CP Response
24	CU3.1 CA3.1	For EAL CU3.1 and CA3.1, please explain how the addition of "...due to the loss of decay heat removal capability..." to EAL CU3.1 and "...due to a loss of RCS cooling..." to EAL CA3.1 would not result in potential misclassification for an event other than a loss of decay heat removal that leads to an unplanned RCS temperature and/or RCS pressure rise. Please provide justification or revise accordingly consistent with endorsed guidance	Deleted "...due to the loss of decay heat removal capability..." from CU3.1. Deleted "...due to a loss of RCS cooling..." from CA3.1. Added the following omitted generic EAL wording: <i>"(This EAL does not apply during water-solid plant conditions.)"</i>
25	CU5.1 SU7.1	For EALs CU5.1 and SU7.1, the Sentry Notification System is provided as an offsite response organization (ORO) communication method for the electronic transmission of a notification form to the OROs. Please provide reference to specific section of the site emergency plan that identifies the Sentry Notification System as a means of timely notification to OROs for a spectrum of potential event responses or revise accordingly.	Callaway Plant Radiological Emergency Response Plan (RERP), Section 7.2.4. <i>"The Sentry System provides a means of performing required ORO emergency notifications in a timely manner (within 15 minutes of classification). "</i> When each ORO acknowledges receipt of a Sentry notification, Sentry provides Callaway Plant with positive confirmation that ORO received the message.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI)
EMERGENCY ACTION LEVEL (EAL) SCHEME CHANGE
Callaway Plant, Unit 1 (CP)
DOCKET NO. 50-483

RAI-CP	SECTION/EAL	Question	CP Response
26	CA3.1	For EAL CA3.1, Note 10: "Begin monitoring hot condition EALs concurrently," was added to the provided EAL Technical Basis. It is not clear to the staff how Note 10 would be applied during an UNPLANNED increase in RCS temperature event. Please provide justification for this difference or revise accordingly.	<p>Revised Note 10 to read:</p> <p><i>"Begin monitoring hot condition EALs concurrently for any new event or condition not related to the loss of decay heat removal."</i></p> <p>This note re-enforces the implementation guidance in NEI 99-01 that states:</p> <p><i>"The mode in effect at the time that an event or condition occurred, and prior to any plant or operator response, is the mode that determines whether or not an IC is applicable. If an event or condition occurs, and results in a mode change before the emergency is declared, the emergency classification level is still based on the mode that existed at the time that the event or condition was initiated (and not when it was declared). Once a different mode is reached, any new event or condition, not related to the original event or condition, requiring emergency classification should be evaluated against the ICs and EALs applicable to the operating mode at the time of the new event or condition."</i></p> <p>The note reminds the end-user that hot condition EALs become applicable for any new event or condition once Mode 4 is entered from Mode 5 during a loss of decay heat removal.</p> <p>(Note 10 revised throughout document and wallchart)</p>
27	CA6.1 SA9.1	For EAL CA6.1 and SA9.1, the Callaway Basis discussion for seismic events refers to a discussion under EAL HU2.1. Please include the discussion on seismic events in the EAL CA6.1 and SA9.1 Callaway Basis or provide justification for not including the discussion as this could impact the timeliness of event assessment.	Added the applicable portion of the seismic event discussion in HU2.1 to the CA6.1 and SA9.1 bases.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI)
EMERGENCY ACTION LEVEL (EAL) SCHEME CHANGE
Callaway Plant, Unit 1 (CP)
DOCKET NO. 50-483

RAI-CP	SECTION/EAL	Question	CP Response
28	HU2.1	<p>For EAL HU2.1, the proposed EAL may not be consistent with from NEI 99-01, Revision 6, guidance, which provides that “site-specific indication that a seismic event met or exceeded OBE [operating basis earthquake] limits” should be based on the indications, alarms, and displays of site-specific monitoring equipment. The proposed EAL appears to base the declaration on implementation of an alarm response manual (OTO-SG-00001). Please provide justification for using OTO-SG-00001 for event classification rather than the appropriate seismic monitoring equipment as provided by NRC endorsed guidance or revise accordingly.</p>	<p>The HU2.1 wording was intended for the Unusual Event classification to be driven by receipt of seismic activity annunciator 98D (OBE) in the control room and not by actions performed in the seismic event AOP (OTO-SG-00001).</p> <p>Revised HU2.1 to read”</p> <p style="padding-left: 40px;"><i>“Seismic event > OBE as indicated by Seismic Activity, Annunciator 98D.”</i></p>
29	HU3.2	<p>For EAL HU3.2, the proposed Callaway Basis identifies the Control Building, Battery Room, and ESF Switchgear Room as internal flooding areas of concern. Additionally, the Callaway Basis for HU3.2, which is applicable for all modes, references CA6.1, which is applicable in modes 5 and 6, for internal flooding affecting one or more safety trains.</p> <p>a. Please explain how the statement in EAL HU3.2 that limits flooding areas of concern will not potentially be used to limit a flooding related EAL declaration to only equipment in the Control Building, Battery Room, and the ESF Switchgear Room or revise accordingly.</p> <p>b. Please explain why EAL HU3.2 only references an EAL that is applicable in lower modes.</p>	<p>a. Deleted bases statement related to internal flooding areas.</p> <p>b. Added reference to SA9.1 in addition to CA6.1 in the HU3.2 bases.</p>

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI)
EMERGENCY ACTION LEVEL (EAL) SCHEME CHANGE
Callaway Plant, Unit 1 (CP)
DOCKET NO. 50-483

RAI-CP	SECTION/EAL	Question	CP Response
30	HS5.1	<p>For EAL HS5.1, please consider the following or provide an explanation how this EAL can be consistently applied:</p> <ul style="list-style-type: none"> • Addition of operating mode specificity to the listed safety functions to preclude event classification when these safety functions are no longer needed in accordance with site technical specifications; and • Including a “Clock” start time in the Callaway Basis discussion. 	<p>1st bullet – Revised to restrict mode applicability of HS5.1 to Modes 1, 2, 3, 4, 5. None of the three listed safety functions are required when the reactor vessel is defueled.</p> <p>Restricted reactivity control safety function to Modes 1, 2 and 3 only since, by definition, the reactor has adequate shutdown margin while in Modes 4 and 5.</p> <p>2nd bullet – Added the following to the bases regarding “clock” start time: <i>“For the purpose of this EAL the 15 minute clock starts when the last licensed operator leaves the Control Room.”</i></p>
31	SU3 [SU4.1]	<p>For NEI 99-01, Revision 6, EAL SU3.1, CP does not provide an EAL that uses site-specific radiation monitor(s). Please provide additional justification that a Callaway EAL cannot be developed consistent with endorsed guidance or revise accordingly.</p>	<p>Callaway does not have a site-specific radiation monitor correlation that supports identifying a monitor reading that correspond to TS coolant activity limits.</p> <p>The associated EAL is based on whether or not Technical Specification limits for RCS activity have been exceeded. Callaway's Technical Specifications include limits for Iodines governed by Dose Equivalent Iodine (DEI) and noble gases governed by Dose Equivalent Xenon (DEXe). DEI and DEXe both represent weighted sums of measured isotopic concentrations. Determination of DEI and DEXe is performed by laboratory analysis. Callaway's inline process radiation monitors do not have the capability to perform gamma spectrum measurements and determine concentrations of the specific isotopes that contribute to DEI or DEXe. Additionally, the process radiation monitors would not have the capability to perform weighted sums to compare measured count rates with applicable Technical Specification limits. (No Document change)</p>

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI)
EMERGENCY ACTION LEVEL (EAL) SCHEME CHANGE
Callaway Plant, Unit 1 (CP)
DOCKET NO. 50-483

