DUKE ENERGY.

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10 CFR 50.90
10 CFR 50 Appendix E, Section IV.B

November 19, 2015
Serial: HNP-15-091

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

Shearon Harris Nuclear Power Plant (HNP), Unit 1
Docket No. 50-400
Renewed License No. NPF-63

Subject: Response to Request for Additional Information Regarding License Amendment Request to Revise Emergency Action Level Scheme to One Based on Revision 6 of Nuclear Energy Institute 99-01, "Development of Emergency Action Levels for Non-Passive Reactors"

Ladies and Gentlemen:

By letter dated April 30, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML 15126A083), Duke Energy Progress, Inc. (Duke Energy), requested approval of a proposed change to the Emergency Action Levels (EALs) used at Shearon Harris Nuclear Plant (HNP), Unit 1. Duke Energy proposes to revise their current HNP EAL scheme to one based upon Nuclear Energy Institute (NEI) document NEI 99-01, "Development of Emergency Action Levels for Non-Passive Reactors," Revision 6 (ADAMS Accession No. ML 12326A805).

The NRC staff reviewed the request and determined that additional information is needed to complete their review. A letter requesting additional information was sent on October 26, 2015, requesting a response by November 20, 2015 (ADAMS Accession No. ML15289A590).

Enclosure 1 to this letter provides the HNP response to the request for additional information. Enclosure 2 provides the HNP Emergency Action Level Technical Bases Document, Revision 1, that incorporates changes in response to the request for additional information and additional changes deemed necessary, as described in Enclosure 1. Enclosure 3 provides the supporting calculation for HNP Radiological Effluent EAL Values, Revision 1, that incorporates one change in response to the request for additional information.

This document contains no new Regulatory Commitments.

Should you have any questions regarding this submittal, please contact John Caves, Regulatory Affairs Manager, at 919-362-2406.

AX45
NRR

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

Executed on November 19, 2015.

Sincerely,

Benjamin C. Waldrep

Enclosures:

1. Response to Request for Additional Information
2. Harris Nuclear Plant Emergency Action Level Technical Bases Document, EP-EAL, "Emergency Action Level Technical Bases" (Clean Version), Revision 1
3. Supporting Calculation for Harris Nuclear Plant Radiological Effluent EAL Values, Revision 1

cc: Mr. J. D. Austin, NRC Sr. Resident Inspector, HNP
Mr. W. L. Cox, III, Section Chief, N.C. DHSR
Ms. M. Barillas, NRC Project Manager, HNP
NRC Regional Administrator, Region II

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SERIAL HNP-15-091

ENCLOSURE 1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1

DOCKET NO. 50-400

RENEWED LICENSE NUMBER NPF-63

By letter dated April 30, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML 15126A083), Duke Energy Progress, Inc. (Duke Energy), requested approval of a proposed change to the Emergency Action Levels (EALs) used at HNP, which would revise the current HNP EAL scheme to one based upon Nuclear Energy Institute (NEI) document NEI 99-01, "Development of Emergency Action Levels for Non-Passive Reactors," Revision 6 (ADAMS Accession No. ML 12326A805). The NRC staff reviewed the request and determined that additional information is needed to complete their review. A letter requesting additional information was sent on October 26, 2015, requesting a response by November 20, 2015 (ADAMS Accession No. ML15289A590).

Duke Energy provides the following response to the request for additional information (RAI) regarding the License Amendment Request to revise the HNP EAL Scheme to one based NEI 99-01, Revision 6. Changes were made to the HNP EAL Technical Bases Document as a result of the RAI and are identified within the HNP RAI Response. Changes were also made to the HNP EAL Technical Bases Document that were not a result of an RAI. These additional changes are described in a table below the RAI response, with an explanation of why each change was deemed necessary. Revision 1 of the HNP EAL Technical Bases Document is provided in Enclosure 2. The response to RAI-HNP-2 resulted in a revision to the Supporting Calculation for Harris Nuclear Plant Radiological Effluent EAL Values. This calculation was previously provided in the HNP License Amendment Request submittal letter dated April 30, 2015 and Revision 1 of this calculation is provided in Enclosure 3.

RAI-HNP-#	Question	HNP Response
1	Section 2.5, "Technical Basis Information," includes a Plant-Specific (HNP) basis section, in addition to a Generic (NEI 99-01) basis section. One of the enhancements provided in Revision 6 to NEI 99-01 is a separation of the developer's notes from the bases information. This change was made to facilitate the use of bases information for the two distinct purposes, development and classification. Considering that the EAL Technical Basis is provided to support proper emergency classification decision making, please explain why a Generic (NEI 99-01) basis section is provided rather than incorporated into Plant-Specific (HNP) basis section.	The HNP site specific and NEI 99-01 generic bases sections have been combined into a single bases section for each EAL. Section 2.5, "Technical Bases Information," has been revised accordingly. Redundant bases, where applicable, have been deleted. Escalation statements have been revised where appropriate to HNP-specific Initiating Condition (IC) numbering. RA1.3 bases description has been revised to delete the reference to gaseous activity. RA1.4 bases description has been revised to delete the last paragraph of the NEI 99-01 bases.

RAI-HNP-#	Question	HNP Response
1 (continued)	Specific examples include the following: • Escalation should refer to HNP EAL numbering vice generic NEI 99-01 EAL numbering to facilitate timely assessments by the Emergency Coordinator. • The Plant-Specific (HNP) basis section information should be specific to each EAL provided by the licensee. The following are two examples of apparent inconsistencies: o For the proposed RA1.3, the NEI 99-01 basis discussion includes reference to gaseous radioactivity while the proposed RA1.3 only applies to liquid effluent samples. o For the proposed RA1.4, the last paragraph of the NEI 99-01 basis discussion includes reference to effluent radiation monitors while the EAL only applies to field survey results.	
2	Section 4.3, "Instrumentation Used for EALs," to NEI 99-01, Revision 6, states in part: "Scheme developers should ensure that specified values used as EAL setpoints are within the calibrated range of the referenced instrumentation." Confirm that all setpoints and indications used in the HNP 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.	HNP has confirmed that all setpoints and indications used in the proposed 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. In the process of reviewing the proposed HNP EAL scheme instrumentation setpoints, indications, calibration ranges, and instrumentation resolution, one change was deemed necessary for the liquid effluent Unusual Event threshold value units. The parameters in the proposed HNP EAL scheme were in counts per minute (cpm), however the radiation monitor indication for the liquid effluent is in micro curies per milliliter (μCi/ml). The detector values are

RAI-HNP-#	Question	HNP Response
2 (continued)		measured in cpm and the software associated with the Radiation Monitor System converts cpm into µCi/ml for display purposes. The calculation that supports the radiological effluent EAL values has been revised to provide EAL threshold values in µCi/ml and is provided in Enclosure 3, Supporting Calculation for HNP Radiological Effluent EAL Values, Revision 1, within Attachment 2. The liquid effluent Unusual Event threshold values included in Table R-1 of the HNP EAL Technical Bases Document have also been revised.
3	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. a. For Section 5.1, "Definitions," please justify the omission of the following definitions, or revise accordingly to include: • Site Area Emergency, • Unusual Event, • Emergency Action Level, • Emergency Classification Level, • Fission Product Barrier Threshold, and • Initiating Condition. b. For Section 5.1, "Definitions," the proposed Alert and General Emergency definitions read "events are in **progress**" vice the proposed "events are in **process**." Provide justification for this difference.	a. The following definitions have been added to Section 5.1 to improve consistency with NEI 99-01, Revision 6: • Site Area Emergency, • Unusual Event, • Emergency Action Level, • Emergency Classification Level, • Fission Product Barrier Threshold, and • Initiating Condition. b. The Alert and General Emergency definitions have been revised to read: "...progress..."

RAI-HNP-#	Question	HNP Response
4	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 by the staff to verify the basis for this change. Provide justification that supports the changes in the Table R-1 values from the previous values to the current values.	The HNP RG1.1, RS1.1 and RA1.1 EALs are based on the NEI 99-01, Revision 6, development guidance and utilize the site specific URI/RASCAL dose assessment model to derive the EAL threshold values. The table on page 5 of this Enclosure provides a comparison between the NEI 99-01, Revision 5, and NEI 99-01, Revision 6, based HNP EAL thresholds for a General Emergency (GE), a Site Area Emergency (SAE), and an Alert. The current HNP RG1.1, RS1.1 and RA1.1 EALs are based upon the NEI 99-01, Revision 5, development guidance. RG1.1 and RS1.1 utilize guidance document (non-utility dose assessment model) calculations to derive the EAL threshold values. RA1.1 utilizes the HNP Offsite Dose Calculation Manual (ODCM) calculations to derive the EAL threshold values. RG1.1 Differences: Accident source term inputs in the NEI 99-01, Revision 5, EALs are based on HNP Final Safety Analysis Report, Table 15.0.9-1 values. Accident source term in the NEI 99-01, Revision 6, EALs (URI/RASCAL model) are based on NUREG-1940, "RASCAL 4: Description of Models and Methods." Stability Class input in the NEI 99-01, Revision 5, EALs is based upon HNP ODCM, Table A-13 annual average (Class 'B'). Stability Class input in the NEI 99-01, Revision 6, EALs are based on median wind speed and stability values at Duke Energy Nuclear Sites established on June 19, 2014 (Class 'D'). Accident dispersion (X/Q) in the NEI 99-01, Revision 5, EALs is based on Meteorology and Atomic Energy,

RAI-HNP-#	Question	HNP Response
4 (continued)		1968 Document and NUREG/CR 3332 equations. Accident dispersion (X/Q) in the NEI 99-01, Revision 6 EALs (URI/RASCAL model) is based on NUREG-1940. RS1.1 Differences: Both NEI 99-01, Revision 5, and NEI 99-01, Revision 6, RS1.1 thresholds are established as one tenth the RG1.1 threshold values. Thus, the differences described above for RG1.1 are the same for RS1.1. RA1.1 Differences: NEI 99-01, Revision 5, established the basis for RA1.1 as 200 times the ODCM limit. NEI 99-01, Revision 6, established the basis for RA1.1 as one tenth the RS1.1 threshold value. Therefore, the methodologies for RA1.1 are different between NEI 99-01, Revision 5, and NEI 99-01, Revision 6.

Table: Comparison of NEI 99-01 Revision 5 and 6 HNP EAL RU1.1, RA1.1, RS1.1 and RG1.1 for RAI-HNP-4 Response

Release Point	Monitor	GE	SAE	Alert
Plant Vent	RM-21AV-3509-1SA (µCi/sec)	Rev 6: 1.05E+8 Rev 5: 1.26E+9	Rev 6: 1.05E+7 Rev 5: 1.26E+8	Rev 6: 1.05E+6 Rev 5: 1.14E+6
Turbine Building	RM-1TV-3536-1 (µCi/sec)	Rev 6: 4.60E+8 Rev 5: 1.27E+9	Rev 6: 4.60E+7 Rev 5: 1.27E+8	Rev 6: 4.60E+6 Rev 5: 1.08E+6
Waste Process Building Vent 5	RM-1WV-3546-1 (µCi/sec)	Rev 6: 7.74E+9 Rev 5: 9.84E+8	Rev 6: 7.74E+8 Rev 5: 9.84E+7	Rev 6: 7.75E+7 Rev 5: 1.95E+7
Waste Process Building Vent 5A	RM-1WV-3547-1 (µCi/sec)	Rev 6: 7.76E+9 Rev 5: 9.84E+8	Rev 6: 7.76E+8 Rev 5: 9.84E+7	Rev 6: 7.76E+7 Rev 5: 1.14E+6

RAI-HNP-#	Question	HNP Response
5	For EAL RU2.1, site-specific refueling pathway level indication is not provided per NEI 99-01, Revision 6. Provide additional information as to why omitting specific level instrumentation for the EAL would not affect timely and accurate assessment, or revise the EAL to provide applicable site specific level indications, including the applicable mode availability for this level instrumentation.	Refueling pathway level indicators LI-5101A/LI-5102A/LI-5103A (spent fuel pools (SFPs)), LI-403 and RCS standpipe (reactor cavity) have been added to RU2.1. SFP level instruments are available in all modes. Reactor cavity level instruments are available in Cold Shutdown, Refueling and Defueled modes.
6	EAL RA 2.1 states, "Unusual Event," rather than an Alert as indicated in NEI 99-01, Revision 6, for this EAL. Provide justification for this difference.	The EAL RA2.1 statement "Unusual Event" has been changed to "Alert."
7	Concerning EAL RA2.2, the logic was changed from NEI 99-01, Revision 6, which 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** there is an increase in radiation monitor indications. Please provide further justification for this deviation or revise accordingly based on NEI 99-01, Revision 6 (EAL AA2).	EAL RA2.2 has been revised to read: *"Damage to irradiated fuel resulting in a release of radioactivity from the fuel as indicated by high alarm on **any** of the following:..."*
8	Table R-3/H-2, "Safe Operation & Shutdown Rooms/Areas," under RA3.2 and HA5.1, indicates that Containment Building access is required in Mode 3. Explain why Containment Building access is required for Mode 3 operations and include what equipment is required to be operated and the specific area of the containment that requires access.	Containment Building access is not required for Mode 3 operations. This row has been removed from Table R-3/H-2.

RAI-HNP-#	Question	HNP Response
9	Concerning EALs CS1.3 and CG1.2, address the following: a. HNP did not include the qualifier from NEI 99-01, Revision 6 (CS1/CG1), "of sufficient magnitude to indicate core uncover," to the unplanned increase in any sump/tank level in the EAL wording. As proposed, EALs CS1.3 and CG1.2 could result in unnecessary Site Area Emergency and General Emergency declarations. Provide further justification, or revise EAL CS1.3 and CG1.2 accordingly consistent with NEI 99-01, Revision 6. b. HNP added, "Visual observation of UNISOLABLE RCS leakage," to the EAL wording. The indication of visual observation of UNISOLABLE RCS leakage does not provide an indication of core uncovery. As proposed, EALs CS1.3 and CG1.2 could result in unnecessary Site Area Emergency and General Emergency declarations. Provide further justification, or revise accordingly consistent with NEI 99-01, Revision 6.	a. The first bullet in EALs CS1.3 and CG1.2 has been revised to read: *"UNPLANNED increase in **any** Table C-1 sump or tank of sufficient magnitude to indicate core uncovery"* b. The second bullet has been deleted from EALs CS1.3 and CG1.2 regarding "visual observation" and the CS1.3 and CG1.2 bases descriptions related to "visual observation" have also been deleted.
10	For EALs CU2.1, SU1.1 and SA1.1, no list/table was provided with the proposed EALs that shows off-site and on-site AC power sources that can supply the required power within 15 minutes. This list/table should only include power supplies that can supply the required power within 15 minutes. This could impact the timeliness and accuracy of assessment. Provide justification as to why list/table of AC power supplies was not provided, or revise accordingly.	New Tables C-6 and S-5 that list AC power sources have been added to EALs CU2.1, SU1.1 and SA1.1.

RAI-HNP-#	Question	HNP Response
11	For EAL CU3.1, the proposed EAL contains the condition, "...due to the loss of decay heat removal capability," which is not consistent with NEI 99-01, Revision 6. This deviation could result in potential misclassification for an event other than a loss of decay heat removal capability that leads to an unplanned RCS temperature to rise. Provide justification for this deviation, or revise accordingly consistent with NEI 99-01, Revision 6.	The phrase "*due to loss of decay heat removal capability*" has been deleted from EAL CU3.1.
12	For EAL CA3.1, the proposed EAL contains the condition, "...due to the loss of RCS cooling," which is not consistent with NEI 99-01, Revision 6. This deviation could result in potential misclassification for an event other than a loss of RCS cooling that leads to an unplanned RCS pressure increase. Provide justification for this deviation, or revise accordingly consistent with NEI 99-01, Revision 6.	The phrase "*due to a loss of RCS cooling*" has been deleted from EAL CA3.1.
13	Concerning EALs CU5.1 and SU7.1, address the following: a. The DEMNET System is provided as a communication method to the offsite response organizations (OROs). Provide evidence that the DEMNET communication method could function as a means of <u>timely</u> notification to OROs for a spectrum of potential event responses, or revise accordingly.	a. DEMNET is the primary means of offsite communication, as described in the HNP Emergency Plan. DEMNET is routinely utilized during drills, exercises, and tabletops and has demonstrated notification to the OROs within a 15 minute timeframe. DEMNET allows intercommunication among the EOF, TSC, control room, counties, and states. DEMNET operates as an internet based (VoIP) communications system with a satellite back-up. Should the internet transfer rate become slow or unavailable, the DEMNET will automatically transfer to satellite mode.

RAI-HNP-#	Question	HNP Response
14	For EAL CA6.1 and SA9.1, the HNP Basis discussion for seismic events refers to a discussion under EAL HU2.1. Provide justification for not including the discussion as this could impact the timeliness of event assessment, or revise accordingly to include the discussion on seismic events in the EAL CA6.1 and SA9.1 HNP Basis.	The first bullet of EAL CA6.1 and SA9.1 bases regarding seismic events has been deleted. The reference to AOP-021, Seismic Disturbances, was also removed from EAL CA6.1 and SA9.1 HNP Bases References.
15	For IC HU4.1 and HU4.2, the proposed EALs appear to cover a wider range of areas than that provided by NEI 99-01, Revision 6. Provide justification that all areas identified for this EAL contain equipment needed for safe operation, safe shutdown and safe cool-down, and demonstrate accurate and timely assessment is achieved.	Table H-1 Fire Areas are based on HNP-E/ELEC-0001 Safe Shutdown Analysis in Case of Fire and Fire Hazards Analysis. Table H-1 Fire Areas include those structures containing functions and systems required for safe shutdown of the plant (SAFETY SYSTEMS).
16	The "Basis-Related Requirements from Appendix R" discussion provided in the NEI 99-01 HU4 Basis, was not included in the HNP EAL HU4.1. This discussion clarifies which rooms or areas should be included in the respective EALs. As such, this discussion supports timely and accurate assessments either during training activities or actual event conditions. Provide further justification for exclusion of this Appendix R basis information, or revise accordingly.	The generic bases related to Appendix R for EALs HU4.1 and HU4.2 have been reinstated.

RAI-HNP-#	Question	HNP Response
17	No clear start time is provided for EALs HA6.1 and HS6.1. Provide a site-specific condition that clearly indicates when the transfer of control from the control room to the alternate control panel begins, or provide justification as to why this detail is not required.	The following basis statement has been added to EALs HA6.1 and HS6.1: *"Transfer of plant control begins when the last licensed operator leaves the Control Room."*
18	For IC RC1, Fission Product Barrier (FPB) Threshold Potential Loss, address the following: a. The Potential Loss 1 proposes the following wording: "> the capacity of one charging pump in the normal mode (greater than 120 gpm)." This is not consistent with NEI 99-01, Revision 6, which states, "Operation of a standby charging (makeup) pump is required." As proposed, the wording could imply that operators must determine an actual leak rate of 120 gpm or greater rather than determine that a second charging pump is required due to either an unisolable RCS leak or steam generator tube leakage. Provide justification for this deviation, or revise accordingly. b. The proposed Generic basis provides that the threshold is met when RCS leakage is determined to be in excess of normal makeup capacity with letdown isolated. This is not consistent with NEI 99-01, Revision 6, which states, "Operation of a standby charging (makeup) pump is required." As proposed, this could imply that this threshold condition is not applicable until letdown is isolated. Furthermore, this basis discussion implies that the threshold is RCS leakage of approximately 120 gpm vice the need to start a second charging pump.	a. and b. RCS Potential Loss A.1 has been revised to read: "Operation of a standby charging pump is required due to **EITHER:** • UNISOLABLE RCS leakage • SG tube leakage" RCS Potential Loss A.1 bases have been revised to be consistent with the generic NEI 99-01, Revision 6 bases.

RAI-HNP-#	Question	HNP Response
18 (continued)	Provide justification for this change, or revise accordingly.	

Summary of EAL Changes Not Associated with RAI Responses

The table below summarizes changes that have been incorporated into the EAL Technical Basis Document contained in Enclosure 2 that are not involved in the NRC RAI response.

Section or EAL #	Description
2.5	Removed reference to EAL Recognition Category 'E' – Independent Spent Fuel Storage Installation, since Harris does not utilize this EAL Recognition Category.
RA1.2, RS1.2, RG1.2	Note 3 has been deleted from EALs RA1.2, RS1.2 and RG1.2. Note 3 states: "If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes." These EALs implement NEI 99-01 example EAL #2 which pertains to dose assessment. The note is intended to apply to the effluent monitor readings of example EAL #1. Note 3 continues to be referenced in EALs RU1.1, RA1.1, RS1.1 and RG1.1 which implement NEI 99-01 example EAL #1.
HU4.1, HU4.2	Added a statement to clarify that HNP is not an Appendix R plant but rather falls under the requirements of NFPA-805 for fire protection. Also modified the H-1 list to separate Transformer Area from the Turbine Building description.

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ENCLOSURE 2

HARRIS NUCLEAR PLANT EMERGENCY ACTION LEVEL TECHNICAL BASES DOCUMENT, EP-EAL,

"EMERGENCY ACTION LEVEL TECHNICAL BASES" (CLEAN VERSION), REVISION 1

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1

DOCKET NO. 50-400

RENEWED LICENSE NUMBER NPF-63

EMERGENCY ACTION LEVEL TECHNICAL BASES

Revision 1

TABLE OF CONTENTS

1.0 PURPOSE

This document provides an explanation and rationale for each Emergency Action Level (EAL) included in the EAL Upgrade Project for Harris Nuclear Station (HNP). It should be used to facilitate review of the HNP EALs and provide historical documentation for future reference. Decision-makers responsible for implementation of PEP-110, Emergency Classification and Protective Action Recommendations, may use this document as a technical reference in support of EAL interpretation. This information may assist the Emergency Coordinator in making classifications, particularly those involving judgment or multiple events. The basis information may also be useful in training and for explaining event classifications to off-site officials.

The expectation is that emergency classifications are to be made as soon as conditions are present and recognizable for the classification, but within 15 minutes or less in all cases of conditions present. Use of this document for assistance is not intended to delay the emergency classification.

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).

2.0 DISCUSSION

2.1 Background

EALs are the plant-specific indications, conditions or instrument readings that are utilized to classify emergency conditions defined in the HNP Emergency Plan.

In 1992, the NRC endorsed NUMARC/NESP-007 "Methodology for Development of Emergency Action Levels" as an alternative to NUREG-0654 EAL guidance.

NEI 99-01 (NUMARC/NESP-007) Revisions 4 and 5 were subsequently issued for industry implementation. Enhancements over earlier revisions included:

- Consolidating the system malfunction initiating conditions and example emergency action levels which address conditions that may be postulated to occur during plant shutdown conditions.
- Initiating conditions and example emergency action levels that fully address conditions that may be postulated to occur at permanently Defueled Stations and Independent Spent Fuel Storage Installations (ISFSIs).
- Simplifying the fission product barrier EAL threshold for a Site Area Emergency.

Subsequently, Revision 6 of NEI 99-01 has been issued which incorporates resolutions to numerous implementation issues including the NRC EAL Frequently Asked Questions (FAQs). Using NEI 99-01 Revision 6, "Methodology for the Development of Emergency Action Levels for Non-Passive Reactors," November 2012 (ADAMS Accession Number ML12326A805) (ref. 4.1.1), HNP conducted an EAL implementation upgrade project that produced the EALs discussed herein.

2.2 Fission Product Barriers

Fission product barrier thresholds represent threats to the defense in depth design concept that precludes the release of radioactive fission products to the environment. This concept

relies on multiple physical barriers, any one of which, if maintained intact, precludes the release of significant amounts of radioactive fission products to the environment.

Many of the EALs derived from the NEI methodology are fission product barrier threshold based. That is, the conditions that define the EALs are based upon thresholds that represent the loss or potential loss of one or more of the three fission product barriers. "Loss" and "Potential Loss" signify the relative damage and threat of damage to the barrier. A "Loss" threshold means the barrier no longer assures containment of radioactive materials. A "Potential Loss" threshold implies an increased probability of barrier loss and decreased certainty of maintaining the barrier.

The primary fission product barriers are:

A. Fuel Clad (FC): The Fuel Clad Barrier is the zircalloy tubes that contain the fuel pellets.

B. Reactor Coolant System (RCS): The RCS Barrier includes the RCS primary side and its connections up to and including the pressurizer safety and relief valves, and other connections up to and including the primary isolation valves.

C. Containment (CNMT): The Containment Barrier includes the containment building and connections up to and including the outermost containment isolation valves. This barrier also includes the main steam, feedwater, and blowdown line extensions outside the containment building up to and including the outermost secondary side isolation valve. Containment Barrier thresholds are used as criteria for escalation of the ECL from Alert to a Site Area Emergency or a General Emergency

2.3 Fission Product Barrier Classification Criteria

The following criteria are the bases for event classification related to fission product barrier loss or potential loss:

Alert:

Any loss or any potential loss of either Fuel Clad or RCS barrier

Site Area Emergency:

Loss or potential loss of any two barriers

General Emergency:

Loss of any two barriers and loss or potential loss of the third barrier

2.4 EAL Organization

The HNP EAL scheme includes the following features:

- Division of the EAL set into three broad groups:
  - EALs applicable under all plant operating modes – This group would be reviewed by the EAL-user any time emergency classification is considered.
  - EALs applicable only under hot operating modes – This group would only be reviewed by the EAL-user when the plant is in Hot Shutdown, Hot Standby, Startup, or Power Operation mode.
  - EALs applicable only under cold operating modes – This group would only be reviewed by the EAL-user when the plant is in Cold Shutdown, Refueling or Defueled mode.

  The purpose of the groups is to avoid review of hot condition EALs when the plant is in a cold condition and avoid review of cold condition EALs when the plant is in a hot condition. This approach significantly minimizes the total number of EALs that must be reviewed by the EAL-user for a given plant condition, reduces EAL-user reading burden and, thereby, speeds identification of the EAL that applies to the emergency.
- Within each group, assignment of EALs to categories and subcategories:

Category and subcategory titles are selected to represent conditions that are operationally significant to the EAL-user. The HNP EAL categories are aligned to and represent the NEI 99-01"Recognition Categories." Subcategories are used in the HNP scheme as necessary to further divide the EALs of a category into logical sets of possible emergency classification thresholds. The HNP EAL categories and subcategories are listed below.

EAL Groups, Categories and Subcategories

EAL Group/Category	EAL Subcategory
Any Operating Mode:	
R – Abnormal Rad Levels / Rad Effluent	1 – Radiological Effluent 2 – Irradiated Fuel Event 3 – Area Radiation Levels
H – Hazards and Other Conditions Affecting Plant Safety	1 – Security 2 – Seismic Event 3 – Natural or Technological Hazard 4 – Fire 5 – Hazardous Gas 6 – Control Room Evacuation 7 – Emergency Coordinator Judgment
Hot Conditions:	
S – System Malfunction	1 – Loss of Emergency AC Power 2 – Loss of Vital DC Power 3 – Loss of Control Room Indications 4 – RCS Activity 5 – RCS Leakage 6 – RPS Failure 7 – Loss of Communications 8 – Containment Failure 9 – Hazardous Event Affecting Safety Systems
F – Fission Product Barrier Degradation	None
Cold Conditions:	
C – Cold Shutdown / Refueling System Malfunction	1 – RCS Level 2 – Loss of Emergency AC Power 3 – RCS Temperature 4 – Loss of Vital DC Power 5 – Loss of Communications 6 – Hazardous Event Affecting Safety Systems

The primary tool for determining the emergency classification level is the EAL Classification Matrix. The user of the EAL Classification Matrix may (but is not required to) consult the EAL Technical Bases Document in order to obtain additional information concerning the EALs under classification consideration. The user should consult Section 3.0 and Attachments 1 & 2 of this document for such information.

2.5 Technical Bases Information

EAL technical bases are provided in Attachment 1 for each EAL according to EAL group (Any, Hot, Cold), EAL category (R, C, H, S, and F) and EAL subcategory. A summary explanation of each category and subcategory is given at the beginning of the technical bases discussions of the EALs included in the category. For each EAL, the following information is provided:

Category Letter & Title

Subcategory Number & Title

Initiating Condition (IC)

Site-specific description of the generic IC given in NEI 99-01 Rev. 6.

EAL Identifier (enclosed in rectangle)

Each EAL is assigned a unique identifier to support accurate communication of the emergency classification to onsite and offsite personnel. Four characters define each EAL identifier:

1. First character (letter): Corresponds to the EAL category as described above (R, C, H, S, or F)
2. Second character (letter): The emergency classification (G, S, A or U)

   G = General Emergency
   S = Site Area Emergency
   A = Alert
   U = Unusual Event

3. Third character (number): Subcategory number within the given category. Subcategories are sequentially numbered beginning with the number one (1). If a category does not have a subcategory, this character is assigned the number one (1).
4. Fourth character (number): The numerical sequence of the EAL within the EAL subcategory. If the subcategory has only one EAL, it is given the number one (1).

Classification (enclosed in rectangle):

Unusual Event (U), Alert (A), Site Area Emergency (S) or General Emergency (G)

EAL (enclosed in rectangle)

Exact wording of the EAL as it appears in the EAL Classification Matrix

Mode Applicability

One or more of the following plant operating conditions comprise the mode to which each EAL is applicable: 1 - Power Operations, 2 - Startup, 3 – Hot Standby, 4 - Hot Shutdown, 5 - Cold Shutdown, 6 - Refueling, D - Defueled, or All. (See Section 2.6 for operating mode definitions)

Definitions:

If the EAL wording contains a defined term, the definition of the term is included in this section. These definitions can also be found in Section 5.1.

Basis:

A basis section that provides HNP-relevant information concerning the EAL as well as a description of the rationale for the EAL as provided in NEI 99-01 Rev. 6.

HNP Basis Reference(s):

Site-specific source documentation from which the EAL is derived

2.6 Operating Mode Applicability (ref. 4.1.7)

1 Power Operations
$K_{eff} \geq 0.99$ and reactor thermal power > 5% and average coolant temperature $\geq$ 350°F

2 Startup
$K_{eff} \geq 0.99$ and reactor thermal power $\leq$ 5% average coolant temperature $\geq$ 350°F

3 Hot Standby
$K_{eff} < 0.99$ and average coolant temperature $\geq$ 350°F

3 Hot Shutdown
$K_{eff} < 0.99$ and average coolant temperature 350°F > T_{avg} > 200 °F (excluding decay heat)

4 Cold Shutdown
$K_{eff} < 0.99$ and average coolant temperature $T_{avg} \leq$ 200°F

5 Refueling
$K_{eff} < 0.95$ and average coolant temperature $T_{avg} \leq$ 140°F; fuel in the reactor vessel with the vessel head closure bolts less than fully tensioned or with the head removed

D Defueled
All reactor fuel removed from reactor pressure vessel (full core off load during refueling or extended outage)

The plant operating mode that exists at the time that the event occurs (prior to any protective system or operator action being initiated in response to the condition) should be compared to the mode applicability of the EALs. If a lower or higher plant operating mode is reached before the emergency classification is made, the declaration shall be based on the mode that existed at the time the event occurred.

3.0 GUIDANCE ON MAKING EMERGENCY CLASSIFICATIONS

3.1 General Considerations

When making an emergency classification, the Emergency Coordinator must consider all information having a bearing on the proper assessment of an Initiating Condition (IC). This includes the Emergency Action Level (EAL) plus the associated Operating Mode Applicability, Notes, and the informing basis information. In the Recognition Category F matrices, EALs are based on loss or potential loss of Fission Product Barrier Thresholds.

3.1.1 Classification Timeliness

NRC regulations require the licensee to establish and maintain the capability to assess, classify, and declare an emergency condition within 15 minutes after the availability of indications to plant operators that an emergency action level has been exceeded and to promptly declare the emergency condition as soon as possible following identification of the appropriate emergency classification level. The NRC staff has provided guidance on implementing this requirement in NSIR/DPR-ISG-01, "Interim Staff Guidance, Emergency Planning for Nuclear Power Plants" (ref. 4.1.10).

3.1.2 Valid Indications

All emergency classification assessments shall be based upon valid indications, reports or conditions. A valid indication, report, or condition, is one that has been verified through appropriate means such that there is no doubt regarding the indicator's operability, the condition's existence, or the report's accuracy. For example, verification could be accomplished through an instrument channel check, response on related or redundant indicators, or direct observation by plant personnel.

An indication, report, or condition is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

3.1.3 Imminent Conditions

For ICs and EALs that have a stipulated time duration (e.g., 15 minutes, 30 minutes, etc.), the Emergency Coordinator should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition has exceeded, or will likely exceed, the applicable time. If an ongoing radiological release is detected and the release start time is unknown, it should be assumed that the release duration specified in the IC/EAL has been exceeded, absent data to the contrary.

3.1.4 Planned vs. Unplanned Events

A planned work activity that results in an expected event or condition which meets or exceeds an EAL does not warrant an emergency declaration provided that: 1) the activity proceeds as planned, and 2) the plant remains within the limits imposed by the operating license. Such activities include planned work to test, manipulate, repair, maintain or modify a system or component. In these cases, the controls associated with the planning, preparation and execution of the work will ensure that compliance is maintained with all aspects of the operating license provided that the activity proceeds and concludes as expected. Events or conditions of this type may be subject to the reporting requirements of 10 § CFR 50.72 (ref. 4.1.4).

3.1.5 Classification Based on Analysis

The assessment of some EALs is based on the results of analyses that are necessary to ascertain whether a specific EAL threshold has been exceeded (e.g., dose assessments, chemistry sampling, RCS leak rate calculation, etc.). For these EALs, the EAL wording or the associated basis discussion will identify the necessary analysis. In these cases, the 15-minute declaration period starts with the availability of the analysis results that show the threshold to be exceeded (i.e., this is the time that the EAL information is first available). The NRC expects licensees to establish the capability to initiate and complete EAL-related analyses within a reasonable period of time (e.g., maintain the necessary expertise on-shift).

3.1.6 Emergency Coordinator Judgment

While the EALs have been developed to address a full spectrum of possible events and conditions which may warrant emergency classification, a provision for classification based on operator/management experience and judgment is still necessary. The NEI 99-01 EAL scheme provides the Emergency Coordinator with the ability to classify events and conditions based upon judgment using EALs that are consistent with the Emergency Classification Level (ECL) definitions (refer to Category H). The Emergency Coordinator will need to determine if the effects or consequences of the event or condition reasonably meet or exceed a particular ECL definition. A similar provision is incorporated in the Fission Product Barrier Tables; judgment may be used to determine the status of a fission product barrier.

3.2 Classification Methodology

To make an emergency classification, the user will compare an event or condition (i.e., the relevant plant indications and reports) to an EAL(s) and determine if the EAL has been met or exceeded. The evaluation of an EAL must be consistent with the related Operating Mode Applicability and Notes. If an EAL has been met or exceeded, the associated IC is likewise met, the emergency classification process "clock" starts, and the ECL must be declared in accordance with plant procedures no later than fifteen minutes after the process "clock" started.

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." For a full discussion of this timing requirement, refer to NSIR/DPR-ISG-01 (ref. 4.1.10).

3.2.1 Classification of Multiple Events and Conditions

When multiple emergency events or conditions are present, the user will identify all met or exceeded EALs. The highest applicable ECL identified during this review is declared. For example:

- If an Alert EAL and a Site Area Emergency EAL are met, whether at one unit or at two different units, a Site Area Emergency should be declared.

There is no "additive" effect from multiple EALs meeting the same ECL. For example:

- If two Alert EALs are met, whether at one unit or at two different units, an Alert should be declared.

Related guidance concerning classification of rapidly escalating events or conditions is provided in Regulatory Issue Summary (RIS) 2007-02, *Clarification of NRC Guidance for Emergency Notifications During Quickly Changing Events* (ref. 4.1.2).

3.2.2 Consideration of Mode Changes During Classification

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.

3.2.3 Classification of Imminent Conditions

Although EALs provide specific thresholds, the Emergency Coordinator must remain alert to events or conditions that could lead to meeting or exceeding an EAL within a relatively short period of time (i.e., a change in the ECL is IMMINENT). If, in the judgment of the Emergency Coordinator, meeting an EAL is IMMINENT, the emergency classification should be made as if the EAL has been met. While applicable to all emergency classification levels, this approach is particularly important at the higher emergency classification levels since it provides additional time for implementation of protective measures.

3.2.4 Emergency Classification Level Upgrading and Downgrading

An ECL may be downgraded when the event or condition that meets the highest IC and EAL no longer exists, and other site-specific downgrading requirements are met. If downgrading the ECL is deemed appropriate, the new ECL would then be based on a lower applicable IC(s) and EAL(s). The ECL may also simply be terminated.

As noted above, guidance concerning classification of rapidly escalating events or conditions is provided in RIS 2007-02 (ref. 4.1.2).

3.2.5 Classification of Short-Lived Events

Event-based ICs and EALs define a variety of specific occurrences that have potential or actual safety significance. By their nature, some of these events may be short-lived and, thus, over before the emergency classification assessment can be completed. If an event occurs that meets or exceeds an EAL, the associated ECL must be declared regardless of its continued presence at the time of declaration. Examples of such events include an earthquake or a failure of the reactor protection system to automatically trip the reactor followed by a successful manual trip.

3.2.6 Classification of Transient Conditions

Many of the ICs and/or EALs employ time-based criteria. These criteria will require that the IC/EAL conditions be present for a defined period of time before an emergency declaration is warranted. In cases where no time-based criterion is specified, it is recognized that some transient conditions may cause an EAL to be met for a brief period of time (e.g., a few seconds to a few minutes). The following guidance should be applied to the classification of these conditions.

EAL momentarily met during expected plant response - In instances where an EAL is briefly met during an expected (normal) plant response, an emergency declaration is not warranted provided that associated systems and components are operating as expected, and operator actions are performed in accordance with procedures.

EAL momentarily met but the condition is corrected prior to an emergency declaration – If an operator takes prompt manual action to address a condition, and the action is successful in correcting the condition prior to the emergency declaration, then the applicable EAL is not considered met and the associated emergency declaration is not required. For illustrative purposes, consider the following example:

> An ATWS occurs and the high pressure ECCS systems fail to automatically start. RPV level rapidly decreases and the plant enters an inadequate core cooling condition (a potential loss of both the fuel clad and RCS barriers). If an operator manually starts a high pressure ECCS system in accordance with an EOP step and clears the inadequate core cooling condition prior to an emergency declaration, then the classification should be based on the ATWS only.

It is important to stress that the 15-minute emergency classification assessment period (process clock) is not a "grace period" during which a classification may be delayed to allow the performance of a corrective action that would obviate the need to classify the event. Emergency classification assessments must be deliberate and timely, with no undue delays. The provision discussed above addresses only those rapidly evolving situations when an operator is able to take a successful corrective action prior to the Emergency Coordinator completing the review and steps necessary to make the emergency declaration. This provision is included to ensure that any public protective actions resulting from the emergency classification are truly warranted by the plant conditions.

3.2.7 After-the-Fact Discovery of an Emergency Event or Condition

In some cases, an EAL may be met but the emergency classification was not made at the time of the event or condition. This situation can occur when personnel discover that an event or condition existed which met an EAL, but no emergency was declared, and the event or condition no longer exists at the time of discovery. This may be due to the event or condition not being recognized at the time or an error that was made in the emergency classification process.

In these cases, no emergency declaration is warranted; however, the guidance contained in NUREG-1022 (ref. 4.1.3) is applicable. Specifically, the event should be reported to the NRC in accordance with 10 CFR § 50.72 (ref. 4.1.4) within one hour of the discovery of the undeclared event or condition. The licensee should also notify appropriate State and local agencies in accordance with the agreed upon arrangements.

3.2.8 Retraction of an Emergency Declaration

Guidance on the retraction of an emergency declaration reported to the NRC is discussed in NUREG-1022 (ref. 4.1.3).

4.0 REFERENCES

4.1 Developmental

4.1.1 NEI 99-01 Revision 6, Methodology for the Development of Emergency Action Levels for Non-Passive Reactors, ADAMS Accession Number ML12326A805

4.1.2 RIS 2007-02 Clarification of NRC Guidance for Emergency Notifications During Quickly Changing Events, February 2, 2007.

4.1.3 NUREG-1022 Event Reporting Guidelines: 10CFR50.72 and 50.73

4.1.4 10 § CFR 50.72 Immediate Notification Requirements for Operating Nuclear Power Reactors

4.1.5 10 § CFR 50.73 License Event Report System

4.1.6 FSAR Figure 1.2.2-1, Site Plan

4.1.7 Technical Specifications Table 1.2 Operational Modes

4.1.8 Technical Specifications Section 3/4.9.4

4.1.9 PRO-NGGC-0201 NGG Procedure Writers Guide

4.1.10 NSIR/DPR-ISG-01 Interim Staff Guidance, Emergency Planning for Nuclear Power Plants

4.1.11 PLP-201 Emergency Plan

4.1.12 GP-008 Draining the Reactor Coolant System

4.1.13 NCR 573223

4.2 Implementing

4.2.1 PEP-110, Emergency Classification and Protective Action Recommendations

4.2.2 NEI 99-01 Rev. 6 to HNP EAL Comparison Matrix

4.2.3 HNP EAL Matrix

5.0 DEFINITIONS, ACRONYMS & ABBREVIATIONS

5.1 Definitions (ref. 4.1.1 except as noted)

Selected terms used in Initiating Condition and Emergency Action Level statements are set in all capital letters (e.g., ALL CAPS). These words are defined terms that have specific meanings as used in this document. The definitions of these terms are provided below.

Alert

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 small fractions of the EPA Protective Action Guideline exposure levels.

Containment Closure

The procedurally defined actions taken to secure containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions.

As applied to HNP, Containment Closure is established when containment penetration closure is established in accordance with Technical Specifications 3/4.9.4 (ref. 4.1.8).

Emergency Action Level (EAL)

A pre-determined, site-specific, observable threshold for an Initiating Condition that, when met or exceeded, places the plant in a given emergency classification level.

Emergency Classification Level (ECL)

One of a set of names or titles established by the US Nuclear Regulatory Commission (NRC) for grouping off-normal events or conditions according to (1) potential or actual effects or consequences, and (2) resulting onsite and offsite response actions. The emergency classification levels, in ascending order of severity, are:

- Unusual Event (UE)
- Alert
- Site Area Emergency (SAE)
- General Emergency (GE)

EPA PAGs

Environment Protection Agency Protective Action Guidelines. The EPA PAGs are expressed in terms of dose commitment: 1 Rem TEDE or 5 Rem CDE Thyroid. Actual or projected offsite exposures in excess of the EPA PAGs requires HNP to recommend protective actions for the general public to offsite planning agencies.

Explosion

A rapid, violent and catastrophic failure of a piece of equipment due to combustion, chemical reaction or overpressurization. A release of steam (from high energy lines or components) or an electrical component failure (caused by short circuits, grounding, arcing, etc.) should not automatically be considered an explosion. Such events require a post-event inspection to determine if the attributes of an explosion are present.

Faulted

The term applied to a steam generator that has a steam leak on the secondary side of sufficient size to cause an uncontrolled drop in steam generator pressure or the steam generator to become completely depressurized.

Fire

Combustion characterized by heat and light. Sources of smoke such as slipping drive belts or overheated electrical equipment do not constitute fires. Observation of flame is preferred but is NOT required if large quantities of smoke and heat are observed.

Fission Product Barrier Threshold

A pre-determined, site-specific, observable threshold indicating the loss or potential loss of a fission product barrier.

Flooding

A condition where water is entering a room or area faster than installed equipment is capable of removal, resulting in a rise of water level within the room or area.

General Emergency

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 actions that result 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.

Hostage

A person(s) held as leverage against the station to ensure that demands will be met by the station.

Hostile Action

An act toward HNP or its personnel that includes the use of violent force to destroy equipment, take hostages, and/or intimidate the licensee to achieve an end. This includes attack by air, land, or water using guns, explosives, projectiles, vehicles, or other devices used to deliver destructive force. Other acts that satisfy the overall intent may be included. Hostile action should not be construed to include acts of civil disobedience or felonious acts that are not part of a concerted attack on HNP. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the owner controlled area).

Hostile Force

One or more individuals who are engaged in a determined assault, overtly or by stealth and deception, equipped with suitable weapons capable of killing, maiming, or causing destruction.

Imminent

The trajectory of events or conditions is such that an EAL will be met within a relatively short period of time regardless of mitigation or corrective actions.

Impede(d)

Personnel access to a room or area is hindered to an extent that extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is not routinely employed).

Initiating Condition (IC)

An event or condition that aligns with the definition of one of the four emergency classification levels by virtue of the potential or actual effects or consequences.

Maintain

Take appropriate action to hold the value of an identified parameter within specified limits.

Normal Levels

As applied to radiological IC/EALs, the highest reading in the past twenty-four hours excluding the current peak value.

Owner Controlled Area

That area surrounding the Protected Area beyond which HNP exercises access control.

Projectile

An object directed toward a Nuclear Power Plant that could cause concern for its continued operability, reliability, or personnel safety.

Protected Area

An area which normally encompasses all controlled areas within the security protected area fence as depicted in FSAR Figure 1.2.2-1, Site Plan (ref. 4.1.6).

RCS Intact

The RCS should be considered intact when the RCS pressure boundary is in its normal condition for the cold shutdown mode of operation (e.g., no freeze seals or nozzle dams).

Refueling Pathway

The reactor refueling cavity, spent fuel pool and fuel transfer canal comprise the refueling pathway.

Reduced Inventory

RCS water level greater than 36 inches below the Reactor Vessel Flange (ref. 4.1.12).

Ruptured

The condition of a steam generator in which primary-to-secondary leakage is of sufficient magnitude to require a safety injection.

Restore

Take the appropriate action required to return the value of an identified parameter to the applicable limits

Safety System

A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10CFR50.2):

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Security Condition

Any security event as listed in the approved security contingency plan that constitutes a threat/compromise to site security, threat/risk to site personnel, or a potential degradation to the level of safety of the plant. A security condition does not involve a hostile action.

Site Area Emergency

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 PAG exposure levels beyond the SITE BOUNDARY.

Site Boundary

A circle of approximately 2500 ft. radius from the center of the containment building (0.47 miles) (ref. 4.1.13).

Unisolable

An open or breached system line that cannot be isolated, remotely or locally.

Unplanned

A parameter change or an event that is not 1) the result of an intended evolution or 2) an expected plant response to a transient. The cause of the parameter change or event may be known or unknown.

Unusual Event

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.

Valid

An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Visible Damage

Damage to a component or structure that is readily observable without measurements, testing, or analysis. The visual impact of the damage is sufficient to cause concern regarding the operability or reliability of the affected component or structure.

5.2 Abbreviations/Acronyms

°F ..... Degrees Fahrenheit
° ..... Degrees
AC ..... Alternating Current
AP ..... Abnormal Operating Procedure
ATWS ..... Anticipated Transient Without Scram
CDE ..... Committed Dose Equivalent
CFR ..... Code of Federal Regulations
CSFST ..... Critical Safety Function Status Tree
DBA ..... Design Basis Accident
DC ..... Direct Current
EAL ..... Emergency Action Level
EC ..... Emergency Coordinator
ECCS ..... Emergency Core Cooling System
ECL ..... Emergency Classification Level
EOF ..... Emergency Operations Facility
EOP ..... Emergency Operating Procedure
EPA ..... Environmental Protection Agency
ERG ..... Emergency Response Guideline
EPIP ..... Emergency Plan Implementing Procedure
ESF ..... Engineered Safety Feature
FAA ..... Federal Aviation Administration
FBI ..... Federal Bureau of Investigation
FEMA ..... Federal Emergency Management Agency
FSAR ..... Final Safety Analysis Report
GE ..... General Emergency
HNP ..... Harris Nuclear Plant
IC ..... Initiating Condition
IPEEE ..... Individual Plant Examination of External Events (Generic Letter 88-20)
ISFSI ..... Independent Spent Fuel Storage Installation
K_{eff} ..... Effective Neutron Multiplication Factor
LCO ..... Limiting Condition of Operation
LER ..... Licensee Event Report
LOCA ..... Loss of Coolant Accident
LWR ..... Light Water Reactor
MPC ..... Maximum Permissible Concentration/Multi-Purpose Canister
MSIV ..... Main Steam Isolation Valve
MSL ..... Main Steam Line
mR, mRem, mrem, mREM ..... milli-Roentgen Equivalent Man
MW ..... Megawatt

RCS ..... Reactor Coolant System
NEI ..... Nuclear Energy Institute
NESP ..... National Environmental Studies Project
NPP ..... Nuclear Power Plant
NRC ..... Nuclear Regulatory Commission
NSSS ..... Nuclear Steam Supply System
NORAD ..... North American Aerospace Defense Command
(NO)UE ..... Notification of Unusual Event
OBE ..... Operating Basis Earthquake
OCA ..... Owner Controlled Area
ODCM ..... Off-site Dose Calculation Manual
ORO ..... Offsite Response Organization
PA ..... Protected Area
PAG ..... Protective Action Guideline
PRA/PSA ..... Probabilistic Risk Assessment / Probabilistic Safety Assessment
PWR ..... Pressurized Water Reactor
PSIG ..... Pounds per Square Inch Gauge
R ..... Roentgen
RAB ..... Reactor Auxiliary Building
Rem, rem, REM ..... Roentgen Equivalent Man
RETS ..... Radiological Effluent Technical Specifications
RPS ..... Reactor Protection System
RV ..... Reactor Vessel
RVLIS ..... Reactor Vessel Level Indicating System
SAR ..... Safety Analysis Report
SBGTS ..... Stand-By Gas Treatment System
SBO ..... Station Blackout
SCBA ..... Self-Contained Breathing Apparatus
SG ..... Steam Generator
SI ..... Safety Injection
SLC ..... Selected Licensee Commitment
SPDS ..... Safety Parameter Display System
SRO ..... Senior Reactor Operator
SSF ..... Safe Shutdown Facility
TEDE ..... Total Effective Dose Equivalent
TOAF ..... Top of Active Fuel
TSC ..... Technical Support Center
WOG ..... Westinghouse Owners Group

6.0 HNP-TO-NEI 99-01 Rev. 6 EAL CROSS-REFERENCE

This cross-reference is provided to facilitate association and location of a HNP EAL within the NEI 99-01 IC/EAL identification scheme. Further information regarding the development of the HNP EALs based on the NEI guidance can be found in the EAL Comparison Matrix.

