

**ENCLOSURE 4**

**EAL TECHNICAL BASES DOCUMENT (REDLINE AND STRIKEOUT VERSION)**



# ***EMERGENCY ACTION LEVEL TECHNICAL BASES***

(Redline and Strikeout Version)

Revision 0 5/6/15

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## 1.0 PURPOSE

This document provides an explanation and rationale for each Emergency Action Level (EAL) included in the EAL Upgrade Project for McGuire Nuclear Station (MNS). It should be used to facilitate review of the MNS EALs and provide historical documentation for future reference. Decision-makers responsible for implementation of RP/0/A/5700/000 Classification of Emergency, may use this document as a technical reference in support of EAL interpretation. This information may assist the Emergency Coordinator/EOF Director 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 MNS 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), MNS 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 (NCS): The NCS Barrier includes the NCS 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 (CMT): 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 NCS 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 MNS 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 No 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 MNS EAL categories are aligned to and represent the NEI 99-01 "Recognition Categories." Subcategories are used in the MNS scheme as necessary to further divide the EALs of a category into logical sets of possible emergency classification thresholds. The MNS EAL categories and subcategories are listed below.

## EAL Groups, Categories and Subcategories

EAL Group/Category	EAL Subcategory
<b><u>Any Operating Mode:</u></b>	
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
E – Independent Spent Fuel Storage Installation (ISFSI)	1 – Confinement Boundary
<b><u>Hot Conditions:</u></b>	
S – System Malfunction	1 – Loss of Essential AC Power 2 – Loss of Vital DC Power 3 – Loss of Control Room Indications 4 – NCS Activity 5 – NCS Leakage 6 – RPS Failure 7 – Loss of Communications 8 – Containment Failure 9 – Hazardous Event Affecting Safety Systems
F – Fission Product Barrier Degradation	None
<b><u>Cold Conditions:</u></b>	
C – Cold Shutdown / Refueling System Malfunction	1 – NCS Level 2 – Loss of Essential AC Power 3 – NCS 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, F and E) 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, F or E)
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, NM - No Mode, 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 Plant-Specific basis section that provides MNS-relevant information concerning the EAL. This is followed by a Generic basis section that provides a description of the rationale for the EAL as provided in NEI 99-01 Rev. 6.

### MNS Basis Reference(s):

Site-specific source documentation from which the EAL is derived

## 2.6 Operating Mode Applicability (ref. 4.1.7)

### 1 Power Operation

$K_{\text{eff}} \geq 0.99$  and reactor thermal power  $> 5\%$

### 2 Startup

$K_{\text{eff}} \geq 0.99$  and reactor thermal power  $\leq 5\%$

### 3 Hot Standby

$K_{\text{eff}} < 0.99$  and average coolant temperature  $\geq 350^\circ\text{F}$

### 4 Hot Shutdown

$K_{\text{eff}} < 0.99$  and average coolant temperature  $350^\circ\text{F} > T_{\text{avg}} > 200^\circ\text{F}$

### 5 Cold Shutdown

$K_{\text{eff}} < 0.99$  and average coolant temperature  $\leq 200^\circ\text{F}$

### 6 Refueling

One or more reactor vessel head closure bolts are less than fully tensioned

### NM No mode

Reactor vessel contains no irradiated fuel

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/EOF Director 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. 4.1.12).

##### **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/EOF Director 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, NCS 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/EOF Director 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/EOF Director 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. 4.1.14).

### 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:

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- 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/EOF Director 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 IMMIDENT). If, in the judgment of the Emergency Coordinator/EOF Director, meeting an EAL is IMMIDENT, 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

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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 NCS 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/EOF Director 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

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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 MNS UFSAR Figure 2-4 Plot Plan and Site Area
- 4.1.7 Technical Specifications Table 1.1-1 Modes
- 4.1.8 PT/1(2)/A/4200/002 C (Containment Closure)
- 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 MNS ISFSI Certificate of Compliance
- 4.1.12 MNS Emergency Plan
- 4.1.13 MNS-SLC-16.11.1 Figure 16.11.1-1 Site Boundary/Exclusion Area Boundary

### 4.2 Implementing

- 4.2.1 RP/0/A/5700/000 Classification of Emergency
- 4.2.2 NEI 99-01 Rev. 6 to MNS EAL Comparison Matrix
- 4.2.3 MNS 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.