RAI-CP	SECTION/EAL	Question	CP Response
32	SU4.1	For EAL SU4.1, please explain why the proposed wording is different from the NEI 99-01, Revision 6, guidance which clearly states “sample analysis indicates that...,” or revise accordingly.	<p>Revised SU4.1 to read:</p> <p style="text-align: center;"><i>“Sample analysis indicates RCS activity > Technical Specification Section 3.4.16 limits”</i></p>
33	SU5.1	For EAL SU5.1, please explain how timely declaration can be performed without reliance on a potentially time consuming “manual” method of performing an RCS inventory balance or revise the Callaway Basis accordingly.	<p>Callaway does not rely on a manual method of performing an RCS inventory balance. As stated in the bases:</p> <p style="text-align: center;"><i>“Manual or computer-based methods of performing an RCS inventory balance are normally used to determine RCS leakage. The Personal Computer (PC) is preferred method of calculating RCS leak rate. When the PC is used, plant status information and all calculations are generated by the OSPBB9 software program. When the PC software is not available, procedural guidance is available to perform the manual RCS inventory balance.”</i></p> <p>If the preferred method (computer) is not available, then the manual analysis method is performed, but only in the absence of computer based methods.</p> <p>Both computer and manual methods can be completed within a 15 minute time period.</p> <p>(No document change)</p>
34	SU6.1	For EAL SU6.1, please provide a justification for including a “subsequent automatic trip” to the EAL condition or revise accordingly	<p>The words “subsequent automatic trip” were added to both SU6.1 and SU6.2 to address the condition where an automatic trip signal other than the initial automatic trip failure successfully shuts down the reactor prior to any manual trip action being initiated. For example, if the reactor receives a valid reactor trip signal on high pressurizer pressure but fails to trip, but AMSAC automatically initiates and successfully trips the reactor before the manual trip signal was inserted, the EAL will still have been exceeded and an Unusual Event declared.</p> <p>(No document change)</p>

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI)
EMERGENCY ACTION LEVEL (EAL) SCHEME CHANGE
Callaway Plant, Unit 1 (CP)
DOCKET NO. 50-483

RAI-CP	SECTION/EAL	Question	CP Response
35	SU6.1, SU6.2, SA6.1, SS6.1	For EALs SU6.1, SU6.2, SA6.1, and SS6.1, please provide further justification as to why greater than or equal to five percent reactor power was added or revise accordingly. (Note: Westinghouse EOPs do not solely rely on Reactor Power level to determine the status of reactor criticality.)	<p>The method used to determine that the reactor is shutdown following a reactor trip, for the purposes of emergency classification, is consistent with the Callaway EOPs (E-0), i.e., indication of reactor power < 5%. This is also the power level that defines power operation in the Technical Specifications. As specified in the generic developers guidance:</p> <p style="padding-left: 40px;"><i>“Developers may include site-specific EOP criteria indicative of a successful reactor shutdown in an EAL statement, the Basis or both (e.g., a reactor power level).”</i></p> <p>Reactor power < 5% is therefore the site-specific indication of a successful reactor trip for emergency classification.</p> <p>(No document change)</p>

**Attachment 2 to
ULNRC-06227**

**Summary of EAL Changes NOT Associated with RAI Responses
1 Page**

Summary of EAL Changes NOT Associated with RAI Responses

The table below summarizes changes that have been introduced to the EAL submittal documentation for reasons other than the responses to the NRC RAIs.

Section/EAL	Description
5.1 Definitions	Added the abbreviation (OCA) to the Owner Controlled Area definition.
5.1 Definitions	Added the abbreviation (PA) to the Protected Area definition.
5.2 Abbreviations/Acronyms	ODCM - Removed the "-" from Off-site for consistency throughout the document.
7.2	Corrected the Attachment 2 Title to Fission Product Barrier Loss / Potential Loss Matrix and Bases, by adding "Loss / Potential Loss".
EU1.1	Corrected the section titled "VCSNS Basis Reference" to "Callaway Basis Reference".
SU4.1	In the Basis, corrected "XE-133" to "Xe-133".
SU6.2	In the Basis, ninth paragraph, second sentence, corrected the sentence by adding "trip" after manually.
SU7.1	In the Basis, corrected the reference from "Table C-5" to "Table S-4".
SU7.1	In the Basis, added the sentence "This EAL is the hot condition equivalent of the cold condition EAL CU5.1.", to match the similar sentence in EAL CU5.1.
Fuel Clad B.1. Potential Loss	In the Basis, deleted duplicate "indicates" in first sentence.
RCS C Potential Loss	In the Category line, corrected " B. CMT Radiation/RCS Activity" to " C. CMT Radiation/RCS Activity".
RCS E.1 Potential Loss	In the Basis section, corrected "Emergency Director" to "Emergency Coordinator".

**Attachment 3 to
ULNRC-06227**

**Basis for Spent Fuel Storage Cask Dose Rate Limits
(Excerpt from Certificate of Compliance No 1040 Amendment No. 0, Appendix A)**

1 Page

5.0 ADMINISTRATIVE CONTROLS AND PROGRAMS (continued)

5.3 Radiation Protection Program

- 5.3.1 Each cask user shall ensure that the Part 50 radiation protection program appropriately addresses dry storage cask loading and unloading, as well as ISFSI operations, including transport of the loaded TRANSFER CASK outside of facilities governed by 10 CFR Part 50. The radiation protection program shall include appropriate controls for direct radiation and contamination, ensuring compliance with applicable regulations, and implementing actions to maintain personnel occupational exposures As Low As Reasonably Achievable (ALARA). The actions and criteria to be included in the program are provided below.
- 5.3.2 As part of its evaluation pursuant to 10 CFR 72.212(b)(2)(i)(C), the licensee shall perform an analysis to confirm that the dose limits of 10 CFR 72.104(a) will be satisfied under the actual site conditions and ISFSI configuration, considering the planned number of casks to be deployed and the cask contents.
- 5.3.3 Based on the analysis performed pursuant to Section 5.3.2, the licensee shall establish individual cask surface dose rate limits for the TRANSFER CASK and the VVM to be used at the site. Total (neutron plus gamma) dose rate limits shall be established at the following locations:
- a. The top of the VVM.
 - b. The side of the TRANSFER CASK
 - c. The outlet vents on the VVM
- 5.3.4 Notwithstanding the limits established in Section 5.3.3, the average of the measured dose rates on a loaded VVM or TRANSFER CASK shall not exceed the following values:
- a. 30 mrem/hr (gamma + neutron) on the top of the closure lid of the VVM
 - b. 3500 mrem/hr (gamma + neutron) on the side of the TRANSFER CASK
- 5.3.5 The licensee shall measure the TRANSFER CASK and VVM surface neutron and gamma dose rates as described in Section 5.3.8 for comparison against the limits established in Section 5.3.3 or Section 5.3.4, whichever are lower.

**Attachment 4 to
ULNRC-06227**

**Basis for Difference in NEI 99-01 Revision 6 and Revision 5
Emergency Action Level Table R-1,
"Effluent Monitor Classification Threshold Values"**

1 Page

BASIS FOR DIFFERENCE IN NEI 99-01 REVISION 6 AND REVISION 5 EMERGENCY ACTION LEVEL TABLE R-1, "EFFLUENT MONITOR CLASSIFICATION THRESHOLD" VALUES

The NEI 99-01 Revision 5 Table R-1 calculation is documented in EPCI-08-01.

The software program MAGNEM was used.

Selection of source terms for MAGNEM is limited compared to the Unified Rascal Interface (URI). A default mix from the FSAR was used.

Fifteen minute release duration was used.

All other parameters were duplicated for the Revision 6 Table R-1 values.

	REVISION 5	REVISION 6
Calculation Software	MAGNEM	Unified RASCAL Interface
Release Duration	15 Minutes	1 Hour
Source Term	Default mix (FSAR)	Clad Damage

The NEI 99-01 Revision 6 Table R-1 calculation is documented in EPCI-14-02.

URI software is the current dose assessment software used at the Callaway Energy Center. URI replaced MAGNEM to meet the requirement to calculate multiple release points.

The URI source term of Clad Damage was selected based on this occurrence being more likely than a core melt down.

The 1 hour release duration is based on NEI 99-01, Methodology for the Development of Emergency Action Levels for Non-Passive Reactors.

Table One compares the different calculational values based on the change in release duration and using core melt or clad damage.