HNP	NEI 99-01 Rev. 6	
EAL	**IC**	**Example EAL**
RU1.1	AU1	1, 2
RU1.2	AU1	3
RU2.1	AU2	1
RA1.1	AA1	1
RA1.2	AA1	2
RA1.3	AA1	3
RA1.4	AA1	4
RA2.1	AA2	1
RA2.2	AA2	2
RA2.3	AA2	3
RA3.1	AA3	1
RA3.2	AA3	2
RS1.1	AS1	1
RS1.2	AS1	2
RS1.3	AS1	3
RS2.1	AS2	1
RG1.1	AG1	1
RG1.2	AG1	2
RG1.3	AG1	3

HNP	NEI 99-01 Rev. 6	
EAL	**IC**	**Example EAL**
RG2.1	AG2	1
CU1.1	CU1	1
CU1.2	CU1	2
CU2.1	CU2	1
CU3.1	CU3	1
CU3.2	CU3	2
CU4.1	CU4	1
CU5.1	CU5	1, 2, 3
CA1.1	CA1	1
CA1.2	CA1	2
CA2.1	CA2	1
CA3.1	CA3	1, 2
CA6.1	CA6	1
CS1.1	CS1	1
CS1.2	CS1	2
CS1.3	CS1	3
CG1.1	CG1	1
CG1.2	CG1	2
FA1.1	FA1	1
FS1.1	FS1	1
FG1.1	FG1	1
HU1.1	HU1	1, 2 3
HU2.1	HU2	1
HU3.1	HU3	1

HNP	NEI 99-01 Rev. 6	
EAL	**IC**	**Example EAL**
HU3.2	HU3	2
HU3.3	HU3	3
HU3.4	HU3	4
HU4.1	HU4	1
HU4.2	HU4	2
HU4.3	HU4	3
HU4.4	HU4	4
HU7.1	HU7	1
HA1.1	HA1	1, 2
HA5.1	HA5	1
HA6.1	HA6	1
HA7.1	HA7	1
HS1.1	HS1	1
HS6.1	HS6	1
HS7.1	HS7	1
HG1.1	HG1	1
HG7.1	HG7	1
SU1.1	SU1	1
SU3.1	SU2	1
SU4.1	SU3	2
SU4.2	SU3	1
SU5.1	SU4	1, 2, 3
SU6.1	SU5	1
SU6.2	SU5	2

HNP	NEI 99-01 Rev. 6	
EAL	**IC**	**Example EAL**
SU7.1	SU6	1, 2, 3
SU8.1	SU7	1, 2
SA1.1	SA1	1
SA3.1	SA2	1
SA6.1	SA5	1
SA9.1	SA9	1
SS1.1	SS1	1
SS2.1	SS8	1
SS6.1	SS5	1
SG1.1	SG1	1
SG1.2	SG8	1

7.0 ATTACHMENTS

7.1 Attachment 1, Emergency Action Level Technical Bases

7.2 Attachment 2, Fission Product Barrier Matrix and Basis

7.3 Attachment 3, Safe Operation & Shutdown Areas Tables R-3/H-2 Bases

Category R – Abnormal Rad Release / Rad Effluent

EAL Group: ANY (EALs in this category are applicable to any plant condition, hot or cold.)

Many EALs are based on actual or potential degradation of fission product barriers because of the elevated potential for offsite radioactivity release. Degradation of fission product barriers though is not always apparent via non-radiological symptoms. Therefore, direct indication of elevated radiological effluents or area radiation levels are appropriate symptoms for emergency classification.

At lower levels, abnormal radioactivity releases may be indicative of a failure of containment systems or precursors to more significant releases. At higher release rates, offsite radiological conditions may result which require offsite protective actions. Elevated area radiation levels in plant may also be indicative of the failure of containment systems or preclude access to plant vital equipment necessary to ensure plant safety.

Events of this category pertain to the following subcategories:

1. Radiological Effluent

Direct indication of effluent radiation monitoring systems provides a rapid assessment mechanism to determine releases in excess of classifiable limits. Projected offsite doses, actual offsite field measurements or measured release rates via sampling indicate doses or dose rates above classifiable limits.

2. Irradiated Fuel Event

Conditions indicative of a loss of adequate shielding or damage to irradiated fuel may preclude access to vital plant areas or result in radiological releases that warrant emergency classification.

3. Area Radiation Levels

Sustained general area radiation levels which may preclude access to areas requiring continuous occupancy also warrant emergency classification.

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

Initiating Condition: Release of gaseous or liquid radioactivity greater than 2 times the ODCM limits for 60 minutes or longer

EAL:

RU1.1 Unusual Event

Reading on **any** Table R-1 effluent radiation monitor > column "UE" for ≥ 60 min. (Notes 1, 2, 3)

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.

Table R-1 Effluent Monitor Classification Thresholds

	Release Point	Monitor	GE	SAE	Alert	UE
Gaseous	Plant Vent	RM-21AV-3509-1SA	1.05E+8 µCi/sec	1.05E+7 µCi/sec	1.05E+6 µCi/sec	8.93E+3 µCi/sec
Gaseous	Turbine Building	RM-1TV-3536-1	4.60E+8 µCi/sec	4.60E+7 µCi/sec	4.60E+6 µCi/sec	1.08E+4 µCi/sec
Gaseous	Waste Process Building Vent 5	RM-1WV-3546-1	7.74E+9 µCi/sec	7.74E+8 µCi/sec	7.75E+7 µCi/sec	1.95E+5 µCi/sec
Gaseous	Waste Process Building Vent 5A	RM-1WV-3547-1	7.76E+9 µCi/sec	7.76E+8 µCi/sec	7.76E+7 µCi/sec	1.14E+4 µCi/sec
Liquid	Treated Laundry & Hot Shower Tank Discharge	REM-1WL-3540	—	—	—	7.02E-04 µCi/ml
Liquid	Waste Monitor/Waste Evaporator Condensate Tank Discharge	REM-21WL-3541	—	—	—	1.97E-03 µCi/ml
Liquid	Secondary Waste Sample Tank Discharge	REM-21WS-3542	—	—	—	7.02E-04 µCi/ml

Mode Applicability:

All

Definition(s):

None

Basis:

The column "UE" gaseous and liquid release values in Table R-1 represent two times the appropriate ODCM release rate limits associated with the specified monitors (ref. 1, 2).

The column "UE" liquid release values in Table R-1 represent two times the alarm setpoint of the specified monitors. The setpoints are established to ensure the ODCM release limits are not exceeded (ref. 1).

This IC addresses a potential decrease in the level of safety of the plant as indicated by a low-level radiological release that exceeds regulatory commitments for an extended period of time (e.g., an uncontrolled release). It includes any gaseous or liquid radiological release, monitored or un-monitored, including those for which a radioactivity discharge permit is normally prepared.

Nuclear power plants incorporate design features intended to control the release of radioactive effluents to the environment. Further, there are administrative controls established to prevent unintentional releases, and to control and monitor intentional releases. The occurrence of an extended, uncontrolled radioactive release to the environment is indicative of degradation in these features and/or controls.

Radiological effluent EALs are also included to provide a basis for classifying events and conditions that cannot be readily or appropriately classified on the basis of plant conditions alone. The inclusion of both plant condition and radiological effluent EALs more fully addresses the spectrum of possible accident events and conditions.

Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

Releases should not be prorated or averaged. For example, a release exceeding 4 times release limits for 30 minutes does not meet the EAL.

This EAL addresses normally occurring continuous radioactivity releases from monitored gaseous or liquid effluent pathways.

Escalation of the emergency classification level would be via IC RA1.

HNP Basis Reference(s):

1. Shearon Harris Nuclear Power Plant Offsite Dose Calculation Manual (ODCM) Section 3.0, Gaseous Effluents
2. EP-EALCALC-HNP-1401, HNP Radiological Effluent EAL Values Rev. 0
3. NEI 99-01 AU1

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

Initiating Condition: Release of gaseous or liquid radioactivity greater than 2 times the ODCM limits for 60 minutes or longer

EAL:

RU1.2	**Unusual Event**
Sample analysis for a gaseous or liquid release indicates a concentration or release rate > 2 x ODCM limits for ≥ 60 min. (Notes 1, 2)	

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.

Mode Applicability:

All

Definition(s):

None

Basis:

Releases in excess of two times the site Offsite Dose Calculation Manual (ODCM) (ref. 1) instantaneous limits that continue for 60 minutes or longer represent an uncontrolled situation and hence, a potential degradation in the level of safety. The final integrated dose (which is very low in the Unusual Event emergency class) is not the primary concern here; it is the degradation in plant control implied by the fact that the release was not isolated within 60 minutes.

This IC addresses a potential decrease in the level of safety of the plant as indicated by a low-level radiological release that exceeds regulatory commitments for an extended period of time (e.g., an uncontrolled release). It includes any gaseous or liquid radiological release, monitored or un-monitored, including those for which a radioactivity discharge permit is normally prepared.

Nuclear power plants incorporate design features intended to control the release of radioactive effluents to the environment. Further, there are administrative controls established to prevent unintentional releases, and to control and monitor intentional releases. The occurrence of an extended, uncontrolled radioactive release to the environment is indicative of degradation in these features and/or controls.

Radiological effluent EALs are also included to provide a basis for classifying events and conditions that cannot be readily or appropriately classified on the basis of plant conditions alone. The inclusion of both plant condition and radiological effluent EALs more fully addresses the spectrum of possible accident events and conditions.

Releases should not be prorated or averaged. For example, a release exceeding 4 times release limits for 30 minutes does not meet the EAL.

This EAL addresses uncontrolled gaseous or liquid releases that are detected by sample analyses or environmental surveys, particularly on unmonitored pathways (e.g., spills of radioactive liquids into storm drains, heat exchanger leakage in river water systems, etc.).

Escalation of the emergency classification level would be via IC RA1.

HNP Basis Reference(s):

1. Shearon Harris Nuclear Power Plant Offsite Dose Calculation Manual (ODCM)
2. NEI 99-01 AU1

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

Initiating Condition: Release of gaseous or liquid radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE

EAL:

RA1.1 Alert

Reading on **any** Table R-1 effluent radiation monitor > column "ALERT" for ≥ 15 min. (Notes 1, 2, 3, 4)

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. If dose assessment results are available, declaration should be based on dose assessment instead of radiation monitor values.

Table R-1 Effluent Monitor Classification Thresholds

Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Plant Vent	RM-21AV-3509-1SA	1.05E+8 µCi/sec	1.05E+7 µCi/sec	1.05E+6 µCi/sec	8.93E+3 µCi/sec
	Turbine Building	RM-1TV-3536-1	4.60E+8 µCi/sec	4.60E+7 µCi/sec	4.60E+6 µCi/sec	1.08E+4 µCi/sec
	Waste Process Building Vent 5	RM-1WV-3546-1	7.74E+9 µCi/sec	7.74E+8 µCi/sec	7.75E+7 µCi/sec	1.95E+5 µCi/sec
	Waste Process Building Vent 5A	RM-1WV-3547-1	7.76E+9 µCi/sec	7.76E+8 µCi/sec	7.76E+7 µCi/sec	1.14E+4 µCi/sec
Liquid	Treated Laundry & Hot Shower Tank Discharge	REM-1WL-3540	—	—	—	7.02E-04 µCi/ml
	Waste Monitor/Waste Evaporator Condensate Tank Discharge	REM-21WL-3541	—	—	—	1.97E-03 µCi/ml
	Secondary Waste Sample Tank Discharge	REM-21WS-3542	—	—	—	7.02E-04 µCi/ml

Mode Applicability:

All

Definition(s):

None

Basis:

This EAL address gaseous radioactivity releases, that for whatever reason, cause effluent radiation monitor readings corresponding to site boundary doses that exceed either:

- 10 mRem TEDE
- 50 mRem CDE Thyroid

The column "ALERT" gaseous effluent release values in Table R-1 correspond to calculated doses of 1% (10% of the calculated SAE thresholds) of the EPA Protective Action Guidelines (TEDE or CDE Thyroid) (ref. 1).

This IC addresses a release of gaseous or liquid radioactivity that results in projected or actual offsite doses greater than or equal to 1% of the EPA Protective Action Guides (PAGs). It includes both monitored and un-monitored releases. Releases of this magnitude represent an actual or potential substantial degradation of the level of safety of the plant as indicated by a radiological release that significantly exceeds regulatory limits (e.g., a significant uncontrolled release).

Radiological effluent EALs are also included to provide a basis for classifying events and conditions that cannot be readily or appropriately classified on the basis of plant conditions alone. The inclusion of both plant condition and radiological effluent EALs more fully addresses the spectrum of possible accident events and conditions.

The TEDE dose is set at 1% of the EPA PAG of 1,000 mrem while the 50 mrem thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

Escalation of the emergency classification level would be via IC RS1.

HNP Basis Reference(s):

1. EP-EALCALC-HNP-1401, HNP Radiological Effluent EAL Values Rev. 0
2. NEI 99-01 AA1

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

Initiating Condition: Release of gaseous or liquid radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE

EAL:

RA1.2 Alert

Dose assessment using actual meteorology indicates doses > 10 mrem TEDE or 50 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note, 4)

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. If dose assessment results are available, declaration should be based on dose assessment instead of radiation monitor values.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - A circle of approximately 2500 ft. radius from the center of the containment building (0.47 miles).

Basis:

Dose assessments are performed by computer-based methods (ref. 1)

This IC addresses a release of gaseous or liquid radioactivity that results in projected or actual offsite doses greater than or equal to 1% of the EPA Protective Action Guides (PAGs). It includes both monitored and un-monitored releases. Releases of this magnitude represent an actual or potential substantial degradation of the level of safety of the plant as indicated by a radiological release that significantly exceeds regulatory limits (e.g., a significant uncontrolled release).

Radiological effluent EALs are also included to provide a basis for classifying events and conditions that cannot be readily or appropriately classified on the basis of plant conditions alone. The inclusion of both plant condition and radiological effluent EALs more fully addresses the spectrum of possible accident events and conditions.

The TEDE dose is set at 1% of the EPA PAG of 1,000 mrem while the 50 mrem thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

Escalation of the emergency classification level would be via IC RS1.

ATTACHMENT 1
EAL Bases

HNP Basis Reference(s):

1. AD-EP-ALL-0202, Emergency Response Offsite Dose Assessment
2. NEI 99-01 AA1

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

Initiating Condition: Release of gaseous or liquid radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE

EAL:

RA1.3 Alert

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)

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.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - A circle of approximately 2500 ft. radius from the center of the containment building (0.47 miles).

Basis:

Dose assessments based on liquid releases are performed per Offsite Dose Calculation Manual (ref. 1).

This IC addresses a release of liquid radioactivity that results in projected or actual offsite doses greater than or equal to 1% of the EPA Protective Action Guides (PAGs). It includes both monitored and un-monitored releases. Releases of this magnitude represent an actual or potential substantial degradation of the level of safety of the plant as indicated by a radiological release that significantly exceeds regulatory limits (e.g., a significant uncontrolled release).

Radiological effluent EALs are also included to provide a basis for classifying events and conditions that cannot be readily or appropriately classified on the basis of plant conditions alone. The inclusion of both plant condition and radiological effluent EALs more fully addresses the spectrum of possible accident events and conditions.

The TEDE dose is set at 1% of the EPA PAG of 1,000 mrem while the 50 mrem thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

Escalation of the emergency classification level would be via IC RS1.

HNP Basis Reference(s):

1. Shearon Harris Nuclear Power Plant Offsite Dose Calculation Manual (ODCM)
2. NEI 99-01 AA1

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

Initiating Condition: Release of gaseous or liquid radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE

EAL:

RA1.4 Alert

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)

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.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - A circle of approximately 2500 ft. radius from the center of the containment building (0.47 miles).

Basis:

PEP-270, Activation and Operation of the Emergency Operations Facility and PEP-330, Radiological Consequences provide guidance for emergency or post-accident radiological environmental monitoring (ref. 1, 2).

This IC addresses a release of gaseous or liquid radioactivity that results in projected or actual offsite doses greater than or equal to 1% of the EPA Protective Action Guides (PAGs). It includes both monitored and un-monitored releases. Releases of this magnitude represent an actual or potential substantial degradation of the level of safety of the plant as indicated by a radiological release that significantly exceeds regulatory limits (e.g., a significant uncontrolled release).

Radiological effluent EALs are also included to provide a basis for classifying events and conditions that cannot be readily or appropriately classified on the basis of plant conditions alone. The inclusion of both plant condition and radiological effluent EALs more fully addresses the spectrum of possible accident events and conditions.

The TEDE dose is set at 1% of the EPA PAG of 1,000 mrem while the 50 mrem thyroid CDE

was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE. Escalation of the emergency classification level would be via IC RS1.

HNP Basis Reference(s):

1. PEP-270, Activation and Operation of the Emergency Operations Facility
2. PEP-330, Radiological Consequences
3. NEI 99-01 AA1

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

Initiating Condition: Release of gaseous radioactivity resulting in offsite dose greater than 100 mrem TEDE or 500 mrem thyroid CDE

EAL:

RS1.1 Site Area Emergency

Reading on **any** Table R-1 effluent radiation monitor > column "SAE" for ≥ 15 min. (Notes 1, 2, 3, 4)

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. If dose assessment results are available, declaration should be based on dose assessment instead of radiation monitor values.

Table R-1 Effluent Monitor Classification Thresholds

Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Plant Vent	RM-21AV-3509-1SA	1.05E+8 µCi/sec	1.05E+7 µCi/sec	1.05E+6 µCi/sec	8.93E+3 µCi/sec
	Turbine Building	RM-1TV-3536-1	4.60E+8 µCi/sec	4.60E+7 µCi/sec	4.60E+6 µCi/sec	1.08E+4 µCi/sec
	Waste Process Building Vent 5	RM-1WV-3546-1	7.74E+9 µCi/sec	7.74E+8 µCi/sec	7.75E+7 µCi/sec	1.95E+5 µCi/sec
	Waste Process Building Vent 5A	RM-1WV-3547-1	7.76E+9 µCi/sec	7.76E+8 µCi/sec	7.76E+7 µCi/sec	1.14E+4 µCi/sec
Liquid	Treated Laundry & Hot Shower Tank Discharge	REM-1WL-3540	—	—	—	7.02E-04 µCi/ml
	Waste Monitor/Waste Evaporator Condensate Tank Discharge	REM-21WL-3541	—	—	—	1.97E-03 µCi/ml
	Secondary Waste Sample Tank Discharge	REM-21WS-3542	—	—	—	7.02E-04 µCi/ml

Mode Applicability:

All

Definition(s):

None

Basis:

This EAL address gaseous radioactivity releases, that for whatever reason, cause effluent radiation monitor readings corresponding to site boundary doses that exceed either:

- 100 mRem TEDE
- 500 mRem CDE Thyroid

The column "SAE" gaseous effluent release value in Table R-1 corresponds to calculated doses of 10% of the EPA Protective Action Guidelines (TEDE or CDE Thyroid) (ref. 1).

This IC addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to 10% of the EPA Protective Action Guides (PAGs). It includes both monitored and un-monitored releases. Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public.

Radiological effluent EALs are also included to provide a basis for classifying events and conditions that cannot be readily or appropriately classified on the basis of plant conditions alone. The inclusion of both plant condition and radiological effluent EALs more fully addresses the spectrum of possible accident events and conditions.

The TEDE dose is set at 10% of the EPA PAG of 1,000 mrem while the 500 mrem thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

Escalation of the emergency classification level would be via IC RG1.

HNP Basis Reference(s):

1. EP-EALCALC-HNP-1401, HNP Radiological Effluent EAL Values Rev. 0
2. NEI 99-01 AS1

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

Initiating Condition: Release of gaseous radioactivity resulting in offsite dose greater than 100 mrem TEDE or 500 mrem thyroid CDE

EAL:

RS1.2	**Site Area Emergency**
Dose assessment using actual meteorology indicates doses > 100 mrem TEDE or 500 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)	

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. If dose assessment results are available, declaration should be based on dose assessment instead of radiation monitor values.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - A circle of approximately 2500 ft. radius from the center of the containment building (0.47 miles).

Basis:

Dose assessments are performed by computer-based methods (ref. 1)

This IC addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to 10% of the EPA Protective Action Guides (PAGs). It includes both monitored and un-monitored releases. Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public.

Radiological effluent EALs are also included to provide a basis for classifying events and conditions that cannot be readily or appropriately classified on the basis of plant conditions alone. The inclusion of both plant condition and radiological effluent EALs more fully addresses the spectrum of possible accident events and conditions.

The TEDE dose is set at 10% of the EPA PAG of 1,000 mrem while the 500 mrem thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

Escalation of the emergency classification level would be via IC RG1.

HNP Basis Reference(s):

1. AD-EP-ALL-0202, Emergency Response Offsite Dose Assessment
2. NEI 99-01 AS1

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

Initiating Condition: Release of gaseous radioactivity resulting in offsite dose greater than 100 mrem TEDE or 500 mrem thyroid CDE

EAL:

RS1.3 Site Area Emergency

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)

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.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - A circle of approximately 2500 ft. radius from the center of the containment building (0.47 miles).

Basis:

PEP-270, Activation and Operation of the Emergency Operations Facility and PEP-330, Radiological Consequences provide guidance for emergency or post-accident radiological environmental monitoring (ref. 1, 2).

This IC addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to 10% of the EPA Protective Action Guides (PAGs). It includes both monitored and un-monitored releases. Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public.

Radiological effluent EALs are also included to provide a basis for classifying events and conditions that cannot be readily or appropriately classified on the basis of plant conditions alone. The inclusion of both plant condition and radiological effluent EALs more fully addresses the spectrum of possible accident events and conditions.

The TEDE dose is set at 10% of the EPA PAG of 1,000 mrem while the 500 mrem thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

Escalation of the emergency classification level would be via IC RG1.

HNP Basis Reference(s):

1. PEP-270, Activation and Operation of the Emergency Operations Facility
2. PEP-330, Radiological Consequences
3. NEI 99-01 AS1

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

Initiating Condition: Release of gaseous radioactivity resulting in offsite dose greater than 1,000 mrem TEDE or 5,000 mrem thyroid CDE

EAL:

RG1.1 General Emergency

Reading on **any** Table R-1 effluent radiation monitor > column "GE" for ≥ 15 min. (Notes 1, 2, 3, 4)

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. If dose assessment results are available, declaration should be based on dose assessment instead of radiation monitor values.

Table R-1 Effluent Monitor Classification Thresholds

	Release Point	Monitor	GE	SAE	Alert	UE
Gaseous	Plant Vent	RM-21AV-3509-1SA	1.05E+8 µCi/sec	1.05E+7 µCi/sec	1.05E+6 µCi/sec	8.93E+3 µCi/sec
	Turbine Building	RM-1TV-3536-1	4.60E+8 µCi/sec	4.60E+7 µCi/sec	4.60E+6 µCi/sec	1.08E+4 µCi/sec
	Waste Process Building Vent 5	RM-1WV-3546-1	7.74E+9 µCi/sec	7.74E+8 µCi/sec	7.75E+7 µCi/sec	1.95E+5 µCi/sec
	Waste Process Building Vent 5A	RM-1WV-3547-1	7.76E+9 µCi/sec	7.76E+8 µCi/sec	7.76E+7 µCi/sec	1.14E+4 µCi/sec
Liquid	Treated Laundry & Hot Shower Tank Discharge	REM-1WL-3540	—	—	—	7.02E-04 µCi/ml
	Waste Monitor/Waste Evaporator Condensate Tank Discharge	REM-21WL-3541	—	—	—	1.97E-03 µCi/ml
	Secondary Waste Sample Tank Discharge	REM-21WS-3542	—	—	—	7.02E-04 µCi/ml

Mode Applicability:

All

Definition(s):

None

Basis:

This EAL address gaseous radioactivity releases, that for whatever reason, cause effluent radiation monitor readings corresponding to site boundary doses that exceed either:

- 1000 mRem TEDE
- 5000 mRem CDE Thyroid

The column "GE" gaseous effluent release values in Table R-1 correspond to calculated doses of 100% of the EPA Protective Action Guidelines (TEDE or CDE Thyroid) (ref. 1).

This IC addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to the EPA Protective Action Guides (PAGs). It includes both monitored and un-monitored releases. Releases of this magnitude will require implementation of protective actions for the public.

Radiological effluent EALs are also included to provide a basis for classifying events and conditions that cannot be readily or appropriately classified on the basis of plant conditions alone. The inclusion of both plant condition and radiological effluent EALs more fully addresses the spectrum of possible accident events and conditions.

The TEDE dose is set at the EPA PAG of 1,000 mrem while the 5,000 mrem thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

HNP Basis Reference(s):

1. EP-EALCALC-HNP-1401, HNP Radiological Effluent EAL Values Rev. 0
2. NEI 99-01 AG1

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

Initiating Condition: Release of gaseous radioactivity resulting in offsite dose greater than 1,000 mrem TEDE or 5,000 mrem thyroid CDE

EAL:

RG1.2	**General Emergency**
Dose assessment using actual meteorology indicates doses > 1,000 mrem TEDE or 5,000 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)	

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. If dose assessment results are available, declaration should be based on dose assessment instead of radiation monitor values.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - A circle of approximately 2500 ft. radius from the center of the containment building (0.47 miles).

Basis:

Dose assessments are performed by computer-based methods (ref. 1)

This IC addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to the EPA Protective Action Guides (PAGs). It includes both monitored and un-monitored releases. Releases of this magnitude will require implementation of protective actions for the public.

Radiological effluent EALs are also included to provide a basis for classifying events and conditions that cannot be readily or appropriately classified on the basis of plant conditions alone. The inclusion of both plant condition and radiological effluent EALs more fully addresses the spectrum of possible accident events and conditions.

The TEDE dose is set at the EPA PAG of 1,000 mrem while the 5,000 mrem thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

HNP Basis Reference(s):

1. AD-EP-ALL-0202, Emergency Response Offsite Dose Assessment

2. NEI 99-01 AG1

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

Initiating Condition: Release of gaseous radioactivity resulting in offsite dose greater than 1,000 mrem TEDE or 5,000 mrem thyroid CDE

EAL:

RG1.3 General Emergency

Field survey results indicate EITHER of the following at or beyond the SITE BOUNDARY:

- Closed window dose rates > 1,000 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 5,000 mrem for 60 min. of inhalation.

(Notes 1, 2)

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.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - A circle of approximately 2500 ft. radius from the center of the containment building (0.47 miles).

Basis:

PEP-270, Activation and Operation of the Emergency Operations Facility and PEP-330, Radiological Consequences provide guidance for emergency or post-accident radiological environmental monitoring (ref. 1, 2).

This IC addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to the EPA Protective Action Guides (PAGs). It includes both monitored and un-monitored releases. Releases of this magnitude will require implementation of protective actions for the public.

Radiological effluent EALs are also included to provide a basis for classifying events and conditions that cannot be readily or appropriately classified on the basis of plant conditions alone. The inclusion of both plant condition and radiological effluent EALs more fully addresses the spectrum of possible accident events and conditions.

The TEDE dose is set at the EPA PAG of 1,000 mrem while the 5,000 mrem thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

HNP Basis Reference(s):

1. PEP-270, Activation and Operation of the Emergency Operations Facility
2. PEP-330, Radiological Consequences
3. NEI 99-01 AG1

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

Initiating Condition: Unplanned loss of water level above irradiated fuel

EAL:

RU2.1 Unusual Event

UNPLANNED water level drop in the REFUELING PATHWAY as indicated by low water level alarm or indication (LI-5101A/LI-5102A/LI-5103A, LI-403 or RCS standpipe)

AND

UNPLANNED rise in corresponding area radiation levels as indicated by **any** Table R-2 area radiation monitors

Table R-2 Refueling Pathway Area Radiation Monitors

Containment

- RM-1CR-3561A-SA Containment Ventilation Isolation
- RM-1CR-3561B-SB Containment Ventilation Isolation
- RM-1CR-3561C-SA Containment Ventilation Isolation
- RM-1CR-3561D-SB Containment Ventilation Isolation

Fuel Handling Building

- RM-1FR-3564A-SA Spent Fuel Pool SW, SE, SW
- RM-1FR-3564B-SB Spent Fuel Pool SW, SE, SE
- RM-1FR-3565A-SA Spent Fuel Pool SW, SE, SW
- RM-1FR-3565B-SB Spent Fuel Pool SW, SE, SE
- RM-1FR-3566A-SA Spent Fuel Pool NE, NW, NE
- RM-1FR-3566B-SB Spent Fuel Pool NW, NE, NW
- RM-1FR-3567A-SA Spent Fuel Pool NW, NE, NW
- RM-1FR-3567B-SB Spent Fuel Pool NE, NW, NE

Mode Applicability:

All

Definition(s):

UNPLANNED - A parameter change or an event that is not 1) the result of an intended evolution or 2) an expected plant response to a transient. The cause of the parameter change or event may be known or unknown.

REFUELING PATHWAY - The reactor refueling cavity, spent fuel pool and fuel transfer canal comprise the refueling pathway.

Basis:

The spent fuel pool low water level alarm setpoint is actuated at a setpoint of 284 ft. (ref. 1, 2, 3). Water level restoration instructions are performed in accordance with AOPs (ref. 4, 5).

The listed SFP level and refueling cavity level instruments provide indication of REFUELING PATHWAY level drop (ref. 7, 8).

The specified radiation monitors are those expected to see increase area radiation levels as a result of a loss of REFUELING PATHWAY inventory (ref. 4, 5, 6). Increasing radiation indications on these monitors in the absence of indications of decreasing REFUELING CAVITY level are not classifiable under this EAL.

When the spent fuel pool and reactor cavity are connected, there could exist the possibility of uncovering irradiated fuel. Therefore, this EAL is applicable for conditions in which irradiated fuel is being transferred to and from the reactor vessel and spent fuel pool.

This IC addresses a decrease in water level above irradiated fuel sufficient to cause elevated radiation levels. This condition could be a precursor to a more serious event and is also indicative of a minor loss in the ability to control radiation levels within the plant. It is therefore a potential degradation in the level of safety of the plant.

A water level decrease will be primarily determined by indications from available level instrumentation. Other sources of level indications may include reports from plant personnel (e.g., from a refueling crew) or video camera observations (if available). A significant drop in the water level may also cause an increase in the radiation levels of adjacent areas that can be detected by monitors in those locations.

The effects of planned evolutions should be considered. For example, a refueling bridge area radiation monitor reading may increase due to planned evolutions such as lifting of the reactor vessel head or movement of a fuel assembly. Note that this EAL is applicable only in cases where the elevated reading is due to an unplanned loss of water level.

A drop in water level above irradiated fuel within the reactor vessel may be classified in accordance Recognition Category C during the Cold Shutdown and Refueling modes.

Escalation of the emergency classification level would be via IC RA2.

HNP Basis Reference(s):

1. APP-ALB-023-4-17, SPENT FP HI/LO LEVEL
2. APP-ALB-023-4-18, SFP C HI/LO LEVEL
3. APP-ALB-023-5-18, SFP D HI/LO LEVEL
4. AOP-013, Fuel Handling Accident
5. AOP-031, Loss of Refueling Cavity Integrity
6. AOP-005, Radiation Monitoring System
7. AOP-20, Loss of RCS Inventory or Residual Heat Removal While Shutdown – Basis Document
8. EC 89579
9. NEI 99-01 AU2

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

Initiating Condition: Significant lowering of water level above, or damage to, irradiated fuel

EAL:

RA2.1 **Alert**
Uncovery of irradiated fuel in the REFUELING PATHWAY

Mode Applicability:

All

Definition(s):

REFUELING PATHWAY- The reactor refueling cavity, spent fuel pool and fuel transfer canal comprise the refueling pathway.

Basis:

None.

This IC addresses events that have caused imminent or actual damage to an irradiated fuel assembly, or a significant lowering of water level within the spent fuel pool. These events present radiological safety challenges to plant personnel and are precursors to a release of radioactivity to the environment. As such, they represent an actual or potential substantial degradation of the level of safety of the plant.

This EAL escalates from RU2.1 in that the loss of level, in the affected portion of the REFUELING PATHWAY, is of sufficient magnitude to have resulted in uncovery of irradiated fuel. Indications of irradiated fuel uncovery may include direct or indirect visual observation (e.g., reports from personnel or camera images), as well as significant changes in water and radiation levels, or other plant parameters. Computational aids may also be used (e.g., a boil-off curve). Classification of an event using this EAL should be based on the totality of available indications, reports and observations.

While an area radiation monitor could detect an increase in a dose rate due to a lowering of water level in some portion of the REFUELING PATHWAY, the reading may not be a reliable indication of whether or not the fuel is actually uncovered. To the degree possible, readings should be considered in combination with other available indications of inventory loss.

A drop in water level above irradiated fuel within the reactor vessel may be classified in accordance Recognition Category C during the Cold Shutdown and Refueling modes.

Escalation of the emergency classification level would be via IC RS1.

HNP Basis Reference(s):

1. AOP-013, Fuel Handling Accident
2. AOP-031, Loss of Refueling Cavity Integrity
3. NEI 99-01 AA2

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

Initiating Condition: Significant lowering of water level above, or damage to, irradiated fuel

EAL:

RA2.2 Alert

Damage to irradiated fuel resulting in a release of radioactivity from the fuel as indicated by high alarm on **any** of the following:

- Table R-2 refueling pathway area radiation monitors
- REM-*1FL-3508A-SA, FHB Emergency Exhaust
- REM-*1FL-3508B-SB, FHB Emergency Exhaust

Table R-2 Refueling Pathway Area Radiation Monitors

Containment

- RM-1CR-3561A-SA Containment Ventilation Isolation
- RM-1CR-3561B-SB Containment Ventilation Isolation
- RM-1CR-3561C-SA Containment Ventilation Isolation
- RM-1CR-3561D-SB Containment Ventilation Isolation

Fuel Handling Building

- RM-1FR-3564A-SA Spent Fuel Pool SW, SE, SW
- RM-1FR-3564B-SB Spent Fuel Pool SW, SE, SE
- RM-1FR-3565A-SA Spent Fuel Pool SW, SE, SW
- RM-1FR-3565B-SB Spent Fuel Pool SW, SE, SE
- RM-1FR-3566A-SA Spent Fuel Pool NE, NW, NE
- RM-1FR-3566B-SB Spent Fuel Pool NW, NE, NW
- RM-1FR-3567A-SA Spent Fuel Pool NW, NE, NW
- RM-1FR-3567B-SB Spent Fuel Pool NE, NW, NE

Mode Applicability:

All

Definition(s):

None

Basis:

The specified radiation monitors are those expected to see increase area radiation levels as a result of damage to irradiated fuel (ref. 1, 2, 3).

The high alarm setpoints for the radiation monitors are set to be indicative of significant increases in area and/or airborne radiation (ref. 4, 5).

This IC addresses events that have caused imminent or actual damage to an irradiated fuel assembly, or a significant lowering of water level within the spent fuel pool. These events present radiological safety challenges to plant personnel and are precursors to a release of radioactivity to the environment. As such, they represent an actual or potential substantial degradation of the level of safety of the plant.

This EAL addresses a release of radioactive material caused by mechanical damage to irradiated fuel. Damaging events may include the dropping, bumping or binding of an assembly, or dropping a heavy load onto an assembly. A rise in readings on radiation monitors should be considered in conjunction with in-plant reports or observations of a potential fuel damaging event (e.g., a fuel handling accident).

Escalation of the emergency classification level would be via IC RS1.

HNP Basis Reference(s):

1. AOP-013, Fuel Handling Accident
2. AOP-031, Loss of Refueling Cavity Integrity
3. AOP-005, Radiation Monitoring System
4. DBD-304, Radiation Monitoring System & Gross Failed Fuel Detector
5. HPP-500, Radiation Monitoring System Data Base Manual
6. NEI 99-01 AA2

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

Initiating Condition: Significant lowering of water level above, or damage to, irradiated fuel

EAL:

RA2.3 **Alert**
Lowering of spent fuel pool level ≤ 270.7 ft. (Level 2)

Mode Applicability:

All

Definition(s):

None

Basis:

Post-Fukushima order EA-12-051 (ref.1) required the installation of reliable SFP level indication capable of identifying normal level (Level 1), SFP level 10 ft. above the top of the fuel racks (Level 2) and SFP level at the top of the fuel racks (Level 3).

The SFP level instruments consist of a three independent remote indicating channels (LI-5101A, LI-5102A and LI-5103A) each spanning approximately 25 ft. (260 ft. – 285 ft. indicated). Level 2 corresponds to an indicated SFP level of 270.7 ft. or approximately 10 ft. above the top of the SFP racks (ref. 2).

This IC addresses events that have caused imminent or actual damage to an irradiated fuel assembly, or a significant lowering of water level within the spent fuel pool. These events present radiological safety challenges to plant personnel and are precursors to a release of radioactivity to the environment. As such, they represent an actual or potential substantial degradation of the level of safety of the plant.

Spent fuel pool water level at this value is within the lower end of the level range necessary to prevent significant dose consequences from direct gamma radiation to personnel performing operations in the vicinity of the spent fuel pool. This condition reflects a significant loss of spent fuel pool water inventory and thus it is also a precursor to a loss of the ability to adequately cool the irradiated fuel assembles stored in the pool.

Escalation of the emergency classification level would be via IC RS2.

HNP Basis Reference(s):

1. NRC EA-12-051, Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation
2. EC 89579
3. NEI 99-01 AA2

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

Initiating Condition: Spent fuel pool level at the top of the fuel racks

EAL:

RS2.1	**Site Area Emergency**
Lowering of spent fuel pool level ≤ 260.7 ft. (Level 3)	

Mode Applicability:

All

Definition(s):

None

Basis:

Post-Fukushima order EA-12-051 (ref.1) required the installation of reliable SFP level indication capable of identifying normal level (Level 1), SFP level 10 ft. above the top of the fuel racks (Level 2) and SFP level at the top of the fuel racks (Level 3).

The SFP level instruments consist of a three independent remote indicating channels (LI-5101A, LI-5102A and LI-5103A) each spanning approximately 25 ft. (260 ft. – 285 ft. indicated). Level 3 corresponds to an indicated SFP level of 260.7 ft. which is the top of the SFP racks (ref. 2).

This EAL addresses a significant loss of spent fuel pool inventory control and makeup capability leading to IMMINENT fuel damage. This condition entails major failures of plant functions needed for protection of the public and thus warrant a Site Area Emergency declaration.

It is recognized that this IC would likely not be met until well after another Site Area Emergency IC was met; however, it is included to provide classification diversity.

Escalation of the emergency classification level would be via IC RG1 or RG2.

HNP Basis Reference(s):

1. NRC EA-12-051, Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation
2. EC 89579
3. NEI 99-01 AS2

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

Initiating Condition: Spent fuel pool level cannot be restored to at least the top of the fuel racks for 60 minutes or longer

EAL:

RG2.1	**General Emergency**
Spent fuel pool level cannot be restored to at least 260.7 ft. (Level 3) for ≥ 60 min. (Note 1)	

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

Mode Applicability:

All

Definition(s):

None

Basis:

Post-Fukushima order EA-12-051 (ref.1) required the installation of reliable SFP level indication capable of identifying normal level (Level 1), SFP level 10 ft. above the top of the fuel racks (Level 2) and SFP level at the top of the fuel racks (Level 3).

The SFP level instruments consist of a three independent remote indicating channels (LI-5101A, LI-5102A and LI-5103A) each spanning approximately 25 ft. (260 ft. – 285 ft. indicated). Level 3 corresponds to an indicated SFP level of 260.7 ft. which is the top of the SFP racks (ref. 2).

This EAL addresses a significant loss of spent fuel pool inventory control and makeup capability leading to a prolonged uncovery of spent fuel. This condition will lead to fuel damage and a radiological release to the environment.

It is recognized that this IC would likely not be met until well after another General Emergency IC was met; however, it is included to provide classification diversity.

HNP Basis Reference(s):

1. NRC EA-12-051, Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation
2. EC 89579
3. NEI 99-01 AG2

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 3 – Area Radiation Levels

Initiating Condition: Radiation levels that IMPEDE access to equipment necessary for normal plant operations, cooldown or shutdown

EAL:

RA3.1 Alert

Dose rates > 15 mR/hr in **EITHER** of the following areas:

Control Room (RM-21RR-3560-SA)

OR

Central Alarm Station (by survey)

Mode Applicability:

All

Definition(s):

IMPEDE(D) - Personnel access to a room or area is hindered to an extent that extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is not routinely employed).

Basis:

Areas that meet this threshold include the Control Room and the Central Alarm Station (CAS). RM-21RR-3560-SA monitors the Control room for area radiation (ref. 1, 2). The CAS is included in this EAL because of its' importance to permitting access to areas required to assure safe plant operations.

There is no permanently installed CAS area radiation monitors that may be used to assess this EAL threshold. Therefore this threshold must be assessed via local radiation survey for the CAS.

This IC addresses elevated radiation levels in certain plant rooms/areas sufficient to preclude or impede personnel from performing actions necessary to maintain normal plant operation, or to perform a normal plant cooldown and shutdown. As such, it represents an actual or potential substantial degradation of the level of safety of the plant. The Emergency Coordinator should consider the cause of the increased radiation levels and determine if another IC may be applicable.

Escalation of the emergency classification level would be via Recognition Category R, C or F ICs.

HNP Basis Reference(s):

1. HPP-500, Radiation Monitoring System Data Base Manual
2. DBD-304, Radiation Monitoring System & Gross Failed Fuel Detector

3. NEI 99-01 AA3

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 3 – Area Radiation Levels

Initiating Condition: Radiation levels that IMPEDE access to equipment necessary for normal plant operations, cooldown or shutdown

EAL:

RA3.2 Alert

An UNPLANNED event results in radiation levels that prohibit or impede access to **any** Table R-3/H-2 rooms or areas (Note 5)

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.

Table R-3/H-2 Safe Operation & Shutdown Rooms/Areas

Room/Area	Mode(s)
RAB 190 (RHR pumps)	4
RAB 216 (BIT)	1, 2, 3, 4, 5
RAB 236 (CSIP, Primary Sample Sink, AFW pumps, CCW pumps and HX, Boric Acid Transfer Pumps, Mezzanine Area)	1, 2, 3, 4, 5
RAB 261 (RHR Heat Exchangers, Demin. Valve Gallery, VCT Valve Gallery)	1, 2, 3, 4, 5
RAB 286 (Switchgear)	3,4,5
Steam Tunnel	1, 2, 3, 4
ESW intakes	1, 2, 3, 4, 5

Mode Applicability:

All

Definition(s):

IMPEDE(D) - Personnel access to a room or area is hindered to an extent that extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is not routinely employed).

UNPLANNED - A parameter change or an event that is not 1) the result of an intended evolution or 2) an expected plant response to a transient. The cause of the parameter change or event may be known or unknown.

Basis:

If the equipment in the listed room or area was already inoperable, or out-of-service, before the event occurred, then no emergency should be declared since the event will have no adverse impact beyond that already allowed by Technical Specifications at the time of the event.

The list of plant rooms or areas with entry-related mode applicability identified specify those rooms or areas that contain equipment which require a manual/local action as specified in operating procedures used for normal plant operation, cooldown and shutdown. Rooms or areas in which actions of a contingent or emergency nature would be performed (e.g., an action to address an off-normal or emergency condition such as emergency repairs, corrective measures or emergency operations) are not included. In addition, the list specifies the plant mode(s) during which entry would be required for each room or area (ref. 1).

This IC addresses elevated radiation levels in certain plant rooms/areas sufficient to preclude or impede personnel from performing actions necessary to maintain normal plant operation, or to perform a normal plant cooldown and shutdown. As such, it represents an actual or potential substantial degradation of the level of safety of the plant. The Emergency Coordinator should consider the cause of the increased radiation levels and determine if another IC may be applicable.

For RA3.2, an Alert declaration is warranted if entry into the affected room/area is, or may be, procedurally required during the plant operating mode in effect at the time of the elevated radiation levels. The emergency classification is not contingent upon whether entry is actually necessary at the time of the increased radiation levels. Access should be considered as impeded if extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., installing temporary shielding, requiring use of non-routine protective equipment, requesting an extension in dose limits beyond normal administrative limits).

An emergency declaration is not warranted if any of the following conditions apply:

- The plant is in an operating mode different than the mode specified for the affected room/area (i.e., entry is not required during the operating mode in effect at the time of the elevated radiation levels). For example, the plant is in Mode 1 when the radiation increase occurs, and the procedures used for normal operation, cooldown and shutdown do not require entry into the affected room until Mode 4.
- The increased radiation levels are a result of a planned activity that includes compensatory measures which address the temporary inaccessibility of a room or area (e.g., radiography, spent filter or resin transfer, etc.).
- The action for which room/area entry is required is of an administrative or record keeping nature (e.g., normal rounds or routine inspections).
- The access control measures are of a conservative or precautionary nature, and would not actually prevent or impede a required action.

If the equipment in the listed room or area was already inoperable, or out-of-service, before the event occurred, then no emergency should be declared since the event will have no adverse impact beyond that already allowed by Technical Specifications at the time of the event.

Escalation of the emergency classification level would be via Recognition Category R, C or F ICs.

HNP Basis Reference(s):

1. Attachment 3, Safe Operation & Shutdown Rooms/Areas Tables R-3/H-2 Bases
2. NEI 99-01 AA3

Category C – Cold Shutdown / Refueling System Malfunction

EAL Group: Cold Conditions (RCS temperature ≤ 200°F); EALs in this category are applicable only in one or more cold operating modes.

Category C EALs are directly associated with cold shutdown or refueling system safety functions. Given the variability of plant configurations (e.g., systems out-of-service for maintenance, containment open, reduced AC power redundancy, time since shutdown) during these periods, the consequences of any given initiating event can vary greatly. For example, a loss of decay heat removal capability that occurs at the end of an extended outage has less significance than a similar loss occurring during the first week after shutdown. Compounding these events is the likelihood that instrumentation necessary for assessment may also be inoperable. The cold shutdown and refueling system malfunction EALs are based on performance capability to the extent possible with consideration given to RCS integrity, containment closure, and fuel clad integrity for the applicable operating modes (5 - Cold Shutdown, 6 - Refueling, D – Defueled).

The events of this category pertain to the following subcategories:

1. RCS Level

Reactor Vessel or RCS water level is directly related to the status of adequate core cooling and, therefore, fuel clad integrity.

2. Loss of Emergency AC Power

Loss of emergency plant electrical power can compromise plant safety system operability including decay heat removal and emergency core cooling systems which may be necessary to ensure fission product barrier integrity. This category includes loss of onsite and offsite power sources for 6.9 KV safeguard buses.

3. RCS Temperature

Uncontrolled or inadvertent temperature or pressure increases are indicative of a potential loss of safety functions.

4. Loss of Vital DC Power

Loss of emergency plant electrical power can compromise plant safety system operability including decay heat removal and emergency core cooling systems which may be necessary to ensure fission product barrier integrity. This category includes loss of power to or degraded voltage on the 125 VDC safeguard buses.

5. Loss of Communications

Certain events that degrade plant operator ability to effectively communicate with essential personnel within or external to the plant warrant emergency classification.

6. Hazardous Event Affecting Safety Systems

Certain hazardous natural and technological events may result in visible damage to or degraded performance of safety systems warranting classification.

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: UNPLANNED loss of RCS inventory for 15 minutes or longer

EAL:

CU1.1 Unusual Event
UNPLANNED loss of reactor coolant results in RCS water level less than a required lower limit for ≥ 15 min. (Note 1)

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

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

UNPLANNED - A parameter change or an event that is not 1) the result of an intended evolution or 2) an expected plant response to a transient. The cause of the parameter change or event may be known or unknown.

Basis:

RCS water level less than a required lower limit is meant to be less than the lower end of the level control band being procedurally maintained for the current condition or evolution.

With the plant in Cold Shutdown, RCS water level is normally maintained above the pressurizer low level setpoint of 17% (ref. 1, 2). However, if RCS level is being controlled below the pressurizer low level setpoint, or if level is being maintained in a designated band in the reactor vessel it is the inability to maintain level above the low end of the designated control band due to a loss of inventory resulting from a leak in the RCS that is the concern.