#### **Confinement Boundary**

The barrier(s) between spent fuel and the environment once the spent fuel is processed for dry storage. **As related to the MNS ISFSI, Confinement Boundary is defined as the Transportable Storage Cask (TSC) for TN, UMS and MAGNASTOR storage systems.**

#### **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 MNS, Containment Closure is established when the requirements of PT/1(2)/A/4200/002 C are met (ref. 4.1.8).**

#### **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 MNS 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.



## **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.

## **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 MNS 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 MNS. 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).

## **Intrusion**

The act of entering without authorization. Discovery of a bomb in a specified area is indication of intrusion into that area by a hostile force.

## **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**

Area outside the PROTECTED AREA fence that immediately surrounds the plant. The site property owned by, or otherwise under the control of, Duke Energy.

## **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 encompassed by physical barriers and to which access is controlled. The Protected Area refers to the designated security area around the process buildings and is depicted in MNS UFSAR Figure 2-4 Plot Plan and Site Area (ref. 4.1.6).

## **NCS Intact**

The NCS should be considered intact when the NCS 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.

## **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 Boundary

Area as depicted in MNS-SLC-16.11.1 Figure 16.11.1-1 Site Boundary/Exclusion Area Boundary (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.

## 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
MNS.....	McGuire Nuclear Station
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
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  
 NCS..... 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  
 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 ..... Standby Shutdown Facility  
TEDE ..... Total Effective Dose Equivalent  
TOAF ..... Top of Active Fuel  
TSC ..... Technical Support Center  
WOG ..... Westinghouse Owners Group

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

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

MNS EAL	NEI 99-01 Rev. 6	
	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
RG2.1	AG2	1

<b>MNS</b>	<b>NEI 99-01 Rev. 6</b>	
<b>EAL</b>	<b>IC</b>	<b>Example EAL</b>
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	3
CG1.1	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
HU3.2	HU3	2
HU3.3	HU3	3
HU3.4	HU3	4
HU4.1	HU4	1
HU4.2	HU4	2



<b>MNS</b>	<b>NEI 99-01 Rev. 6</b>	
<b>EAL</b>	<b>IC</b>	<b>Example EAL</b>
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	1
SU4.2	SU3	2
SU5.1	SU4	1, 2, 3
SU6.1	SU5	1
SU6.2	SU5	2
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

<b>MNS</b>	<b>NEI 99-01 Rev. 6</b>	
<b>EAL</b>	<b>IC</b>	<b>Example EAL</b>
SS1.1	SS1	1
SS2.1	SS8	1
SS6.1	SS5	1
SG1.1	SG1	1
SG1.2	SG8	1
EU1.1	E-HU1	1

## 7.0 ATTACHMENTS

7.1 Attachment 1, Emergency Action Level Technical Bases

7.2 Attachment 2, Fission Product Barrier Matrix and Basis

ATTACHMENT 1  
EAL 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.

**ATTACHMENT 1  
EAL Bases**

**Category:** R – Abnormal Rad Levels / Rad Effluent

**Subcategory:** 1 – Radiological Effluent

**Initiating Condition:** Release of gaseous or liquid radioactivity greater than 2 times the SLC 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/EOF Director 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	Unit Vent Noble Gas Low	1(2)EMF36L	----	----	4.85E+6 cpm	3.10E+3 cpm
	Unit Vent Noble Gas High	1(2)EMF36H	2.61E+4 cpm	2.61E+3 cpm	2.70E+2 cpm	----
Liquid	Liquid Waste Effluent Line High	EMF49H	----	----	----	2.15E+2 cpm
	CVUCDT High	1(2)EMF44H	----	----	----	4.29E+2 cpm

**Mode Applicability:**

All

**Definition(s):**

None

**MNS Basis:**

The column "UE" gaseous and liquid release values in Table R-1 represent two times the appropriate SLC release rate limits associated with the specified monitors (ref. 2, 3, 4).

Gaseous Releases

Instrumentation that may be used to assess this EAL is listed below (ref. 1):

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ATTACHMENT 1  
EAL Bases

- Unit Vent Noble Gas Low Monitor – 1(2)EMF36L

Liquid Releases

Instrumentation that may be used to assess this EAL is listed below (ref. 1):

- Liquid Waste Effluent Line High Monitor – EMF49H (batch release)
- CVUCDT High Monitor – 1(2)EMF44H

**NEI 99-01 Basis:**

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.