TABLE ONE

Revision	UV GE	ASD GE	AFW GE
Rev 5, MAGNEM, Release Duration 0.25 hour (Current Table R-1 Values EPCI-08-91)	5.28 E+8	358	2,080
Rev 5, MAGNEM, Release Duration 1 hour	1.46 E+8	89.5	520
Rev 6, URI Release Duration 1 hour, Core Clad damage (Values used in Revision 6 EPCI-14-02)	6.59 E+7	12	163
Rev 6, URI Release Duration 1 hour, Core Melt	1.61 E+8	29	391

**Attachment 5 to
ULNRC-06227**

**Calculation EPCI-08-01 Rev. 1,
"Dose Projection Calculations to
Support NEI 99-01 Rev.5 Emergency Action Levels"**

7 Pages

CALLAWAY PLANT
EMERGENCY PREPAREDNESS
CALCULATION COVER SHEET

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TITLE: **Dose Projection Calculations to Support NEI 99-01 Rev.5 Emergency Action Levels**



Purpose and Scope

These calculations are being performed to provide a basis for threshold values in Table R-1 of the Emergency Action Levels. The calculations are performed using the MAGNEM Version 21.1.2 dose projection software.

Assumptions and References

The following assumptions and constants were used to perform the calculations:

1. The software uses equations/methodology as described in EPCI 94-03, MAGNEM Dose Calculation.
2. Source Term is the default mix per FSAR and EPCI 94-03.
3. Stability Class is "D" for all calculations based on the RERP and Table 2.3-36 of the FSAR.
4. Wind Speed is 3.5 meters/second (7.8 mph) based on Table 2.3-17 of the FSAR.
5. Calculations are based on a 15 minute release at the radiation monitor threshold value, to reach the applicable trigger point (i.e., EPA Protective Action Guides). To accomplish this, since the software only allows release duration to be set in tenths of hours, duration and trigger values were multiplied by four.
6. Calculations are assumed to be performed 1 hour after reactor shutdown and release start.
7. Wind Direction is 180 degrees, but does not affect the calculations.
8. The trigger points are based on:
 - a. Site Emergency = 100 mrem TEDE/500 mrem CDE Thyroid
 - b. General Emergency = 1 Rem TEDE/5 Rem CDE Thyroid

PREPARED BY:  17914/Emerg. Response Coord./8-20-08 
(Signature/PIN/Title/Date)

INDEPENDENTLY REVIEWED BY:  3204 SR HEALTH PHYSICIST 9/2/08 INIT: 
(Signature/PIN/Title/Date)

APPROVED BY:  803 9/5/08
(Signature/PIN/Title/Date)

MAGNEM 21.1 Printed Output Report

Calculation ID: 8877758
 Input Source: Plant
 Input File: \\calntpfile2\magnemdata\MAGNEM.DAT
 Input Date/Time: 08:59 08/20/2008
 Operator Location: EOF
 Accident Type: LOCA
 Reactor Shutdown: YES
 Reactor Shutdown Time: 07:00
 Reactor Shutdown Date: 08/20/2008
 Release Start Time: 07:00
 Release Start Date: 08/20/2008
 Accident Classification: General Emergency
 Release Duration: 1.0 hours
 Wind Speed: 7.8 MPH
 Wind Direction from: 180.0
 Stability Class: D
 Isotopic Mix: Default Mix
 ***** EFFLUENT MONITOR DATA *****
 Monitor: Unit Vent (GT-RE-21B)
 Reading: 5.82E+08 uCi/sec
 Calculation Time: 08:00
 Calculation Date: 08/20/2008

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 COC
 9/2/08
 3204

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PROJECTED DOSES -- calculated at 08:00 08/20/2008

	(Rem)
EAB TEDE:	1.381
2 Mile TEDE:	0.365
5 Mile TEDE:	0.100
10 Mile TEDE:	0.037
EAB Thyroid:	<u>20.006</u>
2 Mile Thyroid:	5.284
5 Mile Thyroid:	1.453
10 Mile Thyroid:	0.542

Affected Sectors

EAB: ALL
 2 Mile: ALL
 5 Mile: R,A,B
 10 Mile: R,A,B

PARs

EAB: EVACUATE
 2 Mile: EVACUATE
 5 Mile: EVACUATE
 10 Mile: NONE

PAG based on Thyroid exceeded at 2.0 miles

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End of output report

MAGNEM 21.1 Printed Output Report

Calculation ID: 4421693
Input Source: Plant
Input File: \\calntpfile2\magnemdata\MAGNEM.DAT
Input Date/Time: 09:03 08/20/2008
Operator Location: EOF
Accident Type: SGTR (Direct to Atmos.)
Reactor Shutdown: YES
Reactor Shutdown Time: 07:00
Reactor Shutdown Date: 08/20/2008
Release Start Time: 07:00
Release Start Date: 08/20/2008
Accident Classification: General Emergency
Release Duration: 1.0 hours
Wind Speed: 7.8 MPH
Wind Direction from: 180.0
Stability Class: D
Isotopic Mix: Default Mix
***** EFFLUENT MONITOR DATA *****
Monitor: "A" ASD (AB-RE-111)
Reading: 3.58E+02 mr/hr
Flowrate: 5.95E+05 lb/hr
Calculation Time: 08:00
Calculation Date: 08/20/2008

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PROJECTED DOSES -- calculated at 08:00 08/20/2008

	(Rem)
EAB TEDE:	4.003
2 Mile TEDE:	1.054
5 Mile TEDE:	0.288
10 Mile TEDE:	0.107
EAB Thyroid:	14.131
2 Mile Thyroid:	3.724
5 Mile Thyroid:	1.019
10 Mile Thyroid:	0.377

Affected Sectors

EAB: ALL
2 Mile: ALL
5 Mile: R,A,B
10 Mile: R,A,B

PARs

EAB: EVACUATE
2 Mile: EVACUATE
5 Mile: EVACUATE
10 Mile: NONE

PAG based on TEDE exceeded at 2.0 miles

=====

End of output report

MAGNEM 21.1 Printed Output Report

Calculation ID: 8145593
Input Source: Plant
Input File: \\calntpfile2\magnemdata\MAGNEM.DAT
Input Date/Time: 09:06 08/20/2008
Operator Location: EOF
Accident Type: SGTR (Direct to Atmos.)
Reactor Shutdown: YES
Reactor Shutdown Time: 07:00
Reactor Shutdown Date: 08/20/2008
Release Start Time: 07:00
Release Start Date: 08/20/2008
Accident Classification: General Emergency
Release Duration: 1.0 hours
Wind Speed: 7.8 MPH
Wind Direction from: 180.0
Stability Class: D
Isotopic Mix: Default Mix
***** EFFLUENT MONITOR DATA *****
Monitor: AFTD (FC-RE-385)
Reading: 2.08E+03 mr/hr
Flowrate: 7.35E+04 lb/hr
Calculation Time: 08:00
Calculation Date: 08/20/2008

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V/m 8-20-08*

QA 9/2/08

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PROJECTED DOSES -- calculated at 08:00 08/20/2008

	(Rem)
EAB TEDE:	4.002
2 Mile TEDE:	1.054
5 Mile TEDE:	0.288
10 Mile TEDE:	0.107
EAB Thyroid:	14.125
2 Mile Thyroid:	3.723
5 Mile Thyroid:	1.019
10 Mile Thyroid:	0.377

Affected Sectors

EAB: ALL
2 Mile: ALL
5 Mile: R,A,B
10 Mile: R,A,B

PARs

EAB: EVACUATE
2 Mile: EVACUATE
5 Mile: EVACUATE
10 Mile: NONE

PAG based on TEDE exceeded at 2.0 miles

=====

End of output report

MAGNEM 21.1 Printed Output Report

Calculation ID: 6525427
 Input Source: Plant
 Input File: \\calntpfiler2\magnemdata\MAGNEM.DAT
 Input Date/Time: 09:01 08/20/2008
 Operator Location: EOF
 Accident Type: LOCA
 Reactor Shutdown: YES
 Reactor Shutdown Time: 07:00
 Reactor Shutdown Date: 08/20/2008
 Release Start Time: 07:00
 Release Start Date: 08/20/2008
 Accident Classification: Site Emergency
 Release Duration: 1.0 hours
 Wind Speed: 7.8 MPH
 Wind Direction from: 180.0
 Stability Class: D
 Isotopic Mix: Default Mix
 ***** EFFLUENT MONITOR DATA *****
 Monitor: Unit Vent (GT-RE-21B)
 Reading: 5.82E+07 uCi/sec
 Calculation Time: 08:00
 Calculation Date: 08/20/2008