With the plant in Refueling mode, RCS water level is normally maintained at or above the reactor vessel flange (ref. 2, 3, 4).

This IC addresses the inability to restore and maintain water level to a required minimum level (or the lower limit of a level band), or a loss of the ability to monitor RCS level concurrent with indications of coolant leakage. Either of these conditions is considered to be a potential degradation of the level of safety of the plant.

Refueling evolutions that decrease RCS water inventory are carefully planned and controlled. An UNPLANNED event that results in water level decreasing below a procedurally required limit warrants the declaration of an Unusual Event due to the reduced water inventory that is available to keep the core covered.

This EAL recognizes that the minimum required RCS level can change several times during the course of a refueling outage as different plant configurations and system lineups are implemented. This EAL is met if the minimum level, specified for the current plant conditions, cannot be maintained for 15 minutes or longer. The minimum level is typically specified in the applicable operating procedure but may be specified in another controlling document.

The 15-minute threshold duration allows sufficient time for prompt operator actions to restore and maintain the expected water level. This criterion excludes transient conditions causing a brief lowering of water level.

Continued loss of RCS inventory may result in escalation to the Alert emergency classification level via either IC CA1 or CA3.

HNP Basis Reference(s):

1. APP-ALB-009, Main Control Board
2. GP-001, Reactor Coolant System Fill and Vent Mode 5
3. GP-008, Draining the Reactor Coolant System
4. GP-009, Refueling Cavity Fill, Refueling and Drain of the Refueling Cavity Modes 5-6-5
5. NEI 99-01 CU1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: UNPLANNED loss of RCS inventory for 15 minutes or longer

EAL:

CU1.2 Unusual Event

RCS water level cannot be monitored

AND EITHER

- UNPLANNED increase in **any** Table C-1 sump or tank due to a loss of RCS inventory
- Visual observation of UNISOLABLE RCS leakage

Table C-1 Sumps / Tanks
• Containment sumps • PRT • RCDT • CCW surge tank • RAB sumps • RWST • RMWST • Recycle Holdup Tank

Mode Applicability:

5 - Cold Shutdown, 6 – Refueling

Definition(s):

UNISOLABLE - An open or breached system line that cannot be isolated, remotely or locally.

UNPLANNED - A parameter change or an event that is not 1) the result of an intended evolution or 2) an expected plant response to a transient. The cause of the parameter change or event may be known or unknown.

Basis:

In Cold Shutdown mode, the RCS will normally be intact and standard RCS level monitoring means are available. RCS level in the Refueling mode is normally monitored using the standpipe.

In this EAL, all water level indication is unavailable and the RCS inventory loss must be detected by indirect leakage indications. Level increases must be evaluated against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of RCS leakage. If the make-up rate to the RCS unexplainably rises above the pre-established rate, a loss of RCS inventory may be occurring even if the source of the leakage cannot be immediately identified. Sumps and tanks where RCS leakage may accumulate are listed in listed in Table C-1. Visual observation of leakage from systems connected to the RCS that cannot be isolated could also be indicative of a loss of RCS inventory (ref. 1, 2).

This IC addresses the inability to restore and maintain water level to a required minimum level (or the lower limit of a level band), or a loss of the ability to monitor RCS level concurrent with indications of coolant leakage. Either of these conditions is considered to be a potential degradation of the level of safety of the plant.

Refueling evolutions that decrease RCS water inventory are carefully planned and controlled. An UNPLANNED event that results in water level decreasing below a procedurally required limit warrants the declaration of an Unusual Event due to the reduced water inventory that is available to keep the core covered.

This EAL addresses a condition where all means to determine RPV level have been lost. In this condition, operators may determine that an inventory loss is occurring by observing changes in sump and/or tank levels. Sump and/or tank level changes must be evaluated against other potential sources of water flow to ensure they are indicative of leakage from the RCS.

Continued loss of RCS inventory may result in escalation to the Alert emergency classification level via either IC CA1 or CA3.

HNP Basis Reference(s):

1. GP-001, Reactor Coolant System Fill and Vent Mode 5
2. GP-008, Draining the Reactor Coolant System
3. GP-009, Refueling Cavity Fill, Refueling and Drain of the Refueling Cavity Modes 5-6-5
4. NEI 99-01 CU1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Loss of RCS inventory

EAL:

CA1.1 **Alert**
Loss of RCS inventory as indicated by LI-403 or RCS standpipe level < - 82 in.

Mode Applicability:

5 - Cold Shutdown, 6 – Refueling

Definition(s):

None

Basis:

LI-403 or RCS standpipe level of - 82" corresponds to the minimum RCS level for continued RHR pump operation (ref. 1, 2, 3).

This IC addresses conditions that are precursors to a loss of the ability to adequately cool irradiated fuel (i.e., a precursor to a challenge to the fuel clad barrier). This condition represents a potential substantial reduction in the level of plant safety.

For this EAL, a lowering of RCS water level below 82" below the reactor vessel flange indicates that operator actions have not been successful in restoring and maintaining RCS water level. The heat-up rate of the coolant will increase as the available water inventory is reduced. A continuing decrease in water level will lead to core uncovery.

Although related, this EAL is concerned with the loss of RCS inventory and not the potential concurrent effects on systems needed for decay heat removal (e.g., loss of a Residual Heat Removal suction point). An increase in RCS temperature caused by a loss of decay heat removal capability is evaluated under IC CA3.

If the RCS inventory water level continues to lower, then escalation to Site Area Emergency would be via IC CS1.

HNP Basis Reference(s):

1. GP-008, Draining the Reactor Coolant System
2. AOP-20, Loss of RCS Inventory or Residual Heat Removal While Shutdown
3. AOP-20, Loss of RCS Inventory or Residual Heat Removal While Shutdown – Basis Document
4. NEI 99-01 CA1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Loss of RCS inventory

EAL:

CA1.2 Alert

RCS water level cannot be monitored for ≥ 15 min. (Note 1)

AND EITHER

- UNPLANNED increase in **any** Table C-1 sump or tank due to a loss of RCS inventory
- Visual observation of UNISOLABLE RCS leakage

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

Table C-1 Sumps / Tanks
• Containment sumps • PRT • RCDT • CCW surge tank • RAB sumps • RWST • RMWST • Recycle Holdup Tank

Mode Applicability:

5 - Cold Shutdown, 6 – Refueling

Definition(s):

UNISOLABLE - An open or breached system line that cannot be isolated, remotely or locally.

UNPLANNED - A parameter change or an event that is not 1) the result of an intended evolution or 2) an expected plant response to a transient. The cause of the parameter change or event may be known or unknown.

Basis:

In Cold Shutdown mode, the RCS will normally be intact and standard RPV level monitoring means are available. In the Refuel mode, the RCS is not intact and RPV level may be monitored by different means, including the ability to monitor level visually.

In this EAL, all RCS water level indication would be unavailable for greater than 15 minutes, and the RCS inventory loss must be detected by indirect leakage indications. Sump level increases must be evaluated against other potential sources of leakage. If the make-up rate to the RCS unexplainably rises above the pre-established rate, a loss of RCS inventory may be occurring even if the source of the leakage cannot be immediately identified. Sumps and tanks where RCS leakage may accumulate are listed in listed in Table C-1. Visual observation of leakage from systems connected to the RCS that cannot be isolated could also be indicative of a loss of RCS inventory (ref. 1, 2).

This IC addresses conditions that are precursors to a loss of the ability to adequately cool irradiated fuel (i.e., a precursor to a challenge to the fuel clad barrier). This condition represents a potential substantial reduction in the level of plant safety.

For this EAL, the inability to monitor RCS level may be caused by instrumentation and/or power failures, or water level dropping below the range of available instrumentation. If water level cannot be monitored, operators may determine that an inventory loss is occurring by observing changes in sump and/or tank levels. Sump and/or tank level changes must be evaluated against other potential sources of water flow to ensure they are indicative of leakage from the RCS.

The 15-minute duration for the loss of level indication was chosen because it is half of the EAL duration specified in IC CS1.

If the RCS inventory level continues to lower, then escalation to Site Area Emergency would be via IC CS1.

HNP Basis Reference(s):

1. GP-001, Reactor Coolant System Fill and Vent Mode 5
2. GP-008, Draining the Reactor Coolant System
3. GP-009, Refueling Cavity Fill, Refueling and Drain of the Refueling Cavity Modes 5-6-5
4. NEI 99-01 CA1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Loss of RCS inventory affecting core decay heat removal capability

EAL:

CS1.1 **Site Area Emergency**
With CONTAINMENT CLOSURE **not** established, RCS level < 70% RVLIS Full Range

Mode Applicability:

5 – Cold Shutdown, 6 – Refueling

Definition(s):

CONTAINMENT CLOSURE - The procedurally defined actions taken to secure containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions. As applied to HNP, Containment Closure is established when containment penetration closure is established in accordance with Technical Specifications 3/4.9.4.

Basis:

70% RVLIS Full Range (ref. 1, 2) corresponds to the level of six inches below the bottom ID of the RCS hot leg penetration (252.04' el.). 6% has been added to the RVLIS setpoint to account for instrument uncertainties (ref. 2).

This IC addresses a significant and prolonged loss of RCS inventory control and makeup capability leading to IMMINENT fuel damage. The lost inventory may be due to a RCS component failure, a loss of configuration control or prolonged boiling of reactor coolant. These conditions entail major failures of plant functions needed for protection of the public and thus warrant a Site Area Emergency declaration.

Following an extended loss of core decay heat removal and inventory makeup, decay heat will cause reactor coolant boiling and a further reduction in reactor vessel level. If RCS level cannot be restored, fuel damage is probable.

Outage/shutdown contingency plans typically provide for re-establishing or verifying CONTAINMENT CLOSURE following a loss of heat removal or RCS inventory control functions. The difference in the specified RCS levels of CS1.1 and CS1.2 reflect the fact that with CONTAINMENT CLOSURE established, there is a lower probability of a fission product release to the environment.

This EAL addresses concerns raised by Generic Letter 88-17, Loss of Decay Heat Removal; SECY 91-283, Evaluation of Shutdown and Low Power Risk Issues; NUREG-1449, Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States; and NUMARC 91-06, Guidelines for Industry Actions to Assess Shutdown Management.

Escalation of the emergency classification level would be via IC CG1 or RG1

HNP Basis Reference(s):

1. GP-008, Draining the Reactor Coolant System

2. EOP Setpoint Study, Revision 19, 4.0, FN K03
3. NEI 99-01 CS1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Loss of RCS inventory affecting core decay heat removal capability

EAL:

CS1.2	**Site Area Emergency**
With CONTAINMENT CLOSURE established, RCS level < 63% RVLIS Full Range	

Mode Applicability:

5 – Cold Shutdown, 6 – Refueling

Definition(s):

CONTAINMENT CLOSURE - The procedurally defined actions taken to secure containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions. As applied to HNP, Containment Closure is established when containment penetration closure is established in accordance with Technical Specifications 3/4.9.4.

Basis:

63% RVLIS Full Range (ref. 1, 2) corresponds to the top of active fuel (249.01' el.). Other RCS level instruments are off-scale low when core uncovery occurs. 6% has been added to the RVLIS setpoint to account for instrument uncertainties (ref. 2).

This IC addresses a significant and prolonged loss of RCS inventory control and makeup capability leading to IMMINENT fuel damage. The lost inventory may be due to a RCS component failure, a loss of configuration control or prolonged boiling of reactor coolant. These conditions entail major failures of plant functions needed for protection of the public and thus warrant a Site Area Emergency declaration.

Following an extended loss of core decay heat removal and inventory makeup, decay heat will cause reactor coolant boiling and a further reduction in reactor vessel level. If RCS level cannot be restored, fuel damage is probable.

Outage/shutdown contingency plans typically provide for re-establishing or verifying CONTAINMENT CLOSURE following a loss of heat removal or RCS inventory control functions. The difference in the specified RCS levels of CS1.1 and CS1.2 reflect the fact that with CONTAINMENT CLOSURE established, there is a lower probability of a fission product release to the environment.

This EAL addresses concerns raised by Generic Letter 88-17, Loss of Decay Heat Removal; SECY 91-283, Evaluation of Shutdown and Low Power Risk Issues; NUREG-1449, Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States; and NUMARC 91-06, Guidelines for Industry Actions to Assess Shutdown Management.

Escalation of the emergency classification level would be via IC CG1 or RG1

HNP Basis Reference(s):

1. GP-008, Draining the Reactor Coolant System

2. EOP Setpoint Study, Revision 19, 4.0, FN K03
3. NEI 99-01 CS1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Loss of RCS inventory affecting core decay heat removal capability

EAL:

CS1.3 Site Area Emergency

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 or tank of sufficient magnitude to indicate core uncovery
- Containment radiation > 10,000 R/hr (RM-1CR-3589-SA or RM-1CR-3590-SB)
- Erratic source range monitor indication

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

Table C-1 Sumps / Tanks
• Containment sumps • PRT • RCDT • CCW surge tank • RAB sumps • RWST • RMWST • Recycle Holdup Tank

Mode Applicability:

5 – Cold Shutdown, 6 – Refueling

Definition(s):

UNISOLABLE - An open or breached system line that cannot be isolated, remotely or locally.

UNPLANNED - A parameter change or an event that is not 1) the result of an intended evolution or 2) an expected plant response to a transient. The cause of the parameter change or event may be known or unknown.

Basis:

In this EAL, all RCS water level indication would be unavailable for greater than 30 minutes, and the RCS inventory loss must be detected by indirect leakage indications. Sump level

increases must be evaluated against other potential sources of leakage. If the make-up rate to the RCS unexplainably rises above the pre-established rate, a loss of RCS inventory may be occurring even if the source of the leakage cannot be immediately identified. Sumps and tanks where RCS leakage may accumulate are listed in listed in Table C-1(ref. 1, 2).

In the Refueling Mode, as water level in the reactor vessel lowers, the dose rate above the core will increase. The dose rate due to this core shine should result in indications on installed area radiation monitors (RM-1CR-3589-SA or RM-1CR-3590-SB). If these radiation monitors reach and exceed 10,000 R/hr, a loss of inventory with potential to uncover the core is likely to have occurred (ref. 4).

Post-TMI accident studies indicated that the installed PWR nuclear instrumentation will operate erratically when the core is uncovered and that this should be used as a tool for making such determinations.

This IC addresses a significant and prolonged loss of RCS inventory control and makeup capability leading to IMMINENT fuel damage. The lost inventory may be due to a RCS component failure, a loss of configuration control or prolonged boiling of reactor coolant. These conditions entail major failures of plant functions needed for protection of the public and thus warrant a Site Area Emergency declaration.

Following an extended loss of core decay heat removal and inventory makeup, decay heat will cause reactor coolant boiling and a further reduction in reactor vessel level. If RCS level cannot be restored, fuel damage is probable.

The 30-minute criterion is tied to a readily recognizable event start time (i.e., the total loss of ability to monitor level), and allows sufficient time to monitor, assess and correlate reactor and plant conditions to determine if core uncovery has actually occurred (i.e., to account for various accident progression and instrumentation uncertainties). It also allows sufficient time for performance of actions to terminate leakage, recover inventory control/makeup equipment and/or restore level monitoring.

The inability to monitor RCS level may be caused by instrumentation and/or power failures, or water level dropping below the range of available instrumentation. If water level cannot be monitored, operators may determine that an inventory loss is occurring by observing changes in sump and/or tank levels. Sump and/or tank level changes must be evaluated against other potential sources of water flow to ensure they are indicative of leakage from the RCS.

This EAL addresses concerns raised by Generic Letter 88-17, Loss of Decay Heat Removal; SECY 91-283, Evaluation of Shutdown and Low Power Risk Issues; NUREG-1449, Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States; and NUMARC 91-06, Guidelines for Industry Actions to Assess Shutdown Management.

Escalation of the emergency classification level would be via IC CG1 or RG1

HNP Basis Reference(s):

1. GP-001, Reactor Coolant System Fill and Vent Mode 5
2. GP-008, Draining the Reactor Coolant System
3. GP-009, Refueling Cavity Fill, Refueling and Drain of the Refueling Cavity Modes 5-6-5
4. AOP-031-BD, Loss of Refueling Cavity Integrity- Basis Document
5. NEI 99-01 CS1

ATTACHMENT 1
EAL Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Loss of RCS inventory affecting fuel clad integrity with containment challenged

EAL:

CG1.1 General Emergency
RCS level < 63% RVLIS Full Range for ≥ 30 min. (Note 1)
AND
Any Containment Challenge indication, Table C-2

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.

Table C-2 Containment Challenge Indications
• CONTAINMENT CLOSURE **not** established (Note 6)
• Containment hydrogen concentration ≥ 4%
• UNPLANNED rise in Containment pressure

Mode Applicability:

5 - Cold Shutdown, 6 – Refueling

Definition(s):

CONTAINMENT CLOSURE - The procedurally defined actions taken to secure containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions. As applied to HNP, Containment Closure is established when containment penetration closure is established in accordance with Technical Specifications 3/4.9.4.

UNPLANNED - A parameter change or an event that is not 1) the result of an intended evolution or 2) an expected plant response to a transient. The cause of the parameter change or event may be known or unknown.

Basis:

63% RVLIS Full Range (ref. 1, 2) corresponds to the top of active fuel (249.01' el.). Other RCS level instruments are off-scale low when core uncovery occurs. 6% has been added to the RVLIS setpoint to account for instrument uncertainties (ref. 2).

Three conditions are associated with a challenge to containment integrity:

- CONTAINMENT CLOSURE is not established.
- In the early stages of a core uncovery event, it is unlikely that hydrogen buildup due to a core uncovery could result in an explosive mixture of dissolved gases in the containment. However, containment monitoring and/or sampling should be performed to verify this assumption and a General Emergency declared if it is determined that an explosive mixture exists. An explosive mixture can be formed when hydrogen gas concentration in the containment atmosphere is greater than 4% by volume in the presence of oxygen.
- Any unplanned increase in containment pressure in the Cold Shutdown or Refueling mode indicates a potential loss of containment closure capability. Unplanned containment pressure increases indicates containment closure cannot be assured and the containment cannot be relied upon as a barrier to fission product release.

This IC addresses the inability to restore and maintain reactor vessel level above the top of active fuel with containment challenged. This condition represents actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity. Releases can be reasonably expected to exceed EPA PAG exposure levels offsite for more than the immediate site area.

Following an extended loss of core decay heat removal and inventory makeup, decay heat will cause reactor coolant boiling and a further reduction in reactor vessel level. If RCS level cannot be restored, fuel damage is probable.

With CONTAINMENT CLOSURE not established, there is a high potential for a direct and unmonitored release of radioactivity to the environment. If CONTAINMENT CLOSURE is re-established prior to exceeding the 30-minute time limit, then declaration of a General Emergency is not required.

The existence of an explosive mixture means, at a minimum, that the containment atmospheric hydrogen concentration is sufficient to support a hydrogen burn (i.e., at the lower deflagration limit). A hydrogen burn will raise containment pressure and could result in collateral equipment damage leading to a loss of containment integrity. It therefore represents a challenge to Containment integrity.

In the early stages of a core uncovery event, it is unlikely that hydrogen buildup due to a core uncovery could result in an explosive gas mixture in containment. If all installed hydrogen gas monitors are out-of-service during an event leading to fuel cladding damage, it may not be possible to obtain a containment hydrogen gas concentration reading as ambient conditions within the containment will preclude personnel access. During periods when installed containment hydrogen gas monitors are out-of-service, operators may use the other listed indications to assess whether or not containment is challenged.

The 30-minute criterion is tied to a readily recognizable event start time (i.e., the total loss of

ability to monitor level), and allows sufficient time to monitor, assess and correlate reactor and plant conditions to determine if core uncovery has actually occurred (i.e., to account for various accident progression and instrumentation uncertainties). It also allows sufficient time for performance of actions to terminate leakage, recover inventory control/makeup equipment and/or restore level monitoring.

This EAL addresses concerns raised by Generic Letter 88-17, *Loss of Decay Heat Removal*; SECY 91-283, *Evaluation of Shutdown and Low Power Risk Issues*; NUREG-1449, *Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States*; and NUMARC 91-06, *Guidelines for Industry Actions to Assess Shutdown Management*.

HNP Basis Reference(s):

1. GP-008, Draining the Reactor Coolant System
2. EOP Setpoint Study, Revision 19, 4.0, FN K03
6. NEI 99-01 CG1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Loss of RCS inventory affecting fuel clad integrity with containment challenged

EAL:

CG1.2 General Emergency

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 or tank of sufficient magnitude to indicate core uncovery
- Containment radiation > 10,000 R/hr (RM-1CR-3589-SA or RM-1CR-3590-SB)
- Erratic source range monitor indication

AND

Any Containment Challenge indication, Table C-2

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.

Table C-1 Sumps / Tanks
• Containment sumps • PRT • RCDT • CCW surge tank • RAB sumps • RWST • RMWST • Recycle Holdup Tank

Table C-2 Containment Challenge Indications
• CONTAINMENT CLOSURE **not** established (Note 6) • Containment hydrogen concentration ≥ 4% • UNPLANNED rise in Containment pressure

Mode Applicability:

5 - Cold Shutdown, 6 – Refueling

Definition(s):

CONTAINMENT CLOSURE - The procedurally defined actions taken to secure containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions. As applied to HNP, Containment Closure is established when containment penetration closure is established in accordance with Technical Specifications 3/4.9.4.

UNISOLABLE - An open or breached system line that cannot be isolated, remotely or locally.

UNPLANNED - A parameter change or an event that is not 1) the result of an intended evolution or 2) an expected plant response to a transient. The cause of the parameter change or event may be known or unknown.

Basis:

In this EAL, all RCS water level indication would be unavailable for greater than 30 minutes, and the RCS inventory loss must be detected by indirect leakage indications. Sump level increases must be evaluated against other potential sources of leakage. If the make-up rate to the RCS unexplainably rises above the pre-established rate, a loss of RCS inventory may be occurring even if the source of the leakage cannot be immediately identified. Sumps and tanks where RCS leakage may accumulate are listed in listed in Table C-1 (ref. 1, 2).

In the Refueling Mode, as water level in the reactor vessel lowers, the dose rate above the core will increase. The dose rate due to this core shine should result in indications on installed area radiation monitors (RM-1CR-3589-SA or RM-1CR-3590-SB). If these radiation monitors reach and exceed 10,000 R/hr, a loss of inventory with potential to uncover the core is likely to have occurred (ref. 4).

Post-TMI accident studies indicated that the installed PWR nuclear instrumentation will operate erratically when the core is uncovered and that this should be used as a tool for making such determinations.

Three conditions are associated with a challenge to containment integrity:

- CONTAINMENT CLOSURE is not established.
- In the early stages of a core uncovery event, it is unlikely that hydrogen buildup due to a core uncovery could result in an explosive mixture of dissolved gases in the containment. However, containment monitoring and/or sampling should be performed to verify this assumption and a General Emergency declared if it is determined that an

explosive mixture exists. An explosive mixture can be formed when hydrogen gas concentration in the containment atmosphere is greater than 4% by volume in the presence of oxygen.

- Any unplanned increase in containment pressure in the Cold Shutdown or Refueling mode indicates a potential loss of containment closure capability. Unplanned containment pressure increases indicates containment closure cannot be assured and the containment cannot be relied upon as a barrier to fission product release.

This IC addresses the inability to restore and maintain reactor vessel level above the top of active fuel with containment challenged. This condition represents actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity. Releases can be reasonably expected to exceed EPA PAG exposure levels offsite for more than the immediate site area.

Following an extended loss of core decay heat removal and inventory makeup, decay heat will cause reactor coolant boiling and a further reduction in reactor vessel level. If RCS level cannot be restored, fuel damage is probable.

With CONTAINMENT CLOSURE not established, there is a high potential for a direct and unmonitored release of radioactivity to the environment. If CONTAINMENT CLOSURE is re-established prior to exceeding the 30-minute time limit, then declaration of a General Emergency is not required.

The existence of an explosive mixture means, at a minimum, that the containment atmospheric hydrogen concentration is sufficient to support a hydrogen burn (i.e., at the lower deflagration limit). A hydrogen burn will raise containment pressure and could result in collateral equipment damage leading to a loss of containment integrity. It therefore represents a challenge to Containment integrity.

In the early stages of a core uncovery event, it is unlikely that hydrogen buildup due to a core uncovery could result in an explosive gas mixture in containment. If all installed hydrogen gas monitors are out-of-service during an event leading to fuel cladding damage, it may not be possible to obtain a containment hydrogen gas concentration reading as ambient conditions within the containment will preclude personnel access. During periods when installed containment hydrogen gas monitors are out-of-service, operators may use the other listed indications to assess whether or not containment is challenged.

The 30-minute criterion is tied to a readily recognizable event start time (i.e., the total loss of ability to monitor level), and allows sufficient time to monitor, assess and correlate reactor and plant conditions to determine if core uncovery has actually occurred (i.e., to account for various accident progression and instrumentation uncertainties). It also allows sufficient time for performance of actions to terminate leakage, recover inventory control/makeup equipment and/or restore level monitoring.

The inability to monitor RCS level may be caused by instrumentation and/or power failures, or water level dropping below the range of available instrumentation. If water level cannot be monitored, operators may determine that an inventory loss is occurring by observing changes in sump and/or tank levels. Sump and/or tank level changes must be evaluated against other potential sources of water flow to ensure they are indicative of leakage from the RCS.

This EAL addresses concerns raised by Generic Letter 88-17, *Loss of Decay Heat Removal*;

SECY 91-283, *Evaluation of Shutdown and Low Power Risk Issues*; NUREG-1449, *Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States*; and NUMARC 91-06, *Guidelines for Industry Actions to Assess Shutdown Management.*

HNP Basis Reference(s):

1. GP-001, Reactor Coolant System Fill and Vent Mode 5
2. GP-008, Draining the Reactor Coolant System
3. GP-009, Refueling Cavity Fill, Refueling and Drain of the Refueling Cavity Modes 5-6-5
4. AOP-031-BD, Loss of Refueling Cavity Integrity- Basis Document
5. NEI 99-01 CG1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 2 – Loss of Emergency AC Power

Initiating Condition: Loss of **all but one** AC power source to emergency buses for 15 minutes or longer

EAL:

CU2.1 Unusual Event

AC power capability, Table C-6, to emergency 6.9 KV buses 1A-SA and 1B-SB 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

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

Table C-6 AC Power Sources
Offsite: • SUT 1A • SUT 1B • UAT 1A/1B backfed via Main Transformer (**only** if already aligned) **Onsite:** • UAT 1A via Main Generator • UAT 1B via Main Generator • EDG 1A-SA • EDG 1B-SB

Mode Applicability:

5 - Cold Shutdown, 6 – Refueling, D - Defueled

Definition(s):

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10CFR50.2):

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

Power is supplied from the main generator to the switchyard through a main transformer bank. The main generator is directly connected to the main transformer bank through a 22 KV bus system and the 230 KV switchyard.

The Plant Electric Power Distribution System receives power under normal operating conditions from the main generator through two unit auxiliary transformers.

For startup and shutdown, when the main generator is unavailable, power is obtained through two start-up transformers from the grid and the 230 KV switchyard. These two transformers have sufficient capacity to provide for start-up and full load operation of the Unit. They also provide two separate sources of preferred (offsite) power to the Unit.

An additional path of power supply from the grid to the Plant Electric Power Distribution System can be made available after opening the disconnect links and disconnecting the main generator from the 22 KV bus. Power can be fed from the offsite power system through the main transformer bank and 22 KV bus to the unit auxiliary transformer, leaving the main generator disconnected. (ref. 2)

Emergency buses 1A-SA and 1B-SB provide power to supply all of the safety-related loads. The normal source of power for the emergency buses is the main generator/unit auxiliary transformer. When this source of power is not available, power is supplied from the 230 KV switchyard through the start-up transformers or, with the generator disconnect links removed, from the main and unit auxiliary transformers. When neither of these sources is available, power to the two emergency buses is supplied from diesel generators EDG A and EDG B (one diesel generator for each emergency bus). (ref. 3)

This cold condition EAL is equivalent to the hot condition EAL SA1.1.

This IC describes a significant degradation of offsite and onsite AC power sources such that any additional single failure would result in a loss of all AC power to SAFETY SYSTEMS. In this condition, the sole AC power source may be powering one, or more than one, train of safety-related equipment.

When in the cold shutdown, refueling, or defueled mode, this condition is not classified as an Alert because of the increased time available to restore another power source to service. Additional time is available due to the reduced core decay heat load, and the lower temperatures and pressures in various plant systems. Thus, when in these modes, this condition is considered to be a potential degradation of the level of safety of the plant.

An "AC power source" is a source recognized in AOPs and EOPs, and capable of supplying required power to an emergency bus. Some examples of this condition are presented below.

- A loss of all offsite power with a concurrent failure of all but one emergency power source (e.g., an onsite diesel generator).
- A loss of all offsite power and loss of all emergency power sources (e.g., onsite diesel generators) with a single train of emergency buses being back-fed from the unit main generator.

- A loss of emergency power sources (e.g., onsite diesel generators) with a single train of emergency buses being fed from an offsite power source.

Fifteen minutes was selected as a threshold to exclude transient or momentary losses of power.

The subsequent loss of the remaining single power source would escalate the event to an Alert in accordance with IC CA2.

HNP Basis Reference(s):

1. FSAR Figure 8.1.3-1
2. FSAR 8.2
3. FSAR 8.3
4. EOP-ECA-0.0, Loss of all AC Power
5. NEI 99-01 CU2

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 2 – Loss of Emergency AC Power

Initiating Condition: Loss of **all** offsite and **all** onsite AC power to emergency buses for 15 minutes or longer

EAL:

CA2.1	**Alert**
Loss of **all** offsite and **all** onsite AC power capability to 6.9 KV emergency buses 1A-SA and 1B-SB for ≥ 15 min. (Note 1)	

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

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling, D - Defueled

Basis:

Power is supplied from the main generator to the switchyard through a main transformer bank. The main generator is directly connected to the main transformer bank through a 22 KV bus system and the 230 KV switchyard.

The Plant Electric Power Distribution System receives power under normal operating conditions from the main generator through two unit auxiliary transformers.

For startup and shutdown, when the main generator is unavailable, power is obtained through two start-up transformers from the grid and the 230 KV switchyard. These two transformers have sufficient capacity to provide for start-up and full load operation of the Unit. They also provide two separate sources of preferred (offsite) power to the Unit.

An additional path of power supply from the grid to the Plant Electric Power Distribution System can be made available after opening the disconnect links and disconnecting the main generator from the 22 KV bus. Power can be fed from the offsite power system through the main transformer bank and 22 KV bus to the unit auxiliary transformer, leaving the main generator disconnected. (ref. 2)

Emergency buses 1A-SA and 1B-SB provide power to supply all of the safety-related loads. The normal source of power for the emergency buses is the main generator/unit auxiliary transformer. When this source of power is not available, power is supplied from the 230 KV switchyard through the start-up transformers or, with the generator disconnect links removed, from the main and unit auxiliary transformers. When neither of these sources is available, power to the two emergency buses is supplied from diesel generators EDG A and EDG B (one diesel generator for each emergency bus). (ref. 3)

This cold condition EAL is equivalent to the hot condition loss of all offsite AC power EAL SS1.1.

This IC addresses a total loss of AC power that compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink.

When in the cold shutdown, refueling, or defueled mode, this condition is not classified as a Site Area Emergency because of the increased time available to restore an emergency bus to service. Additional time is available due to the reduced core decay heat load, and the lower temperatures and pressures in various plant systems. Thus, when in these modes, this condition represents an actual or potential substantial degradation of the level of safety of the plant.

Fifteen minutes was selected as a threshold to exclude transient or momentary power losses.

Escalation of the emergency classification level would be via IC CS1 or RS1.

HNP Basis Reference(s):

1. FSAR Figure 8.1.3-1
2. FSAR 8.2
3. FSAR 8.3
4. EOP-ECA-0.0, Loss of all AC Power
5. NEI 99-01 CA2

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 3 – RCS Temperature

Initiating Condition: UNPLANNED increase in RCS temperature

EAL:

CU3.1	**Unusual Event**
UNPLANNED increase in RCS temperature to > 200°F	

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

UNPLANNED - A parameter change or an event that is not 1) the result of an intended evolution or 2) an expected plant response to a transient. The cause of the parameter change or event may be known or unknown.

Basis:

Several instruments are capable of providing indication of RCS temperature with respect to the Technical Specification cold shutdown temperature limit (200°F, ref. 1). These include loop TRH0604A (TRH0604B), RHR Pump A (B) Disch Temp TR-604 (TR-606) red pen, RHRP-A (B) Disch, and RCS Wide Range Thot and Tcold (ref. 2) as well as Core Exit Thermocouples (CETs) (ref. 2, 3, 4).

In the absence of reliable RCS temperature indication caused by a loss of decay heat removal capability, classification should be based on EAL CU3.2 should RCS level indication be subsequently lost.

This IC addresses an UNPLANNED increase in RCS temperature above the Technical Specification cold shutdown temperature limit and represents a potential degradation of the level of safety of the plant. If the RCS is not intact and CONTAINMENT CLOSURE is not established during this event, the Emergency Coordinator should also refer to IC CA3.

A momentary UNPLANNED excursion above the Technical Specification cold shutdown temperature limit when the heat removal function is available does not warrant a classification.

This EAL involves a loss of decay heat removal capability, or an addition of heat to the RCS in excess of that which can currently be removed, such that reactor coolant temperature cannot be maintained below the cold shutdown temperature limit specified in Technical Specifications. During this condition, there is no immediate threat of fuel damage because the core decay heat load has been reduced since the cessation of power operation.

During an outage, the level in the reactor vessel will normally be maintained at or above the reactor vessel flange. Refueling evolutions that lower water level below the reactor vessel flange are carefully planned and controlled. A loss of forced decay heat removal at reduced inventory may result in a rapid increase in reactor coolant temperature depending on the time after shutdown.

Fifteen minutes was selected as a threshold to exclude transient or momentary losses of indication.

Escalation to Alert would be via IC CA1 based on an inventory loss or IC CA3 based on exceeding plant configuration-specific time criteria.

HNP Basis Reference(s):

1. HNP Technical Specifications Table 1.2
2. OP-111, Residual Heat Removal System
3. GP-007, Normal Plant Cooldown Mode 3 to Mode 5
4. AOP-020, Loss of RCS Inventory or Residual Heat Removal While Shutdown
5. NEI 99-01 CU3

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 3 – RCS Temperature

Initiating Condition: UNPLANNED increase in RCS temperature

EAL:

CU3.2	**Unusual Event**
Loss of **all** RCS temperature and RCS level indication for ≥ 15 min. (Note 1)	

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

Mode Applicability:

5 - Cold Shutdown, 6- Refueling

Definition(s):

None

Basis:

Several instruments are capable of providing indication of RCS temperature with respect to the Technical Specification cold shutdown temperature limit (200°F, ref. 1). These include loop TRH0604A (TRH0604B), RHR Pump A (B) Disch Temp TR-604 (TR-606) red pen, RHRP-A (B) Disch, and RCS Wide Range Thot and Tcold (ref. 2) as well as Core Exit Thermocouples (CETs) (ref. 2, 3, 4).

RCS water level is normally monitored using various instruments including RVLIS, standpipe and Pressurizer level instruments.

This EAL addresses the inability to determine RCS temperature and level, and represents a potential degradation of the level of safety of the plant. If the RCS is not intact and CONTAINMENT CLOSURE is not established during this event, the Emergency Coordinator should also refer to IC CA3.

This EAL reflects a condition where there has been a significant loss of instrumentation capability necessary to monitor RCS conditions and operators would be unable to monitor key parameters necessary to assure core decay heat removal. During this condition, there is no immediate threat of fuel damage because the core decay heat load has been reduced since the cessation of power operation.

Fifteen minutes was selected as a threshold to exclude transient or momentary losses of indication.

Escalation to Alert would be via IC CA1 based on an inventory loss or IC CA3 based on exceeding plant configuration-specific time criteria.

HNP Basis Reference(s):

1. HNP Technical Specifications Table 1.2
2. OP-111, Residual Heat Removal System

3. GP-007, Normal Plant Cooldown Mode 3 to Mode 5
4. AOP-020, Loss of RCS Inventory or Residual Heat Removal While Shutdown
5. NEI 99-01 CU3

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 3 – RCS Temperature

Initiating Condition: Inability to maintain plant in cold shutdown

EAL:

CA3.1 Alert

UNPLANNED increase in RCS temperature to > 200°F for > Table C-3 duration (Note 1)

OR

UNPLANNED RCS pressure increase > 10 psig (this does **not** apply during water-solid plant conditions)

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

Table C-3: RCS Heat-up Duration Thresholds

RCS Status	Containment Closure Status	Heat-up Duration
Intact (but **not** REDUCED INVENTORY)	N/A	60 min.*
Not intact **OR** At REDUCED INVENTORY	established	20 min.*
	not established	0 min.

* If an RCS heat removal system is in operation within this time frame and RCS temperature is being reduced, the EAL is **not** applicable.

Mode Applicability:

5 - Cold Shutdown, 6 – Refueling

Definition(s):

CONTAINMENT CLOSURE - The procedurally defined actions taken to secure containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions. As applied to HNP, Containment Closure is established when containment penetration closure is established in accordance with Technical Specifications 3/4.9.4.

REDUCED INVENTORY - RCS water level greater than 36 inches below the Reactor Vessel Flange.

UNPLANNED - A parameter change or an event that is not 1) the result of an intended evolution or 2) an expected plant response to a transient. The cause of the parameter change or event may be known or unknown.

Basis:

Several instruments are capable of providing indication of RCS temperature with respect to the Technical Specification cold shutdown temperature limit (200°F, ref. 1). These include loop TRH0604A (TRH0604B), RHR Pump A (B) Disch Temp TR-604 (TR-606) red pen, RHRP-A (B) Disch, and RCS Wide Range T_{hot} and T_{cold} (ref. 2) as well as Core Exit Thermocouples (CETs) (ref. 2, 3, 4).

A 10 psig RPV pressure increase can be read on various instruments including narrow range RCS pressure indicators PI-402.1SA and PI-403.1SB (ref. 5).

In the absence of reliable RCS temperature indication caused by the loss of decay heat removal capability, classification should be based on the RCS pressure increase criteria when in Mode 5 or based on time to boil data when in Mode 6.

This IC addresses conditions involving a loss of decay heat removal capability or an addition of heat to the RCS in excess of that which can currently be removed. Either condition represents an actual or potential substantial degradation of the level of safety of the plant.

A momentary UNPLANNED excursion above the Technical Specification cold shutdown temperature limit when the heat removal function is available does not warrant a classification.

The RCS Heat-up Duration Thresholds table addresses an increase in RCS temperature when CONTAINMENT CLOSURE is established but the RCS is not intact, or RCS inventory is reduced (e.g., mid-loop operation). The 20-minute criterion was included to allow time for operator action to address the temperature increase.

The RCS Heat-up Duration Thresholds table also addresses an increase in RCS temperature with the RCS intact. The status of CONTAINMENT CLOSURE is not crucial in this condition since the intact RCS is providing a high pressure barrier to a fission product release. The 60-minute time frame should allow sufficient time to address the temperature increase without a substantial degradation in plant safety.

Finally, in the case where there is an increase in RCS temperature, the RCS is not intact or is at reduced inventory, and CONTAINMENT CLOSURE is not established, no heat-up duration is allowed (i.e., 0 minutes). This is because 1) the evaporated reactor coolant may be released directly into the containment atmosphere and subsequently to the environment, and 2) there is reduced reactor coolant inventory above the top of irradiated fuel.

The RCS pressure increase threshold provides a pressure-based indication of RCS heat-up in the absence of RCS temperature monitoring capability.

Escalation of the emergency classification level would be via IC CS1 or RS1.

HNP Basis Reference(s):

1. HNP Technical Specifications Table 1.2
2. OP-111, Residual Heat Removal System
3. GP-007, Normal Plant Cooldown Mode 3 to Mode 5
4. AOP-020, Loss of RCS Inventory or Residual Heat Removal While Shutdown
5. Simulator walkdown
6. NEI 99-01 CA3

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 4 – Loss of Vital DC Power

Initiating Condition: Loss of Vital DC power for 15 minutes or longer

EAL:

CU4.1	**Unusual Event**
< 105 VDC bus voltage indications on Technical Specification **required** 125 VDC buses (DP-1A-SA, DP-1B-SB) for ≥ 15 min. (Note 1)	

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

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

None

Basis:

The DC Power System is designed to provide a source of reliable continuous power for the plant protection system, control and instrumentation and other loads for start-up, operation, and shutdown modes of plant operation. The DC Power System consists of three 60 cell, 125V batteries and one 120 cell, 250V battery, each with its own battery chargers, and DC load center. The 125VDC ESF (safety-related) batteries 1A-SA and 1B-SB are located in separate Battery Rooms in the Electrical Switchgear Room on the 286' elevation of the Reactor Auxiliary Building. The battery chargers for batteries 1A-SA and 1B-SB are rated at 150 amperes DC at a nominal charging voltage of 132VDC. Normal operation of the DC system is such that the battery chargers supply all load current while the batteries serve as an emergency source of power in the event power to the chargers is lost. The battery chargers are capable of providing the normal DC load and also maintaining the connected battery in a fully charged condition (ref. 2). When the plant is in Modes 1, 2, 3 or 4, as a minimum, the 125-volt battery bank 1A-SA and either full capacity charger 1A-SA or 1B-SA and the 125-volt battery bank 1B-SB and either full capacity charger 1A-SB or 1B-SB shall be operable (ref. 3).

Minimum bus voltage is 105 VDC (ref. 4, 5).

This EAL is the cold condition equivalent of the hot condition loss of DC power EAL SS7.1.

This IC addresses a loss of vital DC power which compromises the ability to monitor and control operable SAFETY SYSTEMS when the plant is in the cold shutdown or refueling mode. In these modes, the core decay heat load has been significantly reduced, and coolant system temperatures and pressures are lower; these conditions increase the time available to restore a vital DC bus to service. Thus, this condition is considered to be a potential degradation of the level of safety of the plant.

As used in this EAL, "required" means the vital DC buses necessary to support operation of the in-service, or operable, train or trains of SAFETY SYSTEM equipment. For example, if

Train A is out-of-service (inoperable) for scheduled outage maintenance work and Train B is in-service (operable), then a loss of Vital DC power affecting Train B would require the declaration of an Unusual Event. A loss of Vital DC power to Train A would not warrant an emergency classification.

Fifteen minutes was selected as a threshold to exclude transient or momentary power losses.

Depending upon the event, escalation of the emergency classification level would be via IC CA1 or CA3, or an IC in Recognition Category R.

HNP Basis Reference(s):

1. FSAR Figure 8.1.3-3
2. FSAR 8.3.2
3. Technical Specifications 3.8.2.1
4. FSAR Table 8.3.1-1
5. MST-E0013, 1E Battery Performance Test
6. NEI 99-01 CU4

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 5 – Loss of Communications

Initiating Condition: Loss of **all** onsite or offsite communications capabilities

EAL:

CU5.1 Unusual Event

Loss of **all** Table C-4 onsite communication methods

OR

Loss of **all** Table C-4 ORO communication methods

OR

Loss of **all** Table C-4 NRC communication methods

Table C-4 Communication Methods

System	Onsite	ORO	NRC
PABX telephone (desk phones)	X	X	X
HE&EC PABX telephone		X	X
Site paging system	X		
Satellite phone		X	X
DEMNET		X	
Radio communications networks	X		
NRC ETS phone			X
NRC HPN phone			X

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling, D – Defueled

Definition(s):

None

Basis:

Onsite/offsite communications include one or more of the systems listed in Table C-4 (ref. 1, 2, 3, 4, 5).

The NRC ETS Phone and the NRC HPN Phone are part of the PABX and will be unavailable if the PABX is unavailable.

This EAL is the cold condition equivalent of the hot condition EAL SU7.1.

This IC addresses a significant loss of on-site or offsite communications capabilities. While not a direct challenge to plant or personnel safety, this event warrants prompt notifications to OROs and the NRC.

This IC should be assessed only when extraordinary means are being utilized to make communications possible (e.g., use of non-plant, privately owned equipment, relaying of on-site information via individuals or multiple radio transmission points, individuals being sent to offsite locations, etc.).

The first EAL condition addresses a total loss of the communications methods used in support of routine plant operations.

The second EAL condition addresses a total loss of the communications methods used to notify all OROs of an emergency declaration. The OROs referred to here are the State, Chatham, Harnett, Lee and Wake County EOCs

The third EAL addresses a total loss of the communications methods used to notify the NRC of an emergency declaration.

HNP Basis Reference(s):

1. FSAR 9.5.2
2. PLP-201, Emergency Plan, Section 3.8
3. OMM-009, Shift Communications, Section 5.2
4. OP-180, Plant Communication Systems
5. DBD-206, Plant Communications Systems
6. NEI 99-01 CU5

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 6 – Hazardous Event Affecting Safety Systems

Initiating Condition: Hazardous event affecting a SAFETY SYSTEM needed for the current operating mode

EAL:

CA6.1 Alert

The occurrence of **any** Table C-5 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

Table C-5 Hazardous Events
• 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 Shift Manager

Mode Applicability:

6 - Cold Shutdown, 6 - Refueling

Definition(s):

EXPLOSION - A rapid, violent and catastrophic failure of a piece of equipment due to combustion, chemical reaction or overpressurization. A release of steam (from high energy lines or components) or an electrical component failure (caused by short circuits, grounding, arcing, etc.) should not automatically be considered an explosion. Such events require a post-event inspection to determine if the attributes of an explosion are present.

FIRE - Combustion characterized by heat and light. Sources of smoke such as slipping drive belts or overheated electrical equipment do not constitute fires. Observation of flame is preferred but is NOT required if large quantities of smoke and heat are observed.

FLOODING - A condition where water is entering a room or area faster than installed equipment is capable of removal, resulting in a rise of water level within the room or area.

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10CFR50.2):

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

VISIBLE DAMAGE - Damage to a component or structure that is readily observable without measurements, testing, or analysis. The visual impact of the damage is sufficient to cause concern regarding the operability or reliability of the affected component or structure.

Basis:

- Internal FLOODING may be caused by events such as component failures, equipment misalignment, or outage activity mishaps.
- External flooding may be due to high lake level. All structures on the plant site are protected to at least Elevation 261 ft and no structure has any access openings below Elevation 261 ft. (ref. 1, 2).
- The plant Seismic Category I structures are designed to withstand the effects of the design wind, a maximum wind of 179 mph at 30 feet above plant grade. (ref. 2).
- An explosion that degrades the performance of a SAFETY SYSTEM train or visibly damages a SAFETY SYSTEM component or structure would be classified under this EAL.

This IC addresses a hazardous event that causes damage to a SAFETY SYSTEM, or a structure containing SAFETY SYSTEM components, needed for the current operating mode. This condition significantly reduces the margin to a loss or potential loss of a fission product barrier, and therefore represents an actual or potential substantial degradation of the level of safety of the plant.

The first conditional addresses damage to a SAFETY SYSTEM train that is in service/operation since indications for it will be readily available. The indications of degraded performance should be significant enough to cause concern regarding the operability or reliability of the SAFETY SYSTEM train.

The second conditional addresses damage to a SAFETY SYSTEM component that is not in service/operation or readily apparent through indications alone, or to a structure containing SAFETY SYSTEM components. Operators will make this determination based on the totality of available event and damage report information. This is intended to be a brief assessment not requiring lengthy analysis or quantification of the damage.

Escalation of the emergency classification level would be via IC CS1 or RS1.

HNP Basis Reference(s):

1. FSAR 2.4.5.5
2 FSAR 3.3.1.1
3. NEI 99-01 CA6

Category H – Hazards and Other Conditions Affecting Plant Safety

EAL Group: ANY (EALs in this category are applicable to any plant condition, hot or cold.)

Hazards are non-plant, system-related events that can directly or indirectly affect plant operation, reactor plant safety or personnel safety.

1. Security

Unauthorized entry attempts into the Protected Area, bomb threats, sabotage attempts, and actual security compromises threatening loss of physical control of the plant.

2. Seismic Event

Natural events such as earthquakes have potential to cause plant structure or equipment damage of sufficient magnitude to threaten personnel or plant safety.

3. Natural or Technological Hazard

Other natural and non-naturally occurring events that can cause damage to plant facilities include tornados, FLOODING, hazardous material releases and events restricting site access warranting classification.

4. Fire

Fires can pose significant hazards to personnel and reactor safety. Appropriate for classification are fires within the site Protected Area or which may affect operability of equipment needed for safe shutdown.

5. Hazardous Gas

Toxic, corrosive, asphyxiant or flammable gas leaks can affect normal plant operations or preclude access to plant areas required to safely shutdown the plant.

6. Control Room Evacuation

Events that are indicative of loss of Control Room habitability. If the Control Room must be evacuated, additional support for monitoring and controlling plant functions is necessary through the emergency response facilities.

7. Emergency Coordinator Judgment

The EALs defined in other categories specify the predetermined symptoms or events that are indicative of emergency or potential emergency conditions and thus warrant classification. While these EALs have been developed to address the full spectrum of possible emergency conditions which may warrant classification and subsequent implementation of the Emergency Plan, a provision for classification of emergencies based on operator/management experience and judgment is still necessary. The EALs of this category provide the Emergency Coordinator the latitude to classify emergency conditions consistent with the established classification criteria based upon Emergency Coordinator judgment.