~~EAL #1—This EAL addresses normally occurring continuous radioactivity releases from monitored gaseous or liquid effluent pathways.~~

~~EAL #2—This EAL addresses radioactivity releases that cause effluent radiation monitor readings to exceed 2 times the limit established by a radioactivity discharge permit. This EAL will typically be associated with planned batch releases from non-continuous release pathways (e.g., radwaste, waste gas).~~

~~EAL #3—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.).~~

ATTACHMENT 1  
EAL Bases

Escalation of the emergency classification level would be via IC AA4RA1.

ATTACHMENT 1  
EAL Bases

**MNS Basis Reference(s):**

1. MNS ODCM Section 3.0 Setpoint Calculations
2. MNS-SLC 16.11.1 Liquid Effluents - Concentration
3. MNS-SLC 16.11.6 Dose Rate - Gaseous Effluents
4. EP-EALCALC-MNS-1401 MNS Radiological Effluent EAL Values, Rev. 0
5. NEI 99-01 AU1



ATTACHMENT 1  
EAL Bases

**Category:** R – Abnormal Rad Levels / Rad Effluent

**Subcategory:** 1 – Radiological Effluent

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

**EAL:**

<b>RU1.2 Unusual Event</b>
----------------------------

Sample analysis for a gaseous or liquid release indicates a concentration or release rate > 2 x SLC limits for ≥ 60 min. (Notes 1, 2)
---

Note 1: The Emergency Coordinator/EOF Director 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

**MNS Basis:**

None

**NEI 99-01 Basis:**

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

ATTACHMENT 1  
EAL Bases

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.

~~EAL #1 – This EAL addresses normally occurring continuous radioactivity releases from monitored gaseous or liquid effluent pathways.~~

~~EAL #2 – This EAL addresses radioactivity releases that cause effluent radiation monitor readings to exceed 2 times the limit established by a radioactivity discharge permit. This EAL will typically be associated with planned batch releases from non-continuous release pathways (e.g., radwaste, waste gas).~~

~~EAL #3 – 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 AA1RA1.

**MNS Basis Reference(s):**

1. MNS Offsite Dose Calculation Manual
2. MNS-SLC 16.11.1 Liquid Effluents - Concentration
3. MNS-SLC 16.11.6 Dose Rate - Gaseous Effluents
4. NEI 99-01 AU1

**ATTACHMENT 1  
EAL Bases**

**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/EOF Director 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.

**Table R-1 Effluent Monitor Classification Thresholds**

Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Unit Vent Noble Gas Low	1(2)EMF36L	----	----	4.85E+6 cpm	3.10E+3 cpm
	Unit Vent Noble Gas High	1(2)EMF36H	2.61E+4 cpm	2.61E+3 cpm	2.70E+2 cpm	----
Liquid	Liquid Waste Effluent Line High	EMF49H	----	----	----	2.15E+2 cpm
	CVUCDT High	1(2)EMF44H	----	----	----	4.29E+2 cpm

**Mode Applicability:**

All

**Definition(s):**

None

ATTACHMENT 1  
EAL Bases

**MNS 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 SAE thresholds) of the EPA Protective Action Guidelines (TEDE or CDE Thyroid) (ref. 2).

Instrumentation that may be used to assess this EAL is Unit Vent Noble Gas Low Monitor – 1(2)EMF36L and Unit Vent Noble Gas High Monitor – 1(2)EMF36H (ref. 1).

**NEI 99-01 Basis:**

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 [AS4RS1](#).

**MNS Basis Reference(s):**

1. MNS ODCM Section 3.0 Setpoint Calculations
2. EP-EALCALC-MNS-1401 MNS Radiological Effluent EAL Values, Rev. 0
3. NEI 99-01 AA1

ATTACHMENT 1  
EAL Bases

**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 (Notes 3, 4)

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.

**Mode Applicability:**

All

**Definition(s):**

*SITE BOUNDARY* - Area as depicted in MNS-SLC-16.11.1 Figure 16.11.1-1 Site Boundary/Exclusion Area Boundary.

**MNS Basis:**

Dose assessments are performed by computer-based methods (ref. 1, 2)

**NEI 99-01 Basis:**

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

ATTACHMENT 1  
EAL Bases

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 ~~AS4RS1~~.