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PROJECTED DOSES -- calculated at 08:00 08/20/2008

	(Rem)
EAB TEDE:	0.138
2 Mile TEDE:	0.036
5 Mile TEDE:	0.010
10 Mile TEDE:	0.004
EAB Thyroid:	2.001
2 Mile Thyroid:	0.528
5 Mile Thyroid:	0.145
10 Mile Thyroid:	0.054

Affected Sectors

EAB: ALL
 2 Mile: ALL
 5 Mile: R,A,B
 10 Mile: R,A,B

PARs

EAB: NONE
 2 Mile: NONE
 5 Mile: NONE
 10 Mile: NONE

PAG based on Thyroid exceeded at 0.4 miles

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End of output report

MAGNEM 21.1 Printed Output Report

Calculation ID: 8519082
 Input Source: Plant
 Input File: \\calntpfile2\magnemdata\MAGNEM.DAT
 Input Date/Time: 09:03 08/20/2008
 Operator Location: EOF
 Accident Type: SGTR (Direct to Atmos.)
 Reactor Shutdown: YES
 Reactor Shutdown Time: 07:00
 Reactor Shutdown Date: 08/20/2008
 Release Start Time: 07:00
 Release Start Date: 08/20/2008
 Accident Classification: Site Emergency
 Release Duration: 1.0 hours
 Wind Speed: 7.8 MPH
 Wind Direction from: 180.0
 Stability Class: D
 Isotopic Mix: Default Mix
 ***** EFFLUENT MONITOR DATA *****
 Monitor: "A" ASD (AB-RE-111)
 Reading: 3.59E+01 mr/hr
 Flowrate: 5.95E+05 lb/hr
 Calculation Time: 08:00
 Calculation Date: 08/20/2008

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V/M 8-20-08

CO 9/2/08

=====

PROJECTED DOSES -- calculated at 08:00 08/20/2008

	(Rem)
EAB TEDE:	<u>0.401</u>
2 Mile TEDE:	0.106
5 Mile TEDE:	0.029
10 Mile TEDE:	0.011
EAB Thyroid:	1.417
2 Mile Thyroid:	0.373
5 Mile Thyroid:	0.102
10 Mile Thyroid:	0.038

Affected Sectors

EAB: ALL
 2 Mile: ALL
 5 Mile: R,A,B
 10 Mile: R,A,B

PARs

EAB: NONE
 2 Mile: NONE
 5 Mile: NONE
 10 Mile: NONE

PAG based on TEDE exceeded at 0.4 miles

=====

End of output report

MAGNEM 21.1 Printed Output Report

Calculation ID: 2534861
 Input Source: Plant
 Input File: \\calntpfiler2\magnemdata\MAGNEM.DAT
 Input Date/Time: 09:06 08/20/2008
 Operator Location: EOF
 Accident Type: SGTR (Direct to Atmos.)
 Reactor Shutdown: YES
 Reactor Shutdown Time: 07:00
 Reactor Shutdown Date: 08/20/2008
 Release Start Time: 07:00
 Release Start Date: 08/20/2008
 Accident Classification: Site Emergency
 Release Duration: 1.0 hours
 Wind Speed: 7.8 MPH
 Wind Direction from: 180.0
 Stability Class: D
 Isotopic Mix: Default Mix
 ***** EFFLUENT MONITOR DATA *****
 Monitor: AFTD (FC-RE-385)
 Reading: 2.09E+02 mr/hr
 Flowrate: 7.35E+04 lb/hr
 Calculation Time: 08:00
 Calculation Date: 08/20/2008

EPCI 08-01

Rev. 001

7 of 7

VM 8-20-08

COE 9/2/08

=====
 PROJECTED DOSES -- calculated at 08:00 08/20/2008

	(Rem)
EAB TEDE:	<u>0.401</u>
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Affected Sectors

EAB: ALL
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 10 Mile: R,A,B

PARs

EAB: NONE
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 5 Mile: NONE
 10 Mile: NONE

PAG based on TEDE exceeded at 0.4 miles

=====

End of output report

**Attachment 6 to
ULNRC-06227**

**Callaway NEI 99-01 Revision 6 EAL Wall Charts (Information Only)
3 Pages**

GENERAL EMERGENCY

SITE AREA EMERGENCY

ALERT

UNUSUAL EVENT

1 Rad Effluent

Release of gaseous radioactivity resulting in offsite dose greater than 1,000 mrem TEDE or 5,000 mrem thyroid CDE
RG1.1 1 2 3 4 5 6 DEF
Reading on any Table R-1 effluent radiation monitor > column "GE" for ≥ 15 min. (Notes 1, 2, 3, 4)
RG1.2 1 2 3 4 5 6 DEF
Dose assessment using actual meteorology indicates doses > 1000 mrem TEDE or 5000 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)
RG1.3 1 2 3 4 5 6 DEF
Field survey results indicate EITHER of the following at or beyond the SITE BOUNDARY:
• Closed window dose rates > 1000 mR/hr expected to continue for ≥ 60 min.
• Analyses of field survey samples indicate thyroid CDE > 5000 mrem for 60 min. of inhalation. (Notes 1, 2)

Release of gaseous radioactivity resulting in offsite dose greater than 100 mrem TEDE or 500 mrem thyroid CDE
RS1.1 1 2 3 4 5 6 DEF
Reading on any Table R-1 effluent radiation monitor > column "SAE" for ≥ 15 min. (Notes 1, 2, 3, 4)
RS1.2 1 2 3 4 5 6 DEF
Dose assessment using actual meteorology indicates doses > 100 mrem TEDE or 500 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)
RS1.3 1 2 3 4 5 6 DEF
Field survey results indicate EITHER of the following at or beyond the SITE BOUNDARY:
• Closed window dose rates > 100 mR/hr expected to continue for ≥ 60 min.
• Analyses of field survey samples indicate thyroid CDE > 500 mrem for 60 min. of inhalation. (Notes 1, 2)

Release of gaseous or liquid radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE
RA1.1 1 2 3 4 5 6 DEF
Reading on any Table R-1 effluent radiation monitor > column "ALERT" for ≥ 15 min. (Notes 1, 2, 3, 4)
RA1.2 1 2 3 4 5 6 DEF
Dose assessment using actual meteorology indicates doses > 10 mrem TEDE or 50 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)
RA1.3 1 2 3 4 5 6 DEF
Analysis of a liquid effluent sample indicates a concentration or release rate that would result in doses > 10 mrem TEDE or 50 mrem thyroid CDE at or beyond the SITE BOUNDARY for 60 min. of exposure (Notes 1, 2)
RA1.4 1 2 3 4 5 6 DEF
Field survey results indicate EITHER of the following at or beyond the SITE BOUNDARY:
• Closed window dose rates > 10 mR/hr expected to continue for ≥ 60 min.
• Analyses of field survey samples indicate thyroid CDE > 50 mrem for 60 min. of inhalation. (Notes 1, 2)

Release of gaseous or liquid radioactivity greater than 2 times the ODCM limits for 60 minutes or longer
RU1.1 1 2 3 4 5 6 DEF
Reading on any Table R-1 effluent radiation monitor > column "UE" for ≥ 60 min. (Notes 1, 2, 3)
RU1.2 1 2 3 4 5 6 DEF
Sample analyses for a gaseous or liquid release indicates a concentration or release rate > 2 x ODCM limits for ≥ 60 min. (Notes 1, 2)