Category: H – Hazards

Subcategory: 1 – Security

Initiating Condition: Confirmed SECURITY CONDITION or threat

EAL:

HU1.1 Unusual Event

A SECURITY CONDITION that does **not** involve a HOSTILE ACTION as reported by the Security Shift Supervision

OR

Notification of a credible security threat directed at the site

OR

A validated notification from the NRC providing information of an aircraft threat

Mode Applicability:

All

Definition(s):

SECURITY CONDITION - Any security event as listed in the approved security contingency plan that constitutes a threat/compromise to site security, threat/risk to site personnel, or a potential degradation to the level of safety of the plant. A security condition does not involve a hostile action.

HOSTILE ACTION - An act toward HNP or its personnel that includes the use of violent force to destroy equipment, take hostages, and/or intimidate the licensee to achieve an end. This includes attack by air, land, or water using guns, explosives, projectiles, vehicles, or other devices used to deliver destructive force. Other acts that satisfy the overall intent may be included. Hostile action should not be construed to include acts of civil disobedience or felonious acts that are not part of a concerted attack on HNP. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the owner controlled area).

Basis:

This EAL is based on the HNP Security Plan (ref. 1).

This IC addresses events that pose a threat to plant personnel or SAFETY SYSTEM equipment, and thus represent a potential degradation in the level of plant safety. Security events which do not meet one of these EALs are adequately addressed by the requirements of 10 CFR § 73.71 or 10 CFR § 50.72. Security events assessed as HOSTILE ACTIONS are classifiable under ICs HA1, HS1 and HG1.

Timely and accurate communications between Security Shift Supervision and the Control Room is essential for proper classification of a security-related event (ref. 1, 2). Classification of these events will initiate appropriate threat-related notifications to plant personnel and Offsite Response Organizations.

Security plans and terminology are based on the guidance provided by NEI 03-12, *Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan and*

Independent Spent Fuel Storage Installation Security Program.

The first threshold references the Security Shift Supervision because these are the individuals trained to confirm that a security event is occurring or has occurred. Training on security event confirmation and classification is controlled due to the nature of Safeguards and 10 CFR § 2.39 information.

The second threshold addresses the receipt of a credible security threat. The credibility of the threat is assessed in accordance with the HNP Security Plan (ref. 1).

The third threshold addresses the threat from the impact of an aircraft on the plant. The NRC Headquarters Operations Officer (HOO) will communicate to the licensee if the threat involves an aircraft. The status and size of the plane may also be provided by NORAD through the NRC. Validation of the threat is performed in accordance with the HNP Security Plan (ref. 1).

Emergency plans and implementing procedures are public documents; therefore, EALs should not incorporate Security-sensitive information. This includes information that may be advantageous to a potential adversary, such as the particulars concerning a specific threat or threat location. Security-sensitive information should be contained in non-public documents such as the HNP Security Plan (ref. 1).

Escalation of the emergency classification level would be via IC HA1.

HNP Basis Reference(s):

1. HNP Security Plan
2. AOP-027, Response to Acts Against Plant Equipment
3. NEI 99-01 HU1

Category: H – Hazards

Subcategory: 1 – Security

Initiating Condition: Hostile action within the owner controlled area or airborne attack threat

EAL:

HA1.1 Alert

A HOSTILE ACTION is occurring or has occurred within the OWNER CONTROLLED AREA as reported by the Security Shift Supervision

OR

A validated notification from NRC of an aircraft attack threat within 30 min. of the site

Mode Applicability:

All

Definition(s):

HOSTILE ACTION - An act toward HNP or its personnel that includes the use of violent force to destroy equipment, take hostages, and/or intimidate the licensee to achieve an end. This includes attack by air, land, or water using guns, explosives, projectiles, vehicles, or other devices used to deliver destructive force. Other acts that satisfy the overall intent may be included. Hostile action should not be construed to include acts of civil disobedience or felonious acts that are not part of a concerted attack on HNP. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the owner controlled area).

OWNER CONTROLLED AREA - That area surrounding the Protected Area beyond which HNP exercises access control.

Basis:

This IC addresses the occurrence of a HOSTILE ACTION within the OWNER CONTROLLED AREA or notification of an aircraft attack threat. This event will require rapid response and assistance due to the possibility of the attack progressing to the PROTECTED AREA, or the need to prepare the plant and staff for a potential aircraft impact.

Timely and accurate communications between the Security Shift Supervision and the Control Room is essential for proper classification of a security-related event (ref. 1, 2).

Security plans and terminology are based on the guidance provided by NEI 03-12, *Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan.*

As time and conditions allow, these events require a heightened state of readiness by the plant staff and implementation of onsite protective measures (e.g., evacuation, dispersal or sheltering). The Alert declaration will also heighten the awareness of Offsite Response Organizations (OROs), allowing them to be better prepared should it be necessary to consider further actions.

This IC does not apply to incidents that are accidental events, acts of civil disobedience, or otherwise are not a HOSTILE ACTION perpetrated by a HOSTILE FORCE. Examples include the crash of a small aircraft, shots from hunters, physical disputes between employees, etc.

Reporting of these types of events is adequately addressed by other EALs, or the requirements of 10 CFR § 73.71 or 10 CFR § 50.72.

The first threshold is applicable for any HOSTILE ACTION occurring, or that has occurred, in the OWNER CONTROLLED AREA.

The second threshold addresses the threat from the impact of an aircraft on the plant, and the anticipated arrival time is within 30 minutes. The intent of this EAL is to ensure that threat-related notifications are made in a timely manner so that plant personnel and OROs are in a heightened state of readiness. This EAL is met when the threat-related information has been validated in accordance with site-specific security procedures.

The NRC Headquarters Operations Officer (HOO) will communicate to the licensee if the threat involves an aircraft. The status and size of the plane may be provided by NORAD through the NRC.

In some cases, it may not be readily apparent if an aircraft impact within the OWNER CONTROLLED AREA was intentional (i.e., a HOSTILE ACTION). It is expected, although not certain, that notification by an appropriate Federal agency to the site would clarify this point. In this case, the appropriate federal agency is intended to be NORAD, FBI, FAA or NRC. The emergency declaration, including one based on other ICs/EALs, should not be unduly delayed while awaiting notification by a Federal agency.

Emergency plans and implementing procedures are public documents; therefore, EALs should not incorporate Security-sensitive information. This includes information that may be advantageous to a potential adversary, such as the particulars concerning a specific threat or threat location. Security-sensitive information should be contained in non-public documents such as the HNP Security Plan (ref. 1).

HNP Basis Reference(s):

1. HNP Security Plan
2. AOP-027, Response to Acts Against Plant Equipment
3. NEI 99-01 HA1

Category: H – Hazards

Subcategory: 1 – Security

Initiating Condition: Hostile Action within the Protected Area

EAL:

HS1.1	**Site Area Emergency**
A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by the Security Shift Supervision	

Mode Applicability:

All

Definition(s):

HOSTILE ACTION - An act toward HNP or its personnel that includes the use of violent force to destroy equipment, take hostages, and/or intimidate the licensee to achieve an end. This includes attack by air, land, or water using guns, explosives, projectiles, vehicles, or other devices used to deliver destructive force. Other acts that satisfy the overall intent may be included. Hostile action should not be construed to include acts of civil disobedience or felonious acts that are not part of a concerted attack on HNP. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the owner controlled area).

PROTECTED AREA - An area which normally encompasses all controlled areas within the security protected area fence as depicted in FSAR Figure 1.2.2-1, Site Plan.

Basis:

This IC addresses the occurrence of a HOSTILE ACTION within the PROTECTED AREA. This event will require rapid response and assistance due to the possibility for damage to plant equipment.

Timely and accurate communications between Security Shift Supervision and the Control Room is essential for proper classification of a security-related event (ref. 2, 3).

Security plans and terminology are based on the guidance provided by NEI 03-12, *Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan.*

As time and conditions allow, these events require a heightened state of readiness by the plant staff and implementation of onsite protective measures (e.g., evacuation, dispersal or sheltering). The Site Area Emergency declaration will mobilize Offsite Response Organization (ORO) resources and have them available to develop and implement public protective actions in the unlikely event that the attack is successful in impairing multiple safety functions.

This IC does not apply to incidents that are accidental events, acts of civil disobedience, or otherwise are not a HOSTILE ACTION perpetrated by a HOSTILE FORCE. Examples include the crash of a small aircraft, shots from hunters, physical disputes between employees, etc. Reporting of these types of events is adequately addressed by other EALs, or the requirements of 10 CFR § 73.71 or 10 CFR § 50.72.

Emergency plans and implementing procedures are public documents; therefore, EALs should not incorporate Security-sensitive information. This includes information that may be advantageous to a potential adversary, such as the particulars concerning a specific threat or threat location. Security-sensitive information should be contained in non-public documents such as the HNP Security Plan (ref. 1).

Escalation of the emergency classification level would be via IC HG1.

HNP Basis Reference(s):

1. HNP Security Plan
2. AOP-027, Response to Acts Against Plant Equipment
3. NEI 99-01 HS1

Category: H – Hazards

Subcategory: 1 – Security

Initiating Condition: Hostile Action resulting in loss of physical control of the facility

EAL:

HG1.1 General Emergency

A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by the Security Shift Supervision

AND EITHER of the following has occurred:

Any of the following safety functions cannot be controlled or maintained

- Reactivity
- Core cooling
- RCS heat removal

OR

Damage to spent fuel has occurred or is IMMINENT

Mode Applicability:

All

Definition(s):

HOSTILE ACTION - An act toward HNP or its personnel that includes the use of violent force to destroy equipment, take hostages, and/or intimidate the licensee to achieve an end. This includes attack by air, land, or water using guns, explosives, projectiles, vehicles, or other devices used to deliver destructive force. Other acts that satisfy the overall intent may be included. Hostile action should not be construed to include acts of civil disobedience or felonious acts that are not part of a concerted attack on HNP. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the owner controlled area).

IMMINENT - The trajectory of events or conditions is such that an EAL will be met within a relatively short period of time regardless of mitigation or corrective actions

PROTECTED AREA - An area which normally encompasses all controlled areas within the security protected area fence as depicted in FSAR Figure 1.2.2-1, Site Plan.

Basis:

This IC addresses an event in which a HOSTILE FORCE has taken physical control of the facility to the extent that the plant staff can no longer operate equipment necessary to maintain key safety functions. It also addresses a HOSTILE ACTION leading to a loss of physical control that results in actual or IMMINENT damage to spent fuel due to 1) damage to a spent fuel pool cooling system (e.g., pumps, heat exchangers, controls, etc.) or, 2) loss of spent fuel pool integrity such that sufficient water level cannot be maintained.

Timely and accurate communications between Security Shift Supervision and the Control Room is essential for proper classification of a security-related event (ref. 1, 2).

Security plans and terminology are based on the guidance provided by NEI 03-12, *Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan.*

Emergency plans and implementing procedures are public documents; therefore, EALs should not incorporate Security-sensitive information. This includes information that may be advantageous to a potential adversary, such as the particulars concerning a specific threat or threat location. Security-sensitive information should be contained in non-public documents such as the HNP Security Plan (ref.1).

HNP Basis Reference(s):

1. HNP Security Plan
2. AOP-027, Response to Acts Against Plant Equipment
3. NEI 99-01 HG1

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 2 – Seismic Event

Initiating Condition: Seismic event greater than OBE levels

EAL:

HU2.1 Unusual Event

Seismic event > OBE as indicated by **any** of the following:

- ALB-10/4-4, SEISMIC MON SYS OBE EXCEEDED is ALARMED
- ALARM light on Seismic Switch Power Supply is LIT
- **Any** red alarm light is LIT on the Response Spectrum Annunciator

Mode Applicability:

All

Definition(s):

None

Basis:

AOP-021 Seismic Disturbances provides the guidance for determining if the OBE earthquake threshold is exceeded and any required response actions (ref. 1).

Each of the red alarm lights on the Response Spectrum Annunciator is set to illuminate at 100% of the OBE limit (amber lights illuminate at 70% of the OBE limit). The alarm light on the Seismic Switch Power Supply illuminates at 100% of the OBE limit, sending an output to ALB-10/4-4 (which should therefore illuminate simultaneously) (ref. 1).

The Operating Basis Earthquake (OBE) is defined as that earthquake which could reasonably be expected to affect the plant site during the operating life of the plant, based on the earthquake potential of the geographic area. At Harris Plant, this is defined as half of the vibration defined for an SSE or 0.075g. Facility design ensures that all equipment necessary to operate the plant without undue risk to the health and safety of the public will remain functional for any seismic event where ground motion is less than that of the OBE (ref. 1, 2).

To avoid inappropriate emergency classification resulting from spurious actuation of the seismic instrumentation or felt motion not attributable to seismic activity, an offsite agency (USGS, National Earthquake Information Center) can confirm that an earthquake has occurred in the area of the plant. Such confirmation should not, however, preclude a timely emergency declaration based on receipt of the OBE alarm. The NEIC can be contacted by calling **(303) 273-8500**. Select **option #1** and inform the analyst you wish to confirm recent seismic activity in the vicinity of HNP. Provide the analyst with the following HNP coordinates: **35° 38' 00" north latitude, 78° 57' 22" west longitude** (ref. 5). Alternatively, near real-time seismic activity can be accessed via the NEIC website:

http://earthquake.usgs.gov/eqcenter/

This IC addresses a seismic event that results in accelerations at the plant site greater than those specified for an Operating Basis Earthquake (OBE). An earthquake greater than an

OBE but less than a Safe Shutdown Earthquake (SSE) should have no significant impact on safety-related systems, structures and components; however, some time may be required for the plant staff to ascertain the actual post-event condition of the plant (e.g., performs walk-downs and post-event inspections). Given the time necessary to perform walk-downs and inspections, and fully understand any impacts, this event represents a potential degradation of the level of safety of the plant.

Event verification with external sources should not be necessary during or following an OBE. Earthquakes of this magnitude should be readily felt by on-site personnel and recognized as a seismic event (e.g., lateral accelerations in excess of 0.08g). The Shift Manager or Emergency Coordinator may seek external verification if deemed appropriate (e.g., a call to the USGS, check internet news sources, etc.); however, the verification action must not preclude a timely emergency declaration.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA9.

HNP Basis Reference(s):

1. AOP-21, Seismic Disturbances
2. FSAR 3.7.4
3. DBD-004, Seismic Monitoring System
4. FSAR 7.4
5. FSAR 2.1.1
6. NEI 99-01 HU2

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 3 – Natural or Technological Hazard

Initiating Condition: Hazardous event

EAL:

HU3.1	**Unusual Event**
A tornado strike within the PROTECTED AREA	

Mode Applicability:

All

Definition(s):

PROTECTED AREA - An area which normally encompasses all controlled areas within the security protected area fence as depicted in FSAR Figure 1.2.2-1, Site Plan.

Basis:

Response actions associated with a tornado onsite is provided in AP-300 Severe Weather Responses (ref. 1).

If damage is confirmed visually or by other in-plant indications, the event may be escalated to an Alert under EAL CA6.1 or SA9.1.

A tornado striking (touching down) within the PROTECTED AREA warrants declaration of an Unusual Event regardless of the measured wind speed at the meteorological tower. A tornado is defined as a violently rotating column of air in contact with the ground and extending from the base of a thunderstorm.

This IC addresses hazardous events that are considered to represent a potential degradation of the level of safety of the plant.

EAL HU3.1 addresses a tornado striking (touching down) within the PROTECTED AREA.

Escalation of the emergency classification level would be based on ICs in Recognition Categories R, F, S or C.

HNP Basis Reference(s):

1. AP-300, Severe Weather Response
2. NEI 99-01 HU3

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 3 – Natural or Technological Hazard

Initiating Condition: Hazardous event

EAL:

HU3.2 Unusual Event

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

Mode Applicability:

All

Definition(s):

FLOODING - A condition where water is entering a room or area faster than installed equipment is capable of removal, resulting in a rise of water level within the room or area.

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10CFR50.2):

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and *maintain* it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

In the Reactor Auxiliary Building (RAB), the RHR pump rooms on level 190 have critical equipment and are subject to flooding from many sources. The area above this room on level 216 communicates with the RHR pump rooms. The large open area on level 236 contains numerous critical components, including equipment designed to serve redundant functions. The high head pump cubicles are also located on level 236 and are considered in conjunction with level 236 floods. Although not a critical area in terms of equipment, the service water tunnel could be a source of flooding. Floods initiated in the tunnel that then propagate to level 236 and sources on level 236 were considered in the flooding analysis.

The Diesel Generator (DG) building contains important equipment and potential flood sources. Except for electrical cable tunnels, the building is physically separate from the other facilities and does was not considered relative to inter-building flood propagation. The DG building obviously includes the diesels which are important to protection of the reactor core when normal AC power is not available. The rooms housing the two diesels at level 261 in the building (DG Rooms A and B) are therefore critical areas (ref. 1).

This IC addresses hazardous events that are considered to represent a potential degradation of the level of safety of the plant.

This EAL addresses FLOODING of a building room or area that results in operators isolating power to a SAFETY SYSTEM component due to water level or other wetting concerns. Classification is also required if the water level or related wetting causes an automatic isolation of a SAFETY SYSTEM component from its power source (e.g., a breaker or relay trip). To warrant classification, operability of the affected component must be required by Technical Specifications for the current operating mode.

Escalation of the emergency classification level would be based on ICs in Recognition Categories R, F, S or C.

HNP Basis Reference(s):

1. FSAR section 3.6A.6, Flooding Analysis
2. NEI 99-01 HU3

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 3 – Natural or Technological Hazard

Initiating Condition: Hazardous event

EAL:

HU3.3	**Unusual Event**
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)	

Mode Applicability:

All

Definition(s):

IMPEDE(D) - Personnel access to a room or area is hindered to an extent that extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is not routinely employed).

PROTECTED AREA - An area which normally encompasses all controlled areas within the security protected area fence as depicted in FSAR Figure 1.2.2-1, Site Plan.

Basis:

As used here, the term "offsite" is meant to be areas external to the HNP PROTECTED AREA.

This IC addresses hazardous events that are considered to represent a potential degradation of the level of safety of the plant.

This EAL addresses a hazardous materials event originating at an offsite location and of sufficient magnitude to impede the movement of personnel within the PROTECTED AREA.

Escalation of the emergency classification level would be based on ICs in Recognition Categories R, F, S or C.

HNP Basis Reference(s):

1. NEI 99-01 HU3

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 3 – Natural or Technological Hazard

Initiating Condition: Hazardous event

EAL:

HU3.4	**Unusual Event**
A hazardous event that results in on-site conditions sufficient to prohibit the plant staff from accessing the site via personal vehicles (Note 7)	

Note 7: This EAL does **not** apply to routine traffic impediments such as fog, snow, ice, or vehicle breakdowns or accidents.

Mode Applicability:

All

Definition(s):

None

Basis:

This IC addresses hazardous events that are considered to represent a potential degradation of the level of safety of the plant.

This EAL addresses a hazardous event that causes an on-site impediment to vehicle movement and significant enough to prohibit the plant staff from accessing the site using personal vehicles. Examples of such an event include site FLOODING caused by a hurricane, heavy rains, up-river water releases, dam failure, etc., or an on-site train derailment blocking the access road.

This EAL is not intended apply to routine impediments such as fog, snow, ice, or vehicle breakdowns or accidents, but rather to more significant conditions such as the Hurricane Andrew strike on Turkey Point in 1992, the flooding around the Cooper Station during the Midwest floods of 1993, or the flooding around Ft. Calhoun Station in 2011.

Escalation of the emergency classification level would be based on ICs in Recognition Categories R, F, S or C.

HNP Basis Reference(s):

1. NEI 99-01 HU3

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 4 – Fire

Initiating Condition: FIRE potentially degrading the level of safety of the plant

EAL:

HU4.1 Unusual Event

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

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

Table H-1 Fire Areas
• Containment • Reactor Auxiliary Building • Fuel Handling Building • Turbine Building • Transformer Area • Emergency Diesel Generator Building • Diesel Fuel Oil Storage Building (DFOST) • ESW Intake Structure • Auxiliary Reservoir Intake Structure • NSW Structure • Switchyard • Yard 261 Duct Banks serving **any** of the above areas

Mode Applicability:

All

Definition(s):

FIRE - Combustion characterized by heat and light. Sources of smoke such as slipping drive belts or overheated electrical equipment do not constitute fires. Observation of flame is preferred but is NOT required if large quantities of smoke and heat are observed.

Basis:

The 15 minute requirement begins with a credible notification that a fire is occurring, or receipt of multiple valid fire detection system alarms or field validation of a single fire alarm. The alarm is to be validated using available Control Room indications or alarms to prove that it is not spurious, or by reports from the field.

Table H-1 Fire Areas are based on HNP-E/ELEC-0001 Safe Shutdown Analysis in Case of Fire and Fire Hazards Analysis. Table H-1 Fire Areas include those structures containing functions and systems required for safe shutdown of the plant (SAFETY SYSTEMS) (ref. 1, 2).

This IC addresses the magnitude and extent of FIRES that may be indicative of a potential degradation of the level of safety of the plant.

For EAL HU4.1 the intent of the 15-minute duration is to size the FIRE and to discriminate against small FIRES that are readily extinguished (e.g., smoldering waste paper basket). In addition to alarms, other indications of a FIRE could be a drop in fire main pressure, automatic activation of a suppression system, etc.

Upon receipt, operators will take prompt actions to confirm the validity of an initial fire alarm, indication, or report. For EAL assessment purposes, the emergency declaration clock starts at the time that the initial alarm, indication, or report was received, and not the time that a subsequent verification action was performed. Similarly, the fire duration clock also starts at the time of receipt of the initial alarm, indication or report.

<u>Basis-Related Requirements from Appendix R</u>

Appendix R to 10 CFR 50, states in part:

> Criterion 3 of Appendix A to this part specifies that "Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions."
>
> When considering the effects of fire, those systems associated with achieving and maintaining safe shutdown conditions assume major importance to safety because damage to them can lead to core damage resulting from loss of coolant through boil-off.
>
> Because fire may affect safe shutdown systems and because the loss of function of systems used to mitigate the consequences of design basis accidents under post-fire conditions does not per se impact public safety, the need to limit fire damage to systems required to achieve and maintain safe shutdown conditions is greater than the need to limit fire damage to those systems required to mitigate the consequences of design basis accidents.

It should be noted however, HNP is not an Appendix R plant but rather falls under the requirements of NFPA-805 for fire protection.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA9.

HNP Basis Reference(s):

1. HNP-E/ELEC-0001, Safe Shutdown Analysis in Case of Fire and Fire Hazards Analysis
2. FSAR 7.4
3. NEI 99-01 HU4

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 4 – Fire

Initiating Condition: FIRE potentially degrading the level of safety of the plant

EAL:

HU4.2 Unusual Event

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)

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

Table H-1 Fire Areas
• Containment • Reactor Auxiliary Building • Fuel Handling Building • Turbine Building • Transformer Area • Emergency Diesel Generator Building • Diesel Fuel Oil Storage Building (DFOST) • ESW Intake Structure • Auxiliary Reservoir Intake Structure • NSW Structure • Switchyard • Yard 261 Duct Banks serving **any** of the above areas

Mode Applicability:

All

Definition(s):

FIRE - Combustion characterized by heat and light. Sources of smoke such as slipping drive belts or overheated electrical equipment do not constitute fires. Observation of flame is preferred but is NOT required if large quantities of smoke and heat are observed.

Basis:

The 30 minute requirement begins upon receipt of a single valid fire detection system alarm. The alarm is to be validated using available Control Room indications or alarms to prove that it is not spurious, or by reports from the field. Actual field reports must be made within the 30 minute time limit or a classification must be made. If a fire is verified to be occurring by field report, classification shall be made based on EAL HU4.1.

Table H-1 Fire Areas are based on HNP-E/ELEC-0001 Safe Shutdown Analysis in Case of Fire and Fire Hazards Analysis. Table H-1 Fire Areas include those structures containing functions and systems required for safe shutdown of the plant (SAFETY SYSTEMS) (ref. 1, 2).

This IC addresses the magnitude and extent of FIRES that may be indicative of a potential degradation of the level of safety of the plant.

This EAL addresses receipt of a single fire alarm, and the existence of a FIRE is not verified (i.e., proved or disproved) within 30-minutes of the alarm. Upon receipt, operators will take prompt actions to confirm the validity of a single fire alarm. For EAL assessment purposes, the 30-minute clock starts at the time that the initial alarm was received, and not the time that a subsequent verification action was performed.

A single fire alarm, absent other indication(s) of a FIRE, may be indicative of equipment failure or a spurious activation, and not an actual FIRE. For this reason, additional time is allowed to verify the validity of the alarm. The 30-minute period is a reasonable amount of time to determine if an actual FIRE exists; however, after that time, and absent information to the contrary, it is assumed that an actual FIRE is in progress.

If an actual FIRE is verified by a report from the field, then HU4.1 is immediately applicable, and the emergency must be declared if the FIRE is not extinguished within 15-minutes of the report. If the alarm is verified to be due to an equipment failure or a spurious activation, and this verification occurs within 30-minutes of the receipt of the alarm, then this EAL is not applicable and no emergency declaration is warranted.

<u>Basis-Related Requirements from Appendix R</u>

Appendix R to 10 CFR 50, states in part:

> Criterion 3 of Appendix A to this part specifies that "Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions."
>
> When considering the effects of fire, those systems associated with achieving and maintaining safe shutdown conditions assume major importance to safety because damage to them can lead to core damage resulting from loss of coolant through boil-off.
>
> Because fire may affect safe shutdown systems and because the loss of function of systems used to mitigate the consequences of design basis accidents under post-fire conditions does not per se impact public safety, the need to limit fire damage to systems

required to achieve and maintain safe shutdown conditions is greater than the need to limit fire damage to those systems required to mitigate the consequences of design basis accidents.

In addition, Appendix R to 10 CFR 50, requires, among other considerations, the use of 1-hour fire barriers for the enclosure of cable and equipment and associated non-safety circuits of one redundant train (G.2.c). As used in this EAL, the 30-minutes to verify a single alarm is well within this worst-case 1-hour time period.

It should be noted however, HNP is not an Appendix R plant but rather falls under the requirements of NFPA-805 for fire protection.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA9.

HNP Basis Reference(s):

1. HNP-E/ELEC-0001, Safe Shutdown Analysis in Case of Fire and Fire Hazards Analysis
2. FSAR 7.4
3. NEI 99-01 HU4

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 4 – Fire

Initiating Condition: FIRE potentially degrading the level of safety of the plant

EAL:

HU4.3 Unusual Event

A FIRE within the plant PROTECTED AREA not extinguished within 60 min. of the initial report, alarm or indication (Note 1)

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

Mode Applicability:

All

Definition(s):

FIRE - Combustion characterized by heat and light. Sources of smoke such as slipping drive belts or overheated electrical equipment do not constitute fires. Observation of flame is preferred but is NOT required if large quantities of smoke and heat are observed.

PROTECTED AREA - An area which normally encompasses all controlled areas within the security protected area fence as depicted in FSAR Figure 1.2.2-1, Site Plan.

Basis:

This IC addresses the magnitude and extent of FIRES that may be indicative of a potential degradation of the level of safety of the plant.

In addition to a FIRE addressed by EAL HU4.1 or HU4.2, a FIRE within the plant PROTECTED AREA not extinguished within 60-minutes may also potentially degrade the level of plant safety.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA9.

HNP Basis Reference(s):

1. NEI 99-01 HU4

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 4 – Fire

Initiating Condition: FIRE potentially degrading the level of safety of the plant

EAL:

HU4.4 Unusual Event

A FIRE within the plant PROTECTED AREA that requires firefighting support by an offsite fire response agency to extinguish

Mode Applicability:

All

Definition(s):

FIRE - Combustion characterized by heat and light. Sources of smoke such as slipping drive belts or overheated electrical equipment do not constitute fires. Observation of flame is preferred but is NOT required if large quantities of smoke and heat are observed.

PROTECTED AREA - An area which normally encompasses all controlled areas within the security protected area fence as depicted in FSAR Figure 1.2.2-1, Site Plan.

Basis:

This IC addresses the magnitude and extent of FIRES that may be indicative of a potential degradation of the level of safety of the plant.

If a FIRE within the plant PROTECTED AREA is of sufficient size to require a response by an offsite firefighting agency (e.g., a local town Fire Department), then the level of plant safety is potentially degraded. The dispatch of an offsite firefighting agency to the site requires an emergency declaration only if it is needed to actively support firefighting efforts because the fire is beyond the capability of the Fire Brigade to extinguish. Declaration is not necessary if the agency resources are placed on stand-by, or supporting post-extinguishment recovery or investigation actions.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA9.

HNP Basis Reference(s):

1. NEI 99-01 HU4

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 5 – Hazardous Gases

Initiating Condition: Gaseous release IMPEDING access to equipment necessary for normal plant operations, cooldown or shutdown

EAL:

HA5.1 Alert

Release of a toxic, corrosive, asphyxiant or flammable gas into **any** Table R-3/H-2 rooms or areas

AND

Entry into the room or area is prohibited or IMPEDED (Note 5)

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.

Table R-3/H-2 Safe Operation & Shutdown Rooms/Areas

Room/Area	Mode(s)
RAB 190 (RHR pumps)	4
RAB 216 (BIT)	1, 2, 3, 4, 5
RAB 236 (CSIP, Primary Sample Sink, AFW pumps, CCW pumps and HX, Boric Acid Transfer Pumps, Mezzanine Area)	1, 2, 3, 4, 5
RAB 261 (RHR Heat Exchangers, Demin. Valve Gallery, VCT Valve Gallery)	1, 2, 3, 4, 5
RAB 286 (Switchgear)	3,4,5
Steam Tunnel	1, 2, 3, 4
ESW intakes	1, 2, 3, 4, 5

Mode Applicability:

All

Definition(s):

IMPEDE(D) - Personnel access to a room or area is hindered to an extent that extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is not routinely employed).

Basis:

If the equipment in the listed room or area was already inoperable, or out-of-service, before the event occurred, then no emergency should be declared since the event will have no adverse impact beyond that already allowed by Technical Specifications at the time of the event.

The list of plant rooms or areas with entry-related mode applicability identified specify those rooms or areas that contain equipment which require a manual/local action as specified in operating procedures used for normal plant operation, cooldown and shutdown. Rooms or areas in which actions of a contingent or emergency nature would be performed (e.g., an action to address an off-normal or emergency condition such as emergency repairs, corrective measures or emergency operations) are not included. In addition, the list specifies the plant mode(s) during which entry would be required for each room or area (ref. 1).

This IC addresses an event involving a release of a hazardous gas that precludes or impedes access to equipment necessary to maintain normal plant operation, or required for a normal plant cooldown and shutdown. This condition represents an actual or potential substantial degradation of the level of safety of the plant.

An Alert declaration is warranted if entry into the affected room/area is, or may be, procedurally required during the plant operating mode in effect at the time of the gaseous release. The emergency classification is not contingent upon whether entry is actually necessary at the time of the release.

Evaluation of the IC and EAL do not require atmospheric sampling; it only requires the Emergency Coordinator's judgment that the gas concentration in the affected room/area is sufficient to preclude or significantly impede procedurally required access. This judgment may be based on a variety of factors including an existing job hazard analysis, report of ill effects on personnel, advice from a subject matter expert or operating experience with the same or similar hazards. Access should be considered as impeded if extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is not routinely employed).

An emergency declaration is not warranted if any of the following conditions apply:

- The plant is in an operating mode different than the mode specified for the affected room/area (i.e., entry is not required during the operating mode in effect at the time of the gaseous release). For example, the plant is in Mode 1 when the gaseous release occurs, and the procedures used for normal operation, cooldown and shutdown do not require entry into the affected room until Mode 4.
- The gas release is a planned activity that includes compensatory measures which address the temporary inaccessibility of a room or area (e.g., fire suppression system testing).
- The action for which room/area entry is required is of an administrative or record keeping nature (e.g., normal rounds or routine inspections).
- The access control measures are of a conservative or precautionary nature, and would not actually prevent or impede a required action.
- If the equipment in the listed room or area was already inoperable, or out-of-service, before the event occurred, then no emergency should be declared since the event will have no adverse impact beyond that already allowed by Technical Specifications at the time of the event.

An asphyxiant is a gas capable of reducing the level of oxygen in the body to dangerous levels. Most commonly, asphyxiants work by merely displacing air in an enclosed environment. This reduces the concentration of oxygen below the normal level of around 19%, which can lead to breathing difficulties, unconsciousness or even death.

This EAL does not apply to firefighting activities that automatically or manually activate a fire suppression system in an area.

Escalation of the emergency classification level would be via Recognition Category R, C or F ICs.

HNP Basis Reference(s):

1. Attachment 3, Safe Operation & Shutdown Room/Areas Tables R-3/H-2 Bases
2. NEI 99-01 HA5

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 6 – Control Room Evacuation

Initiating Condition: Control Room evacuation resulting in transfer of plant control to alternate locations

EAL:

HA6.1	**Alert**
An event has resulted in plant control being transferred from the Control Room to the ACP	

Mode Applicability:

All

Definition(s):

None

Basis:

The Shift Manager (SM) determines if the Control Room is inoperable and requires evacuation. Control Room inhabitability may be caused by fire, dense smoke, noxious fumes, bomb threat in or adjacent to the Control Room, or other life threatening conditions (Ref. 1).

Transfer of plant control begins when the last licensed operator leaves the Control Room.

Inability to establish plant control from outside the Control Room escalates this event to a Site Area Emergency per EAL HS6.1.

This IC addresses an evacuation of the Control Room that results in transfer of plant control to alternate locations outside the Control Room. The loss of the ability to control the plant from the Control Room is considered to be a potential substantial degradation in the level of plant safety.

Following a Control Room evacuation, control of the plant will be transferred to alternate shutdown locations. The necessity to control a plant shutdown from outside the Control Room, in addition to responding to the event that required the evacuation of the Control Room, will present challenges to plant operators and other on-shift personnel. Activation of the ERO and emergency response facilities will assist in responding to these challenges.

Escalation of the emergency classification level would be via IC HS6.

HNP Basis Reference(s):

1. AOP-004, Remote Shutdown
2. NEI 99-01 HA6

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 6 – Control Room Evacuation

Initiating Condition: Inability to control a key safety function from outside the Control Room

EAL:

HS6.1 Site Area Emergency

An event has resulted in plant control being transferred from the Control Room to the ACP

AND

Control of **any** of the following key safety functions is not reestablished within 15 min. (Note 1):

- Reactivity
- Core Cooling
- RCS heat removal

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

Mode Applicability:

All

Definition(s):

None

Basis:

The Shift Manager determines if the Control Room is inoperable and requires evacuation. Control Room inhabitability may be caused by fire, dense smoke, noxious fumes, bomb threat in or adjacent to the Control Room, or other life threatening conditions (Ref. 1).

Transfer of plant control begins when the last licensed operator leaves the Control Room.

This IC addresses an evacuation of the Control Room that results in transfer of plant control to alternate locations, and the control of a key safety function cannot be reestablished in a timely manner. The failure to gain control of a key safety function following a transfer of plant control to alternate locations is a precursor to a challenge to one or more fission product barriers within a relatively short period of time.

The determination of whether or not "control" is established at the remote safe shutdown location(s) is based on Emergency Coordinator judgment. The Emergency Coordinator is expected to make a reasonable, informed judgment within 15 minutes whether or not the operating staff has control of key safety functions from the remote safe shutdown location(s).

Escalation of the emergency classification level would be via IC FG1 or CG1

HNP Basis Reference(s):

1. AOP-004, Remote Shutdown
2. NEI 99-01 HS6

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Coordinator Judgment

Initiating Condition: Other conditions existing that in the judgment of the Emergency Coordinator warrant declaration of a UE

EAL:

HU7.1	**Unusual Event**
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.	

Mode Applicability:

All

Definition(s):

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10CFR50.2):

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

The Emergency Coordinator is the designated onsite individual having the responsibility and authority for implementing the HNP Emergency Response Plan. The Shift Manager (SM) initially acts in the capacity of the Emergency Coordinator and takes actions as outlined in the Emergency Plan implementing procedures. If required by the emergency classification or if deemed appropriate by the Emergency Coordinator, emergency response personnel are notified and instructed to report to their emergency response locations. In this manner, the individual usually in charge of activities in the Control Room is responsible for initiating the necessary emergency response, but Plant Management is expected to manage the emergency response as soon as available to do so in anticipation of the possible wide-ranging responsibilities associated with managing a major emergency (ref. 1).

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Coordinator to fall under the emergency classification level description for an Unusual Event.

HNP Basis Reference(s):

1. PLP-201, HNP Emergency Plan section 2.4, Assignment of Responsibility
2. NEI 99-01 HU7

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Coordinator Judgment

Initiating Condition: Other conditions exist that in the judgment of the Emergency Coordinator warrant declaration of an Alert

EAL:

HA7.1 Alert

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.

Mode Applicability:

All

Definition(s):

HOSTILE ACTION - An act toward HNP or its personnel that includes the use of violent force to destroy equipment, take hostages, and/or intimidate the licensee to achieve an end. This includes attack by air, land, or water using guns, explosives, projectiles, vehicles, or other devices used to deliver destructive force. Other acts that satisfy the overall intent may be included. Hostile action should not be construed to include acts of civil disobedience or felonious acts that are not part of a concerted attack on HNP. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the owner controlled area).

Basis:

The Emergency Coordinator is the designated onsite individual having the responsibility and authority for implementing the HNP Emergency Response Plan. The Shift Manager (SM) initially acts in the capacity of the Emergency Coordinator and takes actions as outlined in the Emergency Plan implementing procedures. If required by the emergency classification or if deemed appropriate by the Emergency Coordinator, emergency response personnel are notified and instructed to report to their emergency response locations. In this manner, the individual usually in charge of activities in the Control Room is responsible for initiating the necessary emergency response, but Plant Management is expected to manage the emergency response as soon as available to do so in anticipation of the possible wide-ranging responsibilities associated with managing a major emergency (ref.1).

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Coordinator to fall under the emergency classification level description for an Alert.

HNP Basis Reference(s):

1. PLP-201, HNP Emergency Plan section 2.4, Assignment of Responsibility
2. HNP Security Plan
3. NEI 99-01 HA7

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Coordinator Judgment

Initiating Condition: Other conditions existing that in the judgment of the Emergency Coordinator warrant declaration of a Site Area Emergency

EAL:

HS7.1 Site Area Emergency

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

Mode Applicability:

All

Definition(s):

HOSTILE ACTION - An act toward HNP or its personnel that includes the use of violent force to destroy equipment, take hostages, and/or intimidate the licensee to achieve an end. This includes attack by air, land, or water using guns, explosives, projectiles, vehicles, or other devices used to deliver destructive force. Other acts that satisfy the overall intent may be included. Hostile action should not be construed to include acts of civil disobedience or felonious acts that are not part of a concerted attack on HNP. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the owner controlled area).

SITE BOUNDARY - A circle of approximately 2500 ft. radius from the center of the containment building (0.47 miles).

Basis:

The Emergency Coordinator is the designated onsite individual having the responsibility and authority for implementing the HNP Emergency Response Plan. The Shift Manager (SM) initially acts in the capacity of the Emergency Coordinator and takes actions as outlined in the Emergency Plan implementing procedures. If required by the emergency classification or if deemed appropriate by the Emergency Coordinator, emergency response personnel are notified and instructed to report to their emergency response locations. In this manner, the individual usually in charge of activities in the Control Room is responsible for initiating the necessary emergency response, but Plant Management is expected to manage the emergency response as soon as available to do so in anticipation of the possible wide-ranging responsibilities associated with managing a major emergency (ref. 1).

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Coordinator to fall under the emergency classification level description for a Site Area Emergency.

HNP Basis Reference(s):

1. PLP-201, HNP Emergency Plan section 2.4, Assignment of Responsibility
2. HNP Security Plan
3. NEI 99-01 HS7

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Coordinator Judgment

Initiating Condition: Other conditions exist which in the judgment of the Emergency Coordinator warrant declaration of a General Emergency

EAL:

HG7.1	**General Emergency**
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	

Mode Applicability:

All

Definition(s):

HOSTILE ACTION - An act toward HNP or its personnel that includes the use of violent force to destroy equipment, take hostages, and/or intimidate the licensee to achieve an end. This includes attack by air, land, or water using guns, explosives, projectiles, vehicles, or other devices used to deliver destructive force. Other acts that satisfy the overall intent may be included. Hostile action should not be construed to include acts of civil disobedience or felonious acts that are not part of a concerted attack on HNP. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the owner controlled area).

IMMINENT - The trajectory of events or conditions is such that an EAL will be met within a relatively short period of time regardless of mitigation or corrective actions.

Basis:

The Emergency Coordinator is the designated onsite individual having the responsibility and authority for implementing the HNP Emergency Response Plan. The Shift Manager(SM) initially acts in the capacity of the Emergency Coordinator and takes actions as outlined in the Emergency Plan implementing procedures. If required by the emergency classification or if deemed appropriate by the Emergency Coordinator, emergency response personnel are notified and instructed to report to their emergency response locations. In this manner, the individual usually in charge of activities in the Control Room is responsible for initiating the necessary emergency response, but Plant Management is expected to manage the emergency response as soon as available to do so in anticipation of the possible wide-ranging responsibilities associated with managing a major emergency (ref. 1).

Releases can reasonably be expected to exceed EPA PAG plume exposure levels outside the Site Boundary.

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency

Coordinator to fall under the emergency classification level description for a General Emergency.

HNP Basis Reference(s):

1. PLP-201, HNP Emergency Plan section 2.4, Assignment of Responsibility
2. HNP Security Plan
3. NEI 99-01 HG7

Category S – System Malfunction

EAL Group: Hot Conditions (RCS temperature > 200°F); EALs in this category are applicable only in one or more hot operating modes.

Numerous system-related equipment failure events that warrant emergency classification have been identified in this category. They may pose actual or potential threats to plant safety.

The events of this category pertain to the following subcategories:

1. Loss of Emergency AC Power

Loss of emergency electrical power can compromise plant safety system operability including decay heat removal and emergency core cooling systems which may be necessary to ensure fission product barrier integrity. This category includes loss of onsite and offsite sources for 6.9 KV emergency buses.

2. Loss of Vital DC Power

Loss of emergency electrical power can compromise plant safety system operability including decay heat removal and emergency core cooling systems which may be necessary to ensure fission product barrier integrity. This category includes loss of vital plant 125 VDC power sources.

3. Loss of Control Room Indications

Certain events that degrade plant operator ability to effectively assess plant conditions within the plant warrant emergency classification. Losses of indicators are in this subcategory.

4. RCS Activity

During normal operation, reactor coolant fission product activity is very low. Small concentrations of fission products in the coolant are primarily from the fission of tramp uranium in the fuel clad or minor perforations in the clad itself. Any significant increase from these base-line levels (2% - 5% clad failures) is indicative of fuel failures and is covered under the Fission Product Barrier Degradation category. However, lesser amounts of clad damage may result in coolant activity exceeding Technical Specification limits. These fission products will be circulated with the reactor coolant and can be detected by coolant sampling.

5. RCS Leakage

The reactor vessel provides a volume for the coolant that covers the reactor core. The reactor vessel and associated pressure piping (reactor coolant system) together provide a barrier to limit the release of radioactive material should the reactor fuel clad integrity fail. Excessive RCS leakage greater than Technical Specification limits indicates potential pipe cracks that may propagate to an extent threatening fuel clad, RCS and containment integrity.

6. RPS Failure

This subcategory includes events related to failure of the Reactor Protection System (RPS) to initiate and complete reactor trips. In the plant licensing basis, postulated failures of the RPS to complete a reactor trip comprise a specific set of analyzed events referred to as

Anticipated Transient Without Scram (ATWS) events. For EAL classification, however, ATWS is intended to mean any trip failure event that does not achieve reactor shutdown. If RPS actuation fails to assure reactor shutdown, positive control of reactivity is at risk and could cause a threat to fuel clad, RCS and containment integrity.

7. Loss of Communications

Certain events that degrade plant operator ability to effectively communicate with essential personnel within or external to the plant warrant emergency classification.

8. Containment Failure

Failure of containment isolation capability (under conditions in which the containment is not currently challenged) or loss of containment depressurization system capability warrants emergency classification.

9. Hazardous Event Affecting Safety Systems

Various natural and technological events that result in degraded plant safety system performance or significant visible damage warrant emergency classification under this subcategory.

Category: S – System Malfunction

Subcategory: 1 – Loss of Emergency AC Power

Initiating Condition: Loss of **all** offsite AC power capability to emergency buses for 15 minutes or longer

EAL:

SU1.1 Unusual Event

Loss of **all** offsite AC power capability, Table S-5, to 6.9 KV emergency buses 1A-SA and 1B-SB for
≥ 15 min. (Note 1)

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

Table S-5 AC Power Sources
Offsite: • SUT 1A • SUT 1B • UAT 1A/1B backfed via Main Transformer (**only** if already aligned) **Onsite:** • UAT 1A via Main Generator • UAT 1B via Main Generator • EDG 1A-SA • EDG 1B-SB

Mode Applicability:

1 - Power Operations, 2 - Startup, 3 - Hot Standby, 4 – Hot Shutdown

Definition(s):

None

Basis:

Basis:

For emergency classification purposes, "capability" means that an AC power source is available to the emergency buses, whether or not the buses are powered from it.

Power is supplied from the main generator to the switchyard through a main transformer bank. The main generator is directly connected to the main transformer bank through a 22 KV bus system and the 230 KV switchyard.

The Plant Electric Power Distribution System receives power under normal operating conditions from the main generator through two unit auxiliary transformers.

For startup and shutdown, when the main generator is unavailable, power is obtained through two start-up transformers from the grid and the 230 KV switchyard. These two transformers have sufficient capacity to provide for start-up and full load operation of the Unit. They also provide two separate sources of preferred (offsite) power to the Unit.

An additional path of power supply from the grid to the Plant Electric Power Distribution System can be made available after opening the disconnect links and disconnecting the main generator from the 22 KV bus. Power can be fed from the offsite power system through the main transformer bank and 22 KV bus to the unit auxiliary transformer, leaving the main generator disconnected. (ref. 1, 2)

Emergency buses 1A-SA and 1B-SB provide power to supply all of the safety-related loads. The normal source of power for the emergency buses is the main generator/unit auxiliary transformer. When this source of power is not available, power is supplied from the 230 KV switchyard through the start-up transformers or, with the generator disconnect links removed, from the main and unit auxiliary transformers. When neither of these sources is available, power to the two emergency buses is supplied from diesel generators EDG A and EDG B (one diesel generator for each emergency bus). (ref. 3)

This IC addresses a prolonged loss of offsite power. The loss of offsite power sources renders the plant more vulnerable to a complete loss of power to AC emergency buses. This condition represents a potential reduction in the level of safety of the plant.

Fifteen minutes was selected as a threshold to exclude transient or momentary losses of offsite power.

Escalation of the emergency classification level would be via IC SA1.

HNP Basis Reference(s):

1. FSAR Figure 8.1.3-1
2. FSAR 8.2
3. FSAR 8.3
4. EOP-ECA-0.0, Loss of all AC Power
5. NEI 99-01 SU1

Category: S – System Malfunction

Subcategory: 1 – Loss of Emergency AC Power

Initiating Condition: Loss of **all but one** AC power source to emergency buses for 15 minutes or longer

EAL:

SA1.1 Alert

AC power capability, Table S-5, to 6.9 KV emergency buses 1A-SA and 1B-SB 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

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

Table S-5 AC Power Sources
Offsite: • SUT 1A • SUT 1B • UAT 1A/1B backfed via Main Transformer (**only** if already aligned) **Onsite:** • UAT 1A via Main Generator • UAT 1B via Main Generator • EDG 1A-SA • EDG 1B-SB

Mode Applicability:

1 - Power Operations, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10CFR50.2):

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

For emergency classification purposes, "capability" means that an AC power source is available to the emergency buses, whether or not the buses are powered from it.

Power is supplied from the main generator to the switchyard through a main transformer bank. The main generator is directly connected to the main transformer bank through a 22 KV bus system and the 230 KV switchyard.

The Plant Electric Power Distribution System receives power under normal operating conditions from the main generator through two unit auxiliary transformers.

For startup and shutdown, when the main generator is unavailable, power is obtained through two start-up transformers from the grid and the 230 KV switchyard. These two transformers have sufficient capacity to provide for start-up and full load operation of the Unit. They also provide two separate sources of preferred (offsite) power to the Unit.

An additional path of power supply from the grid to the Plant Electric Power Distribution System can be made available after opening the disconnect links and disconnecting the main generator from the 22 KV bus. Power can be fed from the offsite power system through the main transformer bank and 22 KV bus to the unit auxiliary transformer, leaving the main generator disconnected. (ref. 1, 2)

Emergency buses 1A-SA and 1B-SB provide power to supply all of the safety-related loads. The normal source of power for the emergency buses is the main generator/unit auxiliary transformer. When this source of power is not available, power is supplied from the 230 KV switchyard through the start-up transformers or, with the generator disconnect links removed, from the main and unit auxiliary transformers. When neither of these sources is available, power to the two emergency buses is supplied from diesel generators EDG A and EDG B (one diesel generator for each emergency bus). (ref. 3)

The 15-minute interval was selected as a threshold to exclude transient or momentary power losses. If the capability of a second source of emergency bus power is not restored within 15 minutes, an Alert is declared under this EAL.