**MNS Basis Reference(s):**

1. HP/0/B/1009/029 Initial Response On-Shift Dose Assessment
2. AD-EP-ALL-0202, Emergency Response Offsite Dose Assessment
3. NEI 99-01 AA1

ATTACHMENT 1  
EAL Bases

**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/EOF Director 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* - Area as depicted in MNS-SLC-16.11.1 Figure 16.11.1-1 Site Boundary/Exclusion Area Boundary.

**MNS Basis:**

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

**NEI 99-01 Basis:**

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.

ATTACHMENT 1  
EAL Bases

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 ~~AS1RS1~~.

**MNS Basis Reference(s):**

1. MNS Offsite Dose Calculation Manual
2. NEI 99-01 AA1



ATTACHMENT 1  
EAL Bases

**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/EOF Director 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* - Area as depicted in MNS-SLC-16.11.1 Figure 16.11.1-1 Site Boundary/Exclusion Area Boundary.

**MNS Basis:**

HP/0/B/1009/023, Environmental Monitoring for Emergency Conditions provides guidance for emergency or post-accident radiological environmental monitoring (ref. 1).

**NEI 99-01 Basis:**

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).

ATTACHMENT 1  
EAL Bases

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 **AS4RS1**.

**MNS Basis Reference(s):**

1. HP/0/B/1009/023 Environmental Monitoring for Emergency Conditions
2. NEI 99-01 AA1

**ATTACHMENT 1  
EAL Bases**

**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/EOF Director 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.

<b>Table R-1 Effluent Monitor Classification Thresholds</b>						
<b>Release Point</b>		<b>Monitor</b>	<b>GE</b>	<b>SAE</b>	<b>Alert</b>	<b>UE</b>
<b>Gaseous</b>	Unit Vent Noble Gas Low	1(2)EMF36L	----	----	4.85E+6 cpm	3.10E+3 cpm
	Unit Vent Noble Gas High	1(2)EMF36H	2.61E+4 cpm	2.61E+3 cpm	2.70E+2 cpm	----
<b>Liquid</b>	Liquid Waste Effluent Line High	EMF49H	----	----	----	2.15E+2 cpm
	CVUCDT High	1(2)EMF44H	----	----	----	4.29E+2 cpm

**Mode Applicability:**

All

**Definition(s):**

None

ATTACHMENT 1  
EAL Bases

**MNS 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).

Instrumentation that may be used to assess this EAL is Unit Vent Noble Gas High Monitor – 1(2)EMF36H (ref 2).

**NEI 99-01 Basis:**

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 **AG1RG1**.

**MNS Basis Reference(s):**

1. EP-EALCALC-MNS-1401 MNS Radiological Effluent EAL Values, Rev. 0
2. MNS ODCM Section 3.0 Setpoint Calculations
3. NEI 99-01 AS1

ATTACHMENT 1  
EAL Bases

**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 (Notes 3, 4)

- 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.

**Mode Applicability:**

All

**Definition(s):**

*SITE BOUNDARY* - Area as depicted in MNS-SLC-16.11.1 Figure 16.11.1-1 Site Boundary/Exclusion Area Boundary.

**MNS Basis:**

Dose assessments are performed by computer-based methods (ref. 1, 2)

**NEI 99-01 Basis:**

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.

ATTACHMENT 1  
EAL Bases

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 **AG1RG1**.

**MNS Basis Reference(s):**

1. HP/0/B/1009/029 Initial Response On-Shift Dose Assessment
2. AD-EP-ALL-0202, Emergency Response Offsite Dose Assessment
3. NEI 99-01 AS1

ATTACHMENT 1  
EAL Bases

**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/EOF Director 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* - Area as depicted in MNS-SLC-16.11.1 Figure 16.11.1-1 Site Boundary/Exclusion Area Boundary.

**MNS Basis:**

HP/0/B/1009/023, Environmental Monitoring for Emergency Conditions provides guidance for emergency or post-accident radiological environmental monitoring (ref. 1).

**NEI 99-01Basis:**

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

ATTACHMENT 1  
EAL Bases

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 **AG1RG1**.

**MNS Basis Reference(s):**

1. HP/0/B/1009/023 Environmental Monitoring for Emergency Conditions
2. NEI 99-01 AS1



**ATTACHMENT 1  
EAL Bases**

**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/EOF Director 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.