2 Irradiated Fuel Event

Spent fuel pool level cannot be restored to at least the top of the fuel racks for 60 minutes or longer
RG2.1 1 2 3 4 5 6 DEF
Spent fuel pool level cannot be restored to at least 2022 ft. 1.25 in. (Level 3) for ≥ 60 min. (Note 1)

Spent fuel pool level at the top of the fuel racks
RS2.1 1 2 3 4 5 6 DEF
Lowering of spent fuel pool level to 2022 ft. 1.25 in. (Level 3)

Significant lowering of water level above, or damage to, irradiated fuel
RA2.1 1 2 3 4 5 6 DEF
Uncovery of irradiated fuel in the REFUELING PATHWAY
RA2.2 1 2 3 4 5 6 DEF
Damage to irradiated fuel resulting in a release of radioactivity from the fuel as indicated by any of the following:
• Hi-Hi Alarm on Fuel Building exhaust monitors (GG-RE-27 or 28)
• Manipulator crane radiation monitor (SD-RE-41) >100 mR/hr
• Fuel Pool Bridge Crane OR Spent Fuel Pool Area radiation monitor (SD-RE-37 or 38) > 30 mR/hr
RA2.3 1 2 3 4 5 6 DEF
Lowering of spent fuel pool level to 2031 ft. 1.25 in. (Level 2)

Unplanned loss of water level above irradiated fuel
RU2.1 1 2 3 4 5 6 DEF
UNPLANNED water level drop in the REFUELING PATHWAY as indicated by low water level alarm or indication (EC LI-0039A)
AND
UNPLANNED rise in corresponding area radiation levels as indicated by any Table R-2 radiation monitors

Table R-1 Effluent Monitor Classification Thresholds
Table with 6 columns: Release Point, Monitor, GE, SAE, Alert, UE. Rows include Unit Vent, ASD Monitors (A/B/C/D), TD AFW Steam Discharge, Radwaste Bldg Vent, Liquid Radwaste Discharge.

Table R-2 Fuel Building & Containment Area Radiation Monitors
Fuel Building:
• SD-RE-34, Cask Handle Area Radiation
• SD-RE-35, New Fuel Storage Area Radiation
• SD-RE-36, New Fuel Storage Area Radiation
• SD-RE-37, Fuel Pool Bridge Crane Radiation
• SD-RE-38, Spent Fuel Pool Area Radiation
Containment:
• SD-RE-40, Personnel Access Hatch Area
• SD-RE-41, Manipulator Crane Radiation Monitor
• SD-RE-42, Containment Building Radiation
• GT-RE-59 Containment High Area Radiation Monitor
• GT-RE-60 Containment High Area Radiation Monitor

3 Area Radiation Levels

None

None

Radiation levels that IMPEDE access to equipment necessary for normal plant operations, cooldown or shutdown
RA3.1 1 2 3 4 5 6 DEF
Dose rate > 15 mR/hr in EITHER of the following areas:
• Control Room (SD-RE-33)
• Central Alarm Station (by survey)

Damage to a loaded cask CONFINEMENT BOUNDARY
EU1.1 1 2 3 4 5 6 DEF
Damage to a loaded cask CONFINEMENT BOUNDARY as indicated by an on-contact radiation reading > EITHER of the following:
• 60 mrem/hr (gamma + neutron) on the top of the closure lid of the overpack
• 7,000 mrem/hr (gamma + neutron) on the side of the transfer cask

1 ISFSI

None

None

None

Damage to a loaded cask CONFINEMENT BOUNDARY as indicated by an on-contact radiation reading > EITHER of the following:
• 60 mrem/hr (gamma + neutron) on the top of the closure lid of the overpack
• 7,000 mrem/hr (gamma + neutron) on the side of the transfer cask

1 Security

HOSTILE ACTION resulting in loss of physical control of the facility
HG1.1 1 2 3 4 5 6 DEF
A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by the Security Shift Supervisor
AND EITHER of the following has occurred:
• Any of the following safety functions cannot be controlled or maintained
- Reactivity control
- Core cooling
- RCS heat removal
OR
• Damage to spent fuel has occurred or is IMMINENT

HOSTILE ACTION within the PROTECTED AREA
HS1.1 1 2 3 4 5 6 DEF
A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by the Security Shift Supervisor

HOSTILE ACTION within the OWNER CONTROLLED AREA or airborne attack threat within 30 minutes
HA1.1 1 2 3 4 5 6 DEF
A HOSTILE ACTION is occurring or has occurred within the OWNER CONTROLLED AREA as reported by the Security Shift Supervisor
OR
A validated notification from NRC of an aircraft attack threat within 30 min. of the site

Confirmed SECURITY CONDITION or threat
HU1.1 1 2 3 4 5 6 DEF
A SECURITY CONDITION that does not involve a HOSTILE ACTION as reported by Security Shift Supervisor
OR
Notification of a credible security threat directed at the site
OR
A validated notification from the NRC providing information of an aircraft threat

2 Seismic Event

None

None

None

Seismic event greater than OBE level
HU2.1 1 2 3 4 5 6 DEF
Seismic event > OBE as indicated by Seismic Activity, Annunciator 98D

3 Natural or Tech. Hazard

Notes
Note 1: The Emergency Coordinator should declare the event promptly upon determining that time limit has been exceeded, or will likely be exceeded
Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit
Note 3: If the effluent flow past an effluent monitor is known to have stopped, indicating that the release path is isolated, the effluent monitor reading is no longer VALID for classification purposes
Note 4: The pre-calculated effluent monitor values presented in EALs RA1.1, RS1.1 and RG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available
Note 5: If the equipment in the listed room or area was already inoperable or out-of-service before the event occurred, then no emergency classification is warranted
Note 6: If CONTAINMENT CLOSURE is re-established prior to exceeding the 30-minute time limit, declaration of a General Emergency is not required
Note 7: This EAL does not apply to routine traffic impediments such as fog, snow, ice, or vehicle breakdowns or accidents
Note 8: A manual trip action is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does not include manually driving in control rods or implementation of boron injection strategies
Note 9: One Containment Spray System train and one Containment Cooling System train comprise one full train of depressurization equipment
Note 10: Begin monitoring hot condition EALs concurrently for any new event or condition not related to the loss of decay heat removal

None

None

Hazardous event
HU3.1 1 2 3 4 5 6 DEF
A tornado strike within the PROTECTED AREA
HU3.2 1 2 3 4 5 6 DEF
Internal room or area FLOODING of a magnitude sufficient to require manual or automatic electrical isolation of a SAFETY SYSTEM component needed for the current operating mode
HU3.3 1 2 3 4 5 6 DEF
Movement of personnel within the PROTECTED AREA is IMPEDED due to an offsite event involving hazardous materials (e.g., an offsite chemical spill or toxic gas release)
HU3.4 1 2 3 4 5 6 DEF
A hazardous event that results in on-site conditions sufficient to prohibit the plant staff from accessing the site via personal vehicles (Note 7)

4 Fire

None

None

Control Room evacuation resulting in transfer of plant control to alternate locations
HA5.1 1 2 3 4 5 6 DEF
An event has resulted in plant control being transferred from the Control Room to the Auxiliary Shutdown Panel (ASP)

FIRE potentially degrading the level of safety of the plant
HU4.1 1 2 3 4 5 6 DEF
A FIRE is not extinguished within 15 min. of any of the following FIRE detection indications (Note 1):
• Report from the field (i.e., visual observation)
• Receipt of multiple (more than 1) fire alarms or indications
• Field verification of a single fire alarm
AND
The FIRE is located within any Table H-1 area
HU4.2 1 2 3 4 5 6 DEF
Receipt of a single fire alarm (i.e., no other indications of a FIRE)
AND
The fire alarm is indicating a FIRE within any Table H-1 area
AND
The existence of a FIRE is not verified within 30 min. of alarm receipt (Note 1)
HU4.3 1 2 3 4 5 6 DEF
A FIRE within the plant PROTECTED AREA not extinguished within 60 min. of the initial report, alarm or indication (Note 1)
HU4.4 1 2 3 4 5 6 DEF
A FIRE within the plant PROTECTED AREA that requires firefighting support by an offsite fire response agency to extinguish

Table H-1 Fire Areas
• Area 5
• Containment
• Aux Feed Pump Rooms
• Auxiliary Building
• Diesel Generator Building
• UHS Cooling Tower
• UHS Pumphouse
• Control Building/ Communications Corridor
• RWST
• Fuel Building

5 Control Room Evacuation

None

Inability to control a key safety function from outside the Control Room
HS5.1 1 2 3 4 5 6 DEF
An event has resulted in plant control being transferred from the Control Room to the Auxiliary Shutdown Panel (ASP)
AND
Control of any of the following key safety functions is not reestablished within 15 min. (Note 1):
• Reactivity control (Mode 1, 2 and 3 only)
• Core cooling
• RCS heat removal

Control Room evacuation resulting in transfer of plant control to alternate locations
HA5.1 1 2 3 4 5 6 DEF
An event has resulted in plant control being transferred from the Control Room to the Auxiliary Shutdown Panel (ASP)

None

6 Judgment

Other conditions existing that in the judgment of the Emergency Coordinator warrant declaration of General Emergency
HG6.1 1 2 3 4 5 6 DEF
Other conditions exist which in the judgment of the Emergency Coordinator indicate that events are in progress or have occurred which involve actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.