This IC describes a significant degradation of offsite and onsite AC power sources such that any additional single failure would result in a loss of all AC power to SAFETY SYSTEMS. In this condition, the sole AC power source may be powering one, or more than one, train of safety-related equipment. This IC provides an escalation path from IC SU1.

An "AC power source" is a source recognized in AOPs and EOPs, and capable of supplying required power to an emergency bus. Some examples of this condition are presented below.

- A loss of all offsite power with a concurrent failure of all but one emergency power source (e.g., an onsite diesel generator).
- A loss of all offsite power and loss of all emergency power sources (e.g., onsite diesel generators) with a single train of emergency buses being back-fed from the unit main generator.

- A loss of emergency power sources (e.g., onsite diesel generators) with a single train of emergency buses being back-fed from an offsite power source.

Escalation of the emergency classification level would be via IC SS1.

HNP Basis Reference(s):

1. FSAR Figure 8.1.3-1
2. FSAR 8.2
3. FSAR 8.3
4. EOP-ECA-0.0, Loss of all AC Power
5. NEI 99-01 SA1

Category: S – System Malfunction

Subcategory: 1 – Loss of Emergency AC Power

Initiating Condition: Loss of **all** offsite power and **all** onsite AC power to emergency buses for 15 minutes or longer

EAL:

SS1.1	**Site Area Emergency**
Loss of **all** offsite and **all** onsite AC power capability to 6.9 KV emergency buses 1A-SA and 1B-SB for ≥ 15 min. (Note 1)	

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

Mode Applicability:

1 - Power Operations, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

This EAL is indicated by the loss of all offsite and onsite AC power capability to 6.9 KV emergency buses 1A-SA and 1B-SB. For emergency classification purposes, "capability" means that an AC power source is available to the emergency buses, whether or not the buses are powered from it.

Power is supplied from the main generator to the switchyard through a main transformer bank. The main generator is directly connected to the main transformer bank through a 22 KV bus system and the 230 KV switchyard.

The Plant Electric Power Distribution System receives power under normal operating conditions from the main generator through two unit auxiliary transformers.

For startup and shutdown, when the main generator is unavailable, power is obtained through two start-up transformers from the grid and the 230 KV switchyard. These two transformers have sufficient capacity to provide for start-up and full load operation of the Unit. They also provide two separate sources of preferred (offsite) power to the Unit.

An additional path of power supply from the grid to the Plant Electric Power Distribution System can be made available after opening the disconnect links and disconnecting the main generator from the 22 KV bus. Power can be fed from the offsite power system through the main transformer bank and 22 KV bus to the unit auxiliary transformer, leaving the main generator disconnected. (ref. 1, 2)

Emergency buses 1A-SA and 1B-SB provide power to supply all of the safety-related loads. The normal source of power for the emergency buses is the main generator/unit auxiliary transformer. When this source of power is not available, power is supplied from the 230 KV switchyard through the start-up transformers or, with the generator disconnect links removed, from the main and unit auxiliary transformers. When neither of these sources is available,

power to the two emergency buses is supplied from diesel generators EDG A and EDG B (one diesel generator for each emergency bus). (ref. 3)

The 15-minute interval was selected as a threshold to exclude transient or momentary power losses. The interval begins when both offsite and onsite AC power capability are lost.

This IC addresses a total loss of AC power that compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink. In addition, fission product barrier monitoring capabilities may be degraded under these conditions. This IC represents a condition that involves actual or likely major failures of plant functions needed for the protection of the public.

Escalation of the emergency classification level would be via ICs RG1, FG1 or SG1.

HNP Basis Reference(s):

1. FSAR Figure 8.1.3-1
2. FSAR 8.2
3. FSAR 8.3
4. EOP-ECA-0.0, Loss of all AC Power
5. NEI 99-01 SS1

Category: S –System Malfunction

Subcategory: 1 – Loss of Emergency AC Power

Initiating Condition: Prolonged loss of **all** offsite and **all** onsite AC power to emergency buses

EAL:

SG1.1 General Emergency

Loss of **all** offsite and **all** onsite AC power capability to 6.9 KV emergency buses 1A-SA and 1B-SB

AND EITHER:

- Restoration of at least one emergency bus in < 4 hours is **not** likely (Note 1)
- Core Cooling RED Path entry conditions met

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

Mode Applicability:

1 - Power Operations, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

This EAL is indicated by the extended loss of all offsite and onsite AC power capability 6.9 KV emergency buses 1A-SA and 1B-SB either for greater then the HNP Station Blackout (SBO) coping analysis time (4 hrs.) (ref. 1) or that has resulted in indications of an actual loss of adequate core cooling.

Power is supplied from the main generator to the switchyard through a main transformer bank. The main generator is directly connected to the main transformer bank through a 22 KV bus system and the 230 KV switchyard.

The Plant Electric Power Distribution System receives power under normal operating conditions from the main generator through two unit auxiliary transformers.

For startup and shutdown, when the main generator is unavailable, power is obtained through two start-up transformers from the grid and the 230 KV switchyard. These two transformers have sufficient capacity to provide for start-up and full load operation of the Unit. They also provide two separate sources of preferred (offsite) power to the Unit.

An additional path of power supply from the grid to the Plant Electric Power Distribution System can be made available after opening the disconnect links and disconnecting the main generator from the 22 KV bus. Power can be fed from the offsite power system through the main transformer bank and 22 KV bus to the unit auxiliary transformer, leaving the main generator disconnected. (ref. 1, 2)

Emergency buses 1A-SA and 1B-SB provide power to supply all of the safety-related loads. The normal source of power for the emergency buses is the main generator/unit auxiliary

transformer. When this source of power is not available, power is supplied from the 230 KV switchyard through the start-up transformers or, with the generator disconnect links removed, from the main and unit auxiliary transformers. When neither of these sources is available, power to the two emergency buses is supplied from diesel generators EDG A and EDG B (one diesel generator for each emergency bus). (ref. 3)

Four hours is the station blackout coping time (ref 3, 5).

Indication of continuing core cooling degradation must be based on fission product barrier monitoring with particular emphasis on Emergency Coordinator judgment as it relates to imminent Loss or Potential Loss of fission product barriers and degraded ability to monitor fission product barriers. Indication of continuing core cooling degradation is manifested by CSFST Core Cooling RED Path conditions being met (ref. 6). Specifically, Core Cooling RED Path conditions exist if either core exit T/Cs are reading greater than or equal to 1200°F or subcooling is less than 10°F AND no RCPs are running AND core exit T/Cs are reading greater than 730°F AND RVLIS Full Range is less than 39% (ref. 6).

This IC addresses a prolonged loss of all power sources to AC emergency buses. A loss of all AC power compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink. A prolonged loss of these buses will lead to a loss of one or more fission product barriers. In addition, fission product barrier monitoring capabilities may be degraded under these conditions.

The EAL should require declaration of a General Emergency prior to meeting the thresholds for IC FG1. This will allow additional time for implementation of offsite protective actions.

Escalation of the emergency classification from Site Area Emergency will occur if it is projected that power cannot be restored to at least one AC emergency bus by the end of the analyzed station blackout coping period. Beyond this time, plant responses and event trajectory are subject to greater uncertainty, and there is an increased likelihood of challenges to multiple fission product barriers.

The estimate for restoring at least one emergency bus should be based on a realistic appraisal of the situation. Mitigation actions with a low probability of success should not be used as a basis for delaying a classification upgrade. The goal is to maximize the time available to prepare for, and implement, protective actions for the public.

The EAL will also require a General Emergency declaration if the loss of AC power results in parameters that indicate an inability to adequately remove decay heat from the core.

HNP Basis Reference(s):

1. FSAR Figure 8.1.3-1
2. FSAR 8.2
3. FSAR 8.3
4. EOP-ECA-0.0, Loss of all AC Power
5. SBO-Calc-001
6. EOP-CSFST Core Cooling CSF-2
7. NEI 99-01 SG1

Category: S –System Malfunction

Subcategory: 1 – Loss of Emergency AC Power

Initiating Condition: Loss of **all** emergency AC and vital DC power sources for 15 minutes or longer

EAL:

SG1.2 General Emergency

Loss of **all** offsite and **all** onsite AC power capability to 6.9 KV emergency buses 1A-SA and 1B-SB for ≥ 15 min.

AND

Loss of **all** 125 VDC power based on battery bus voltage indications < 105 VDC on **both** emergency DC buses (DP-1A-SA, DP-1B-SB) for ≥ 15 min.

(Note 1)

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

Mode Applicability:

1 - Power Operations, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

This EAL is indicated by the loss of all offsite and onsite emergency AC power capability to 6.9 KV emergency buses 1A-SA and 1B-SB for greater than 15 minutes in combination with degraded vital DC power voltage. This EAL addresses operating experience from the March 2011 accident at Fukushima Daiichi.

Power is supplied from the main generator to the switchyard through a main transformer bank. The main generator is directly connected to the main transformer bank through a 22 KV bus system and the 230 KV switchyard.

The Plant Electric Power Distribution System receives power under normal operating conditions from the main generator through two unit auxiliary transformers.

For startup and shutdown, when the main generator is unavailable, power is obtained through two start-up transformers from the grid and the 230 KV switchyard. These two transformers have sufficient capacity to provide for start-up and full load operation of the Unit. They also provide two separate sources of preferred (offsite) power to the Unit.

An additional path of power supply from the grid to the Plant Electric Power Distribution System can be made available after opening the disconnect links and disconnecting the main generator from the 22 KV bus. Power can be fed from the offsite power system through the main transformer bank and 22 KV bus to the unit auxiliary transformer, leaving the main generator disconnected. (ref. 1, 2)

Emergency buses 1A-SA and 1B-SB provide power to supply all of the safety-related loads. The normal source of power for the emergency buses is the main generator/unit auxiliary transformer. When this source of power is not available, power is supplied from the 230 KV switchyard through the start-up transformers or, with the generator disconnect links removed, from the main and unit auxiliary transformers. When neither of these sources is available, power to the two emergency buses is supplied from diesel generators EDG A and EDG B (one diesel generator for each emergency bus). (ref. 3)

The DC Power System is designed to provide a source of reliable continuous power for the plant protection system, control and instrumentation and other loads for start-up, operation, and shutdown modes of plant operation. The DC Power System consists of three 60 cell, 125V batteries and one 120 cell, 250V battery, each with its own battery chargers, and DC load center. The 125VDC ESF (safety-related) batteries 1A-SA and 1B-SB are located in separate Battery Rooms in the Electrical Switchgear Room on the 286' elevation of the Reactor Auxiliary Building. The battery chargers for batteries 1A-SA and 1B-SB are rated at 150 amperes DC at a nominal charging voltage of 132VDC. Normal operation of the DC system is such that the battery chargers supply all load current while the batteries serve as an emergency source of power in the event power to the chargers is lost. The battery chargers are capable of providing the normal DC load and also maintaining the connected battery in a fully charged condition (ref. 3, 5, 7). When the plant is in Modes 1, 2, 3 or 4, as a minimum, the 125-volt battery bank 1A-SA and either full capacity charger 1A-SA or 1B-SA and the 125-volt battery bank 1B-SB and either full capacity charger 1A-SB or 1B-SB shall be operable (ref. 6).

Minimum bus voltage is 105 VDC (ref. 7, 9).

This IC addresses a concurrent and prolonged loss of both emergency AC and Vital DC power. A loss of all emergency AC power compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink. A loss of vital DC power compromises the ability to monitor and control SAFETY SYSTEMS. A sustained loss of both emergency AC and vital DC power will lead to multiple challenges to fission product barriers.

Fifteen minutes was selected as a threshold to exclude transient or momentary power losses. The 15-minute emergency declaration clock begins at the point when both EAL thresholds are met.

HNP Basis Reference(s):

1. FSAR Figure 8.1.3-1
2. FSAR 8.2
3. FSAR 8.3
4. EOP-ECA-0.0, Loss of all AC Power
5. FSAR Figure 8.1.3-3
6. Technical Specifications 3.8.2.1
7. FSAR Table 8.3.1-1
8. MST-E0013, 1E Battery Performance Test
9. NEI 99-01 SG8

Category: S – System Malfunction

Subcategory: 2 – Loss of Vital DC Power

Initiating Condition: Loss of all vital DC power for 15 minutes or longer

EAL:

SS2.1 Site Area Emergency

Loss of **all** 125 VDC power based on battery bus voltage indications < 105 VDC on **both** emergency DC buses (DP-1A-SA, DP-1B-SB) for ≥ 15 min. (Note 1)

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

Mode Applicability:

1 - Power Operations, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

The DC Power System is designed to provide a source of reliable continuous power for the plant protection system, control and instrumentation and other loads for start-up, operation, and shutdown modes of plant operation. The DC Power System consists of three 60 cell, 125V batteries and one 120 cell, 250V battery, each with its own battery chargers, and DC load center. The 125VDC ESF (safety-related) batteries 1A-SA and 1B-SB are located in separate Battery Rooms in the Electrical Switchgear Room on the 286' elevation of the Reactor Auxiliary Building. The battery chargers for batteries 1A-SA and 1B-SB are rated at 150 amperes DC at a nominal charging voltage of 132VDC. Normal operation of the DC system is such that the battery chargers supply all load current while the batteries serve as an emergency source of power in the event power to the chargers is lost. The battery chargers are capable of providing the normal DC load and also maintaining the connected battery in a fully charged condition (ref. 1, 2, 4). When the plant is in Modes 1, 2, 3 or 4, as a minimum, the 125-volt battery bank 1A-SA and either full capacity charger 1A-SA or 1B-SA and the 125-volt battery bank 1B-SB and either full capacity charger 1A-SB or 1B-SB shall be operable (ref. 3).

Minimum bus voltage is 105 VDC (ref. 4, 5).

This IC addresses a loss of vital DC power which compromises the ability to monitor and control SAFETY SYSTEMS. In modes above Cold Shutdown, this condition involves a major failure of plant functions needed for the protection of the public.

Fifteen minutes was selected as a threshold to exclude transient or momentary power losses.

Escalation of the emergency classification level would be via ICs RG1, FG1 or SG1.

HNP Basis Reference(s):

1. FSAR 8.3
2. FSAR Figure 8.1.3-3

3. Technical Specifications 3.8.2.1
4. FSAR Table 8.3.1-1
5. MST-E0013, 1E Battery Performance Test
6. NEI 99-01 SS8

Category: S – System Malfunction

Subcategory: 3 – Loss of Control Room Indications

Initiating Condition: UNPLANNED loss of Control Room indications for 15 minutes or longer

EAL:

SU3.1 Unusual Event

An UNPLANNED event results in the inability to monitor one or more Table S-1 parameters from within the Control Room for ≥ 15 min. (Note 1)

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

Table S-1 Safety System Parameters
• 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

Mode Applicability:

1 - Power Operations, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

UNPLANNED - A parameter change or an event that is not 1) the result of an intended evolution or 2) an expected plant response to a transient. The cause of the parameter change or event may be known or unknown.

Basis:

SAFETY SYSTEM parameters listed in Table S-1 are monitored in the Control Room through a combination of hard control panel indicators as well as computer based information systems. The OSI/PI monitor and SPDS/ERFIS plant computer serve as a redundant compensatory indicators which may be utilized in lieu of normal Control Room indicators (ref. 1, 2, 3).

This IC addresses the difficulty associated with monitoring normal plant conditions without the ability to obtain SAFETY SYSTEM parameters from within the Control Room. This condition is a precursor to a more significant event and represents a potential degradation in the level of safety of the plant.

As used in this EAL, an "inability to monitor" means that values for one or more of the listed parameters cannot be determined from within the Control Room. This situation would require a loss of all of the Control Room sources for the given parameter(s). For example, the reactor power level cannot be determined from any analog, digital and recorder source within the Control Room.

An event involving a loss of plant indications, annunciators and/or display systems is evaluated in accordance with 10 CFR 50.72 (and associated guidance in NUREG-1022) to determine if an NRC event report is required. The event would be reported if it significantly impaired the capability to perform emergency assessments. In particular, emergency assessments necessary to implement abnormal operating procedures, emergency operating procedures, and emergency plan implementing procedures addressing emergency classification, accident assessment, or protective action decision-making.

This EAL is focused on a selected subset of plant parameters associated with the key safety functions of reactivity control, core cooling and RCS heat removal. The loss of the ability to determine one or more of these parameters from within the Control Room is considered to be more significant than simply a reportable condition. In addition, if all indication sources for one or more of the listed parameters are lost, then the ability to determine the values of other SAFETY SYSTEM parameters may be impacted as well. For example, if the value for reactor vessel level cannot be determined from the indications and recorders on a main control board, the SPDS or the plant computer, the availability of other parameter values may be compromised as well.

Fifteen minutes was selected as a threshold to exclude transient or momentary losses of indication.

Escalation of the emergency classification level would be via IC SA3.

HNP Basis Reference(s):

1. Spec. X-G-003, Emergency Response Facility Information System Data Acquisition replacement Project Specification
2. OP-163, ERFIS
3. DBD-307, Emergency Response Facility Information System (ERFIS) and Waste Processing (WP) Computer System
4. NEI 99-01 SU2

Category: S – System Malfunction

Subcategory: 3 – Loss of Control Room Indications

Initiating Condition: UNPLANNED loss of Control Room indications for 15 minutes or longer with a significant transient in progress

EAL:

SA3.1 Alert

An UNPLANNED event results in the inability to monitor **one or more** Table S-1 parameters from within the Control Room for ≥ 15 min. (Note 1)

AND

Any significant transient is in progress, Table S-2

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

Table S-1 Safety System Parameters
• 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

Table S-2 Significant Transients
• Reactor trip • Runback > 25% thermal power • Electrical load rejection > 25% electrical load • Safety injection actuation

Mode Applicability:

1 - Power Operations, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

UNPLANNED - A parameter change or an event that is not 1) the result of an intended evolution or 2) an expected plant response to a transient. The cause of the parameter change or event may be known or unknown.

Basis:

SAFETY SYSTEM parameters listed in Table S-1 are monitored in the Control Room through a combination of hard control panel indicators as well as computer based information systems. The OSI/PI monitor and SPDS/ERFIS plant computer serve as a redundant compensatory indicators which may be utilized in lieu of normal Control Room indicators (ref. 1, 2, 3).

Significant transients are listed in Table S-2 and include response to automatic or manually initiated functions such as reactor trips, runbacks involving greater than 25% thermal power change, electrical load rejections of greater than 25% full electrical load or SI injection actuations.

This IC addresses the difficulty associated with monitoring rapidly changing plant conditions during a transient without the ability to obtain SAFETY SYSTEM parameters from within the Control Room. During this condition, the margin to a potential fission product barrier challenge is reduced. It thus represents a potential substantial degradation in the level of safety of the plant.

As used in this EAL, an "inability to monitor" means that values for one or more of the listed parameters cannot be determined from within the Control Room. This situation would require a loss of all of the Control Room sources for the given parameter(s). For example, the reactor power level cannot be determined from any analog, digital and recorder source within the Control Room.

An event involving a loss of plant indications, annunciators and/or display systems is evaluated in accordance with 10 CFR 50.72 (and associated guidance in NUREG-1022) to determine if an NRC event report is required. The event would be reported if it significantly impaired the capability to perform emergency assessments. In particular, emergency assessments necessary to implement abnormal operating procedures, emergency operating procedures, and emergency plan implementing procedures addressing emergency classification, accident assessment, or protective action decision-making.

This EAL is focused on a selected subset of plant parameters associated with the key safety functions of reactivity control, core cooling and RCS heat removal. The loss of the ability to determine one or more of these parameters from within the Control Room is considered to be more significant than simply a reportable condition. In addition, if all indication sources for one or more of the listed parameters are lost, then the ability to determine the values of other SAFETY SYSTEM parameters may be impacted as well. For example, if the value for reactor vessel level cannot be determined from the indications and recorders on a main control board, the SPDS or the plant computer, the availability of other parameter values may be compromised as well.

Fifteen minutes was selected as a threshold to exclude transient or momentary losses of indication.

Escalation of the emergency classification level would be via ICs FS1 or IC RS1

HNP Basis Reference(s):

1. Spec. X-G-003, Emergency Response Facility Information System Data Acquisition replacement Project Specification
2. OP-163, ERFIS

3. DBD-307, Emergency Response Facility Information System (ERFIS) and Waste Processing (WP) Computer System
4. NEI 99-01 SA2

Category: S – System Malfunction

Subcategory: 4 – RCS Activity

Initiating Condition: RCS activity greater than Technical Specification allowable limits

EAL:

SU4.1	**Unusual Event**
RCS activity > Technical Specification Section 3.4.8 limits	

Mode Applicability:

1 - Power Operations, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

This EAL addresses reactor coolant samples exceeding Technical Specification 3.4.8 which are applicable in Modes 1, 2, 3 and 4. The Technical Specification limits accommodate an iodine spike phenomenon that may occur following changes in thermal power. The Technical Specification LCO limits are established to minimize the offsite radioactivity dose consequences in the event of a steam generator tube rupture (SGTR) accident (ref. 1, 2).

This IC addresses a reactor coolant activity value that exceeds an allowable limit specified in Technical Specifications. This condition is a precursor to a more significant event and represents a potential degradation of the level of safety of the plant.

Escalation of the emergency classification level would be via ICs FA1 or the Recognition Category R ICs.

HNP Basis Reference(s):

1. Technical Specification 3.4.8
2. AOP-032, High RCS Activity
3. NEI 99-01 SU3

Category: S – System Malfunction

Subcategory: 4 – RCS Activity

Initiating Condition: RCS activity greater than Technical Specification allowable limits

EAL:

SU4.2	**Unusual Event**
Valid Gross Failed Fuel Detector (RS-7411A) high alarm (> 1E+04 cpm)	

Mode Applicability:

1 - Power Operations, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

This EAL addresses indication of gross failed fuel that may be in excess of Technical Specification coolant activity limits. The Gross Failed Fuel Detector System continuously monitors the delayed neutron activity in a sample drawn from the RCS. This provides a rapid indication of gross amounts of fission products contained in the RCS resulting from possible fuel defects (ref. 1, 2).

This IC addresses a reactor coolant activity value that exceeds an allowable limit specified in Technical Specifications. This condition is a precursor to a more significant event and represents a potential degradation of the level of safety of the plant.

Escalation of the emergency classification level would be via ICs FA1 or the Recognition Category R ICs.

HNP Basis Reference(s):

1. APP-ALB-026 2-1, Gross Failed Fuel Det Trouble
2. AOP-032, High RCS Activity
3. NEI 99-01 SU3

Category: S – System Malfunction

Subcategory: 5 – RCS Leakage

Initiating Condition: RCS leakage for 15 minutes or longer

EAL:

SU5.1 Unusual Event

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)

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

Mode Applicability:

1 - Power Operations, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

Unidentified leakage and identified leakage are determined by performance of the RCS water inventory balance. Pressure boundary leakage would first appear as unidentified leakage and can only be positively identified by inspection. OST-1026 and OST-1226 are used to ensure RCS leakage is within Technical Specification limits (ref. 2, 3). AOP-016, Excessive Primary Plant Leakage, is used for excessive RCS leakage (ref. 4).

Technical Specifications (ref. 1) defines RCS leakage as follows:

Identified Leakage:

a. Leakage (except controlled leakage) into closed systems, such as pump seal or valve packing leaks that are captured and conducted to a sump or collecting tank , or

b. Leakage into the containment atmosphere from sources that are both specifically located or known either not to interfere with the operation of leakage detection systems or not to be pressure boundary leakage, or

c. RCS leakage through a steam generator to the Secondary Coolant System (primary-to-secondary leakage).

Unidentified Leakage:

All leakage which is not identified Leakage or controlled leakage. (Controlled leakage is that seal water flow supplied to the reactor coolant pump seals.)

Pressure Boundary Leakage:

Leakage (except primary-to-secondary leakage) through a non-isolable fault in a RCS component body, pipe wall, or vessel wall.

RCS leakage outside of the containment that is not considered identified or unidentified leakage per Technical Specifications includes leakage via interfacing systems such as RCS to the Component Cooling Water, or systems that directly see RCS pressure outside containment such as Chemical & Volume Control System, Nuclear Sampling System and Residual Heat Removal System (when in the shutdown cooling mode) (ref. 4).

Escalation of this EAL to the Alert level is via Category F, Fission Product Barrier Degradation, IC FA1.

This IC addresses RCS leakage which may be a precursor to a more significant event. In this case, RCS leakage has been detected and operators, following applicable procedures, have been unable to promptly isolate the leak. This condition is considered to be a potential degradation of the level of safety of the plant.

The first and second EAL conditions are focused on a loss of mass from the RCS due to "unidentified leakage", "pressure boundary leakage" or "identified leakage" (as these leakage types are defined in the plant Technical Specifications). The third condition addresses an RCS mass loss caused by an UNISOLABLE leak through an interfacing system. These conditions thus apply to leakage into the containment, a secondary-side system (e.g., steam generator tube leakage) or a location outside of containment.

The leak rate values for each condition were selected because they are usually observable with normal Control Room indications. Lesser values typically require time-consuming calculations to determine (e.g., a mass balance calculation). The first condition uses a lower value that reflects the greater significance of unidentified or pressure boundary leakage.

The release of mass from the RCS due to the as-designed/expected operation of a relief valve does not warrant an emergency classification. An emergency classification would be required if a mass loss is caused by a relief valve that is not functioning as designed/expected (e.g., a relief valve sticks open and the line flow cannot be isolated).

The 15-minute threshold duration allows sufficient time for prompt operator actions to isolate the leakage, if possible.

HNP Basis Reference(s):

1. HNP Technical Specifications Definitions section 1.1
2. OST-1026, Reactor Coolant System Leakage Evaluation, Computer Calculation, Daily Interval, Modes 1-2-3-4
3. OST-1226, Reactor Coolant System Leakage Evaluation, Manual Calculation, Daily Interval, Modes 1-2-3-4
4. AOP-016, Excessive Primary Plant Leakage
5. NEI 99-01 SU4

Category: S – System Malfunction

Subcategory: 6 – RPS Failure

Initiating Condition: Automatic or manual trip fails to shut down the reactor

EAL:

SU6.1 Unusual Event

An automatic trip did **not** shut down the reactor as indicated by reactor power ≥ 5% after **any** RPS setpoint is exceeded

AND

A subsequent automatic trip or manual trip action taken at the reactor control console (actuation of MCB Reactor Trip Switch #1, #2 or MCB Turbine Trip switch) is successful in shutting down the reactor as indicated by reactor power < 5% (Note 8)

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.

Mode Applicability:

1 - Power Operations

Definition(s):

None

Basis:

The first condition of this EAL identifies the need to cease critical reactor operations by actuation of the automatic Reactor Protection System (RPS) trip function. A reactor trip is automatically initiated by the RPS when certain continuously monitored parameters exceed predetermined setpoints (ref. 1).

Following a successful reactor trip, rapid insertion of the control rods occurs. Nuclear power promptly drops to a fraction of the original power level and then decays to a level several decades less with a negative startup rate. The reactor power drop continues until reactor power reaches the point at which the influence of source neutrons on reactor power starts to be observable. A predictable post-trip response from an automatic reactor trip signal should therefore consist of a prompt drop in reactor power as sensed by the nuclear instrumentation and a lowering of power into the source range. A successful trip has therefore occurred when there is sufficient rod insertion from the trip of RPS to bring the reactor power below the immediate shutdown decay heat level of 5% (ref. 2, 3, 4).

For the purposes of emergency classification, successful manual trip actions are those which can be quickly performed from the reactor control console (i.e., actuation of MCB Reactor Trip Switch #1, #2 or MCB Turbine Trip switch). Reactor shutdown achieved by use of other trip actions specified in EOP-FR-S.1 Response to Nuclear Power Generation/ATWS (depressing TURBINE MANUAL, emergency boration or manually driving control rods) do not constitute a successful manual trip (ref. 4).

Following any automatic RPS trip signal, EOP-E-0 (ref. 1) and EOP-FR-S.1 (ref. 3) prescribe insertion of redundant manual trip signals to back up the automatic RPS trip function and

ensure reactor shutdown is achieved. Even if the first subsequent manual trip signal inserts all control rods to the full-in position immediately after the initial failure of the automatic trip, the lowest level of classification that must be declared is an Unusual Event.

In the event that the operator identifies a reactor trip is imminent and initiates a successful manual reactor trip before the automatic RPS trip setpoint is reached, no declaration is required. The successful manual trip of the reactor before it reaches its automatic trip setpoint or reactor trip signals caused by instrumentation channel failures do not lead to a potential fission product barrier loss. However, if subsequent manual reactor trip actions fail to reduce reactor power below 5%, the event escalates to the Alert under EAL SA6.1.

If by procedure, operator actions include the initiation of an immediate manual trip following receipt of an automatic trip signal and there are no clear indications that the automatic trip failed (such as a time delay following indications that a trip setpoint was exceeded), it may be difficult to determine if the reactor was shut down because of automatic trip or manual actions. If a subsequent review of the trip actuation indications reveals that the automatic trip did not cause the reactor to be shut down, then consideration should be given to evaluating the fuel for potential damage, and the reporting requirements of 50.72 should be considered for the transient event.

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, and either a subsequent operator manual action taken at the reactor control consoles or an automatic trip is successful in shutting down the reactor. This event is a precursor to a more significant condition and thus represents a potential degradation of the level of safety of the plant.

Following the failure on an automatic reactor trip, operators will promptly initiate manual actions at the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor trip). If these manual actions are successful in shutting down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

If an initial manual reactor trip is unsuccessful, operators will promptly take manual action at another location(s) on the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor trip using a different switch). Depending upon several factors, the initial or subsequent effort to manually trip the reactor, or a concurrent plant condition, may lead to the generation of an automatic reactor trip signal. If a subsequent manual or automatic trip is successful in shutting down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

A manual action at the reactor control consoles is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core (e.g., initiating a manual reactor trip). This action does not include manually driving in control rods or implementation of boron injection strategies. Actions taken at back-panels or other locations within the Control Room, or any location outside the Control Room, are not considered to be "at the reactor control consoles".

The plant response to the failure of an automatic or manual reactor trip will vary based upon several factors including the reactor power level prior to the event, availability of the condenser, performance of mitigation equipment and actions, other concurrent plant conditions, etc. If subsequent operator manual actions taken at the reactor control consoles

are also unsuccessful in shutting down the reactor, then the emergency classification level will escalate to an Alert via IC SA6. Depending upon the plant response, escalation is also possible via IC FA1. Absent the plant conditions needed to meet either IC SA6 or FA1, an Unusual Event declaration is appropriate for this event.

A reactor shutdown is determined in accordance with applicable Emergency Operating Procedure criteria.

Should a reactor trip signal be generated as a result of plant work (e.g., RPS setpoint testing), the following classification guidance should be applied.

- If the signal causes a plant transient that should have included an automatic reactor trip and the RPS fails to automatically shutdown the reactor, then this IC and the EALs are applicable, and should be evaluated.
- If the signal does not cause a plant transient and the trip failure is determined through other means (e.g., assessment of test results), then this IC and the EALs are not applicable and no classification is warranted.

HNP Basis Reference(s):

1. EOP-E-0 Reactor Trip or Safety Injection
2. EOP-User's Guide
3. EOP-FR-S.1, Response to Nuclear Power Generation/ATWS
4. EOP-CSFST, Subcriticality CSF-1
5. NEI 99-01 SU5

Category: S – System Malfunction

Subcategory: 6 – RPS Failure

Initiating Condition: Automatic or manual trip fails to shut down the reactor

EAL:

SU6.2 Unusual Event

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 (actuation of MCB Reactor Trip Switch #1, #2 or MCB Turbine Trip switch) is successful in shutting down the reactor as indicated by reactor power < 5% (Note 8)

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.

Mode Applicability:

1 - Power Operations

Definition(s):

None

Basis:

This EAL addresses a failure of a manually initiated trip in the absence of having exceeded an automatic RPS trip setpoint and a subsequent automatic or manual trip is successful in shutting down the reactor (reactor power < 5%). (ref. 1).

Following a successful reactor trip, rapid insertion of the control rods occurs. Nuclear power promptly drops to a fraction of the original power level and then decays to a level several decades less with a negative startup rate. The reactor power drop continues until reactor power reaches the point at which the influence of source neutrons on reactor power starts to be observable. A predictable post-trip response from a manual reactor trip signal should therefore consist of a prompt drop in reactor power as sensed by the nuclear instrumentation and a lowering of power into the source range. A successful trip has therefore occurred when there is sufficient rod insertion from the trip of RPS to bring the reactor power below the immediate shutdown decay heat level of 5% (ref. 2, 3 4).

For the purposes of emergency classification, successful manual trip actions are those which can be quickly performed from the reactor control console (i.e., actuation of MCB Reactor Trip Switch #1, #2 or MCB Turbine Trip switch). Reactor shutdown achieved by use of other trip actions specified in EOP-FR-S.1 Response to Nuclear Power Generation/ATWS (depressing TURBINE MANUAL, emergency boration or manually driving control rods) do not constitute a successful manual trip (ref. 4).

If both subsequent automatic and subsequent manual reactor trip actions in the Control Room fail to reduce reactor power below the power associated with the safety system design (< 5%) following a failure of an initial manual trip, the event escalates to an Alert under EAL SA6.1

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, and either a subsequent operator manual action taken at the reactor control consoles or an automatic trip is successful in shutting down the reactor. This event is a precursor to a more significant condition and thus represents a potential degradation of the level of safety of the plant.

Following the failure on an automatic reactor trip, operators will promptly initiate manual actions at the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor trip). If these manual actions are successful in shutting down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

If an initial manual reactor trip is unsuccessful, operators will promptly take manual action at another location(s) on the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor trip using a different switch). Depending upon several factors, the initial or subsequent effort to manually the reactor, or a concurrent plant condition, may lead to the generation of an automatic reactor trip signal. If a subsequent manual or automatic trip is successful in shutting down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

A manual action at the reactor control consoles is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core (e.g., initiating a manual reactor trip). This action does not include manually driving in control rods or implementation of boron injection strategies. Actions taken at back-panels or other locations within the Control Room, or any location outside the Control Room, are not considered to be "at the reactor control consoles".

The plant response to the failure of an automatic or manual reactor trip will vary based upon several factors including the reactor power level prior to the event, availability of the condenser, performance of mitigation equipment and actions, other concurrent plant conditions, etc. If subsequent operator manual actions taken at the reactor control consoles are also unsuccessful in shutting down the reactor, then the emergency classification level will escalate to an Alert via IC SA6. Depending upon the plant response, escalation is also possible via IC FA1. Absent the plant conditions needed to meet either IC SA6 or FA1, an Unusual Event declaration is appropriate for this event.

A reactor shutdown is determined in accordance with applicable Emergency Operating Procedure criteria.

Should a reactor trip signal be generated as a result of plant work (e.g., RPS setpoint testing), the following classification guidance should be applied.

- If the signal causes a plant transient that should have included an automatic reactor trip and the RTS fails to automatically shutdown the reactor, then this IC and the EALs are applicable, and should be evaluated.
- If the signal does not cause a plant transient and the trip failure is determined through other means (e.g., assessment of test results), then this IC and the EALs are not applicable and no classification is warranted.

HNP Basis Reference(s):

1. EOP-E-0, Reactor Trip or Safety Injection
2. EOP-User's Guide
3. EOP-FR-S.1, Response to Nuclear Power Generation/ATWS
4. EOP-CSFST, Subcriticality CSF-1
5. NEI 99-01 SU5

Category: S – System Malfunction

Subcategory: 2 – RPS Failure

Initiating Condition: 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

EAL:

SA6.1 Alert

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 (actuation of MCB Reactor Trip Switch #1, #2 or MCB Turbine Trip switch) are **not** successful in shutting down the reactor as indicated by reactor power ≥ 5% (Note 8)

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.

Mode Applicability:

1 - Power Operations

Definition(s):

None

Basis:

This EAL addresses any automatic or manual reactor trip signal that fails to shut down the reactor followed by a subsequent manual trip that fails to shut down the reactor to an extent the reactor is producing energy in excess of the heat load for which the safety systems were designed.

For the purposes of emergency classification, successful manual trip actions are those which can be quickly performed from the reactor control console (i.e., actuation of MCB Reactor Trip Switch #1, #2 or MCB Turbine Trip switch). Reactor shutdown achieved by use of other trip actions specified in EOP-FR-S.1 Response to Nuclear Power Generation/ATWS (depressing TURBINE MANUAL, emergency boration or manually driving control rods) do not constitute a successful manual trip (ref. 4).

5% rated power is a minimum reading on the power range scale that indicates continued power production. It also approximates the decay heat which the shutdown systems were designed to remove and is indicative of a condition requiring immediate response to prevent subsequent core damage. Below 5%, plant response will be similar to that observed during a normal shutdown. Nuclear instrumentation can be used to determine if reactor power is greater than 5 % power (ref. 1).

Escalation of this event to a Site Area Emergency would be under IC SS6 or Emergency Coordinator judgment.

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, and subsequent operator manual actions taken at the reactor control consoles to shutdown the reactor are also unsuccessful. This condition represents an actual or potential substantial degradation of the level of safety of the plant. An emergency declaration is required even if the reactor is subsequently shutdown by an action taken away from the reactor control consoles since this event entails a significant failure of the RPS.

A manual action at the reactor control console is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core (e.g., initiating a manual reactor trip). This action does not include manually driving in control rods or implementation of boron injection strategies. If this action(s) is unsuccessful, operators would immediately pursue additional manual actions at locations away from the reactor control console (e.g., locally opening breakers). Actions taken at backpanels or other locations within the Control Room, or any location outside the Control Room, are not considered to be "at the reactor control console".

The plant response to the failure of an automatic or manual reactor trip will vary based upon several factors including the reactor power level prior to the event, availability of the condenser, performance of mitigation equipment and actions, other concurrent plant conditions, etc. If the failure to shut down the reactor is prolonged enough to cause a challenge to the core cooling or RCS heat removal safety functions, the emergency classification level will escalate to a Site Area Emergency via IC SS6. Depending upon plant responses and symptoms, escalation is also possible via IC FS1. Absent the plant conditions needed to meet either IC SS6 or FS1, an Alert declaration is appropriate for this event.

It is recognized that plant responses or symptoms may also require an Alert declaration in accordance with the Recognition Category F ICs; however, this IC and EAL are included to ensure a timely emergency declaration.

A reactor shutdown is determined in accordance with applicable Emergency Operating Procedure criteria.

HNP Basis Reference(s):

1. EOP-E-0, Reactor Trip or Safety Injection
2. EOP-User's Guide
3. EOP-FR-S.1, Response to Nuclear Power Generation/ATWS
4. EOP-CSFST, Subcriticality CSF-1
5. NEI 99-01 SA5

Category: S – System Malfunction

Subcategory: 2 – RPS Failure

Initiating Condition: Inability to shut down the reactor causing a challenge to core cooling or RCS heat removal

EAL:

SS6.1 Site Area Emergency

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:

- Core Cooling RED Path entry conditions met
- Heat Sink RED Path entry conditions met

Mode Applicability:

1 - Power Operations

Definition(s):

None

Basis:

This EAL addresses the following:

- Any automatic reactor trip signal followed by a manual trip that fails to shut down the reactor to an extent the reactor is producing energy in excess of the heat load for which the safety systems were designed (EAL SA6.1), **AND**
- Indications that either core cooling is extremely challenged or heat removal is extremely challenged.

The combination of failure of both front line and backup protection systems to function in response to a plant transient, along with the continued production of heat, poses a direct threat to the Fuel Clad and RCS barriers.

Reactor shutdown achieved by use of EOP-FR-S.1 Response to Nuclear Power Generation/ATWS (depressing TURBINE MANUAL, emergency boration or manually driving control rods, opening reactor trip or MG breakers) are also credited as a successful manual trip provided reactor power can be reduced below 5% before indications of an extreme challenge to either core cooling or heat removal exist (ref. 1, 2, 3, 4).

5% rated power is a minimum reading on the power range scale that indicates continued power production. It also approximates the decay heat which the shutdown systems were designed to remove and is indicative of a condition requiring immediate response to prevent subsequent core damage. Below 5%, plant response will be similar to that observed during a

normal shutdown. Nuclear instrumentation can be used to determine if reactor power is greater than 5% power (ref. 1).

Indication of continuing core cooling degradation is manifested by CSFST Core Cooling RED Path conditions being met. Specifically, Core Cooling RED Path conditions exist if either core exit T/Cs are reading greater than 1200ºF or subcooling is less than 10°F AND no RCPs are running AND core exit T/Cs are reading greater than 730ºF AND RVLIS level less than 39% (ref. 5).

Indication of inability to adequately remove heat from the RCS is manifested by CSFST Heat Sink RED Path conditions being met. Specifically, Heat Sink RED Path conditions exist if narrow range level in at least on steam generator is not greater than or equal to 25% and total feedwater flow to the intact steam generators is less than 210 KPPH. (ref. 6).

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, all subsequent operator actions to manually shutdown the reactor are unsuccessful, and continued power generation is challenging the capability to adequately remove heat from the core and/or the RCS. This condition will lead to fuel damage if additional mitigation actions are unsuccessful and thus warrants the declaration of a Site Area Emergency.

In some instances, the emergency classification resulting from this IC/EAL may be higher than that resulting from an assessment of the plant responses and symptoms against the Recognition Category F ICs/EALs. This is appropriate in that the Recognition Category F ICs/EALs do not address the additional threat posed by a failure to shut down the reactor. The inclusion of this IC and EAL ensures the timely declaration of a Site Area Emergency in response to prolonged failure to shutdown the reactor.

A reactor shutdown is determined in accordance with applicable Emergency Operating Procedure criteria.

Escalation of the emergency classification level would be via IC RG1 or FG1.

HNP Basis Reference(s):

1. EOP-E-0, Reactor Trip or Safety Injection
2. EOP-User's Guide
3. EOP-FR-S.1, Response to Nuclear Power Generation/ATWS
4. EOP-CSFST, Subcriticality CSF-1
5. EOP-CSFST, Core Cooling CSF-2
6. EOP-CSFST, Heat Sink CSF-3
7. NEI 99-01 SS5

Category: S – System Malfunction

Subcategory: 7 – Loss of Communications

Initiating Condition: Loss of **all** onsite or offsite communications capabilities

EAL:

SU7.1 Unusual Event

Loss of **all** Table S-3 onsite communication methods

OR

Loss of **all** Table S-3 ORO communication methods

OR

Loss of **all** Table S-3 NRC communication methods

Table S-3 Communication Methods

System	Onsite	ORO	NRC
PABX telephone (desk phones)	X	X	X
HE&EC PABX telephone		X	X
Site paging system	X		
Satellite phone		X	X
DEMNET		X	
Radio communications networks	X		
NRC ETS phone			X
NRC HPN phone			X

Mode Applicability:

1 - Power Operations, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

Onsite/offsite communications include one or more of the systems listed in Table S-3 (ref. 1, 2, 3, 4, 5).

The NRC ETS Phone and the NRC HPN Phone are part of the PABX and will be unavailable if the PABX is unavailable.

This EAL is the hot condition equivalent of the cold condition EAL CU5.1.

This IC addresses a significant loss of on-site or offsite communications capabilities. While not a direct challenge to plant or personnel safety, this event warrants prompt notifications to OROs and the NRC.

This IC should be assessed only when extraordinary means are being utilized to make communications possible (e.g., use of non-plant, privately owned equipment, relaying of on-site information via individuals or multiple radio transmission points, individuals being sent to offsite locations, etc.).

The first EAL condition addresses a total loss of the communications methods used in support of routine plant operations.

The second EAL condition addresses a total loss of the communications methods used to notify all OROs of an emergency declaration. The OROs referred to here are the State, Chatham, Harnett, Lee and Wake County EOCs

The third EAL addresses a total loss of the communications methods used to notify the NRC of an emergency declaration.

HNP Basis Reference(s):

1. FSAR 9.5.2
2. PLP-201, Emergency Plan, Section 3.8
3. OMM-009, Shift Communications, Section 5.2
4. OP-180, Plant Communication Systems
5. DBD-206, Plant Communications Systems
6. NEI 99-01 SU6

Category: S – System Malfunction

Subcategory: 8 – Containment Failure

Initiating Condition: Failure to isolate containment or loss of containment pressure control.

EAL:

SU8.1 Unusual Event

EITHER:

Any penetration is **not** isolated within 15 min. of a VALID containment isolation signal

OR

Containment pressure > 10 psig with < one full train of depressurization equipment operating (one CNMT spray pump and two CNMT fan coolers) per design for > 15 min.

(Note 1)

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

Mode Applicability:

1 - Power Operations, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

VALID - An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Basis:

The Containment pressure setpoint (10 psig) is the pressure at which the Containment Spray System should actuate (ref. 1, 2). Limiting LOCA analyses assume one Containment Spray pump and two CNMT fan coolers operate (ref. 3).

EOP-ECA-1.2 and AOP-023 provide guidance for failures of containment isolations (ref. 4, 5).

This EAL addresses a failure of one or more containment penetrations to automatically isolate (close) when required by an actuation signal. It also addresses an event that results in high containment pressure with a concurrent failure of containment pressure control systems. Absent challenges to another fission product barrier, either condition represents potential degradation of the level of safety of the plant.

For the first condition, the containment isolation signal must be generated as the result on an off-normal/accident condition (e.g., a safety injection or high containment pressure); a failure resulting from testing or maintenance does not warrant classification. The determination of

containment and penetration status – isolated or not isolated – should be made in accordance with the appropriate criteria contained in the plant AOPs and EOPs. The 15-minute criterion is included to allow operators time to manually isolate the required penetrations, if possible.

The second condition addresses a condition where containment pressure is greater than the setpoint at which containment energy (heat) removal systems are designed to automatically actuate, and less than one full train of equipment is capable of operating per design. The 15-minute criterion is included to allow operators time to manually start equipment that may not have automatically started, if possible. The inability to start the required equipment indicates that containment heat removal/depressurization systems (e.g., containment sprays or ice condenser fans) are either lost or performing in a degraded manner.

This event would escalate to a Site Area Emergency in accordance with IC FS1 if there were a concurrent loss or potential loss of either the Fuel Clad or RCS fission product barriers.

HNP Basis Reference(s):

1. EOP-CSFST, CSF-5
2. OP-112, Containment Spray System
3. FSAR 6.2.1.1.3.2
4. EOP-ECA-1.2, LOCA Outside Containment
5. AOP-023, Loss of Containment Integrity
6. NEI 99-01 SU7

Category: S – System Malfunction

Subcategory: 9 – Hazardous Event Affecting Safety Systems

Initiating Condition: Hazardous event affecting a SAFETY SYSTEM needed for the current operating mode

EAL:

SA9.1 Alert

The occurrence of **any** Table S-4 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

Table S-4 Hazardous Events
• 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 Shift Manager

Mode Applicability:

1 - Power Operations, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

EXPLOSION - A rapid, violent and catastrophic failure of a piece of equipment due to combustion, chemical reaction or overpressurization. A release of steam (from high energy lines or components) or an electrical component failure (caused by short circuits, grounding, arcing, etc.) should not automatically be considered an explosion. Such events require a post-event inspection to determine if the attributes of an explosion are present.

FIRE - Combustion characterized by heat and light. Sources of smoke such as slipping drive belts or overheated electrical equipment do not constitute fires. Observation of flame is preferred but is NOT required if large quantities of smoke and heat are observed.

FLOODING - A condition where water is entering a room or area faster than installed equipment is capable of removal, resulting in a rise of water level within the room or area.

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems

classified as safety-related (as defined in 10CFR50.2):

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

VISIBLE DAMAGE - Damage to a component or structure that is readily observable without measurements, testing, or analysis. The visual impact of the damage is sufficient to cause concern regarding the operability or reliability of the affected component or structure.

Basis:

- Internal FLOODING may be caused by events such as component failures, equipment misalignment, or outage activity mishaps.
- External flooding may be due to high lake level. All structures on the plant site are protected to at least Elevation 261 ft and no structure has any access openings below Elevation 261 ft. (ref. 1, 2).
- The plant Seismic Category I structures are designed to withstand the effects of the design wind, a maximum wind of 179 mph at 30 feet above plant grade. (ref. 2).
- An explosion that degrades the performance of a SAFETY SYSTEM train or visibly damages a SAFETY SYSTEM component or structure would be classified under this EAL.

This IC addresses a hazardous event that causes damage to a SAFETY SYSTEM, or a structure containing SAFETY SYSTEM components, needed for the current operating mode. This condition significantly reduces the margin to a loss or potential loss of a fission product barrier, and therefore represents an actual or potential substantial degradation of the level of safety of the plant.

The first condition addresses damage to a SAFETY SYSTEM train that is in service/operation since indications for it will be readily available. The indications of degraded performance should be significant enough to cause concern regarding the operability or reliability of the SAFETY SYSTEM train.

The second condition addresses damage to a SAFETY SYSTEM component that is not in service/operation or readily apparent through indications alone, or to a structure containing SAFETY SYSTEM components. Operators will make this determination based on the totality of available event and damage report information. This is intended to be a brief assessment not requiring lengthy analysis or quantification of the damage.