<b>Table R-1 Effluent Monitor Classification Thresholds</b>						
<b>Release Point</b>		<b>Monitor</b>	<b>GE</b>	<b>SAE</b>	<b>Alert</b>	<b>UE</b>
<b>Gaseous</b>	Unit Vent Noble Gas Low	1(2)EMF36L	---	---	4.85E+6 cpm	3.10E+3 cpm
	Unit Vent Noble Gas High	1(2)EMF36H	2.61E+4 cpm	2.61E+3 cpm	2.70E+2 cpm	---
<b>Liquid</b>	Liquid Waste Effluent Line High	EMF49H	---	---	---	2.15E+2 cpm
	CVUCDT High	1(2)EMF44H	---	---	---	4.29E+2 cpm

**Mode Applicability:**

All

**Definition(s):**

None

ATTACHMENT 1  
EAL Bases

**MNS 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).

Instrumentation that may be used to assess this EAL is the Unit Vent Noble Gas High Monitor 1(2)EMF36H (ref 2).

**NEI 99-01Basis:**

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.

**MNS Basis Reference(s):**

1. EP-EALCALC-MNS-1401 MNS Radiological Effluent EAL Values, Rev. 0
2. MNS ODCM Section 3.0 Setpoint Calculations
3. NEI 99-01 AG1

ATTACHMENT 1  
EAL Bases

**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 (Notes 3, 4)

- 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.

**Mode Applicability:**

All

**Definition(s):**

*SITE BOUNDARY* - Area as depicted in MNS-SLC-16.11.1 Figure 16.11.1-1 Site Boundary/Exclusion Area Boundary.

**MNS Basis:**

Dose assessments are performed by computer-based methods (ref. 1, 2)

**NEI 99-01 Basis:**

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.

ATTACHMENT 1  
EAL Bases

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.

**MNS Basis Reference(s):**

1. HP/0/B/1009/029 Initial Response On-Shift Dose Assessment
2. AD-EP-ALL-0202, Emergency Response Offsite Dose Assessment
3. NEI 99-01 AG1

ATTACHMENT 1  
EAL Bases

**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/EOF Director 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* - Area as depicted in MNS-SLC-16.11.1 Figure 16.11.1-1 Site Boundary/Exclusion Area Boundary.

**MNS Basis:**

HP/0/B/1009/023, Environmental Monitoring for Emergency Conditions provides guidance for emergency or post-accident radiological environmental monitoring (ref. 1).

**NEI 99-01 Basis:**

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

ATTACHMENT 1  
EAL Bases

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.~~

**MNS Basis Reference(s):**

1. HP/0/B/1009/023 Environmental Monitoring for Emergency Conditions
2. NEI 99-01 AG1

ATTACHMENT 1  
EAL Bases

**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

**AND**

UNPLANNED rise in corresponding area radiation levels as indicated by **EITHER** of the following radiation monitors:

- 1EMF17 (2EMF4) Spent Fuel Building Refueling Bridge
- 1EMF16 (2EMF3) Containment Building Refueling Bridge (Mode 6)

**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.

**MNS Basis:**

The spent fuel pool low water level alarm setpoint is OAC point M1(2)D2937 (ref. 1). Water level restoration instructions are performed in accordance with AOPs (ref. 2, 3).

The specified radiation monitors are those expected to see increase area radiation levels as a result of a loss of REFUELING PATHWAY inventory (ref. 2, 3). Increasing radiation indications on these monitors in the absence of indications of decreasing REFUELING PATHWAY level are not classifiable under this EAL. 1EMF16 (2EMF3) Containment Building Refueling Bridge monitors are only operable in Mode 6 (Refueling).

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.

ATTACHMENT 1  
EAL Bases

**NEI 99-01 Basis:**

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 [AA2RA2](#).

**MNS Basis Reference(s):**

1. OP/1(2)/A/6102/001
2. AP/1(2)/A/5500/40 Loss of Refueling Cavity Level
3. AP/1(2)/A/5500/41 Loss of Spent Fuel Cooling or Level
4. NEI 99-01 AU2



ATTACHMENT 1  
EAL Bases

**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.

**MNS Basis:**

None.

**NEI 99-01 Basis:**

—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 ~~(see Developer Notes)~~. 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 IC applies to irradiated fuel that is licensed for dry storage up to the point that the loaded storage cask is sealed. Once sealed, damage to a loaded cask causing loss of the CONFINEMENT BOUNDARY is classified in accordance with IC E-HU1.~~

—~~Escalation of the emergency would be based on either Recognition Category A or C ICs.~~

EAL #1

This EAL escalates from **AU2-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

ATTACHMENT 1  
EAL Bases

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. EAL #2

~~———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).~~

———EAL #3

~~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 assemblies stored in the pool.~~

Escalation of the emergency classification level would be via ICs ~~AS1-RS1 or RS2~~ AS2 (see *AS2 Developer Notes*).