Other conditions existing that in the judgment of the Emergency Coordinator warrant declaration of Site Area Emergency
HS6.1 1 2 3 4 5 6 DEF
Other conditions exist which in the judgment of the Emergency Coordinator indicate that events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or HOSTILE ACTION that results in intentional damage or malicious acts, (1) toward site personnel or equipment that could lead to the likely failure of or, (2) that prevent effective access to equipment needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels beyond the SITE BOUNDARY.

Other conditions existing that in the judgment of the Emergency Coordinator warrant declaration of an Alert
HA6.1 1 2 3 4 5 6 DEF
Other conditions exist which, in the judgment of the Emergency Coordinator, indicate that events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. Any releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.

Other conditions existing that in the judgment of the Emergency Coordinator warrant declaration of a UE
HU6.1 1 2 3 4 5 6 DEF
Other conditions exist which in the judgment of the Emergency Coordinator indicate that events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of SAFETY SYSTEMS occurs

Modes:

- 1 Power Operation, 2 Startup, 3 Hot Standby, 4 Hot Shutdown, 5 Cold Shutdown, 6 Refueling, DEF Defueled





EIP-ZZ-00101, Addendum 1 Rev.[xx]
EAL Classification Matrix
Page 1 of 3
ALL CONDITIONS

		GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT																																
S System Malfunc.	1 Loss of Emergency AC Power	Prolonged loss of all offsite and all onsite AC power to emergency buses SG1.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 Loss of all offsite and all onsite AC power capability, Table S-1, to emergency 4.16KV buses NB01 and NB02 AND EITHER: <ul style="list-style-type: none"> Restoration of at least one emergency bus in < 4 hours is not likely (Note 1) CSFST Core Cooling-RED Path conditions met Loss of all AC and vital DC power sources for 15 minutes or longer SG1.2 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 Loss of all offsite and all onsite AC power capability, Table S-1, to emergency 4.16KV buses NB01 and NB02 for ≥ 15 min. AND Loss of all 125 VDC power based on battery bus voltage indications < 107 VDC on all vital DC buses NK01, NK03 (Division 1) and NK02, NK04 (Division 2) for ≥ 15 min. (Note 1)	Loss of all offsite and all onsite AC power to emergency buses for 15 minutes or longer SS1.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 Loss of all offsite and all onsite AC power capability, Table S-1, to emergency 4.16KV buses NB01 and NB02 for ≥ 15 min. (Note 1)	Loss of all but one AC power source to emergency buses for 15 minutes or longer SA1.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 AC power capability, Table S-1, to emergency 4.16KV buses NB01 and NB02 reduced to a single power source for ≥ 15 min. (Note 1) AND Any additional single power source failure will result in loss of all AC power to SAFETY SYSTEMS	Loss of all offsite AC power capability to emergency buses for 15 minutes or longer SU1.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 Loss of all offsite AC power capability, Table S-1, to emergency 4.16KV buses NB01 and NB02 for ≥ 15 min. (Note 1) <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> Table S-1 AC Power Supplies Offsite: <ul style="list-style-type: none"> Safeguards XFMR A or B via ESF LTC XFMR XNB01 Startup XFMR XMR01 via ESF LTC XFMR XNB02 Main XFMR XMA01 backed up via UAT XFMR XMA02 (only if already aligned) Onsite: <ul style="list-style-type: none"> EDG NE01 EDG NE02 </div>																																
	2 Loss of Vital DC Power	Loss of all AC and vital DC power sources for 15 minutes or longer SG1.2 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 Loss of all offsite and all onsite AC power capability, Table S-1, to emergency 4.16KV buses NB01 and NB02 for ≥ 15 min. AND Loss of all 125 VDC power based on battery bus voltage indications < 107 VDC on all vital DC buses NK01, NK03 (Division 1) and NK02, NK04 (Division 2) for ≥ 15 min. (Note 1)	Loss of all vital DC power for 15 minutes or longer SS2.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 Loss of all 125 VDC power based on battery bus voltage indications < 107 VDC on all vital DC buses NK01, NK03 (Division 1) and NK02, NK04 (Division 2) for ≥ 15 min. (Note 1)	None	None																																
	3 Loss of Control Room Indications	None	Table S-2 Safety System Parameters <ul style="list-style-type: none"> Reactor power RCS level RCS pressure Core Exit T/C temperature Level in at least one S/G Auxiliary or emergency feed flow in at least one S/G 	UNPLANNED loss of Control Room indications for 15 minutes or longer with a significant transient in progress SA3.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 An UNPLANNED event results in the inability to monitor one or more Table S-2 parameters from within the Control Room for ≥ 15 min. (Note 1) AND Any significant transient is in progress, Table S-3	UNPLANNED loss of Control Room indications for 15 minutes or longer SU3.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 An UNPLANNED event results in the inability to monitor one or more Table S-2 parameters from within the Control Room for ≥ 15 min. (Note 1)																																
	4 RCS Activity	None	Table S-3 Significant Transients <ul style="list-style-type: none"> Reactor trip Runback ≥ 25% thermal power Electrical load rejection > 25% electrical load ECSS actuation 	None	Reactor coolant activity greater than Technical Specification allowable limits SU4.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 Sample analysis indicates RCS activity > Technical Specification Section 3.4.16 limits																																
	5 RCS Leakage	None	None	None	RCS leakage for 15 minutes or longer SU5.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 RCS unidentified or pressure boundary leakage > 10 gpm for ≥ 15 min. OR RCS identified leakage > 25 gpm for ≥ 15 min. OR Leakage from the RCS to a location outside containment > 25 gpm for ≥ 15 min. (Note 1)																																
	6 RTS Failure	None	Inability to shut down the reactor causing a challenge to core cooling or RCS heat removal SS6.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 An automatic or manual trip fails to shut down the reactor as indicated by reactor power ≥ 5% AND All actions to shut down the reactor are not successful as indicated by reactor power ≥ 5% AND EITHER: <ul style="list-style-type: none"> CSFST Core Cooling-RED Path conditions met CSFST Heat Sink-RED Path conditions met 	Automatic or manual trip fails to shut down the reactor and subsequent manual actions taken at the reactor control consoles are not successful in shutting down the reactor SA6.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 An automatic or manual trip fails to shut down the reactor as indicated by reactor power ≥ 5% AND Manual trip actions taken at the reactor control console (SB-HS-1 or SB-HS-42) are not successful in shutting down the reactor as indicated by reactor power ≥ 5% (Note 8)	Automatic or manual trip fails to shut down the reactor SU6.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 An automatic trip did not shut down the reactor as indicated by reactor power ≥ 5% after any RTS setpoint is exceeded AND A subsequent automatic trip or manual trip action taken at the reactor control consoles (SB-HS-1 or SB-HS-42) is successful in shutting down the reactor as indicated by reactor power < 5% (Note 8) SU6.2 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 A manual trip did not shut down the reactor as indicated by reactor power ≥ 5% after any manual trip action was initiated AND A subsequent automatic trip or manual trip action taken at the reactor control console (SB-HS-1 or SB-HS-42) is successful in shutting down the reactor as indicated by reactor power < 5% (Note 8)																																
	7 Loss of Comm.	Notes Note 1: The Emergency Coordinator should declare the event promptly upon determining that time limit has been exceeded, or will likely be exceeded Note 8: A manual action is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does not include manually driving in control rods or implementation of boron injection strategies Note 9: One Containment Spray System train and one Containment Cooling System train comprise one full train of depressurization equipment	None	Table S-4 Communications Methods <table border="1"> <thead> <tr> <th>System</th> <th>Onsite</th> <th>ORO</th> <th>NRC</th> </tr> </thead> <tbody> <tr> <td>Galtronics</td> <td>X</td> <td></td> <td></td> </tr> <tr> <td>Plant Radios</td> <td>X</td> <td></td> <td></td> </tr> <tr> <td>Plant Emergency Dedicated Phones</td> <td>X</td> <td></td> <td></td> </tr> <tr> <td>Plant Telephone System</td> <td>X</td> <td>X</td> <td>X</td> </tr> <tr> <td>ENS (Red Phone) Line</td> <td></td> <td>X</td> <td>X</td> </tr> <tr> <td>Back-Up Radio System</td> <td></td> <td>X</td> <td></td> </tr> <tr> <td>Sentry Notification System</td> <td></td> <td>X</td> <td></td> </tr> </tbody> </table>	System	Onsite	ORO	NRC	Galtronics	X			Plant Radios	X			Plant Emergency Dedicated Phones	X			Plant Telephone System	X	X	X	ENS (Red Phone) Line		X	X	Back-Up Radio System		X		Sentry Notification System		X		Loss of all onsite or offsite communications capabilities SU7.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 Loss of all Table S-4 onsite communication methods OR Loss of all Table S-4 ORO communication methods OR Loss of all Table S-4 NRC communication methods
	System	Onsite	ORO	NRC																																	
	Galtronics	X																																			
Plant Radios	X																																				
Plant Emergency Dedicated Phones	X																																				
Plant Telephone System	X	X	X																																		
ENS (Red Phone) Line		X	X																																		
Back-Up Radio System		X																																			
Sentry Notification System		X																																			
8 CMT Isolation Failure	None	None	None	Failure to isolate containment or loss of containment pressure control SU8.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 Any penetration is not isolated within 15 min. of a VALID containment isolation signal OR Containment pressure > 27 psig with < one full train of containment depressurization equipment operating per design for ≥ 15 min. (Note 9) (Note 1)																																	
9 Hazardous Event Affecting Safety Systems	None	Table S-5 Hazardous Events <ul style="list-style-type: none"> Seismic event (earthquake) Internal or external FLOODING event High winds or tornado strike FIRE EXPLOSION Other events with similar hazard characteristics as determined by the Emergency Coordinator 	Hazardous event affecting a SAFETY SYSTEM needed for the current operating mode SA9.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 The occurrence of any Table S-5 hazardous event AND EITHER: <ul style="list-style-type: none"> Event damage has caused indications of degraded performance in at least one train of a SAFETY SYSTEM needed for the current operating mode The event has caused VISIBLE DAMAGE to a SAFETY SYSTEM component or structure needed for the current operating mode 	None																																	
F Fission Product Barrier Degradation	FG1.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 Loss of any two barriers AND Loss or potential loss of third barrier (Table F-1)	FS1.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 Loss or potential loss of any two barriers (Table F-1)	FA1.1 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 Any loss or any potential loss of either Fuel Clad or RCS (Table F-1)	None																																	