Escalation of the emergency classification level would be via IC FS1 or RS1.

HNP Basis Reference(s):

1. FSAR 2.4.5.5
2 FSAR 3.3.1.1
3. NEI 99-01 CA6

Category F – Fission Product Barrier Degradation

EAL Group: Hot Conditions (RCS temperature > 200°F); EALs in this category are applicable only in one or more hot operating modes.

EALs in this category represent threats to the defense in depth design concept that precludes the release of highly radioactive fission products to the environment. This concept relies on multiple physical barriers any one of which, if maintained intact, precludes the release of significant amounts of radioactive fission products to the environment. The primary fission product barriers are:

A. Fuel Clad (FC): The Fuel Clad Barrier consists of the cladding material that contains the fuel pellets.
B. Reactor Coolant System (RCS): The RCS Barrier includes the RCS primary side and its connections up to and including the pressurizer safety and relief valves, and other connections up to and including the primary isolation valves.
C. Containment (CNMT): The Containment Barrier includes the containment building and connections up to and including the outermost containment isolation valves. This barrier also includes the main steam, feedwater, and blowdown line extensions outside the containment building up to and including the outermost secondary side isolation valve. Containment Barrier thresholds are used as criteria for escalation of the ECL from Alert to a Site Area Emergency or a General Emergency.

The EALs in this category require evaluation of the loss and potential loss thresholds listed in the fission product barrier matrix of Table F-1 (Attachment 2). "Loss" and "Potential Loss" signify the relative damage and threat of damage to the barrier. "Loss" means the barrier no longer assures containment of radioactive materials. "Potential Loss" means integrity of the barrier is threatened and could be lost if conditions continue to degrade. The number of barriers that are lost or potentially lost and the following criteria determine the appropriate emergency classification level:

Alert:
Any loss or any potential loss of either Fuel Clad or RCS

Site Area Emergency:
Loss or potential loss of any two barriers

General Emergency:
Loss of any two barriers and loss or potential loss of third barrier

The logic used for emergency classification based on fission product barrier monitoring should reflect the following considerations:

- The Fuel Clad Barrier and the RCS Barrier are weighted more heavily than the Containment Barrier.
- Unusual Event ICs associated with RCS and Fuel Clad Barriers are addressed under System Malfunction ICs.
- For accident conditions involving a radiological release, evaluation of the fission product barrier thresholds will need to be performed in conjunction with dose assessments to

ensure correct and timely escalation of the emergency classification. For example, an evaluation of the fission product barrier thresholds may result in a Site Area Emergency classification while a dose assessment may indicate that an EAL for General Emergency IC RG1 has been exceeded.

- The fission product barrier thresholds specified within a scheme reflect plant-specific HNP design and operating characteristics.
- As used in this category, the term RCS leakage encompasses not just those types defined in Technical Specifications but also includes the loss of RCS mass to any location– inside the primary containment, an interfacing system, or outside of the primary containment. The release of liquid or steam mass from the RCS due to the as-designed/expected operation of a relief valve is not considered to be RCS leakage.
- At the Site Area Emergency level, EAL users should maintain cognizance of how far present conditions are from meeting a threshold that would require a General Emergency declaration. For example, if the Fuel Clad and RCS fission product barriers were both lost, then there should be frequent assessments of containment radioactive inventory and integrity. Alternatively, if both the Fuel Clad and RCS fission product barriers were potentially lost, the Emergency Coordinator would have more assurance that there was no immediate need to escalate to a General Emergency.

Category: Fission Product Barrier Degradation

Subcategory: N/A

Initiating Condition: **Any** loss or **any** potential loss of either Fuel Clad or RCS

EAL:

FA1.1 **Alert**
Any loss or **any** potential loss of either Fuel Clad or RCS (Table F-1)

Mode Applicability:

1 - Power Operations, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

Fuel Clad, RCS and Containment comprise the fission product barriers. Table F-1 (Attachment 2) lists the fission product barrier thresholds, bases and references.

At the Alert classification level, Fuel Clad and RCS barriers are weighted more heavily than the Containment barrier. Unlike the Containment barrier, loss or potential loss of either the Fuel Clad or RCS barrier may result in the relocation of radioactive materials or degradation of core cooling capability. Note that the loss or potential loss of Containment barrier in combination with loss or potential loss of either Fuel Clad or RCS barrier results in declaration of a Site Area Emergency under EAL FS1.1

HNP Basis Reference(s):

1. NEI 99-01 FA1

Category: Fission Product Barrier Degradation

Subcategory: N/A

Initiating Condition: Loss or potential loss of **any** two barriers

EAL:

FS1.1	**Site Area Emergency**
Loss or potential loss of **any** two barriers (Table F-1)	

Mode Applicability:

1 - Power Operations, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

Fuel Clad, RCS and Containment comprise the fission product barriers. Table F-1 (Attachment 2) lists the fission product barrier thresholds, bases and references.

At the Site Area Emergency classification level, each barrier is weighted equally. A Site Area Emergency is therefore appropriate for any combination of the following conditions:

- One barrier loss and a second barrier loss (i.e., loss - loss)
- One barrier loss and a second barrier potential loss (i.e., loss - potential loss)
- One barrier potential loss and a second barrier potential loss (i.e., potential loss - potential loss)

At the Site Area Emergency classification level, the ability to dynamically assess the proximity of present conditions with respect to the threshold for a General Emergency is important. For example, the existence of Fuel Clad and RCS Barrier loss thresholds in addition to offsite dose assessments would require continual assessments of radioactive inventory and Containment integrity in anticipation of reaching a General Emergency classification. Alternatively, if both Fuel Clad and RCS potential loss thresholds existed, the Emergency Coordinator would have greater assurance that escalation to a General Emergency is less imminent.

HNP Basis Reference(s):

1. NEI 99-01 FS1

Category: Fission Product Barrier Degradation

Subcategory: N/A

Initiating Condition: Loss of **any** two barriers and loss or potential loss of third barrier

EAL:

FG1.1 General Emergency

Loss of **any** two barriers

AND

Loss or potential loss of third barrier (Table F-1)

Mode Applicability:

1 - Power Operations, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

Fuel Clad, RCS and Containment comprise the fission product barriers. Table F-1 (Attachment 2) lists the fission product barrier thresholds, bases and references.

At the General Emergency classification level each barrier is weighted equally. A General Emergency is therefore appropriate for any combination of the following conditions:

- Loss of Fuel Clad, RCS and Containment barriers
- Loss of Fuel Clad and RCS barriers with potential loss of Containment barrier
- Loss of RCS and Containment barriers with potential loss of Fuel Clad barrier
- Loss of Fuel Clad and Containment barriers with potential loss of RCS barrier

HNP Basis Reference(s):

1. NEI 99-01 FG1

Introduction

Table F-1 lists the threshold conditions that define the Loss and Potential Loss of the three fission product barriers (Fuel Clad, Reactor Coolant System, and Containment). The table is structured so that each of the three barriers occupies adjacent columns. Each fission product barrier column is further divided into two columns; one for Loss thresholds and one for Potential Loss thresholds.

The first column of the table (to the left of the Fuel Clad Loss column) lists the categories (types) of fission product barrier thresholds. The fission product barrier categories are:

A. RCS or SG Tube Leakage

B. Inadequate Heat removal

C. CNMT Radiation / RCS Activity

D. CNMT Integrity or Bypass

E. Emergency Coordinator Judgment

Each category occupies a row in Table F-1 thus forming a matrix defined by the categories. The intersection of each row with each Loss/Potential Loss column forms a cell in which one or more fission product barrier thresholds appear. If NEI 99-01 does not define a threshold for a barrier Loss/Potential Loss, the word "None" is entered in the cell.

Thresholds are assigned sequential numbers within each Loss and Potential Loss column beginning with number one. In this manner, a threshold can be identified by its category title and number. For example, the first Fuel Clad barrier Loss in Category A would be assigned "FC Loss A.1," the third Containment barrier Potential Loss in Category C would be assigned "CNMT P-Loss C.3," etc.

If a cell in Table F-1 contains more than one numbered threshold, each of the numbered thresholds, if exceeded, signifies a Loss or Potential Loss of the barrier. It is not necessary to exceed all of the thresholds in a category before declaring a barrier Loss/Potential Loss.

Subdivision of Table F-1 by category facilitates association of plant conditions to the applicable fission product barrier Loss and Potential Loss thresholds. This structure promotes a systematic approach to assessing the classification status of the fission product barriers.

When equipped with knowledge of plant conditions related to the fission product barriers, the EAL-user first scans down the category column of Table F-1, locates the likely category and then reads across the fission product barrier Loss and Potential Loss thresholds in that category to determine if a threshold has been exceeded. If a threshold has not been exceeded, the EAL-user proceeds to the next likely category and continues review of the thresholds in the new category

If the EAL-user determines that any threshold has been exceeded, by definition, the barrier is lost or potentially lost – even if multiple thresholds in the same barrier column are exceeded, only that one barrier is lost or potentially lost. The EAL-user must examine each of the three fission product barriers to determine if other barrier thresholds in the category are lost or potentially lost. For example, if containment radiation is sufficiently high, a Loss of the Fuel Clad and RCS barriers and a Potential Loss of the Containment barrier can occur. Barrier

Losses and Potential Losses are then applied to the algorithms given in EALs FG1.1, FS1.1, and FA1.1 to determine the appropriate emergency classification.

In the remainder of this Attachment, the Fuel Clad barrier threshold bases appear first, followed by the RCS barrier and finally the Containment barrier threshold bases. In each barrier, the bases are given according category Loss followed by category Potential Loss beginning with Category A, then B,..., E.

Table F-1 Fission Product Barrier Threshold Matrix

	Fuel Clad (FC) Barrier		Reactor Coolant System (RCS) Barrier		Containment (CNMT) Barrier	
Category	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**
A **RCS or SG Tube Leakage**	None	None	1. An automatic or manual ECCS (SI) actuation required by **EITHER:** • UNISOLABLE RCS leakage • SG tube RUPTURE	1. Operation of a standby charging pump is required by **EITHER:** • UNISOLABLE RCS leakage • SG tube leakage 2. CSFST Integrity-RED Path entry conditions met	1. A leaking or RUPTURED SG is FAULTED outside of containment	None
B **Inadequate Heat Removal**	1. CSFST Core Cooling-RED Path entry conditions met	1. CSFST Core Cooling-ORANGE PATH entry conditions met 2. CSFST Heat Sink-RED Path entry conditions met **AND** Heat sink is required	None	1. CSFST Heat Sink-RED Path entry conditions met **AND** Heat sink is required	None	1. CSFST Core Cooling-RED Path entry conditions met **AND** Restoration procedures **not** effective within 15 min. (Note 1)
C **CNMT Radiation / RCS Activity**	1. Containment radiation >150 R/hr (RM-1CR-3589-SA or RM-1CR-3590-SB) 2. Dose equivalent I-131 coolant activity > 300 µCi/gm	None	1. Containment Leak Detection Monitor Noble Gas (REM-1LT-3502A-SA) > 8.3E-3 µCi/ml	None	None	1. Containment radiation >600 R/hr (RM-1CR-3589-SA or RM-1CR-3590-SB)
D **CNMT Integrity or Bypass**	None	None	None	None	1. Containment isolation is required **AND EITHER:** • 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 entry conditions met 2. Containment hydrogen concentration > 4% 3. Containment pressure > 10 psig with < one full train of depressurization equipment operating (one CNMT spray pump and two CNMT fan coolers) per design for > 15 min. (Note 1)
E **EC 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

Barrier: Fuel Clad

Category: 1. RCS or SG Tube Leakage

Degradation Threat: Loss

Threshold:

None

Barrier: Fuel Clad

Category: 1. RCS or SG Tube Leakage

Degradation Threat: Potential Loss

Threshold:

None

Barrier: Fuel Clad

Category: B. Inadequate Heat Removal

Degradation Threat: Loss

Threshold:

1. CSFST Core Cooling-RED Path entry conditions met

Definition(s):

None

Basis:

Critical Safety Function Status Tree (CSFST) Core Cooling-RED path indicates significant core exit superheating and core uncovery. The CSFSTs are can be monitored using ERFIS or the SPDS display on the Plant Computer (ref. 1, 2, 3).

Specifically, Core Cooling RED Path conditions exist if either core exit T/Cs are reading greater than or equal to 1200ºF or subcooling is less than 10°F AND no RCPs are running AND core exit T/Cs are reading greater than 730ºF AND RVLIS Full Range is less than 39% (ref. 1).

This reading indicates temperatures within the core are sufficient to cause significant superheating of reactor coolant.

HNP Basis Reference(s):

1. EOP-CSFST, Core Cooling CSF-2
2. EOP-User's Guide
3. OP-163, ERFIS
4. NEI 99-01 Inadequate Heat Removal Fuel Clad Loss 2.A

Barrier: Fuel Clad

Category: B. Inadequate Heat Removal

Degradation Threat: Potential Loss

Threshold:

1. CSFST Core Cooling-**ORANGE** Path entry conditions met

Definition(s):

None

Basis:

Critical Safety Function Status Tree (CSFST) Core Cooling-ORANGE Path indicates a loss of subcooling. The CSFSTs are can be monitored using ERFIS or the SPDS display on the Plant Computer (ref. 1, 2, 3).

Specifically, Core Cooling ORANGE Path conditions exist if RCS subcooling is less than 10°F and EITHER core exit T/Cs are reading greater than or equal to 730ºF OR if RVLIS Full Range is less than 39% with no RCPs are running (alternate RVLIS levels are specified if one or more RCPs are running) (ref. 1).

This reading indicates a reduction in reactor vessel water level sufficient to allow the onset of heat-induced cladding damage.

HNP Basis Reference(s):

1. EOP-CSFST, Core Cooling CSF-2
2. EOP-User's Guide
3. OP-163, ERFIS
4. NEI 99-01 Inadequate Heat Removal Fuel Clad Loss 2.A

Barrier: Fuel Clad

Category: B. Inadequate Heat Removal

Degradation Threat: Potential Loss

Threshold:

2. CSFST Heat Sink-RED Path entry conditions met **AND** Heat sink is required

Definition(s):

None

Basis:

In combination with RCS Potential Loss B.1, meeting this threshold results in a Site Area Emergency.

Critical Safety Function Status Tree (CSFST) Heat Sink-RED path indicates the ultimate heat sink function is under extreme challenge and that some fuel clad damage may potentially occur (ref. 1).

The CSFSTs are can be monitored using ERFIS or the SPDS display on the Plant Computer (ref. 1, 2, 3).

The phrase "and heat sink required" precludes the need for classification for conditions in which RCS pressure is less than SG pressure or Heat Sink-RED Path entry was created through operator action directed by an EOP. For example, EOP-FR-H.1, Response to Loss of Secondary Heat Sink, specifically states that functional response procedure actions should not be performed if total feed flow capability of 210 KPPH is available and total feed flow has been reduced due to operator action as directed by the EOPs. Therefore, Heat Sink Red Path should not be required and, should not be assessed for EAL classification because a LOCA event alone should not require higher than an Alert classification (ref. 4).

This condition indicates an extreme challenge to the ability to remove RCS heat using the steam generators (i.e., loss of an effective secondary-side heat sink). This condition represents a potential loss of the Fuel Clad Barrier. In accordance with EOPs, there may be unusual accident conditions during which operators intentionally reduce the heat removal capability of the steam generators; during these conditions, classification using threshold is not warranted.

HNP Basis Reference(s):

1. EOP-CSFST, Heat Sink CSF-3
2. EOP-User's Guide
3. OP-163, ERFIS
4. EOP-FR-H.1, Response to Loss of Secondary Heat Sink

5. NEI 99-01 Inadequate Heat Removal Fuel Clad Loss 2.B

ATTACHMENT 2
Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Fuel Clad

Category: C. CNMT Radiation / RCS Activity

Degradation Threat: Loss

Threshold:

1. Containment radiation >150 R/hr (RM-1CR-3589-SA or RM-1CR-3590-SB)

Definition(s):

None

Basis:

Containment radiation monitor readings greater than 150.3 R/hr, rounded to 150 R/hr for readability, indicate the release of reactor coolant, with elevated activity indicative of fuel damage, into the Containment. The reading is derived assuming the instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory associated with a concentration of 300 µCi/cc dose equivalent I-131 into the Containment atmosphere.

Reactor coolant concentrations of this magnitude are several times larger than the maximum concentrations (including iodine spiking) allowed within technical specifications and are therefore indicative of fuel damage (approximately 5% clad failure depending on core inventory and RCS volume). (ref. 1)

RM-1CR-3589-SA and RM-1CR-3590-SB are the Containment High Range Monitors that provide indication of radiation levels in Containment during and after postulated accidents. The Alert alarms are set at 6.5 R/hr and the High alarms are set at 17.5 R/hr. (ref. 2, 3).

The radiation monitor reading corresponds to an instantaneous release of all reactor coolant mass into the containment, assuming that reactor coolant activity equals 300 µCi/gm dose equivalent I-131. Reactor coolant activity above this level is greater than that expected for iodine spikes and corresponds to an approximate range of 2% to 5% fuel clad damage. Since this condition indicates that a significant amount of fuel clad damage has occurred, it represents a loss of the Fuel Clad Barrier.

The radiation monitor reading in this threshold is higher than that specified for RCS Barrier Loss threshold C.1 since it indicates a loss of both the Fuel Clad Barrier and the RCS Barrier. Note that a combination of the two monitor readings appropriately escalates the ECL to a Site Area Emergency.

HNP Basis Reference(s):

1. Calculation 3-B-12-022, DHRAM- Response to a Fuel and RCS Breach
2. DBD-304, Radiation Monitoring System and Gross Failed Fuel Monitor
3. HP-500, Radiation Monitoring System Data Base Manual
4. NEI 99-01 CNMT Radiation / RCS Activity Fuel Clad Loss 3.A

Barrier: Fuel Clad

Category: C. CNMT Radiation / RCS Activity

Degradation Threat: Loss

Threshold:

2. Dose equivalent I-131 coolant activity > 300 µCi/gm

Definition(s):

None

Basis:

Elevated reactor coolant activity represents a potential degradation in the level of safety of the plant and a potential precursor of more serious problems. The threshold dose equivalent I-131 concentration is well above that expected for iodine spikes and corresponds to about 2% - 5% fuel clad damage. When reactor coolant activity reaches this level the Fuel Clad barrier is considered lost. (ref. 1, 2).

This threshold indicates that RCS radioactivity concentration is greater than 300 µCi/gm dose equivalent I-131. Reactor coolant activity above this level is greater than that expected for iodine spikes and corresponds to an approximate range of 2% to 5% fuel clad damage. Since this condition indicates that a significant amount of fuel clad damage has occurred, it represents a loss of the Fuel Clad Barrier.

There is no Potential Loss threshold associated with RCS Activity / Containment Radiation.

HNP Basis Reference(s):

1. AOP-032, High RCS Activity
2. PEP-342, Core Damage Assessment
3. NEI 99-01 CNMT Radiation / RCS Activity Fuel Clad Loss 3.B

ATTACHMENT 2
Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Fuel Clad

Category: C. CNMT Radiation / RCS Activity

Degradation Threat: Potential Loss

Threshold:

None

ATTACHMENT 2
Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Fuel Clad

Category: D. CNMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

None

ATTACHMENT 2
Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Fuel Clad

Category: D. CNMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

None

Barrier: Fuel Clad

Category: E. Emergency Coordinator Judgment

Degradation Threat: Loss

Threshold:

1. **Any** condition in the opinion of the Emergency Coordinator that indicates loss of the Fuel Clad barrier

Definition(s):

None

Basis:

The Emergency Coordinator judgment threshold addresses any other factors relevant to determining if the Fuel Clad barrier is lost. Such a determination should include imminent barrier degradation, barrier monitoring capability and dominant accident sequences.

- Imminent barrier degradation exists if the degradation will likely occur within two hours based on a projection of current safety system performance. The term "imminent" refers to recognition of the inability to reach safety acceptance criteria before completion of all checks.
- Barrier monitoring capability is decreased if there is a loss or lack of reliable indicators. This assessment should include instrumentation operability concerns, readings from portable instrumentation and consideration of offsite monitoring results.
- Dominant accident sequences lead to degradation of all fission product barriers and likely entry to the EOPs. The Emergency Coordinator should be mindful of the Loss of AC power (Station Blackout) and ATWS EALs to assure timely emergency classification declarations.

This threshold addresses any other factors that are to be used by the Emergency Coordinator in determining whether the Fuel Clad barrier is lost

HNP Basis Reference(s):

1. NEI 99-01 Emergency Director Judgment Fuel Clad Loss 6.A

Barrier: Fuel Clad

Category: E. Emergency Coordinator Judgment

Degradation Threat: Potential Loss

Threshold:

1. **Any** condition in the opinion of the Emergency Coordinator that indicates potential loss of the Fuel Clad barrier

Basis:

The Emergency Coordinator judgment threshold addresses any other factors relevant to determining if the Fuel Clad barrier is potentially lost. Such a determination should include imminent barrier degradation, barrier monitoring capability and dominant accident sequences.

- Imminent barrier degradation exists if the degradation will likely occur within two hours based on a projection of current safety system performance. The term "imminent" refers to recognition of the inability to reach safety acceptance criteria before completion of all checks.
- Barrier monitoring capability is decreased if there is a loss or lack of reliable indicators. This assessment should include instrumentation operability concerns, readings from portable instrumentation and consideration of offsite monitoring results.
- Dominant accident sequences lead to degradation of all fission product barriers and likely entry to the EOPs. The Emergency Coordinator should be mindful of the Loss of AC power (Station Blackout) and ATWS EALs to assure timely emergency classification declarations.

This threshold addresses any other factors that are to be used by the Emergency Coordinator in determining whether the Fuel Clad barrier is potentially lost. The Emergency Coordinator should also consider whether or not to declare the barrier potentially lost in the event that barrier status cannot be monitored.

HNP Basis Reference(s):

1. NEI 99-01 Emergency Director Judgment Potential Fuel Clad Loss 6.A

Barrier: Reactor Coolant System

Category: A. RCS or SG Tube Leakage

Degradation Threat: Loss

Threshold:

1. An automatic or manual ECCS (SI) actuation required by **EITHER:**
   - UNISOLABLE RCS leakage
   - SG tube RUPTURE

Definition(s):

UNISOLABLE - An open or breached system line that cannot be isolated, remotely or locally.

RUPTURE - The condition of a steam generator in which primary-to-secondary leakage is of sufficient magnitude to require a safety injection.

Basis:

ECCS (SI) actuation is caused by (ref. 1):

- Pressurizer pressure < 1850 psig
- Containment pressure > 3.0 psig
- Steam Line Pressure < 601 psig

This threshold is based on an UNISOLABLE RCS leak of sufficient size to require an automatic or manual actuation of the Emergency Core Cooling System (ECCS). This condition clearly represents a loss of the RCS Barrier.

This threshold is applicable to unidentified and pressure boundary leakage, as well as identified leakage. It is also applicable to UNISOLABLE RCS leakage through an interfacing system. The mass loss may be into any location – inside containment, to the secondary-side (i.e., steam generator tube leakage) or outside of containment.

A steam generator with primary-to-secondary leakage of sufficient magnitude to require a safety injection is considered to be RUPTURED. If a RUPTURED steam generator is also FAULTED outside of containment, the declaration escalates to a Site Area Emergency since the Containment Barrier Loss threshold A.1 will also be met.

HNP Basis Reference(s):

1. EOP-E-0, Reactor Trip or Safety Injection
2. EOP-E-3, Steam Generator Tube Rupture
3. NEI 99-01 RCS or SG Tube Leakage Reactor Coolant System Loss 1.A

Barrier: Reactor Coolant System

Category: A. RCS or SG Tube Leakage

Degradation Threat: Potential Loss

Threshold:

1. Operation of a standby charging pump is required due to **EITHER:**
   - UNISOLABLE RCS leakage
   - SG tube leakage

Definition(s):

UNISOLABLE - An open or breached system line that cannot be isolated, remotely or locally.

RUPTURE - The condition of a steam generator in which primary-to-secondary leakage is of sufficient magnitude to require a safety injection.

Basis:

The Chemical and Volume Control System (CVCS) includes three centrifugal charging pumps each with a capacity of 120 gpm in the normal charging mode (ref. 1).

This threshold is based on an UNISOLABLE RCS leak that results in the inability to maintain pressurizer level within specified limits by operation of a normally used charging (makeup) pump, but an ECCS (SI) actuation has not occurred. The threshold is met when an operating procedure, or operating crew supervision, directs that a standby charging (makeup) pump be placed in service to restore and maintain pressurizer level.

This threshold is applicable to unidentified and pressure boundary leakage, as well as identified leakage. It is also applicable to UNISOLABLE RCS leakage through an interfacing system. The mass loss may be into any location – inside containment, to the secondary-side (i.e., steam generator tube leakage) or outside of containment.

If a leaking steam generator is also FAULTED outside of containment, the declaration escalates to a Site Area Emergency since the Containment Barrier Loss threshold A.1 will also be met.

HNP Basis Reference(s):

1. AOP-16, Excessive Primary Plant Leakage
2. NEI 99-01 RCS or SG Tube Leakage Reactor Coolant System Potential Loss 1.A

Barrier: Reactor Coolant System

Category: A. RCS or SG Tube Leakage

Degradation Threat: Potential Loss

Threshold:

2. CSFST Integrity-RED Path entry conditions met

Definition(s):

None

Basis:

The "Potential Loss" threshold is defined by the CSFST Reactor Coolant Integrity - RED Path. CSFST RCS Integrity - Red Path plant conditions and associated PTS Limit A indicates an extreme challenge to the safety function when plant parameters are to the right of the limit curve following excessive RCS cooldown under pressure (ref. 1, 2).

This condition indicates an extreme challenge to the integrity of the RCS pressure boundary due to pressurized thermal shock – a transient that causes rapid RCS cooldown while the RCS is in Mode 3 or higher (i.e., hot and pressurized).

HNP Basis Reference(s):

1. EOP-CSFST, RCS Integrity CSF-4
2. EOP-User's Guide
3. NEI 99-01 RCS or SG Tube Leakage Reactor Coolant System Potential Loss 1.B

Barrier: Reactor Coolant System

Category: B. Inadequate Heat Removal

Degradation Threat: Loss

Threshold:

None

Barrier: Reactor Coolant System

Category: B. Inadequate Heat Removal

Degradation Threat: Potential Loss

Threshold:

1. CSFST Heat Sink-RED path entry conditions met

   AND

   Heat sink is required

Definition(s):

None

Basis:

In combination with FC Potential Loss B.2, meeting this threshold results in a Site Area Emergency.

Critical Safety Function Status Tree (CSFST) Heat Sink-RED path indicates the ultimate heat sink function is under extreme challenge and that the RCS may potentially be lost (ref. 1).

The CSFSTs are can be monitored using ERFIS or the SPDS display on the Plant Computer (ref. 1, 2, 3).

The phrase "and heat sink required" precludes the need for classification for conditions in which RCS pressure is less than SG pressure or Heat Sink-RED Path entry was created through operator action directed by an EOP. For example, EOP-FR-H.1, Response to Loss of Secondary Heat Sink, specifically states that functional response procedure actions should not be performed if total feed flow capability of 210 KPPH is available and total feed flow has been reduced due to operator action as directed by the EOPs. Therefore, Heat Sink Red Path should not be required and, should not be assessed for EAL classification because a LOCA event alone should not require higher than an Alert classification (ref. 4).

This condition indicates an extreme challenge to the ability to remove RCS heat using the steam generators (i.e., loss of an effective secondary-side heat sink). This condition represents a potential loss of the RCS Barrier. In accordance with EOPs, there may be unusual accident conditions during which operators intentionally reduce the heat removal capability of the steam generators; during these conditions, classification using threshold is not warranted.

Meeting this threshold results in a Site Area Emergency because this threshold is identical to Fuel Clad Barrier Potential Loss threshold B.2; both will be met. This condition warrants a Site Area Emergency declaration because inadequate RCS heat removal may result in fuel heat-up sufficient to damage the cladding and increase RCS pressure to the point where mass will be lost from the system.

HNP Basis Reference(s):

1. EOP-CSFST, Heat Sink CSF-3

2. EOP-User's Guide
3. OP-163, ERFIS
4. EOP-FR-H.1, Response to Loss of Secondary Heat Sink
5. NEI 99-01 Inadequate Heat Removal RCS Loss 2.B

Barrier: Reactor Coolant System

Category: C. CNMT Radiation/ RCS Activity

Degradation Threat: Loss

Threshold:

1. Containment Leak Detection Monitor Noble Gas (REM-1LT-3502A-SA) > 8.3E-3 µCi/ml

Definition(s):

None

Basis:

Containment radiation monitor readings on REM-1LT-3502A-SA noble gas channel greater than 8.3E-3 µCi/ml (ref. 1) indicate the release of reactor coolant to the Containment. The readings assume the instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory associated with normal operating concentrations (i.e., within Technical Specifications) into the Containment atmosphere. Because of the very high fuel clad integrity, only small amounts of noble gases would be dissolved in the primary coolant.

The Containment High Range Monitors (RM-1CR-3589-SA or RM-1CR-3590-SB) are bugged to read at least 1 R/hr and are not capable of detecting this radiation level (ref. 2, 3).

The radiation monitor reading corresponds to an instantaneous release of all reactor coolant mass into the containment, assuming that reactor coolant activity equals Technical Specification allowable limits. This value is lower than that specified for Fuel Clad Barrier Loss threshold C.1 since it indicates a loss of the RCS Barrier only.

There is no Potential Loss threshold associated with RCS Activity / Containment Radiation.

HNP Basis Reference(s):

1. Calculation HNP-M/MECH-1074, Alternate Source Term Effect on REM-3502A Response to RCS Breach with Non-Failed Fuel
2. DBD-304, Radiation Monitoring System and Gross Failed Fuel Monitor
3. HP-500, Radiation Monitoring System Data Base Manual
4. NEI 99-01 CNMT Radiation / RCS Activity RCS Loss 3.A

ATTACHMENT 2
Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Reactor Coolant System

Category: B. CNMT Radiation/ RCS Activity

Degradation Threat: Potential Loss

Threshold:

None

ATTACHMENT 2
Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Reactor Coolant System

Category: D. CNMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

None

ATTACHMENT 2
Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Reactor Coolant System

Category: D. CNMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

None

Barrier: Reactor Coolant System

Category: E. Emergency Coordinator Judgment

Degradation Threat: Loss

Threshold:

1. **Any** condition in the opinion of the Emergency Coordinator that indicates loss of the RCS barrier

Definition(s):

None

Basis:

The Emergency Coordinator judgment threshold addresses any other factors relevant to determining if the RCS barrier is lost. Such a determination should include imminent barrier degradation, barrier monitoring capability and dominant accident sequences.

- Imminent barrier degradation exists if the degradation will likely occur within two hours based on a projection of current safety system performance. The term "imminent" refers to the recognition of the inability to reach safety acceptance criteria before completion of all checks.
- Barrier monitoring capability is decreased if there is a loss or lack of reliable indicators. This assessment should include instrumentation operability concerns, readings from portable instrumentation and consideration of offsite monitoring results.
- Dominant accident sequences lead to degradation of all fission product barriers and likely entry to the EOPs. The Emergency Coordinator should be mindful of the Loss of AC power (Station Blackout) and ATWS EALs to assure timely emergency classification declarations.

This threshold addresses any other factors that may be used by the Emergency Coordinator in determining whether the RCS Barrier is lost.

HNP Basis Reference(s):

1. NEI 99-01 Emergency Director Judgment RCS Loss 6.A

Barrier: Reactor Coolant System

Category: E. Emergency Coordinator Judgment

Degradation Threat: Potential Loss

Threshold:

1. **Any** condition in the opinion of the Emergency Coordinator that indicates potential loss of the RCS barrier

Definition(s):

None

Basis:

The Emergency Coordinator judgment threshold addresses any other factors relevant to determining if the RCS barrier is potentially lost. Such a determination should include imminent barrier degradation, barrier monitoring capability and dominant accident sequences.

- Imminent barrier degradation exists if the degradation will likely occur within two hours based on a projection of current safety system performance. The term "imminent" refers to the inability to reach final safety acceptance criteria before completing all checks.
- Barrier monitoring capability is decreased if there is a loss or lack of reliable indicators. This assessment should include instrumentation operability concerns, readings from portable instrumentation and consideration of offsite monitoring results.
- Dominant accident sequences lead to degradation of all fission product barriers and likely entry to the EOPs. The Emergency Coordinator should be mindful of the Loss of AC power (Station Blackout) and ATWS EALs to assure timely emergency classification declarations.

This threshold addresses any other factors that may be used by the Emergency Coordinator in determining whether the RCS Barrier is potentially lost. The Emergency Coordinator should also consider whether or not to declare the barrier potentially lost in the event that barrier status cannot be monitored.

HNP Basis Reference(s):

1. NEI 99-01 Emergency Director Judgment RCS Potential Loss 6.A

Barrier: Containment

Category: A. RCS or SG Tube Leakage

Degradation Threat: Loss

Threshold:

1. A leaking or RUPTURED SG is FAULTED outside of containment

Definition(s):

FAULTED - The term applied to a steam generator that has a steam leak on the secondary side of sufficient size to cause an uncontrolled drop in steam generator pressure or the steam generator to become completely depressurized.

RUPTURED - The condition of a steam generator in which primary-to-secondary leakage is of sufficient magnitude to require a safety injection.

Basis:

This threshold addresses a leaking or RUPTURED Steam Generator (SG) that is also FAULTED outside of containment. The condition of the SG, whether leaking or RUPTURED, is determined in accordance with the thresholds for RCS Barrier Potential Loss A.1 and Loss A.1, respectively. This condition represents a bypass of the containment barrier.

FAULTED is a defined term within the NEI 99-01 methodology; this determination is not necessarily dependent upon entry into, or diagnostic steps within, an EOP. For example, if the pressure in a steam generator is decreasing uncontrollably (part of the FAULTED definition) and the FAULTED steam generator isolation procedure is not entered because EOP user rules are dictating implementation of another procedure to address a higher priority condition, the steam generator is still considered FAULTED for emergency classification purposes.

The FAULTED criterion establishes an appropriate lower bound on the size of a steam release that may require an emergency classification. Steam releases of this size are readily observable with normal Control Room indications. The lower bound for this aspect of the containment barrier is analogous to the lower bound criteria specified in IC SU4 for the fuel clad barrier (i.e., RCS activity values) and IC SU5 for the RCS barrier (i.e., RCS leak rate values).

This threshold also applies to prolonged steam releases necessitated by operational considerations such as the forced steaming of a leaking or RUPTURED steam generator directly to atmosphere to cooldown the plant, or to drive an auxiliary (emergency) feed water pump. These types of conditions will result in a significant and sustained release of radioactive steam to the environment (and are thus similar to a FAULTED condition). The inability to isolate the steam flow without an adverse effect on plant cooldown meets the intent of a loss of containment.

Steam releases associated with the expected operation of a SG power operated relief valve or safety relief valve do not meet the intent of this threshold. Such releases may occur intermittently for a short period of time following a reactor trip as operators process through emergency operating procedures to bring the plant to a stable condition and prepare to initiate a plant cooldown. Steam releases associated with the unexpected operation of a valve (e.g., a stuck-open safety valve) do meet this threshold.

Following an SG tube leak or rupture, there may be minor radiological releases through a secondary-side system component (e.g., air ejectors, glad seal exhausters, valve packing, etc.). These types of releases do not constitute a loss or potential loss of containment but should be evaluated using the Recognition Category R ICs.

The ECLs resulting from primary-to-secondary leakage, with or without a steam release from the FAULTED SG, are summarized below.

	Affected SG is FAULTED Outside of Containment?	
P-to-S Leak Rate	**Yes**	**No**
Less than or equal to 25 gpm	No classification	No classification
Greater than 25 gpm	Unusual Event per SU5.1	Unusual Event per SU5.1
Requires operation of a standby charging (makeup) pump (*RCS Barrier Potential Loss*)	Site Area Emergency per FS1.1	Alert per FA1.1
Requires an automatic or manual ECCS (SI) actuation (*RCS Barrier Loss*)	Site Area Emergency per FS1.1	Alert per FA1.1

There is no Potential Loss threshold associated with RCS or SG Tube Leakage.

ATTACHMENT 2
Fission Product Barrier Loss/Potential Loss Matrix and Bases

HNP Basis Reference(s):

1. EOP-E-2, Faulted Steam Generator Isolation
2. EOP-E-3, Steam Generator Tube Rupture
3. EOP-ECA-3.1, SGTR with Loss of Reactor Coolant: Subcooled Recovery
4. EOP-ECA-3.2, SGTR with Loss of Reactor Coolant: Saturated Recovery
5. NEI 99-01 RCS or SG Tube Leakage Containment Loss 1.A

ATTACHMENT 2
Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Containment

Category: A. RCS or SG Tube Leakage

Degradation Threat: Potential Loss

Threshold:

None

Barrier: Containment

Category: B. Inadequate heat Removal

Degradation Threat: Potential Loss

Threshold:

1. CSFST Core Cooling-RED Path entry conditions met

   AND

   Restoration procedures **not** effective within 15 min. (Note 1)

Definition(s):

None

Basis:

Critical Safety Function Status Tree (CSFST) Core Cooling-RED path indicates significant core exit superheating and core uncovery. The CSFSTs are can be monitored using ERFIS or the SPDS display on the Plant Computer (ref. 1, 2, 3).

Specifically, Core Cooling RED Path conditions exist if either core exit T/Cs are reading greater than or equal to 1200ºF or subcooling is less than 10°F AND no RCPs are running AND core exit T/Cs are reading greater than 730ºF AND RVLIS Full Range is less than 39% (ref. 1).

The function restoration procedures are those emergency operating procedures that address the recovery of the core cooling critical safety functions. The procedure is considered effective if the temperature is decreasing or if the vessel water level is increasing (ref. 4).

A direct correlation to status trees can be made if the effectiveness of the restoration procedures is also evaluated. If core exit thermocouple (TC) readings are greater than 1,200°F (ref. 1), Fuel Clad barrier is also lost.

This condition represents an IMMINENT core melt sequence which, if not corrected, could lead to vessel failure and an increased potential for containment failure. For this condition to occur, there must already have been a loss of the RCS Barrier and the Fuel Clad Barrier. If implementation of a procedure(s) to restore adequate core cooling is not effective (successful) within 15 minutes, it is assumed that the event trajectory will likely lead to core melting and a subsequent challenge of the Containment Barrier.

The restoration procedure is considered "effective" if core exit thermocouple readings are decreasing and/or if reactor vessel level is increasing. Whether or not the procedure(s) will be effective should be apparent within 15 minutes. The Emergency Coordinator should escalate the emergency classification level as soon as it is determined that the procedure(s) will not be effective.

Severe accident analyses (e.g., NUREG-1150) have concluded that function restoration procedures can arrest core degradation in a significant fraction of core damage scenarios, and that the likelihood of containment failure is very small in these events. Given this, it is

appropriate to provide 15 minutes beyond the required entry point to determine if procedural actions can reverse the core melt sequence.

HNP Basis Reference(s):

1. EOP-CSFST, Core Cooling CSF-2
2. EOP-User's Guide
3. OP-163, ERFIS
4. EOP-FR-C.1, Response to Inadequate Core Cooling
5. NEI 99-01 Inadequate Heat Removal Containment Potential Loss 2.A

ATTACHMENT 2
Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Containment

Category: C. CNMT Radiation/RCS Activity

Degradation Threat: Loss

Threshold:

None

Barrier: Containment

Category: C. CNMT Radiation/RCS Activity

Degradation Threat: Potential Loss

Threshold:

1. Containment radiation > 600 R/hr (RM-1CR-3589-SA or RM-1CR-3590-SB)

Definition(s):

None

Basis:

Containment radiation monitor readings greater than 601.2 R/hr, rounded to 600 R/hr for readability, (ref. 1) indicate significant fuel damage well in excess of that required for loss of the RCS barrier and the Fuel Clad barrier.

The readings are higher than that specified for Fuel Clad Loss C.1 and RCS Loss C.1. Containment radiation readings at or above the Containment barrier Potential Loss threshold, therefore, signify a loss of two fission product barriers and Potential Loss of the third, indicating the need to upgrade the emergency classification to a General Emergency.

RM-1CR-3589-SA and RM-1CR-3590-SB are the Containment High Range Monitors that provide indication of radiation levels in Containment during and after postulated accidents. The Alert alarms are set at 6.5 R/hr and the High alarms are set at 17.5 R/hr. (ref. 2, 3).

The radiation monitor reading corresponds to an instantaneous release of all reactor coolant mass into the containment, assuming that 20% of the fuel cladding has failed. This level of fuel clad failure is well above that used to determine the analogous Fuel Clad Barrier Loss and RCS Barrier Loss thresholds.

NUREG-1228, Source Estimations During Incident Response to Severe Nuclear Power Plant Accidents, indicates the fuel clad failure must be greater than approximately 20% in order for there to be a major release of radioactivity requiring offsite protective actions. For this condition to exist, there must already have been a loss of the RCS Barrier and the Fuel Clad Barrier. It is therefore prudent to treat this condition as a potential loss of containment which would then escalate the ECL to a General Emergency.

ATTACHMENT 2
Fission Product Barrier Loss/Potential Loss Matrix and Bases

HNP Basis Reference(s):

1. Calculation 3-B-12-022 DHRAM, Response to a Fuel and RCS Breach
2. DBD-304, Radiation Monitoring System and Gross Failed Fuel Monitor
3. HP-500, Radiation Monitoring System Data Base Manual
4. NEI 99-01 CNMT Radiation / RCS Activity Containment Potential Loss 3.A

ATTACHMENT 2
Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Containment

Category: D. CNMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

1. Containment isolation is required

   AND EITHER:

   - Containment integrity has been lost based on Emergency Coordinator judgment
   - UNISOLABLE pathway from containment to the environment exists

Definition(s):

UNISOLABLE - An open or breached system line that cannot be isolated, remotely or locally.

Basis:

These thresholds address a situation where containment isolation is required and one of two conditions exists as discussed below. Users are reminded that there may be accident and release conditions that simultaneously meet both bulleted thresholds.

First Threshold – Containment integrity has been lost, i.e., the actual containment atmospheric leak rate likely exceeds that associated with allowable leakage (or sometimes referred to as design leakage). Following the release of RCS mass into containment, containment pressure will fluctuate based on a variety of factors; a loss of containment integrity condition may (or may not) be accompanied by a noticeable drop in containment pressure. Recognizing the inherent difficulties in determining a containment leak rate during accident conditions, it is expected that the Emergency Coordinator will assess this threshold using judgment, and with due consideration given to current plant conditions, and available operational and radiological data (e.g., containment pressure, readings on radiation monitors outside containment, operating status of containment pressure control equipment, etc.).

Refer to the middle piping run of Figure 1. Two simplified examples are provided. One is leakage from a penetration and the other is leakage from an in-service system valve. Depending upon radiation monitor locations and sensitivities, the leakage could be detected by any of the four monitors depicted in the figure.

Another example would be a loss or potential loss of the RCS barrier, and the simultaneous occurrence of two FAULTED locations on a steam generator where one fault is located inside containment (e.g., on a steam or feedwater line) and the other outside of containment. In this case, the associated steam line provides a pathway for the containment atmosphere to escape to an area outside the containment.

Following the leakage of RCS mass into containment and a rise in containment pressure, there may be minor radiological releases associated with allowable (design) containment leakage through various penetrations or system components. These releases do not constitute a loss or potential loss of containment but should be evaluated using the Recognition Category R ICs.

Second Threshold – Conditions are such that there is an UNISOLABLE pathway for the migration of radioactive material from the containment atmosphere to the environment. As used here, the term "environment" includes the atmosphere of a room or area, outside the containment, that may, in turn, communicate with the outside-the-plant atmosphere (e.g., through discharge of a ventilation system or atmospheric leakage). Depending upon a variety of factors, this condition may or may not be accompanied by a noticeable drop in containment pressure.

Refer to the top piping run of Figure 1. In this simplified example, the inboard and outboard isolation valves remained open after a containment isolation was required (i.e., containment isolation was not successful). There is now an UNISOLABLE pathway from the containment to the environment.

The existence of a filter is not considered in the threshold assessment. Filters do not remove fission product noble gases. In addition, a filter could become ineffective due to iodine and/or particulate loading beyond design limits (i.e., retention ability has been exceeded) or water saturation from steam/high humidity in the release stream.

Leakage between two interfacing liquid systems, by itself, does not meet this threshold.

Refer to the bottom piping run of Figure 1. In this simplified example, leakage in an RCP seal cooler is allowing radioactive material to enter the Auxiliary Building. The radioactivity would be detected by the Process Monitor. If there is no leakage from the closed water cooling system to the Auxiliary Building, then no threshold has been met. If the pump developed a leak that allowed steam/water to enter the Auxiliary Building, then second threshold would be met. Depending upon radiation monitor locations and sensitivities, this leakage could be detected by any of the four monitors depicted in the figure and cause the first threshold to be met as well.

Following the leakage of RCS mass into containment and a rise in containment pressure, there may be minor radiological releases associated with allowable containment leakage through various penetrations or system components. Minor releases may also occur if a containment isolation valve(s) fails to close but the containment atmosphere escapes to an enclosed system. These releases do not constitute a loss or potential loss of containment but should be evaluated using the Recognition Category R ICs.

The status of the containment barrier during an event involving steam generator tube leakage is assessed using Loss Threshold A.1.

HNP Basis Reference(s):

1. NEI 99-01 CNMT Integrity or Bypass Containment Loss 4.A

Barrier: Containment

Category: D. CNMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

2. Indications of RCS leakage outside of containment

Definition(s):

None

Basis:

ECA-1.2 LOCA Outside Containment (ref. 1) provides instructions to identify and isolate a LOCA outside of the containment. Potential RCS leak pathways outside containment include (ref. 1):

- Residual Heat Removal
- Safety Injection
- Chemical & Volume Control
- RCP seals/seal return
- PZR/RCS/PASS sample lines

Containment sump, temperature, pressure and/or radiation levels will increase if reactor coolant mass is leaking into the containment. If these parameters have not increased, then the reactor coolant mass may be leaking outside of containment (i.e., a containment bypass sequence). Increases in sump, temperature, pressure, flow and/or radiation level readings outside of the containment may indicate that the RCS mass is being lost outside of containment.

Unexpected elevated readings and alarms on radiation monitors with detectors outside containment should be corroborated with other available indications to confirm that the source is a loss of RCS mass outside of containment. If the fuel clad barrier has not been lost, radiation monitor readings outside of containment may not increase significantly; however, other unexpected changes in sump levels, area temperatures or pressures, flow rates, etc. should be sufficient to determine if RCS mass is being lost outside of the containment.

Refer to the middle piping run of Figure 1. In this simplified example, a leak has occurred at a reducer on a pipe carrying reactor coolant in the Auxiliary Building. Depending upon radiation monitor locations and sensitivities, the leakage could be detected by any of the four monitors depicted in the figure and cause threshold D.1 to be met as well.

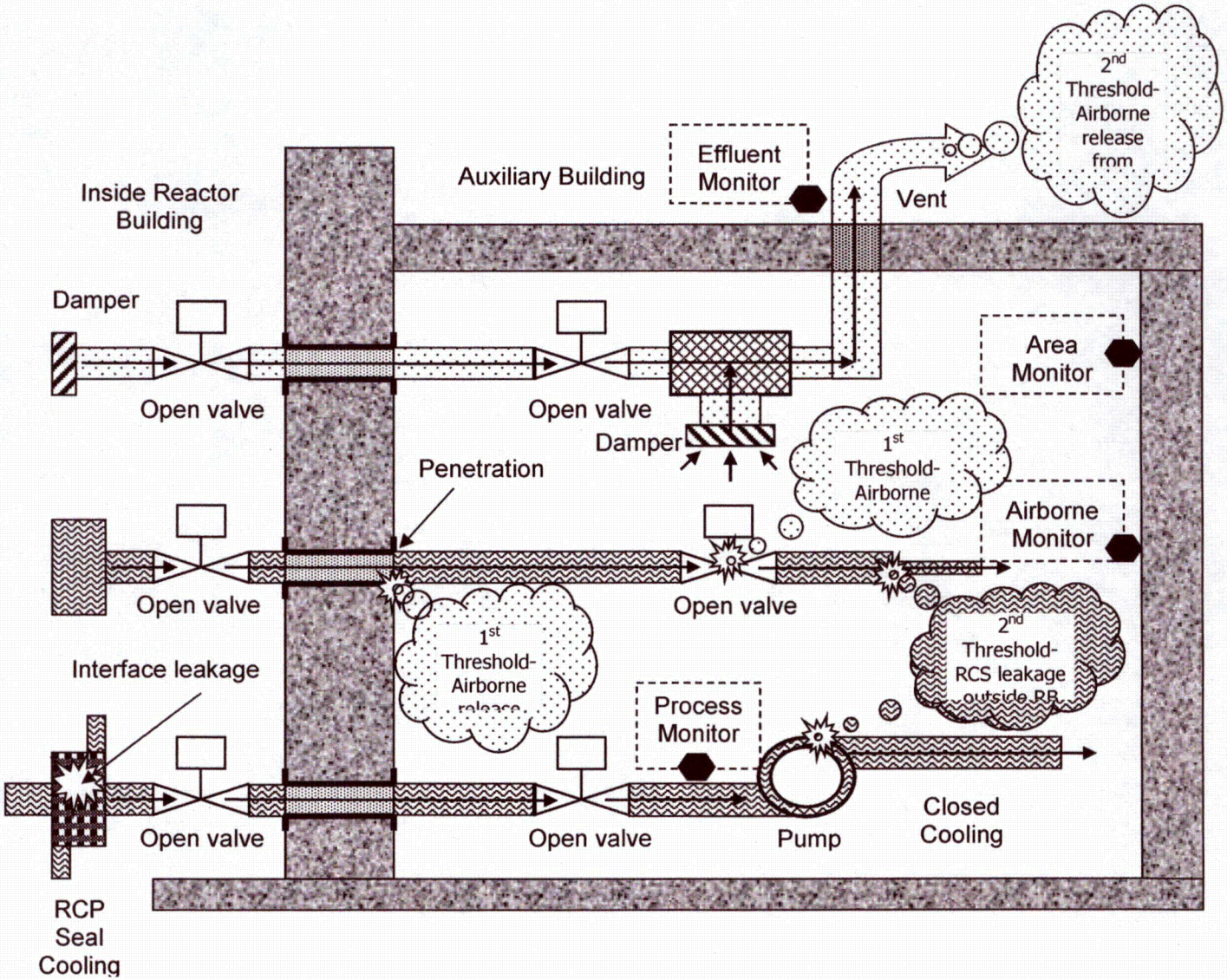
To ensure proper escalation of the emergency classification, the RCS leakage outside of containment must be related to the mass loss that is causing the RCS Loss and/or Potential Loss threshold A.1 to be met.