Table F-1 Fission Product Barrier Matrix

Category	Fuel Clad (FC) Barrier		Reactor Coolant System (RCS) Barrier		Containment (CMT) Barrier	
	Loss	Potential Loss	Loss	Potential Loss	Loss	Potential Loss
A RCS or SG Tube Leakage	None	None	1. An automatic or manual ECSS (SI) actuation required by EITHER: <ul style="list-style-type: none"> UNISOLABLE RCS leakage SG tube RUPTURE 	1. Operation of a standby charging pump is required by EITHER: <ul style="list-style-type: none"> UNISOLABLE RCS leakage SG tube leakage 2. CSFST Integrity-RED Path conditions met	1. A leaking or RUPTURED SG is FAULTED outside of containment	None
B Inadequate Heat Removal	1. CSFST Core Cooling-RED Path conditions met	1. CSFST Core Cooling-ORANGE Path conditions met 2. CSFST Heat Sink-RED Path conditions met AND Heat sink required	None	1. CSFST Heat Sink-RED Path conditions met AND Heat sink required	None	1. CSFST Core Cooling-RED Path conditions met AND Restoration procedures not effective within 15 min. (Note 1)
C CMT Radiation / RCS Activity	1. Containment radiation > 2.80E+03 R/hr on GT-RE-59 (591) or GT-RE-60 (601) 2. Dose equivalent I-131 coolant activity > 300 µCi/cc 3. CVCS letdown radiation > 2.50E+01 µCi/ml on SJ-RE-01 (016)	None	1. Containment radiation > 6.40E+00 R/hr on GT-RE-59 (591); or GT-RE-60 (601)	None	None	1. Containment radiation > 8.06E+04 R/hr on GT-RE-59 (591) or GT-RE-60 (601)
D CMT Integrity or Bypass	None	None	None	None	1. Containment isolation is required AND EITHER: <ul style="list-style-type: none"> Containment integrity has been lost based on Emergency Coordinator judgment UNISOLABLE pathway from containment to the environment exists 2. Indications of RCS leakage outside of containment	1. CSFST Containment-RED Path conditions met 2. Containment hydrogen concentration ≥ 4% 3. Containment pressure > 27 psig with < one full train of Containment depressurization equipment operating per design for ≥ 15 min. (Note 1, 9)
E Judgment	1. Any condition in the opinion of the Emergency Coordinator that indicates loss of the Fuel Clad barrier	1. Any condition in the opinion of the Emergency Coordinator that indicates potential loss of the Fuel Clad barrier	1. Any condition in the opinion of the Emergency Coordinator that indicates loss of the RCS barrier	1. Any condition in the opinion of the Emergency Coordinator that indicates potential loss of the RCS barrier	1. Any condition in the opinion of the Emergency Coordinator that indicates loss of the Containment barrier	1. Any condition in the opinion of the Emergency Coordinator that indicates potential loss of the Containment barrier

Modes: <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> DEF	 	EIP-ZZ-00101, Addendum 1, Rev.[xx] EAL Classification Matrix Page 2 of 3 HOT CONDITIONS RCS > 200°F
Power Operation Startup Hot Standby Hot Shutdown Cold Shutdown Refueling Defueled		

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT																																
C Cold SD/ Refueling System Malfunct.	1 RCS Level	Loss of RCS inventory affecting fuel clad integrity with Containment challenged CG1.1 [] [] [] [] [] [] [] [] 5 6 RVLIS Pumps Off < 65% (Top of Fuel) for > 30 min. (Note 1) AND Any Containment Challenge indication, Table C-2 CG1.2 [] [] [] [] [] [] [] [] 5 6 RCS level cannot be monitored for ≥ 30 min. (Note 1) AND Core uncovery is indicated by any of the following: • UNPLANNED increase in any Table C-1 sump/tank level of sufficient magnitude to indicate core uncovery • Manipulator crane radiation monitor SD-RE-41 > 10,000 mR/hr • Erratic Source Range Monitor indication AND Any Containment Challenge indication, Table C-2 Table C-2 Containment Challenge Indications <ul style="list-style-type: none"> CONTAINMENT CLOSURE not established (Note 6) Containment hydrogen concentration $\geq 4\%$ Unplanned rise in Containment pressure 	Loss of RCS inventory affecting core decay heat removal capability CS1.1 [] [] [] [] [] [] [] [] 5 6 With CONTAINMENT CLOSURE not established, RVLIS Pumps Off < 72% CS1.2 [] [] [] [] [] [] [] [] 5 6 With CONTAINMENT CLOSURE established, RVLIS Pumps Off < 65% (Top of Fuel) CS1.3 [] [] [] [] [] [] [] [] 5 6 RCS water level cannot be monitored for ≥ 30 min. (Note 1) AND Core uncovery is indicated by any of the following: • UNPLANNED increase in any Table C-1 sump/tank level of sufficient magnitude to indicate core uncovery • Manipulator crane radiation monitor SD-RE-41 > 10,000 mR/hr • Erratic Source Range Monitor indication	Loss of RCS inventory CA1.1 [] [] [] [] [] [] [] [] 5 6 Loss of RCS inventory as indicated by Reactor Vessel level < bottom of RCS hot leg ID (RVLIS Pumps Off < 73% or BBLI-53 A/B at 0 inches) CA1.2 [] [] [] [] [] [] [] [] 5 6 RCS water level cannot be monitored for ≥ 15 min. (Note 1) AND EITHER • UNPLANNED increase in any Table C-1 Sump / Tank level • Visual observation of UNISOLABLE RCS leakage Table C-1 Sumps/Tanks <ul style="list-style-type: none"> Containment Sumps Containment Normal Sumps Containment Instrument Sump PRT RCDT Auxiliary Building Sump 	UNPLANNED loss of RCS inventory for 15 minutes or longer CU1.1 [] [] [] [] [] [] [] [] 5 6 UNPLANNED loss of reactor coolant results in RCS level less than a required lower limit for ≥ 15 min. (Note 1) CU1.2 [] [] [] [] [] [] [] [] 5 6 RCS water level cannot be monitored AND EITHER: • UNPLANNED increase in any Table C-1 sump/tank level due to a loss of RCS inventory • Visual observation of UNISOLABLE RCS leakage																															
	2 Loss of Emergency AC Power	None	Table C-3 AC Power Supplies Offsite: • Safeguards XMFR A or B via ESF LTC XMFR XNB01 • Startup XMFR XMR01 via ESF LTC XMFR XNB02 • Main XMFR XMA01 backed up via UAT XMFR XMA02 (only if already aligned) Onsite: • EDG NE01 • EDG NE02	Loss of all offsite and all onsite AC power to emergency buses for greater than 15 minutes CA2.1 [] [] [] [] [] [] [] [] 5 6 DEF Loss of all offsite and all onsite AC power capability, Table C-3, to emergency 4.16kV buses NB01 and NB02 for ≥ 15 min. (Note 1)	Loss of all but one AC power source to emergency buses for 15 minutes or longer CU2.1 [] [] [] [] [] [] [] [] 5 6 DEF AC power capability, Table C-3, to emergency 4.16kV buses NB01 and NB02 reduced to a single power source for ≥ 15 min. (Note 1) AND Any additional single power source failure will result in loss of all AC power to SAFETY SYSTEMS																															
	3 RCS Temp.	None	Table C-4 RCS Reheat Duration Thresholds * If an RCS heat removal system is in operation within this time frame and RCS temperature is being reduced the EAL is not applicable <table border="1"> <thead> <tr> <th>RCS Status</th> <th>Containment Closure Status</th> <th>Heat-up Duration</th> </tr> </thead> <tbody> <tr> <td>Intact (but not REDUCED INVENTORY)</td> <td>N/A</td> <td>60 min. *</td> </tr> <tr> <td>Not intact OR REDUCED INVENTORY</td> <td>established</td> <td>20 min. *</td> </tr> <tr> <td></td> <td>not established</td> <td>0 min.</td> </tr> </tbody> </table>	RCS Status	Containment Closure Status	Heat-up Duration	Intact (but not REDUCED INVENTORY)	N/A	60 min. *	Not intact OR REDUCED INVENTORY	established	20 min. *		not established	0 min.	Inability to maintain plant in cold shutdown CA3.1 [] [] [] [] [] [] [] [] 5 6 UNPLANNED increase in RCS temperature to > 200°F for > Table C-4 duration (Notes 1, 10) OR UNPLANNED RCS pressure increase > 10 psig (This EAL does not apply during water-solid plant conditions)	UNPLANNED increase in RCS temperature CU3.1 [] [] [] [] [] [] [] [] 5 6 UNPLANNED increase in RCS temperature to > 200°F (Note 10) CU3.2 [] [] [] [] [] [] [] [] 5 6 Loss of all RCS temperature and RCS level indication for ≥ 15 min. (Note 1)																			
	RCS Status	Containment Closure Status	Heat-up Duration																																	
	Intact (but not REDUCED INVENTORY)	N/A	60 min. *																																	
	Not intact OR REDUCED INVENTORY	established	20 min. *																																	
	not established	0 min.																																		
4 Loss of Vital DC Power	None	None	Table C-5 Communications Methods <table border="1"> <thead> <tr> <th>System</th> <th>Onsite</th> <th>ORO</th> <th>NRC</th> </tr> </thead> <tbody> <tr> <td>Gailronics</td> <td>X</td> <td></td> <td></td> </tr> <tr> <td>Plant Radios</td> <td>X</td> <td></td> <td></td> </tr> <tr> <td>Plant Emergency Dedicated Phones</td> <td>X</td> <td></td> <td></td> </tr> <tr> <td>Plant Telephone System</td> <td>X</td> <td>X</td> <td>X</td> </tr> <tr> <td>ENS (Red Phone) Line</td> <td>X</td> <td>X</td> <td>X</td> </tr> <tr> <td>Back-Up Radio System</td> <td>X</td> <td>X</td> <td></td> </tr> <tr> <td>Sentry Notification System</td> <td>X</td> <td>X</td> <td></td> </tr> </tbody> </table>	System	Onsite	ORO	NRC	Gailronics	X			Plant Radios	X			Plant Emergency Dedicated Phones	X			Plant Telephone System	X	X	X	ENS (Red Phone) Line	X	X	X	Back-Up Radio System	X	X		Sentry Notification System	X	X		Loss of required DC power for 15 minutes or longer CU4.1 [] [] [] [] [] [] [] [] 5 6 < 107 VDC bus voltage indications on Technical Specification required 125 VDC buses for ≥ 15 min. (Note 1)
System	Onsite	ORO	NRC																																	
Gailronics	X																																			
Plant Radios	X																																			
Plant Emergency Dedicated Phones	X																																			
Plant Telephone System	X	X	X																																	
ENS (Red Phone) Line	X	X	X																																	
Back-Up Radio System	X	X																																		
Sentry Notification System	X	X																																		
5 Loss of Comm.	None	None		Loss of all onsite or offsite communications capabilities CU5.1 [] [] [] [] [] [] [] [] 5 6 DEF Loss of all Table C-5 onsite communication methods OR Loss of all Table C-5 ORO communication methods OR Loss of all Table C-5 NRC communication methods																																
6 Hazardous Event Affecting Safety Systems	None	Table C-6 Hazardous Events <ul style="list-style-type: none"> Seismic event (earthquake) Internal or external FLOODING event High winds or tornado strike FIRE EXPLOSION Other events with similar hazard characteristics as determined by the Emergency Coordinator 	Hazardous event affecting a SAFETY SYSTEM needed for the current operating mode CA6.1 [] [] [] [] [] [] [] [] 5 6 The occurrence of any Table C-6 hazardous event AND EITHER: • Event damage has caused indications of degraded performance in at least one train of a SAFETY SYSTEM needed for the current operating mode • The event has caused VISIBLE DAMAGE to a SAFETY SYSTEM component or structure needed for the current operating mode	None																																

Notes

Note 1: The Emergency Coordinator should declare the event promptly upon determining that time limit has been exceeded, or will likely be exceeded

Note 6: If CONTAINMENT CLOSURE is re-established prior to exceeding the 30-minute time limit, declaration of a General Emergency is not required.

Note 10: Begin monitoring hot condition EALS concurrently for any new event or condition not related to the loss of decay heat removal

Modes:

1 Power Operation	2 Startup	3 Hot Standby	4 Hot Shutdown	5 Cold Shutdown	6 Refueling	DEF Defueled
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