HNP Basis Reference(s):

1. EOP-ECA-1.2, LOCA Outside Containment

2. NEI 99-01 CNMT Integrity or Bypass Containment Loss

Figure 1: Containment Integrity or Bypass Examples



Barrier: Containment

Category: D. CNMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

1. CSFST Containment-RED Path entry conditions met

Definition(s):

None

Basis:

Critical Safety Function Status Tree (CSFST) Containment-RED Path is entered if containment pressure is greater than or equal to 45 psig and represents an extreme challenge to safety function. (ref. 1).

45 psig is based on the containment design pressure (ref. 2).

If containment pressure exceeds the design pressure, there exists a potential to lose the Containment Barrier. To reach this level, there must be an inadequate core cooling condition for an extended period of time; therefore, the RCS and Fuel Clad barriers would already be lost. Thus, this threshold is a discriminator between a Site Area Emergency and General Emergency since there is now a potential to lose the third barrier.

HNP Basis Reference(s):

1. EOP-FR-Z.1, Response to High Containment Pressure
2. FSAR 6.2.1.1.2
3. NEI 99-01 CNMT Integrity or Bypass Containment Potential Loss 4.A

Barrier: Containment

Category: D. CNMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

2. Containment hydrogen concentration ≥ 4%

Definition(s):

None

Basis:

In the early stages of a core uncovery event, it is unlikely that hydrogen buildup due to a core uncovery could result in an explosive mixture of dissolved gases in Containment.

However, Containment monitoring and/or sampling should be performed to verify this assumption and a General Emergency declared if it is determined that an explosive mixture exists. A combustible mixture can be formed when hydrogen gas concentration in the Containment atmosphere is greater than 4% by volume.

Hydrogen concentration is recorded and displayed on the Remote Control Panel located in the Control Room. Hydrogen concentration may also be obtained from any of the following (ref. 1, 2, 3):

- SPDS
- Computer points ACM0700A and ACM0700B
- Locally at hydrogen control panels

A high hydrogen concentration (3% by volume) at any sample point will activate an alarm in the Control Room. The hydrogen analyzers are capable of measuring in the 0-10 percent hydrogen range by volume, with an accuracy of ±2.0 percent of full scale.

To generate explosive mixtures of combustible gas, loss of the Fuel Clad and RCS barriers must have occurred. With the Potential Loss of the Containment barrier, the threshold hydrogen concentration, therefore, will likely warrant declaration of a General Emergency.

The existence of an explosive mixture means, at a minimum, that the containment atmospheric hydrogen concentration is sufficient to support a hydrogen burn (i.e., at the lower deflagration limit). A hydrogen burn will raise containment pressure and could result in collateral equipment damage leading to a loss of containment integrity. It therefore represents a potential loss of the Containment Barrier.

HNP Basis Reference(s):

1. EOP-E-0, Reactor Trip or Safety Injection
2. DBD-305, Hydrogen Monitoring System
3. OP-125, Hydrogen Monitoring System (HSM)

4. NEI 99-01 CNMT Integrity or Bypass Containment Potential Loss 4.B

Barrier: Containment

Category: D. CNMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

3. Containment pressure > 10 psig with < one full train of depressurization equipment operating (one CNMT spray pump and two CNMT fan coolers) per design for > 15 min. (Note 1)

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

Definition(s):

None

Basis:

The Containment pressure setpoint (10 psig) is the pressure at which the Containment Spray System should actuate (ref. 1, 2). Limiting LOCA analyses assume one Containment Spray pump and two CNMT fan coolers operate (ref. 3).

This threshold describes a condition where containment pressure is greater than the setpoint at which containment energy (heat) removal systems are designed to automatically actuate, and less than one full train of equipment is capable of operating per design. The 15-minute criterion is included to allow operators time to manually start equipment that may not have automatically started, if possible. This threshold represents a potential loss of containment in that containment heat removal/depressurization systems (e.g., containment sprays, ice condenser fans, etc., but not including containment venting strategies) are either lost or performing in a degraded manner.

HNP Basis Reference(s):

1. EOP-CSFST, CSF-5
2. OP-112, Containment Spray System
3. FSAR 6.2.1.1.3.2
4. NEI 99-01 CNMT Integrity or Bypass Containment Potential Loss 4.C

Barrier: Containment

Category: F. Emergency Coordinator Judgment

Degradation Threat: Loss

Threshold:

1. **Any** condition in the opinion of the Emergency Coordinator that indicates loss of the Containment barrier

Definition(s):

None

Basis:

The Emergency Coordinator judgment threshold addresses any other factors relevant to determining if the Primary Containment barrier is lost. Such a determination should include imminent barrier degradation, barrier monitoring capability and dominant accident sequences.

- Imminent barrier degradation exists if the degradation will likely occur within two hours based on a projection of current safety system performance. The term "imminent" refers to recognition of the inability to reach safety acceptance criteria before completion of all checks.
- Barrier monitoring capability is decreased if there is a loss or lack of reliable indicators. This assessment should include instrumentation operability concerns, readings from portable instrumentation and consideration of offsite monitoring results.
- Dominant accident sequences lead to degradation of all fission product barriers and likely entry to the EOPs. The Emergency Coordinator should be mindful of the Loss of AC power (Station Blackout) and ATWS EALs to assure timely emergency classification declarations.

This threshold addresses any other factors that may be used by the Emergency Coordinator in determining whether the Containment Barrier is lost.

HNP Basis Reference(s):

1. NEI 99-01 Emergency Director Judgment PC Loss 6.A

Barrier: Containment

Category: F. Emergency Coordinator Judgment

Degradation Threat: Potential Loss

Threshold:

1. **Any** condition in the opinion of the Emergency Coordinator that indicates potential loss of the Containment barrier

Definition(s):

None

Basis:

The Emergency Coordinator judgment threshold addresses any other factors relevant to determining if the Primary Containment barrier is potentially lost. Such a determination should include imminent barrier degradation, barrier monitoring capability and dominant accident sequences.

- Imminent barrier degradation exists if the degradation will likely occur within two hours based on a projection of current safety system performance. The term "imminent" refers to recognition of the inability to reach safety acceptance criteria before completion of all checks.
- Barrier monitoring capability is decreased if there is a loss or lack of reliable indicators. This assessment should include instrumentation operability concerns, readings from portable instrumentation and consideration of offsite monitoring results.
- Dominant accident sequences lead to degradation of all fission product barriers and likely entry to the EOPs. The Emergency Coordinator should be mindful of the Loss of AC power (Station Blackout) and ATWS EALs to assure timely emergency classification declarations.

This threshold addresses any other factors that may be used by the Emergency Coordinator in determining whether the Containment Barrier is lost.

HNP Basis Reference(s):

1. NEI 99-01 Emergency Director Judgment PC Potential Loss 6.A

Background

NEI 99-01 Revision 6 ICs AA3 and HA5 prescribe declaration of an Alert based on impeded access to rooms or areas (due to either area radiation levels or hazardous gas concentrations) where equipment necessary for normal plant operations, cooldown or shutdown is located. These areas are intended to be plant operating mode dependent. Specifically the Developers Notes for AA3 and HA5 states:

> *The "site-specific list of plant rooms or areas with entry-related mode applicability identified" should specify those rooms or areas that contain equipment which require a manual/local action as specified in operating procedures used for normal plant operation, cooldown and shutdown. Do not include rooms or areas in which actions of a contingent or emergency nature would be performed (e.g., an action to address an off-normal or emergency condition such as emergency repairs, corrective measures or emergency operations). In addition, the list should specify the plant mode(s) during which entry would be required for each room or area.*
>
> *The list should not include rooms or areas for which entry is required solely to perform actions of an administrative or record keeping nature (e.g., normal rounds or routine inspections).*

Further, as specified in IC HA5:

> *The list need not include the Control Room if adequate engineered safety/design features are in place to preclude a Control Room evacuation due to the release of a hazardous gas. Such features may include, but are not limited to, capability to draw air from multiple air intakes at different and separate locations, inner and outer atmospheric boundaries, or the capability to acquire and maintain positive pressure within the Control Room envelope.*

ATTACHMENT 3

Safe Operation & Shutdown Room/Areas Tables R-3/H-2 Bases

HNP Table R-3 and H-2 Bases

A review of HNP operating procedures identified the following mode dependent in-plant actions and associated areas that are required for normal plant operation, shutdown, and cool-down:

MODE 1 (Power Operation)

- RAB 216 (BIT)
- RAB 236 236 (CSIP, Primary Sample Sink, CCW pumps and HX, Boric Acid Transfer Pumps, Mezzanine Area)
- RAB 261 (Demin Valve Gallery,VCT Valve Gallery)
- Steam Tunnel
- ESW Structure (intakes)

MODE 2 (Startup)

- RAB 216 (BIT)
- RAB 236 236 (CSIP, Primary Sample Sink, CCW pumps and HX, Boric Acid Transfer Pumps, Mezzanine Area)
- RAB 261 (Demin Valve Gallery,VCT Valve Gallery)
- Steam Tunnel
- ESW Structure (intakes)

MODE 3 (Hot Standby)

- RAB 216 (BIT)
- RAB 236 236 (CSIP, Primary Sample Sink, CCW pumps and HX, Boric Acid Transfer Pumps, Mezzanine Area)
- RAB 261 (Demin Valve Gallery,VCT Valve Gallery)
- RAB 286 (Switch Gear)
- Steam Tunnel
- ESW Structure (intakes)

MODE 4 (Hot Shutdown)/Mode 5 (Cold Shutdown)

- RAB 190 (RHR pumps)
- RAB 216 (BIT)
- RAB 236 236 (CSIP, Primary Sample Sink, AFW Pumps, CCW Pumps and HX, Boric Acid Transfer Pumps, Mezzanine Area)
- RAB 261 (RHR Heat Exchangers, Demin Valve Gallery, VCT Valve Gallery)
- RAB 286 (Switch Gear)
- Steam Tunnel
- ESW Structure (intakes)

Procedures Reviewed

1. GP-005, Power Operation (Mode 2 to Mode 1)
2. GP-006, Normal Plant Shutdown from Power Operation to Hot Standby (Mode 1 to Mode 3)
3. GP-007, Normal Plant Cooldown (Mode 3 to Mode 5)

GP-005, GP-006, and GP-007 have branching procedures to perform tasks to accomplish the steps in the General Procedure. These lower tier procedures are referenced in the General Procedures. All steps in the GPs were researched to provide input into these tables.

ATTACHMENT 3

Safe Operation & Shutdown Room/Areas Tables R-3/H-2 Bases

Table R-3 & H-2 Results

Table R-3/H-2 Safe Operation & Shutdown Rooms/Areas	
Room/Area	**Mode(s)**
RAB 190 (RHR pumps)	4
RAB 216 (BIT)	1, 2, 3, 4, 5
RAB 236 (CSIP, Primary Sample Sink, AFW pumps, CCW pumps and HX, Boric Acid Transfer Pumps, Mezzanine Area)	1, 2, 3, 4, 5
RAB 261 (RHR Heat Exchangers, Demin. Valve Gallery, VCT Valve Gallery)	1, 2, 3, 4, 5
RAB 286 (Switchgear)	3,4,5
Steam Tunnel	1, 2, 3, 4
ESW intakes	1, 2, 3, 4, 5

SERIAL HNP-15-091

ENCLOSURE 3

SUPPORTING CALCULATION FOR HARRIS NUCLEAR PLANT RADIOLOGICAL EFFLUENT EAL VALUES, REVISION 1

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1

DOCKET NO. 50-400

RENEWED LICENSE NUMBER NPF-63

Harris Nuclear Plant (HNP)

Radiological Effluent EAL Values

EP-EALCALC-HNP-1401
Revision 1

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EPM Approval:		11/16/15

Table of Contents

ATTACHMENTS

1. Purpose

The Harris Nuclear Plant (HNP) Emergency Action Level (EAL) Technical Bases Manual contains background information, event declaration thresholds, bases and references for the site specific EAL and Fission Product Barrier (FPB) values used to implement the Nuclear Energy Institute (NEI) 99-01 Rev. 6 EAL guidance methodology. This calculation document provides additional technical detail specific to the derivation of the gaseous and liquid radiological effluent EAL values developed in accordance with the guidance in NEI 99-01 Rev. 6.

Documentation of the assumptions, calculations and results are provided for the HNP site specific Rx1 series EAL effluent monitor values associated the NEI 99-01 Rev 6 EALs listed below.

- NEI EAL AU1.1 (gaseous and liquid)
- NEI EAL AA1.1 (gaseous and liquid)
- NEI EAL AS1.1 (gaseous)
- NEI EAL AG1.1 (gaseous)

2. DEVELOPMENT METHODOLOGY AND BASES

2.1. Threshold Limits

2.1.1. RU1.1 Liquid Threshold Limits

Guidance Criteria

The RU1 Initiating Condition (IC) addresses a release of gaseous or liquid radioactivity greater than 2 times the Offsite Dose Calculation Manual (ODCM) limits for 60 minutes or longer.

HNP Bases

The ODCM Sections 2.0 and 2.1 (with reference to ODCM Operational Requirement 3.11.1.1) limits for the concentration of radioactive liquid effluents released from the site to the unrestricted area are as follows:

- 10 times the effluent concentration (EC) levels of 10CFR20, Appendix B, Table 2
- 2.0E-04 µCi/ml for dissolved and entrained noble gases

The RU1.1 liquid effluent EAL threshold values will equate to 2 times the ODCM limit.

2.1.2. RU1.1 Gaseous Threshold Limits

Guidance Criteria

The RU1 Initiating Condition (IC) addresses a release of gaseous or liquid radioactivity greater than 2 times the Offsite Dose Calculation Manual (ODCM) limits for 60 minutes or longer.

HNP Bases

The ODCM Section 3.1 (with reference to ODCM Operational Requirement 3.11.2.1) limits for the concentration of radioactive gaseous effluents at the site boundary are as follows:

- Less than or equal to 500 mrem/yr to the whole body (Noble Gasses)
- Less than or equal to 3000 mrem/yr to the skin (Noble Gasses)
- Less than or equal to 1500 mrem/yr to any organ (I-131, I-133, tritium, and particulate with half-lives greater than 8 days)

  Inhalation (internal organ) limits are not applicable for EAL threshold determination since the specified surveillance involves collection and analysis of composite samples. This after-the-fact assessment (individual uptake) could not be made in a timely manner conducive to accident classification.

The RU1.1 gaseous effluent EAL threshold values will equate to 2 times the ODCM limit for the lesser of the whole body or skin exposure pathways.

2.1.3. RA1.1 Liquid Threshold Limits

Guidance Criteria

The RA1 Initiating Condition (IC) addresses a release of radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE.

This is based on values at 1% of the EPA Protective Action Guides (PAGs).

Per NEI 99-01, the effluent monitor readings should correspond to the above dose limits at the "site-specific dose receptor point" (consistent with the calculation methodology employed) for one hour of exposure.

HNP Bases

The liquid effluent limits are based on the water concentration values given in 10 CFR 20 Appendix B Table 2 Column 2 (see Section 2.1.1 above). The 10 CFR 20 values are equivalent to the radionuclide concentrations which, if ingested continuously over the course of a year, would produce a total effective dose equivalent of 0.05 rem (50 millirem). The EPA PAGs are based on a TEDE dose from immersion, inhalation and deposition. The 10 CFR 20 limits and the EPA limits do not represent the same type of exposure and thus cannot be compared on a one to one basis.

Additionally, significant dilution assumptions are incorporated in determining ODCM ingestion limits for liquid releases such that obtaining a dose of 10 mrem in one hour would require a discharge concentration above the effluent monitor threshold (ingestion of radioactivity from a liquid release at the site boundary is not practical).

Thus, the site specific EALs will not contain the RA1.1 liquid effluent monitor threshold value that equates to 1% of the EPA PAG. However, EALs RA1.3 and RA1.4 will remain applicable for liquid effluent releases that exceed the threshold based upon sample and field survey results.

2.1.4. RA1.1 Gaseous Threshold Limits

Guidance Criteria

The RA1 IC addresses a release of radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE.

Per NEI 99-01, the effluent monitor readings are based on values at 1% of the EPA Protective Action Guides (PAGs) at the "site-specific dose receptor point" (consistent with the calculation methodology employed) for one hour of exposure.

HNP Bases

The gaseous effluent limits for RA1.1 are based on values that equate to an offsite dose greater than 10 mrem TEDE or 50 mrem CDE thyroid, which are 1% of the EPA PAGs.

2.1.5. RS1.1 Gaseous Threshold Limits

Guidance Criteria

The RS1 IC addresses a release of radioactivity resulting in offsite dose greater than 100 mrem TEDE or 500 mrem thyroid CDE.

This is based on values at 10% of the EPA Protective Action Guides (PAGs) at the "site-specific dose receptor point" (consistent with the calculation methodology employed) for one hour of exposure.

HNP Bases

The gaseous effluent limits for RS1.1 are based on values that equate to an offsite dose greater than 100 mrem TEDE or 500 mrem CDE thyroid, which are 10% of the EPA PAGs.

2.1.6. RG1.1 Gaseous Threshold Limits

Guidance Criteria

The RG1 IC addresses a release of radioactivity resulting in offsite dose greater than 1,000 mrem TEDE or 5,000 mrem thyroid CDE.

This is based on values at 100% of the EPA Protective Action Guides (PAGs) at the "site-specific dose receptor point" (consistent with the calculation methodology employed) for one hour of exposure.

HNP Bases

The gaseous effluent limits for RG1.1 are based on values that equate to an offsite dose greater than 1,000 mrem TEDE or 5,000 mrem CDE thyroid, which are 100% of the EPA PAGs.

2.2. Effluent Release Points

Note – All effluent release points assume a background reading of zero to conservatively account for all modes of operation applicable to the EALs.

2.2.1. Liquid Release Points

Guidance Criteria

Per NEI 99-01, the RU1 IC addresses normally occurring continuous radioactivity releases from monitored gaseous or liquid effluent pathways (EAL #1) and planned batch releases from non-continuous release pathways (EAL #2).

Per NEI 99-01, the RA1 IC includes events or conditions involving a radiological release, whether gaseous or liquid, monitored or un-monitored. Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

The "site-specific monitor list and threshold values" should be determined with consideration of the selection of the appropriate installed gaseous and liquid effluent monitors.

HNP Bases

There are seven liquid radwaste discharge points to the environment at HNP (ODCM 2.0 and Figures 2.1-1 through 2.1-3):

1. Treated Laundry and Hot Shower Tank (TL&HST) – REM-1WL-3540

2. Waste Evaporator Condensate Tank (WECT) – REM-1WL-3541

3. Waste Monitor Tank (WMT) – REM-1WL-3542

4. Normal Service Water (NSW) System – REM-3500A/B

   Per the ODCM, the NSW system has a low potential for radioactive effluent releases, thus the NSW pathway does not meet the NEI 99-01 criteria for use as an EAL threshold.

5. Turbine Building Floor Drains (TBFD) – REM-1MD-3528

   Per the ODCM, the TBFD effluent has a low probability of radioactive contamination, thus the TBFD pathway does not meet the NEI 99-01 criteria for use as an EAL threshold.

6. Outside Tank Area Drains (OTAD) – REM-1MD-3530

   Per the ODCM, the OTAD effluent has a low probability of radioactive contamination, thus the OTAD pathway does not meet the NEI 99-01 criteria for use as an EAL threshold.

7. Secondary Waste Sample Tank (SWST) – REM-1WL-3542

   Per the ODCM, the SWST has a low potential for radioactive effluent releases, thus the SWST pathway does not meet the NEI 99-01 criteria for use as an EAL threshold.

Cooling tower blowdown minimum dilution flow rates range from 14,250 gpm to 3,800 gpm (ODCM Table 2.1-2). Minimum dilution flow for the EAL threshold values for the release pathways above is assumed to be 3800 gpm.

2.2.2. Gaseous Release Points

Guidance Criteria

Per NEI 99-01, the RU1 IC addresses normally occurring continuous radioactivity releases from monitored gaseous or liquid effluent pathways (EAL #1) and planned batch releases from non-continuous release pathways (EAL #2).

Per NEI 99-01, the RA1 IC includes events or conditions involving a radiological release, whether gaseous or liquid, monitored or un-monitored. Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

Per NEI 99-01, the RS1 and RG1 ICs addresses monitored and un-monitored releases of gaseous radioactivity. Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

The "site-specific monitor list and threshold values" should include the effluent monitors described in emergency plan and emergency dose assessment procedures.

HNP Bases

There are four gaseous effluent release points to the environment at HNP (ODCM 3.0 and Figure 3.1):

1. Plant Vent Stack 1 – RM-21AV-3509-1SA
2. Turbine Building Vent Stack 3A – RM-1TV3536-1
3. Waste Processing Building Vent Stack 5 – RM-1WV-3546-1
4. Waste Processing Building Vent Stack 5A – RM-1WV-3547-1

ODCM Figure 3.1 illustrates the waste streams that can flow into the four gaseous effluent release points. Containment purge and vent during refueling and decay tank pathways are not considered because they are intermittent or mode restricted sources.

The HNP vent flow rates, in cfm, for the gaseous EAL thresholds is based on the Maximum Effluent Design Flow Rates (ODCM Table 3-1-3).

2.3. Source Term

2.3.1. RU1.1 Liquid Source Term

Guidance Criteria

NEI 99-01 does not provide specific guidance for AU1 liquid source term assumptions.

HNP Bases

The source term used for liquid effluent releases is Cs-134. Cs-134 has been selected based on it being the lowest effluent concentration value for any detectable radionuclide not known to be absent from the liquid effluent (ODCM 2.1.1).

2.3.2. RU1.1 Gaseous Source Term

Guidance Criteria

NEI 99-01 does not provide specific guidance for AU1 gaseous source term assumptions.

HNP Bases

The gaseous source term used for the Plant Vent release is based upon the NUREG-1940 Table 1-6 noble gas fraction of activity available at shutdown for fleet standardization.

The RU1.1 gaseous source term used for the Turbine Building vent, Waste Process Building vent 5 and Waste Process Building vent 5A are based upon the averaged annual release concentration given in ODCM Table 3.1-1.

The RU1.1 source term is based on an activity mix that is limited to gaseous isotopes whereby all activity is assumed to be monitored as it is discharged.

2.3.3. RA1.1, RS1.1 and RG1.1 Gaseous Source Terms

Guidance Criteria

NEI 99-01 specifies that the calculation of monitor readings will require use of an assumed release isotopic mix; the selected mix should be the same for ICs AA1, AS1 and AG1.

HNP Bases

DEC utilizes a common plant vent RCS source term basis for fleet standardization. The source term utilized in the URI dose model provides the relative fractions and is taken from NUREG-1940 (referenced from URI Requirements Specification Appendix A Section A.1) with the release path 'I' selected to model a LOCA type event with fuel clad damage.

RCS	Containment HUT < 2 hrs Sprays Off	Aux Bldg HUT < 2 hrs	Norm Filter Working	Plant Vent	Env

The RA/S/G1.1 source term for the pathway from the Turbine Building is taken from NUREG-1940 (referenced from URI Requirements Specification Appendix A Section A.1) with the release path 'E' selected to model a SGTR type event with fuel clad damage.

RCS	S/G Boiling	Turb Bldg HUT < 2 hrs	Filter Working	TB Vent	Env

The RA/S/G1.1 source term utilized in the URI dose model for the pathway from the Waste Gas Decay Tank via the Waste Process Building vents is taken from FSAR table 15.7.1-2 (referenced from URI Requirements Specification Appendix A Section A.1) with the release path 'T' selected to model a tank rupture event.

WGT (Path T)	**WPB** HUT < 2 hrs	**WPB Vent 5**	**Env**
WGT (Path U)	**WPB** HUT < 2 hrs	**WPB Vent 5A**	**Env**

No credit is taken for source term decay. The start of release time entered into URI is coincident with the time of reactor trip.

2.4. Release Duration

Guidance Criteria

Per NEI 99-01, the effluent monitor readings for RA1.1, RS1.1 and RG1.1 gaseous EAL threshold values should correspond to a dose at the "site-specific dose receptor point" (consistent with the calculation methodology employed) for one hour of exposure.

HNP Bases

The effluent monitor readings for RA1.1, RS1.1 and RG1.1 gaseous EAL threshold values are calculated for a release duration of one hour.

2.5. Meteorology

Guidance Criteria

The effluent monitor readings should correspond to the applicable dose limit at the "site-specific dose receptor point." The "site-specific dose receptor point" is the distance(s) and/or locations used by the licensee to distinguish between on-site and offsite doses. The selected distance(s) and/or locations should reflect the content of the emergency plan, and the procedural methodology used to determine offsite doses and protective action recommendations. This is typically the boundary of the Owner Controlled Area.

Monitor readings will be calculated using a set of assumed meteorological data or atmospheric dispersion factors; the data or factors selected for use should be the same for ICs AA1, AS1 and AG1.

HNP Bases

The site specific meteorology used for the calculation of monitor readings is based on selections and inputs for the URI dose assessment model as documented below.

2.5.1. Wind Speed and Stability Class (Median WS and stability memo – see Attachment 1)

The median meteorology values for the stations used to develop the EAL thresholds are as follows:

Median Wind Speed ..... 3.5 mph

Stability Class (A-G) ..... D

2.5.2. Wind Direction (ODCM 3.1.1 and Table A-1 through A-4)

The HNP "site-specific dose receptor point" utilized in the derivation of the EAL effluent release thresholds has been established as the closest on-land site boundary line, which is in the SW (wind direction from 045°) sector at 1.33 miles.

2.5.3. Other Parameters

No precipitation is assumed to occur for the duration of the release and plume transport across the EPZ.

3. DESIGN INPUTS

3.1. General Constants and Conversion Factors

3.1.1. 472 cc/sec per cfm

3.1.2. 10^6 µCi per Ci

3.2. Liquid Effluent

3.2.1. Liquid Effluent Monitor Ranges (FSAR Table 11.5.2-2)

TL&HST (REM-1WL-3540) ..... 10^1-10^7 cpm

WECT (REM-21WL-3541) ..... 10^1-10^7 cpm

WMT (REM-21WL-3542) ..... 10^1-10^7 cpm

3.2.2. Liquid Effluent Dilution Flow (*F*)

Liquid Effluent Dilution Flow (ODCM Table 2.1-2) ..... 3.80E+03 gpm

3.2.3. Liquid Effluent Source Flow (*f*)

TL&HST pump (ODCM Table 2.1-1a) ..... 100 gpm

WECT pump (ODCM Table 2.1-1a) ..... 35 gpm

WMT pump (ODCM Table 2.1-1a) ..... 100 gpm

3.2.4. Recirculation Factor (σ)

The recirculation factor accounts for the fraction of discharged water reused by the station. The HNP ODCM liquid effluent setpoint calculation does not account for a recirculation factor, thus a value of 1.0 is used.

3.2.5. 10CFR20 Appendix B, Table 2, Column 2 Source Term Limit (EC_i)

Cs-134 ..... 9.0E-07 µCi/ml

3.2.6. Cs-137 to Cs-134 Equivalency Factor (Eq_i)

Liquid radiation monitors are calibrated to Cs-137. The Cs-137 equivalence factor accounts for the different gamma energies and abundance of isotopes other than Cs-137.The equivalency factor is applied to the Cs-134 source term isotope as follows:

REM-3540/41 (ODCM Table 2.1-4) 2.5

3.2.7. Cs-137 Correlation Factor (*CFi*)

The liquid effluent monitor Cs-137 correlation factor converts the release concentration in μCi/ml to effluent monitor to cpm. The Cs-137 correlation factor is as follows:

REM-3540/41 (ODCM Table 2.1-4) ..... 1.04E+08 cpm/μCi/ml

3.3. Gaseous Effluent

3.3.1. Gaseous Effluent Monitor Ranges (UFSAR Table 11.5.2-2)

- Plant Vent – RM-21AV-3509-1SA ..... 10^{-7}-10^{5} μCi/cc

  This equates to a low scale of 1.96E+01 μCi/sec and a high scale of 1.96E+13 μCi/sec for a vent flow of 4.15E+05 CFM.

- Turbine Building Stack – RM-1TV-3536-1 ..... 10^{-7}-10^{5} μCi/cc

  This equates to a low scale of 1.35E+00 μCi/sec and a high scale of 1.35E+12 μCi/sec for a vent flow of 2.862E+04 CFM.

- WPB Vent Stack 5 – RM-1WV-3546-1 ..... 10^{-7}-10^{5} μCi/cc

  This equates to a low scale of 1.1E+01 μCi/sec and a high scale of 1.1E+13 μCi/sec for a vent flow of 2.325E+05 CFM.

- WPB Vent Stack 5A – RM-1WV-3547-1 ..... 10^{-7}-10^{5} μCi/cc

  This equates to a low scale of 4.86E+00 μCi/sec and a high scale of 4.86E+12 μCi/sec for a vent flow of 1.0305E+05 CFM.

3.3.2. RU1.1 Gaseous Effluent Source Flow (*f*)

Plant Vent Stack (ODCM Table 3.1-3) ..... 4.15E+05 cfm

Turbine Building Stack (ODCM Table 3.1-3) ..... 2.862E+04 cfm

WPB Vent Stack 5 (ODCM Table 3.1-3) ..... 2.325E+05 cfm

WPB Vent Stack 5A (ODCM Table 3.1-3) ..... 1.0305E+05 cfm

3.3.3. RU1.1 Dispersion Factor (X/Q)

Dispersion Factor (ODCM 3.1.1) ..... 2.30E-05 sec/m^3

3.3.4. RU1.1 Source Term Fraction (S_i)

NUREG-1940 Table 1-6 noble gas fraction of activity available at shutdown is the fleet standard source term used for events that originate from the RCS and are release from the plant vent.

	PV Fraction (unitless)
Kr-83m	1.83E-02
Kr-85	1.70E-03
Kr-85m	3.71E-02
Kr-87	7.40E-02
Kr-88	1.02E-01
Xe-131m	2.20E-03
Xe-133	3.26E-01
Xe-133m	1.03E-02
Xe-135	8.54E-02
Xe-135m	6.90E-02
Xe-138	2.74E-01
	1.00E+00

3.3.5. RU1.1 Source Term Concentrations

HNP source term concentrations for site specific release points other than the plant vent are taken from the averaged annual release concentrations in ODCM Table 3.1-1.

	Stack 3A (µCi/cc)	Stack 5 (µCi/cc)	Stack 5A (µCi/cc)
Kr-83m	0.00E+00	0.00E+00	0.00E+00
Kr-85	0.00E+00	1.60E-07	0.00E+00
Kr-85m	4.70E-09	0.00E+00	1.96E-09
Kr-87	4.70E-09	0.00E+00	1.96E-09
Kr-88	7.04E-09	0.00E+00	3.91E-09
Xe-131m	0.00E+00	4.86E-09	1.30E-09
Xe-133	1.17E-08	0.00E+00	7.17E-09
Xe-133m	0.00E+00	0.00E+00	0.00E+00
Xe-135	1.64E-08	0.00E+00	9.78E-09
Xe-135m	2.35E-09	0.00E+00	1.96E-09
Xe-138	2.35E-09	0.00E+00	1.96E-09

3.3.6. ODCM Dose Factors (Regulatory Guide 1.109 Table B-1)

Note – RG1.109 values converted from mRem/yr per ρCi/m^3 to mRem/yr per μCi/m^3.

	Total Body Dose Factor Ki (mRem/yr per μCi/m3)	Skin Beta Dose Factor Li (mRem/yr per μCi/m3)	Gamma Air Dose Factor Mi (mRad/yr per μCi/m3)
Kr-83m	7.56E-02	0.00E+00	1.93E+01
Kr-85	1.61E+01	1.34E+03	1.72E+01
Kr-85m	1.17E+03	1.46E+03	1.23E+03
Kr-87	5.92E+03	9.73E+03	6.17E+03
Kr-88	1.47E+04	2.37E+03	1.52E+04
Xe-131m	9.15E+01	4.76E+02	1.56E+02
Xe-133	2.94E+02	3.06E+02	3.53E+02
Xe-133m	2.51E+02	9.94E+02	3.27E+02
Xe-135	1.81E+03	1.86E+03	1.92E+03
Xe-135m	3.12E+03	7.11E+02	3.36E+03
Xe-138	8.83E+03	4.13E+03	9.21E+03

4. Calculations

4.1. RU1.1 Liquid Release

4.1.1. ODCM Liquid Release Limit

$$C_i \leq \frac{(F+f) \times (10 \times EC_i)}{\sigma \times f} \qquad SP \leq \sum_i (C_i \times Eq_i \times CF_{Cs-137}) + bkg$$

Where:	
C_i	concentration of radionuclide 'i' in the liquid effluent (µCi/ml) – this is considered the ODCM limit for EAL purposes
F	dilution flow (gpm)
f	undiluted flow from the source of the release (gpm)
10	TS multiplier – component of ODCM Limit (see definition)
EC_i	concentration of radionuclide 'i' from 10CFR20, Appendix B, Table 2, Column 2 (µCi/ml)
σ	most restrictive recirculation factor at equilibrium (unitless)
SP	radiation monitor setpoint equivalent to the ODCM limit (cpm)
Eq_i	Cs-137 equivalence factor for radionuclide 'i' (unitless)
CF_{Cs-137}	radiation monitor correlation factor for Cs-137 (cpm per µCi/ml)
bkg	background reading for the radiation monitor (cpm)

4.1.2. RU1.1 Liquid Release EAL Threshold

$$RU1.1 = 2\left(\sum_i (C_i \times Eq_i \times CF_{Cs-137})\right) + bkg$$

See Attachment 2 for the spreadsheet calculations that develop the RU1.1 liquid effluent EAL threshold values for each applicable monitor at each station.

4.2. RU1.1 Gaseous Release

4.2.1. ODCM Gaseous Release Limit

$$\mathrm{SP}_{\text{total body}}\ (\mu\mathrm{Ci/sec}) = \left(\frac{500}{\frac{\chi}{Q} \times \sum_i \left(S_i \times K_i\right)} \right) + bkg$$

$$\mathrm{SP}_{\text{Skin}}\ (\mu\mathrm{Ci/sec}) = \left(\frac{3000}{\frac{\chi}{Q} \times \sum_i \left(S_i \times \left(L_i + 1.1M_i\right)\right)} \right) + bkg$$

Where:	
500/3000	ODCM Limit – 500 total body or 3000 skin (mrem/yr)
X/Q	annual average meteorological dispersion to the controlling site boundary location (sec/m^3)
S_i	isotopic fraction of the mix activity released (unitless)
K_i	total body dose factor (mrem/yr per µCi/m^3)
L_i + 1.1M_i	skin dose factor (mrem/yr per µCi/m^3)
bkg	background reading for the radiation monitor (µCi/sec)

4.2.2. RU1.1 Gaseous Release EAL Threshold

RU1.1 is two times the lesser of the calculated total body or skin value plus background.

See Attachment 3 for the spreadsheet calculations that develop the RU1.1 gaseous effluent EAL threshold values for each applicable monitor at each station.

4.3. RA1.1, RS1.1 and RG1.1 Gaseous Release

The RA1.1, RS1.1 and RG1.1 gaseous release EAL threshold are developed using the URI site specific dose assessment models with the inputs described in Section 2 above.

Refer to Attachment 4 for the results of the URI gaseous effluent EAL threshold calculations.

5. Conclusion

	Release Point	Monitor	GE	SAE	Alert	UE
Gaseous	Plant Vent	RM-21AV-3509-1SA	1.05E+8 (µCi/sec)	1.05E+7 (µCi/sec)	1.05E+6 (µCi/sec)	8.93E+3 (µCi/sec)
	Turbine Building	RM-1TV-3536-1	4.60E+8 (µCi/sec)	4.60E+7 (µCi/sec)	4.60E+6 (µCi/sec)	1.08E+4 (µCi/sec)
	Waste Process Building Vent 5	RM-1WV-3546-1	7.74E+9 (µCi/sec)	7.74E+8 (µCi/sec)	7.75E+7 (µCi/sec)	1.95E+5 (µCi/sec)
	Waste Process Building Vent 5A	RM-1WV-3547-1	7.76E+9 (µCi/sec)	7.76E+8 (µCi/sec)	7.76E+7 (µCi/sec)	1.14E+4 (µCi/sec)
Liquid	TL&HST	REM-1WL-3540	N/A	N/A	N/A	7.02E-4 (µCi/ml)
	WECT	REM-1WL-3541	N/A	N/A	N/A	1.97E-3 (µCi/ml)
	WMT	REM-1WL-3542	N/A	N/A	N/A	7.02E-4 (µCi/ml)

6. References

6.1. NEI 99-01 R6, Methodology for Development of Emergency Action Levels, November 2012

6.2. NUREG-1940, RASCAL 4: Description of Models and Methods, December 2012

6.3. Shearon Harris Nuclear Power Plant Offsite Dose Calculation Manual (ODCM), Revision 24

6.4. Unified RASCAL Interface Requirements Specification, Harris, Version 2

6.5. SHNPP UFSAR Table 11.5.2-2, Effluent Radiation Monitors, Amendment No. 59

6.6. Memo: Median Wind Speed and Stability Values at Duke Energy Nuclear Sites, 06/19/14

Date: June 19, 2014
To: Caryl Ingram, NGO-EP

From: Stanton Lanham, Meteorology - Environmental Services
Marsha Kinley, Meteorology - Environmental Services

Subject: Median Wind Speed and Stability Values at Duke Energy Nuclear Sites

1.0 Overview

Data from the most recent full five years (2009-2013) was used to calculate the median wind speed (WS), vertical temperature gradient (Delta-T), and stability class at each of the Duke Energy nuclear sites in the Carolinas. Upper level winds were used at Brunswick. All other sites use the lower level. Singular median values for WS, Delta-T, and stability class from all wind direction sectors are given in **Table 1**. NEI 99-01 Rev. 6 does not provide any guidance on selection of default meteorological conditions.

- These median values are irrespective of season or time of day, so the difference between the median values and actual meteorological conditions could be large.
- Also note that the median Delta-T values are in normalized units of (deg C/100m), and would need to be converted to reflect actual sensor separation distance on a tower, if needed.

Table 2.1 through Table 2.6 contains sector-specific median values of Wind Speed, Delta-T and Stability Class for each of the 16 directional sectors. This information provides more site-specific characteristics, similar to what would have been evaluated for the previous Rev. 4 of NEI-99-01 guidance. In addition, the most frequent sector from which the wind is blowing at each site for the five year period is also indicated in these tables.

Table 1 Median Values from Years 2009-2013

	Median WS (mph)	Median Delta-T (C/100m) **	Stability Class
DEC Sites			
CNS	4.8	-0.7	D
MNS	6	-0.9	D
ONS	3.7	-0.78	D
DEP Sites			
BNP*	13.4	-0.71	D
HNP	3.5	-0.51	D
RNP	4.4	-0.84	D

* Upper level winds are used at BNP. All other sites use lower level winds.
**Note: Delta-T values listed are in degs C/100 m. The units may need to be converted if actual delta-T based on tower-specific separation distances are required.

2.0 Data

The data presented represents the median of the entire five-year span at each site (**Table 1**), as well as the overall medians broken down by directional sector (Tables 2.1 - 2.6). Each value represents the middle of the dataset, with 50% of values above the median, and 50% of values below the median.

Data for the Legacy Duke Energy sites was obtained from the Duke's Environmental Monitoring "Ambient Administration" archive, which contains validated hourly meteorological data. Data for the Legacy Progress sites was obtained from hourly meteorological data files provided by the vendor (Murray and Trettel), and has undergone their data review/QA process. The five-year analysis results presented here were determined independently of previous studies, however comparison to the Annual Effluent reports (2013 MET) for all sites showed good agreement with the values presented in **Table 1**. The sector-specific median values (**Tables 2.1 through 2.6**) had not been investigated previously.

Legacy Duke Sites (DEC):

Table 2.1 Catawba Nuclear: 5-year Lower Level Medians by Sector

Sector	Median WS (mph)	Median Delta-T (C/100m)	Stability Class
N	7.4	-1.08	D
NNE	8.7	-1.3	D
NE	9	-1.2	D
ENE	6.1	-1.06	D
E	4.6	-0.94	D
ESE	4.4	-0.9	D
SE	4.8	-0.8	D
SSE	4.4	-0.76	D
S*	3.9	-0.36	E
SSW	4.1	-0.66	D
SW	3.8	-0.7	D
WSW	3.4	-0.4	E
W	3.6	0	E
WNW	4	0	E
NW	4.4	0	E
NNW	5.1	0	E

* Most frequent CNS wind direction (2009-2013): from South

Table 2.2 McGuire Nuclear: 5-year Lower Level Medians by Sector

Sector	Median WS (mph)	Median Delta-T (C/100m)	Stability Class
N	6.9	-1.18	D
NNE	7	-1.16	D
NE	7.8	-1.06	D
ENE	6.6	-1.02	D
E	6.2	-0.88	D
ESE	5.5	-0.88	D
SE	5.1	-0.68	D
SSE	4.2	-0.42	E
S	4.6	-0.12	E
SSW	5	-0.14	E
SW*	6.3	-0.72	D
WSW	5.2	-0.74	D
W	4.9	-0.76	D
WNW	6.3	-0.92	D
NW	8.5	-1.06	D
NNW	9.1	-1.16	D

* Most frequent MNS wind direction (2009-2013): from SW

Table 2.3 Oconee Nuclear: 5-year Lower Level Medians by Sector

Sector	Median WS (mph)	Median Delta-T (C/100m)	Stability Class
N	2.5	-0.44	E
NNE	2.8	-0.58	D
NE	3.9	-0.84	D
ENE	4.6	-0.88	D
E	3.7	-0.72	D
ESE	3.2	-0.4	E
SE	3.3	-0.42	E
SSE	3.3	-0.5	D
S	3.4	-0.68	D
SSW	4.6	-1.2	D
SW*	5	-1.32	D
WSW	4.8	-1.06	D
W	3.6	-0.8	D
WNW	2.8	-0.46	E
NW	2.7	-0.2	E
NNW	2.5	-0.42	E

* Most frequent ONS wind direction (2009-2013): from SW

Legacy Progress Sites (DEP):

Table 2.4 Brunswick Nuclear: 5-year Upper Level Medians by Sector

Sector	Median WS (mph)	Median Delta-T (C/100m)	Stability Class
N	14	-0.71	D
NNE	14.7	-0.68	D
NE	14.2	-0.69	D
ENE	13.6	-0.81	D
E	11.2	-0.79	D
ESE	9.5	-0.635	D
SE	9	-0.67	D
SSE	9.5	-0.46	E
S	11.4	-0.34	E
SSW	13.6	-0.79	D
SW*	16.2	-0.95	D
WSW	14.2	-0.74	D
W	9.6	-0.24	E
WNW	14.3	-0.28	E
NW	14.4	-0.44	E
NNW	15	-0.7	D

* Most frequent BNP wind direction (2009-2013): from SW

Table 2.5 Harris Nuclear: 5-year Lower Level Medians by Sector

Sector	Median WS (mph)	Median Delta-T (C/100m)	Stability Class
N	3.3	-0.35	E
NNE*	3.1	-0.26	E
NE	1.6	0.92	E
ENE	2.1	0.26	E
E	2.2	-0.07	E
ESE	2.6	-0.39	E
SE	2.9	-0.49	E
SSE	3.4	-0.59	D
S	4.2	-0.64	D
SSW	4.7	-0.58	D
SW	4.7	-0.64	D
WSW	4.6	-0.86	D
W	3.7	-0.68	D
WNW	4.2	-0.74	D
NW	4.1	-0.805	D
NNW	3.5	-0.55	D

* Most frequent HNP wind direction (2009-2013): from NNE

Table 2.6 Robinson Nuclear: 5-year Lower Level Medians by Sector

Sector	Median WS (mph)	Median Delta-T (C/100m)	Stability Class
N*	5.8	-1.03	D
NNE	5.2	-1.09	D
NE	4	-1.11	D
ENE	3.8	-1.14	D
E	3.6	-1.2	D
ESE	3.3	-1.28	D
SE	3.5	-1.12	D
SSE	4.2	-0.69	D
S	4.7	-0.6	D
SSW	4.6	-0.68	D
SW	4.6	-0.83	D
WSW	4	-0.71	D
W	3.9	-0.59	D
WNW	3.9	-0.47	E
NW	4.1	0.28	E
NNW	4.7	0.31	E

* Most frequent RNP wind direction (2009-2013): from North

3.0 Discussion and Conclusion

The median wind speed data presented in **Table 1** compared to **Tables 2.1 through 2.6** indicates typically varying conditions, depending on the directional sectors at each site. The overall median wind speed at a site (3-6 mph) is in the middle of the wider range of the sector-specific medians (1-9 mph). The singular median values sometime match well with the sector-specific median conditions of the most frequent directional sector, but can also be entirely different from the median of the most frequent wind direction sector. These differences span from potentially lower wind speeds which would be conservative for dose (i.e. Brunswick), to potentially higher wind speeds which would be non-conservative for dose (i.e Catawba).

- Thus, the median values of wind speed should only be used for dose assessment as a last resort, when actual meteorological data is not available, or dose calculation is for some reason impaired.

The median Stability Class is generally neutral (class D), but varies between D and E (slightly more stable) in the sector-specific tables (Tables 2.1 through 2.6). These median values are typical of daytime conditions, with a thermally mixed boundary layer.

- Thus, the median stability class should only be used when there is no concern about actual time of day, seasonal variances, or extreme weather events.

This table is the original (Rev 0) calculation for the liquid effluent data. The assumptions were based on the liquid effluent detectors reading in counts per minute (cpm) as described in the FSAR. The detectors do read in counts per minute, but the software associated with the Radiation Monitoring System converts cpm into micro curies per milliliter for display purposes. The calculation table on the following page defines the setpoints in microcuries per milliliter (µCi/ml) to be used in table R-1 of the EAL Bases.

Monitor	Dilution Flow (F)	Undiluted Flow (f)	Recirculation Factor (σ)	Cs-137 Equivalence Factor (Eqi)	Correlation Factor (CFi)	Maximum Allowable Concentration - Ci (µCi/ml)	Radiation Monitor Setpoint - SP (cpm)	RU1.1 EAL Threshold Value (cpm)
TL&HST REM-3540	3.80E+03	100	1	2.5	1.04E+08	3.51E-04	9.13E+04	1.83E+05
WECT REM-3541	3.80E+03	35	1	2.5	1.04E+08	9.86E-04	2.56E+05	5.13E+05
WMT REM-3541	3.80E+03	100	1	2.5	1.04E+08	3.51E-04	9.13E+04	1.83E+05

Cs-134 10CFR20 Limit - ECi (µCi/ml):	9.0E-07
TS Multiplier:	1.0E+01
Background (cpm):	0

This table is the revised (Rev 1) calculation for the liquid effluent data. It remains based on the 10 CFR 20 Appendix B, Table 2, Column 2 limit for Cs-134. The RMS uses a single efficiency factor to convert cpm to µCi/ml. Since a liquid source term will be a mix of isotopes which can vary and thus involve a degree of uncertainty, the use of the RMS conversion is considered acceptable for purposes of the EAL threshold.

Monitor	Dilution Flow (F)	Undiluted Flow (f)	Recirculation Factor (σ)	Maximum Allowable Concentration - Ci (µCi/ml)	RU1.1 EAL Threshold Value (µCi/ml)
TL&HST REM-3540	3.80E+03	100	1	3.51E-04	7.02E-04
WECT REM-3541	3.80E+03	35	1	9.86E-04	1.97E-03
WMT REM-3541	3.80E+03	100	1	3.51E-04	7.02E-04

Cs-134 10CFR20 Limit - ECi (µCi/ml):	9.0E-07
TS Multiplier:	1.0E+01
Background (cpm):	0

	TBV ODCM Annual Average	WPBV 5 ODCM Annual Average	WPBV 5A ODCM Annual Average	PV Fraction - Si	TBV Fraction - Si	WPBV 5 Fraction - Si	WPBV 5A Fraction - Si
Kr-83m	0.00E+00	0.00E+00	0.00E+00	1.83E-02	0.00E+00	0.00E+00	0.00E+00
Kr-85	0.00E+00	1.60E-07	0.00E+00	1.70E-03	0.00E+00	9.71E-01	0.00E+00
Kr-85m	4.70E-09	0.00E+00	1.96E-09	3.71E-02	9.55E-02	0.00E+00	6.53E-02
Kr-87	4.70E-09	0.00E+00	1.96E-09	7.40E-02	9.55E-02	0.00E+00	6.53E-02
Kr-88	7.04E-09	0.00E+00	3.91E-09	1.02E-01	1.43E-01	0.00E+00	1.30E-01
Xe-131m	0.00E+00	4.86E-09	1.30E-09	2.20E-03	0.00E+00	2.95E-02	4.33E-02
Xe-133	1.17E-08	0.00E+00	7.17E-09	3.26E-01	2.38E-01	0.00E+00	2.39E-01
Xe-133m	0.00E+00	0.00E+00	0.00E+00	1.03E-02	0.00E+00	0.00E+00	0.00E+00
Xe-135	1.64E-08	0.00E+00	9.78E-09	8.54E-02	3.33E-01	0.00E+00	3.26E-01
Xe-135m	2.35E-09	0.00E+00	1.96E-09	6.90E-02	4.77E-02	0.00E+00	6.53E-02
Xe-138	2.35E-09	0.00E+00	1.96E-09	2.74E-01	4.77E-02	0.00E+00	6.53E-02
	4.92E-08	1.65E-07	3.00E-08	1.00E+00	1.00E+00	1.00E+00	1.00E+00

	Total Body Dose Factor - Ki (mRem/yr per µCi/m3)	Skin Beta Dose Factor - Li (mRem/yr per µCi/m3)	Gamma Air Dose Factor - Mi (mRad/yr per µCi/m3)	Plant Vent		TB Vent		WPB Vent 5		WPB Vent 5A	
				Si x Ki (mRem/yr per µCi/m3)	Si x (Li + 1.1Mi) (mRem/yr per µCi/m3)	Si x Ki (mRem/yr per µCi/m3)	Si x (Li + 1.1Mi) (mRem/yr per µCi/m3)	Si x Ki (mRem/yr per µCi/m3)	Si x (Li + 1.1Mi) (mRem/yr per µCi/m3)	Si x Ki (mRem/yr per µCi/m3)	Si x (Li + 1.1Mi) (mRem/yr per µCi/m3)
Kr-83m	7.56E-02	0.00E+00	1.93E+01	1.38E-03	3.89E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Kr-85	1.61E+01	1.34E+03	1.72E+01	2.74E-02	2.31E+00	0.00E+00	0.00E+00	1.56E+01	1.32E+03	0.00E+00	0.00E+00
Kr-85m	1.17E+03	1.46E+03	1.23E+03	4.34E+01	1.04E+02	1.12E+02	2.69E+02	0.00E+00	0.00E+00	7.64E+01	1.84E+02
Kr-87	5.92E+03	9.73E+03	6.17E+03	4.38E+02	1.22E+03	5.65E+02	1.58E+03	0.00E+00	0.00E+00	3.87E+02	1.08E+03
Kr-88	1.47E+04	2.37E+03	1.52E+04	1.50E+03	1.95E+03	2.10E+03	2.73E+03	0.00E+00	0.00E+00	1.92E+03	2.49E+03
Xe-131m	9.15E+01	4.76E+02	1.56E+02	2.01E-01	1.42E+00	0.00E+00	0.00E+00	2.70E+00	1.91E+01	3.97E+00	2.81E+01
Xe-133	2.94E+02	3.06E+02	3.53E+02	9.59E+01	2.26E+02	6.99E+01	1.65E+02	0.00E+00	0.00E+00	7.03E+01	1.66E+02
Xe-133m	2.51E+02	9.94E+02	3.27E+02	2.59E+00	1.39E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-135	1.81E+03	1.86E+03	1.92E+03	1.55E+02	3.39E+02	6.03E+02	1.32E+03	0.00E+00	0.00E+00	5.90E+02	1.29E+03
Xe-135m	3.12E+03	7.11E+02	3.36E+03	2.15E+02	3.04E+02	1.49E+02	2.10E+02	0.00E+00	0.00E+00	2.04E+02	2.88E+02
Xe-138	8.83E+03	4.13E+03	9.21E+03	2.42E+03	3.90E+03	4.21E+02	6.81E+02	0.00E+00	0.00E+00	5.77E+02	9.32E+02
				4.87E+03	8.07E+03	4.02E+03	6.95E+03	1.83E+01	1.34E+03	3.82E+03	6.46E+03

	PV	TBV	WPB 5	WPB 5A
ODCM Limit for Total Body (µCi/sec):	4.46E+03	5.41E+03	1.19E+06	5.68E+03
ODCM Limit for Skin (µCi/sec):	1.62E+04	1.88E+04	9.75E+04	2.02E+04
2x ODCM Limit (µCi/sec):	8.93E+03	1.08E+04	1.95E+05	1.14E+04

Total Body Dose Rate Limit (mRem/yr):	500
Skin Dose Rate Limit (mRem/yr):	3000
Background (µCi/sec):	0
X/Q (sec/m3):	2.30E-05

Dose Assessment

Shearon Harris **Monday, January 12, 2015 13:57**

Method: Detailed Assessment - Monitored Release

Release Pathway: (I) <RCS> <Containment> <Aux Bldg> <NormFilter> <Plant Vent> <Env> PRF: 1.60E-02

Containment HUT: = < 2 Hours | Cont Sprays: = OFF | Purge Filter: = N/A | Aux/Fuel Bldg HUT: = < 2 Hours

Aux/Fuel Filter: = Working | Steam Gen: = N/A | Turb Bldg HUT: = N/A | Turb Bldg Filter: = N/A

Source Term: Reactor Core Accident - Clad

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00 ETE (hh:mm): [N/A]

Lower

Wind: From 45° @ 3.5 mph

Stability Class: D

Precipitation: None

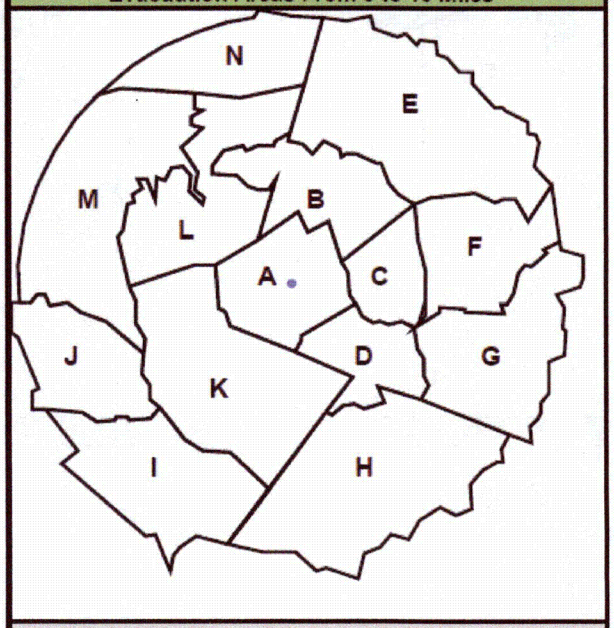
Monitor: Plant Vent rate Readings: 1.05E+06 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	3.23E+00	2.16E+00	2.03E+00	7.68E-01	4.95E+00	5.03E+01
0.5	2.93E+00	1.95E+00	1.75E+00	6.82E-01	4.39E+00	4.32E+01
0.7	2.01E+00	1.32E+00	1.10E+00	4.57E-01	2.88E+00	2.68E+01
1.0	1.23E+00	7.96E-01	6.44E-01	2.81E-01	1.72E+00	1.53E+01
1.5	6.48E-01	4.16E-01	3.64E-01	1.58E-01	9.38E-01	8.56E+00
2.0	5.16E-01	3.39E-01	2.63E-01	1.06E-01	7.08E-01	6.24E+00
3.0	5.16E-01	3.48E-01	2.11E-01	0.00E+00	5.59E-01	4.98E+00
4.0	3.63E-01	2.46E-01	1.73E-01	0.00E+00	4.20E-01	4.11E+00
5.0	3.07E-01	2.09E-01	1.58E-01	0.00E+00	3.67E-01	3.76E+00
7.0	1.76E-01	1.20E-01	1.11E-01	0.00E+00	2.31E-01	2.67E+00
10.0	9.80E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.85E+00

Assessment Data Results Saved to File:

Shearon Harris 10Miles Monitored Release 01122015 135718.URI7

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci / sec)	
Particulate	1.04E-03 (0.1%)
Iodine	2.56E-02 (2.4%)
Noble Gas	1.05E+00 (97.5%)

*** * * Classification: Validate against Emergency Action Levels * * ***

Reviewed By: _____

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Dose Assessment

Shearon Harris **Monday, January 12, 2015 13:57**

Method: Detailed Assessment - Monitored Release

Release Pathway: (I) <RCS> <Containment> <Aux Bldg> <NormFilter> <Plant Vent> <Env> PRF: 1.60E-02

Containment HUT: = < 2 Hours	Cont Sprays: = OFF	Purge Filter: = N/A	Aux/Fuel Bldg HUT: = < 2 Hours
Aux/Fuel Filter: = Working	Steam Gen: = N/A	Turb Bldg HUT: = N/A	Turb Bldg Filter: = N/A

Source Term: Reactor Core Accident - Clad

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00 ETE (hh:mm): [N/A]

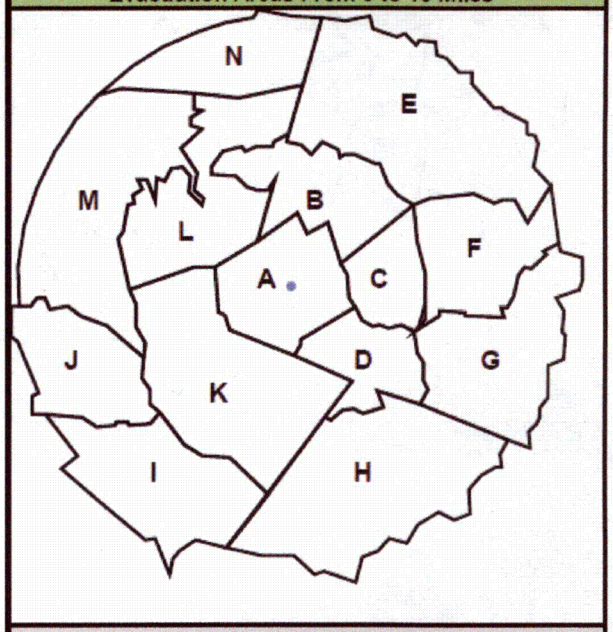
Lower
Wind: From 45° @ 3.5 mph
Stability Class: D
Precipitation: None

Monitor: Plant Vent rate Readings: 1.05E+07 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	3.23E+01	2.16E+01	2.03E+01	7.68E+00	4.95E+01	5.03E+02
0.5	2.93E+01	1.95E+01	1.75E+01	6.82E+00	4.39E+01	4.32E+02
0.7	2.01E+01	1.32E+01	1.10E+01	4.57E+00	2.88E+01	2.68E+02
1.0	1.23E+01	7.96E+00	6.44E+00	2.81E+00	1.72E+01	1.53E+02
1.5	6.48E+00	4.16E+00	3.64E+00	1.58E+00	9.38E+00	8.56E+01
2.0	5.16E+00	3.39E+00	2.63E+00	1.06E+00	7.08E+00	6.24E+01
3.0	5.16E+00	3.48E+00	2.11E+00	8.46E-01	6.44E+00	4.98E+01
4.0	3.63E+00	2.46E+00	1.73E+00	6.50E-01	4.85E+00	4.11E+01
5.0	3.07E+00	2.09E+00	1.58E+00	5.71E-01	4.24E+00	3.76E+01
7.0	1.76E+00	1.20E+00	1.11E+00	3.59E-01	2.67E+00	2.67E+01
10.0	9.80E-01	6.68E-01	7.59E-01	2.24E-01	1.65E+00	1.85E+01

Assessment Data Results Saved to File:
Shearon Harris 10Miles Monitored Release 01122015 135755.URI7

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

*** * * Classification: Site Area Emergency * * ***

Release Rates (Ci / sec)	
Particulate	1.04E-02 (0.1%)
Iodine	2.56E-01 (2.4%)
Noble Gas	1.05E+01 (97.5%)

Reviewed By: _____

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Dose Assessment

Shearon Harris **Monday, January 12, 2015 13:58**

Method: Detailed Assessment - Monitored Release

Release Pathway: (I) <RCS> <Containment> <Aux Bldg> <NormFilter> <Plant Vent> <Env> PRF: 1.60E-02

Containment HUT: = < 2 Hours	Cont Sprays: = OFF	Purge Filter: = N/A	Aux/Fuel Bldg HUT: = < 2 Hours
Aux/Fuel Filter: = Working	Steam Gen: = N/A	Turb Bldg HUT: = N/A	Turb Bldg Filter: = N/A

Source Term: Reactor Core Accident - Clad

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00 ETE (hh:mm): [N/A]

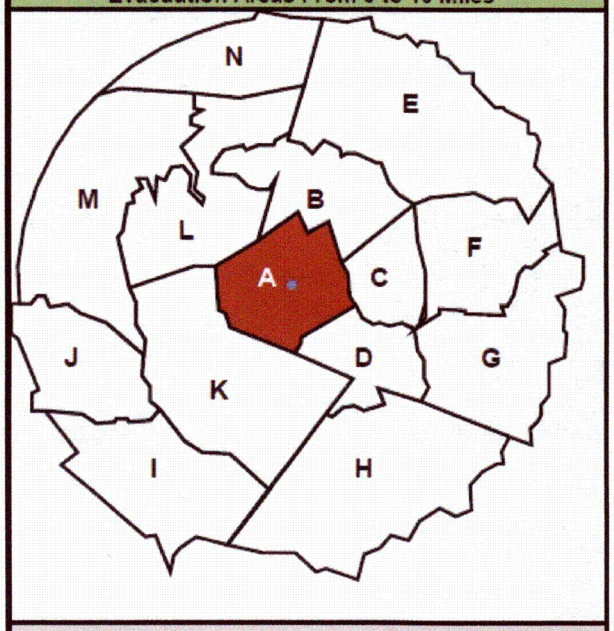
Monitor: Plant Vent rate Readings: 1.05E+08 uCi/sec

Lower
Wind: From 45° @ 3.5 mph
Stability Class: D
Precipitation: None

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	3.23E+02	2.16E+02	2.03E+02	7.68E+01	4.95E+02	5.03E+03
0.5	2.93E+02	1.95E+02	1.75E+02	6.82E+01	4.39E+02	4.32E+03
0.7	2.01E+02	1.32E+02	1.10E+02	4.57E+01	2.88E+02	2.68E+03
1.0	1.23E+02	7.96E+01	6.44E+01	2.81E+01	1.72E+02	1.53E+03
1.5	6.48E+01	4.16E+01	3.64E+01	1.58E+01	9.38E+01	8.56E+02
2.0	5.16E+01	3.39E+01	2.63E+01	1.06E+01	7.08E+01	6.24E+02
3.0	5.16E+01	3.48E+01	2.11E+01	8.46E+00	6.44E+01	4.98E+02
4.0	3.63E+01	2.46E+01	1.73E+01	6.50E+00	4.85E+01	4.11E+02
5.0	3.07E+01	2.09E+01	1.58E+01	5.71E+00	4.24E+01	3.76E+02
7.0	1.76E+01	1.20E+01	1.11E+01	3.59E+00	2.67E+01	2.67E+02
10.0	9.80E+00	6.68E+00	7.59E+00	2.24E+00	1.65E+01	1.85E+02

Assessment Data Results Saved to File:
Shearon Harris 10Miles Monitored Release 01122015 135842.URI7

Evacuation Areas From 0 to 10 Miles



PAGs Exceeded in Designated Areas

Release Rates (Ci / sec)	
Particulate	1.04E-01 (0.1%)
Iodine	2.56E+00 (2.4%)
Noble Gas	1.05E+02 (97.5%)

*** * * Classification: General Emergency * * ***

Reviewed By: _____

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Dose Assessment

Shearon Harris **Wednesday, January 14, 2015 09:24**

Method: Detailed Assessment - Monitored Release

Release Pathway: (E) <RCS> <Steam Gen> <Turb Bldg> <Filter> <TB Vent> <Env> PRF: 8.00E-04

Containment HUT: = N/A	Cont Sprays: = N/A	Purge Filter: = N/A	Aux/Fuel Bldg HUT: = N/A
Aux/Fuel Filter: = N/A	Steam Gen: = Boiling	Turb Bldg HUT: = < 2 Hours	Turb Bldg Filter: = Working

Source Term: Reactor Core Accident - Clad

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00 ETE (hh:mm): [N/A]

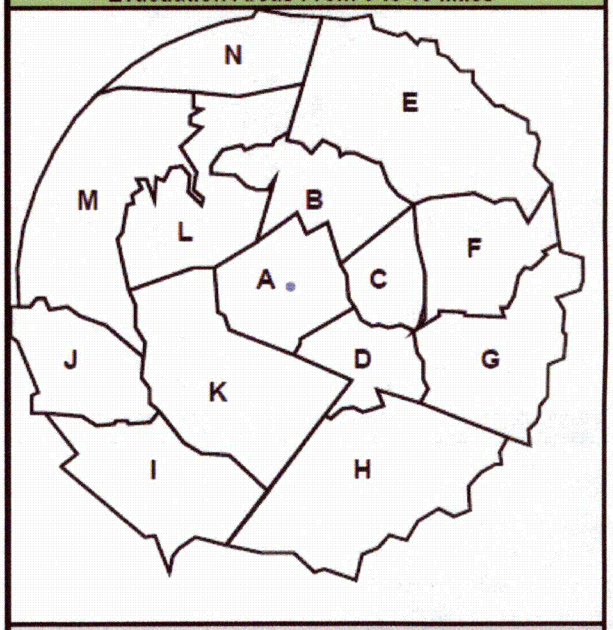
Monitor: Turb Vent rate Readings: 4.60E+06 uCi/sec

Lower
Wind: From 45° @ 3.5 mph
Stability Class: D
Precipitation: None

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.32E+01	8.99E+00	5.86E-01	4.66E-01	1.00E+01	1.08E+01
0.5	1.20E+01	8.12E+00	5.52E-01	4.99E-01	9.17E+00	9.28E+00
0.7	8.00E+00	5.24E+00	4.76E-01	5.62E-01	6.28E+00	5.68E+00
1.0	4.76E+00	3.10E+00	3.08E-01	3.72E-01	3.78E+00	3.23E+00
1.5	3.12E+00	2.05E+00	1.84E-01	2.05E-01	2.44E+00	1.85E+00
2.0	2.15E+00	1.43E+00	1.28E-01	1.21E-01	1.68E+00	1.40E+00
3.0	2.02E+00	1.37E+00	1.05E-01	1.10E-01	1.59E+00	1.06E+00
4.0	1.53E+00	1.04E+00	0.00E+00	0.00E+00	1.04E+00	9.47E-01
5.0	1.22E+00	8.36E-01	0.00E+00	0.00E+00	8.36E-01	8.30E-01
7.0	7.04E-01	4.66E-01	0.00E+00	0.00E+00	4.66E-01	5.78E-01
10.0	3.55E-01	2.55E-01	0.00E+00	0.00E+00	2.55E-01	3.98E-01

Assessment Data Results Saved to File:
Shearon Harris 10Miles Monitored Release 01142015 092450.URI7

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

*** * * Classification: Validate against Emergency Action Levels * * ***

Release Rates (Ci / sec)	
Particulate	2.28E-04 (0.0%)
Iodine	5.60E-03 (0.1%)
Noble Gas	4.60E+00 (99.9%)

Reviewed By: _____

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Dose Assessment

Shearon Harris **Wednesday, January 14, 2015 09:25**

Method: Detailed Assessment - Monitored Release

Release Pathway: (E) <RCS> <Steam Gen> <Turb Bldg> <Filter> <TB Vent> <Env> PRF: 8.00E-04

Containment HUT: = N/A	Cont Sprays: = N/A	Purge Filter: = N/A	Aux/Fuel Bldg HUT: = N/A
Aux/Fuel Filter: = N/A	Steam Gen: = Boiling	Turb Bldg HUT: = < 2 Hours	Turb Bldg Filter: = Working

Source Term: Reactor Core Accident - Clad

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00 ETE (hh:mm): [N/A]

Lower

Wind: From 45° @ 3.5 mph

Stability Class: D

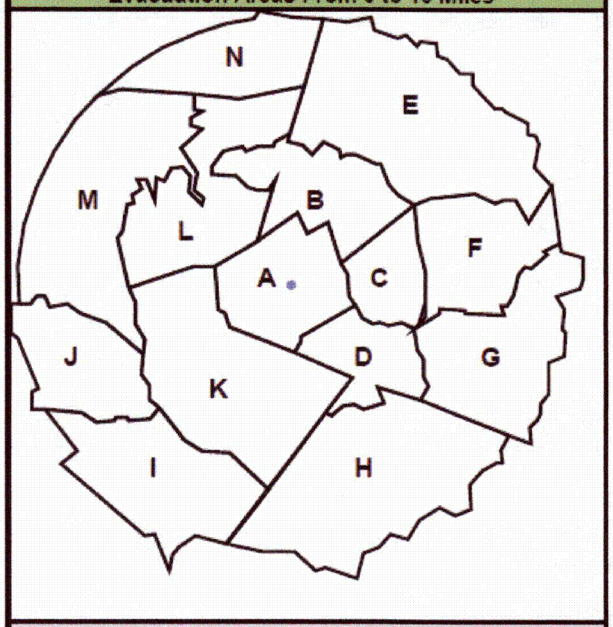
Precipitation: None

Monitor: Turb Vent rate Readings: 4.60E+07 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.32E+02	8.99E+01	5.86E+00	4.66E+00	1.00E+02	1.08E+02
0.5	1.20E+02	8.12E+01	5.52E+00	4.99E+00	9.17E+01	9.28E+01
0.7	8.00E+01	5.24E+01	4.76E+00	5.62E+00	6.28E+01	5.68E+01
1.0	4.76E+01	3.10E+01	3.08E+00	3.72E+00	3.78E+01	3.23E+01
1.5	3.12E+01	2.05E+01	1.84E+00	2.05E+00	2.44E+01	1.85E+01
2.0	2.15E+01	1.43E+01	1.28E+00	1.21E+00	1.68E+01	1.40E+01
3.0	2.02E+01	1.37E+01	1.05E+00	1.10E+00	1.59E+01	1.06E+01
4.0	1.53E+01	1.04E+01	8.96E-01	8.13E-01	1.21E+01	9.47E+00
5.0	1.22E+01	8.36E+00	7.54E-01	6.26E-01	9.74E+00	8.30E+00
7.0	7.04E+00	4.66E+00	4.61E-01	2.94E-01	5.41E+00	5.78E+00
10.0	3.55E+00	2.55E+00	2.78E-01	1.32E-01	2.96E+00	3.98E+00

Assessment Data Results Saved to File:
Shearon Harris 10Miles Monitored Release 01142015 092557.URI7

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

*** * * Classification: Site Area Emergency * * ***

Release Rates (Ci / sec)	
Particulate	2.28E-03 (0.0%)
Iodine	5.60E-02 (0.1%)
Noble Gas	4.60E+01 (99.9%)

Reviewed By: _____

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Dose Assessment

Shearon Harris **Wednesday, January 14, 2015 09:26**

Method: Detailed Assessment - Monitored Release

Release Pathway: (E) <RCS> <Steam Gen> <Turb Bldg> <Filter> <TB Vent> <Env> PRF: 8.00E-04

Containment HUT: = N/A	Cont Sprays: = N/A	Purge Filter: = N/A	Aux/Fuel Bldg HUT: = N/A
Aux/Fuel Filter: = N/A	Steam Gen: = Boiling	Turb Bldg HUT: = < 2 Hours	Turb Bldg Filter: = Working

Source Term: Reactor Core Accident - Clad

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00 ETE (hh:mm): [N/A]

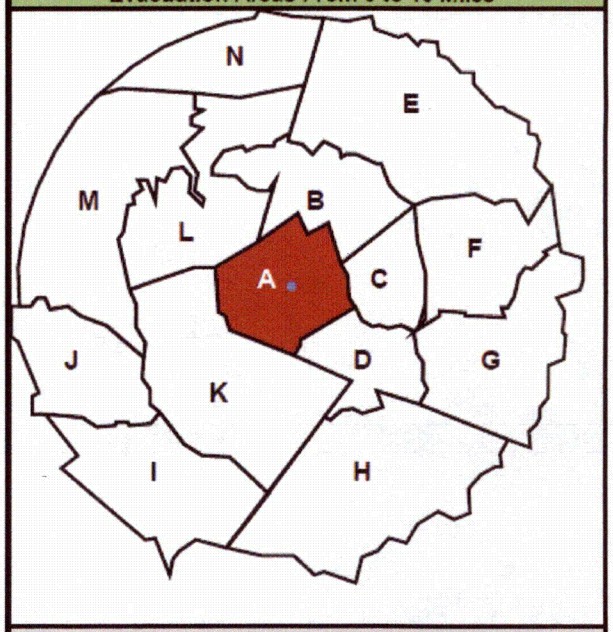
Lower
Wind: From 45° @ 3.5 mph
Stability Class: D
Precipitation: None

Monitor: Turb Vent rate Readings: 4.60E+08 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.32E+03	8.99E+02	5.86E+01	4.66E+01	1.00E+03	1.08E+03
0.5	1.20E+03	8.12E+02	5.52E+01	4.99E+01	9.17E+02	9.28E+02
0.7	8.00E+02	5.24E+02	4.76E+01	5.62E+01	6.28E+02	5.68E+02
1.0	4.76E+02	3.10E+02	3.08E+01	3.72E+01	3.78E+02	3.23E+02
1.5	3.12E+02	2.05E+02	1.84E+01	2.05E+01	2.44E+02	1.85E+02
2.0	2.15E+02	1.43E+02	1.28E+01	1.21E+01	1.68E+02	1.40E+02
3.0	2.02E+02	1.37E+02	1.05E+01	1.10E+01	1.59E+02	1.06E+02
4.0	1.53E+02	1.04E+02	8.96E+00	8.13E+00	1.21E+02	9.47E+01
5.0	1.22E+02	8.36E+01	7.54E+00	6.26E+00	9.74E+01	8.30E+01
7.0	7.04E+01	4.66E+01	4.61E+00	2.94E+00	5.41E+01	5.78E+01
10.0	3.55E+01	2.55E+01	2.78E+00	1.32E+00	2.96E+01	3.98E+01

Assessment Data Results Saved to File:
Shearon Harris 10Miles Monitored Release 01142015 092629.URI7

Evacuation Areas From 0 to 10 Miles



PAGs Exceeded in Designated Areas

*** * * Classification: General Emergency * * ***

Release Rates (Ci / sec)	
Particulate	2.28E-02 (0.0%)
Iodine	5.60E-01 (0.1%)
Noble Gas	4.60E+02 (99.9%)

Reviewed By: _____

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Dose Assessment

Shearon Harris **Thursday, February 19, 2015 07:54**

Method: Detailed Assessment - Monitored Release

Release Pathway: (T) <Waste Gas> <WPB> <WPB Vent 5> <Env> PRF: 4.00E-01

Containment HUT: = N/A	Cont Sprays: = N/A	Purge Filter: = N/A	Aux/Fuel Bldg HUT: = < 2 Hours
Aux/Fuel Filter: = N/A	Steam Gen: = N/A	Turb Bldg HUT: = N/A	Turb Bldg Filter: = N/A

Source Term: Waste Gas Tank

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00 ETE (hh:mm): [N/A]

Lower

Wind: From 45° @ 3.5 mph

Stability Class: D

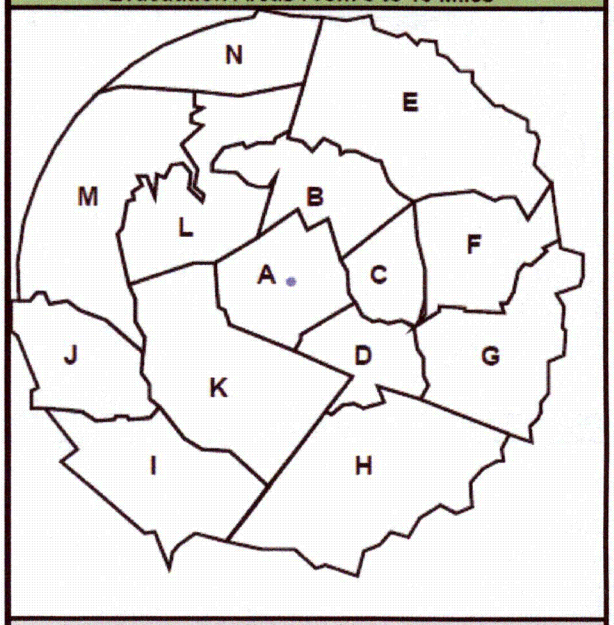
Precipitation: None

Monitor: WPB 5 rate Readings: 7.75E+07 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.43E+01	1.00E+01	0.00E+00	0.00E+00	1.00E+01	0.00E+00
0.5	1.28E+01	9.00E+00	0.00E+00	0.00E+00	9.00E+00	0.00E+00
0.7	8.48E+00	5.92E+00	0.00E+00	0.00E+00	5.92E+00	0.00E+00
1.0	5.16E+00	3.61E+00	0.00E+00	0.00E+00	3.61E+00	0.00E+00
1.5	3.72E+00	2.60E+00	0.00E+00	0.00E+00	2.60E+00	0.00E+00
2.0	3.07E+00	2.14E+00	0.00E+00	0.00E+00	2.14E+00	0.00E+00
3.0	2.46E+00	1.70E+00	0.00E+00	0.00E+00	1.70E+00	0.00E+00
4.0	2.14E+00	1.49E+00	0.00E+00	0.00E+00	1.49E+00	0.00E+00
5.0	1.92E+00	1.32E+00	0.00E+00	0.00E+00	1.32E+00	0.00E+00
7.0	1.32E+00	9.30E-01	0.00E+00	0.00E+00	9.30E-01	0.00E+00
10.0	9.04E-01	6.48E-01	0.00E+00	0.00E+00	6.48E-01	0.00E+00

Assessment Data Results Saved to File:
Shearon Harris 10Miles Monitored Release 02192015 075412.URI7

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

*** * * Classification: Validate against Emergency Action Levels * * ***

Release Rates (Ci / sec)	
Particulate	0.00E+00 (0.0%)
Iodine	0.00E+00 (0.0%)
Noble Gas	7.75E+01 (100.0%)

Reviewed By: _____

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Dose Assessment

Shearon Harris **Thursday, February 19, 2015 07:55**

Method: Detailed Assessment - Monitored Release

Release Pathway: (T) <Waste Gas> <WPB> <WPB Vent 5> <Env> PRF: 4.00E-01

Containment HUT: = N/A	Cont Sprays: = N/A	Purge Filter: = N/A	Aux/Fuel Bldg HUT: = < 2 Hours
Aux/Fuel Filter: = N/A	Steam Gen: = N/A	Turb Bldg HUT: = N/A	Turb Bldg Filter: = N/A

Source Term: Waste Gas Tank

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00 ETE (hh:mm): [N/A]

Lower

Wind: From 45° @ 3.5 mph

Stability Class: D

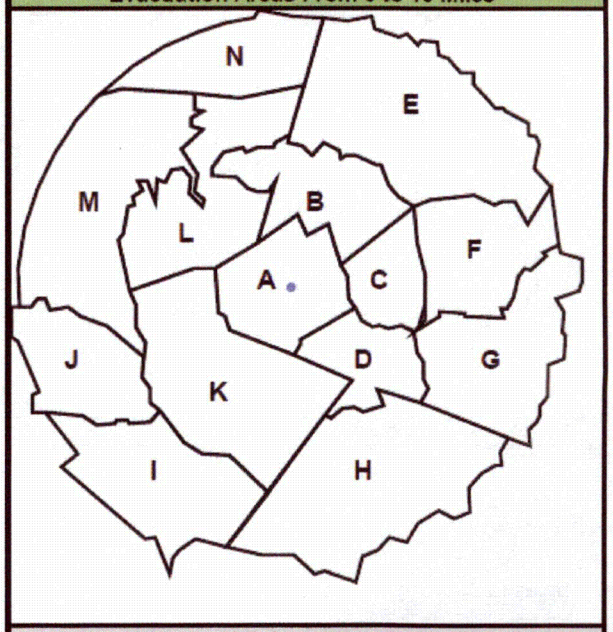
Precipitation: None

Monitor: WPB 5 rate Readings: 7.74E+08 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.43E+02	9.99E+01	2.44E-01	1.44E-01	1.00E+02	0.00E+00
0.5	1.28E+02	8.96E+01	2.87E-01	1.69E-01	9.01E+01	0.00E+00
0.7	8.44E+01	5.92E+01	3.19E-01	1.86E-01	5.97E+01	0.00E+00
1.0	5.16E+01	3.60E+01	2.97E-01	1.72E-01	3.65E+01	0.00E+00
1.5	3.72E+01	2.59E+01	2.32E-01	1.32E-01	2.63E+01	0.00E+00
2.0	3.07E+01	2.14E+01	1.84E-01	1.03E-01	2.16E+01	0.00E+00
3.0	2.46E+01	1.70E+01	1.28E-01	0.00E+00	1.71E+01	0.00E+00
4.0	2.14E+01	1.49E+01	1.22E-01	0.00E+00	1.50E+01	0.00E+00
5.0	1.92E+01	1.32E+01	1.09E-01	0.00E+00	1.33E+01	0.00E+00
7.0	1.32E+01	9.28E+00	0.00E+00	0.00E+00	9.28E+00	0.00E+00
10.0	9.04E+00	6.47E+00	0.00E+00	0.00E+00	6.47E+00	0.00E+00

Assessment Data Results Saved to File:
Shearon Harris 10Miles Monitored Release 02192015 075553.URI7

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

*** * * Classification: Site Area Emergency * * ***

Release Rates (Ci / sec)	
Particulate	0.00E+00 (0.0%)
Iodine	0.00E+00 (0.0%)
Noble Gas	7.74E+02 (100.0%)

Reviewed By: _____

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Dose Assessment

Shearon Harris **Thursday, February 19, 2015 07:56**

Method: Detailed Assessment - Monitored Release

Release Pathway: (T) <Waste Gas> <WPB> <WPB Vent 5> <Env> PRF: 4.00E-01

Containment HUT: = N/A | Cont Sprays: = N/A | Purge Filter: = N/A | Aux/Fuel Bldg HUT: = < 2 Hours

Aux/Fuel Filter: = N/A | Steam Gen: = N/A | Turb Bldg HUT: = N/A | Turb Bldg Filter: = N/A

Source Term: Waste Gas Tank

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00 ETE (hh:mm): [N/A]

Lower

Wind: From 45° @ 3.5 mph

Stability Class: D

Precipitation: None

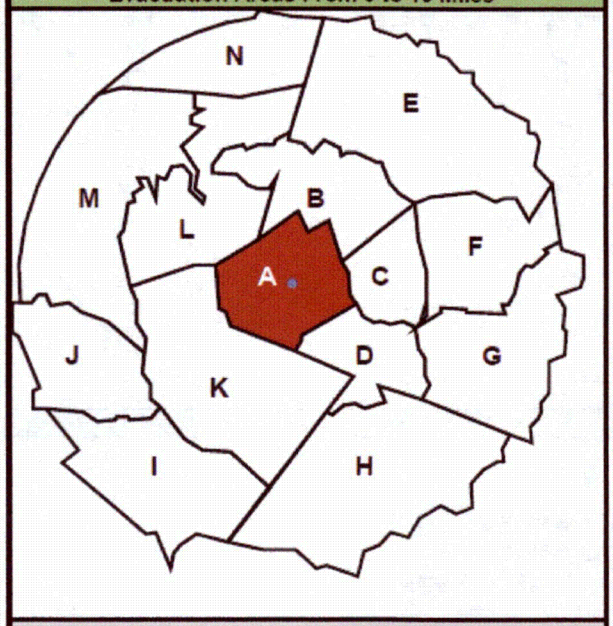
Monitor: WPB 5 rate Readings: 7.74E+09 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.43E+03	9.99E+02	2.44E+00	1.44E+00	1.00E+03	1.51E-01
0.5	1.28E+03	8.96E+02	2.87E+00	1.69E+00	9.01E+02	1.78E-01
0.7	8.44E+02	5.92E+02	3.19E+00	1.86E+00	5.97E+02	1.97E-01
1.0	5.16E+02	3.60E+02	2.97E+00	1.72E+00	3.65E+02	1.83E-01
1.5	3.72E+02	2.59E+02	2.32E+00	1.32E+00	2.63E+02	1.42E-01
2.0	3.07E+02	2.14E+02	1.84E+00	1.03E+00	2.16E+02	1.12E-01
3.0	2.46E+02	1.70E+02	1.28E+00	6.74E-01	1.72E+02	0.00E+00
4.0	2.14E+02	1.49E+02	1.22E+00	6.28E-01	1.51E+02	0.00E+00
5.0	1.92E+02	1.32E+02	1.09E+00	5.52E-01	1.34E+02	0.00E+00
7.0	1.32E+02	9.28E+01	7.20E-01	3.53E-01	9.38E+01	0.00E+00
10.0	9.04E+01	6.47E+01	4.36E-01	2.08E-01	6.53E+01	0.00E+00

Assessment Data Results Saved to File:

Shearon Harris 10Miles Monitored Release 02192015 075653.URI7

Evacuation Areas From 0 to 10 Miles



PAGs Exceeded in Designated Areas

*** * * Classification: General Emergency * * ***

Release Rates (Ci / sec)	
Particulate	0.00E+00 (0.0%)
Iodine	0.00E+00 (0.0%)
Noble Gas	7.74E+03 (100.0%)

Reviewed By: _____

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Dose Assessment

Shearon Harris **Thursday, February 19, 2015 07:59**

Method: Detailed Assessment - Monitored Release

Release Pathway: (U) <Waste Gas> <WPB> <WPB Vent 5A> <Env> PRF: 4.00E-01

Containment HUT: = N/A	Cont Sprays: = N/A	Purge Filter: = N/A	Aux/Fuel Bldg HUT: = < 2 Hours
Aux/Fuel Filter: = N/A	Steam Gen: = N/A	Turb Bldg HUT: = N/A	Turb Bldg Filter: = N/A

Source Term: Waste Gas Tank

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00 ETE (hh:mm): [N/A]

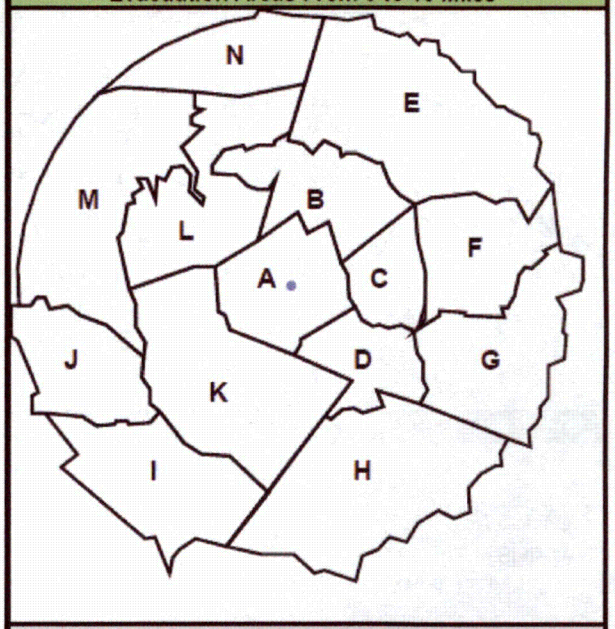
Monitor: WPB 5A rate Readings: 7.76E+07 uCi/sec

Lower
Wind: From 45° @ 3.5 mph
Stability Class: D
Precipitation: None

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.43E+01	1.00E+01	0.00E+00	0.00E+00	1.00E+01	0.00E+00
0.5	1.28E+01	8.96E+00	0.00E+00	0.00E+00	8.96E+00	0.00E+00
0.7	8.36E+00	5.84E+00	0.00E+00	0.00E+00	5.84E+00	0.00E+00
1.0	5.04E+00	3.50E+00	0.00E+00	0.00E+00	3.50E+00	0.00E+00
1.5	3.77E+00	2.63E+00	0.00E+00	0.00E+00	2.63E+00	0.00E+00
2.0	3.23E+00	2.25E+00	0.00E+00	0.00E+00	2.25E+00	0.00E+00
3.0	2.44E+00	1.72E+00	0.00E+00	0.00E+00	1.72E+00	0.00E+00
4.0	2.18E+00	1.53E+00	0.00E+00	0.00E+00	1.53E+00	0.00E+00
5.0	1.91E+00	1.34E+00	0.00E+00	0.00E+00	1.34E+00	0.00E+00
7.0	1.36E+00	9.30E-01	0.00E+00	0.00E+00	9.30E-01	0.00E+00
10.0	8.76E-01	6.37E-01	0.00E+00	0.00E+00	6.37E-01	0.00E+00

Assessment Data Results Saved to File:
Shearon Harris 10Miles Monitored Release 02192015 075950.URI7

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci / sec)	
Particulate	0.00E+00 (0.0%)
Iodine	0.00E+00 (0.0%)
Noble Gas	7.76E+01 (100.0%)

*** * * Classification: Validate against Emergency Action Levels * * ***

Reviewed By: _____

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Dose Assessment

Shearon Harris **Thursday, February 19, 2015 08:00**

Method: Detailed Assessment - Monitored Release

Release Pathway: (U) <Waste Gas> <WPB> <WPB Vent 5A> <Env> PRF: 4.00E-01

Containment HUT: = N/A	Cont Sprays: = N/A	Purge Filter: = N/A	Aux/Fuel Bldg HUT: = < 2 Hours
Aux/Fuel Filter: = N/A	Steam Gen: = N/A	Turb Bldg HUT: = N/A	Turb Bldg Filter: = N/A

Source Term: Waste Gas Tank

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00 ETE (hh:mm): [N/A]

Lower

Wind: From 45° @ 3.5 mph

Stability Class: D

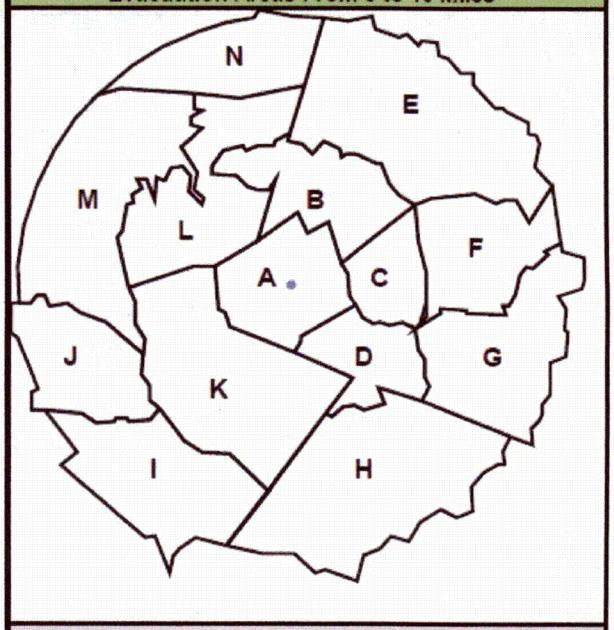
Precipitation: None

Monitor: WPB 5A rate Readings: 7.76E+08 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.43E+02	1.00E+02	2.40E-01	1.41E-01	1.00E+02	0.00E+00
0.5	1.28E+02	8.96E+01	2.82E-01	1.65E-01	9.00E+01	0.00E+00
0.7	8.36E+01	5.84E+01	4.20E-01	2.45E-01	5.91E+01	0.00E+00
1.0	5.04E+01	3.50E+01	3.26E-01	1.88E-01	3.56E+01	0.00E+00
1.5	3.77E+01	2.63E+01	2.37E-01	1.35E-01	2.67E+01	0.00E+00
2.0	3.23E+01	2.25E+01	1.87E-01	1.05E-01	2.28E+01	0.00E+00
3.0	2.44E+01	1.72E+01	1.32E-01	0.00E+00	1.74E+01	0.00E+00
4.0	2.18E+01	1.53E+01	1.26E-01	0.00E+00	1.54E+01	0.00E+00
5.0	1.91E+01	1.34E+01	1.10E-01	0.00E+00	1.35E+01	0.00E+00
7.0	1.36E+01	9.30E+00	0.00E+00	0.00E+00	9.30E+00	0.00E+00
10.0	8.76E+00	6.37E+00	0.00E+00	0.00E+00	6.37E+00	0.00E+00

Assessment Data Results Saved to File:
Shearon Harris 10Miles Monitored Release 02192015 080011.URI7

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

*** * * Classification: Site Area Emergency * * ***

Release Rates (Ci / sec)	
Particulate	0.00E+00 (0.0%)
Iodine	0.00E+00 (0.0%)
Noble Gas	7.76E+02 (100.0%)

Reviewed By: _____

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Dose Assessment

Shearon Harris **Thursday, February 19, 2015 08:00**

Method: Detailed Assessment - Monitored Release

Release Pathway: (U) <Waste Gas> <WPB> <WPB Vent 5A> <Env> PRF: 4.00E-01

Containment HUT: = N/A	Cont Sprays: = N/A	Purge Filter: = N/A	Aux/Fuel Bldg HUT: = < 2 Hours
Aux/Fuel Filter: = N/A	Steam Gen: = N/A	Turb Bldg HUT: = N/A	Turb Bldg Filter: = N/A

Source Term: Waste Gas Tank

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00 ETE (hh:mm): [N/A]

Lower

Wind: From 45° @ 3.5 mph

Stability Class: D

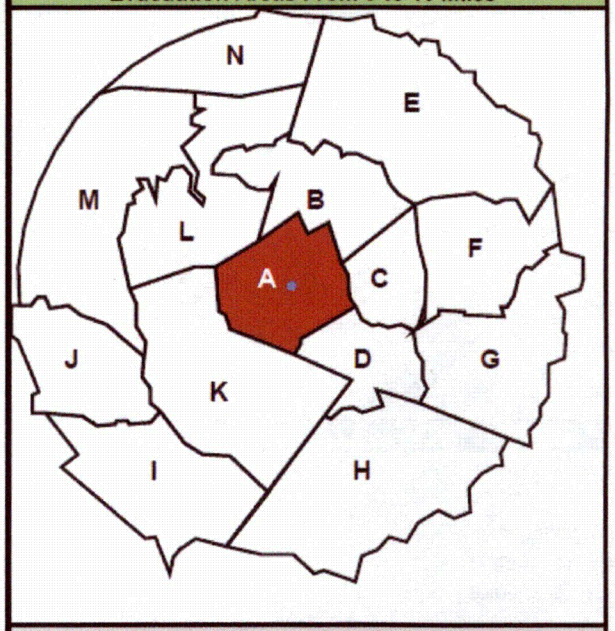
Precipitation: None

Monitor: WPB 5A rate Readings: 7.76E+09 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.43E+03	1.00E+03	2.40E+00	1.41E+00	1.00E+03	1.49E-01
0.5	1.28E+03	8.96E+02	2.82E+00	1.65E+00	9.00E+02	1.74E-01
0.7	8.36E+02	5.84E+02	4.20E+00	2.45E+00	5.91E+02	2.60E-01
1.0	5.04E+02	3.50E+02	3.26E+00	1.88E+00	3.56E+02	2.01E-01
1.5	3.77E+02	2.63E+02	2.37E+00	1.35E+00	2.67E+02	1.45E-01
2.0	3.23E+02	2.25E+02	1.87E+00	1.05E+00	2.28E+02	1.14E-01
3.0	2.44E+02	1.72E+02	1.32E+00	6.92E-01	1.74E+02	0.00E+00
4.0	2.18E+02	1.53E+02	1.26E+00	6.40E-01	1.55E+02	0.00E+00
5.0	1.91E+02	1.34E+02	1.10E+00	5.54E-01	1.36E+02	0.00E+00
7.0	1.36E+02	9.30E+01	7.05E-01	3.44E-01	9.40E+01	0.00E+00
10.0	8.76E+01	6.37E+01	4.16E-01	1.95E-01	6.44E+01	0.00E+00

Assessment Data Results Saved to File:
Shearon Harris 10Miles Monitored Release 02192015 080033.URI7

Evacuation Areas From 0 to 10 Miles



PAGs Exceeded in Designated Areas

Release Rates (Ci / sec)	
Particulate	0.00E+00 (0.0%)
Iodine	0.00E+00 (0.0%)
Noble Gas	7.76E+03 (100.0%)

*** * * Classification: General Emergency * * ***

Reviewed By: _____

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