**MNS Basis Reference(s):**

1. AP/1(2)/A/5500/040 Loss of Refueling Cavity Level
2. AP/1(2)/A/5500/041 Loss of Spent Fuel Cooling or Level
3. NEI 99-01 AA2

ATTACHMENT 1  
EAL Bases

**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

**AND**

A Trip 2 radiation alarm on **any** of the following radiation monitor indications:

- 1EMF17 (2EMF4) Spent Fuel Building Refueling Bridge
- 1EMF16 (2EMF3) Containment Building Refueling Bridge (Mode 6)
- 1EMF42 (2EMF42) Fuel Building Ventilation
- 1EMF39 (2EMF39) Containment Gas

**Mode Applicability:**

All

**Definition(s):**

None

**MNS Basis:**

The specified radiation monitors are those expected to see increased area radiation levels as a result of damage to irradiated fuel (ref. 1). 1EMF16 (2EMF3) Containment Building Refueling Bridge monitors are only operable in Mode 6 (Refueling).

The Trip 2 alarm setpoints for the radiation monitors are set to be indicative of significant increases in area and/or airborne radiation (ref. 2).

**NEI 99-01 Basis:**

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 ~~(see Developer Notes)~~. 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 IC applies to irradiated fuel that is licensed for dry storage up to the point that the loaded storage cask is sealed. Once sealed, damage to a loaded cask causing loss of the~~

ATTACHMENT 1  
EAL Bases

~~CONFINEMENT BOUNDARY is classified in accordance with IC E-HU1.~~

Escalation of the emergency would be based on either Recognition Category ~~A-R~~ or C ICs.

~~——— EAL #This EAL escalates from AU2 in that the loss of level, in the affected portion of the REFUELING PATHWAY, is of sufficient magnitude to have resulted in uncovering of irradiated fuel. Indications of irradiated fuel uncovering 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.~~

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). ~~EAL #3 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 assemblies stored in the pool.~~

Escalation of the emergency classification level would be via ICs ~~AS1-RS1 or RS2 or AS2 (see AS2 Developer Notes).~~

**MNS Basis Reference(s):**

1. AP/1(2)/A/5500/25 Spent Fuel Damage
2. HP/0/B/1003/008 Determination of Radiation Monitor Setpoints (EMFs)
3. NEI 99-01 AA2

ATTACHMENT 1  
EAL Bases

**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**

Spent fuel pool level  $\leq$  -15 ft. (756 ft. ele.) (KFP5350 or NVPG6530)

**Mode Applicability:**

All

**Definition(s):**

None

**MNS 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 primary channel (1(2)KFP5350) and back-up channel (1(2)NVPG6530) each spanning approximately 30 ft. (-25 ft. – +5 ft.) (745 ft. ele. – 775 ft. ele.). Level 2 is a SFP level of -15 ft. (756' ft. ele.) or approximately 10 ft. above the top of the SFP racks (ref. 2, 3).

**NEI 99-01 Basis:**

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 ~~(see Developer Notes)~~. 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 IC applies to irradiated fuel that is licensed for dry storage up to the point that the loaded storage cask is sealed. Once sealed, damage to a loaded cask causing loss of the CONFINEMENT BOUNDARY is classified in accordance with IC E-HU1.~~

~~———— Escalation of the emergency would be based on either Recognition Category A-R or C ICs. EAL # This EAL escalates from AU2 in that the loss of level, in the affected portion of the REFUELING PATHWAY, is of sufficient magnitude to have resulted in uncover of irradiated fuel. Indications of irradiated fuel uncover 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-~~

ATTACHMENT 1  
EAL Bases

~~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.~~

~~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).~~

EAL #3 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 assemblies stored in the pool.

Escalation of the emergency classification level would be via ICs ~~AS1-RS1 or AS2 (see AS2 Developer Notes)~~.

**MNS Basis Reference(s):**

1. NRC EA-12-051 Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation
2. MNS-14-023 Second Six-Month Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)
3. Engineering Change Packages #109073 and #109074
4. NEI 99-01 AA2

ATTACHMENT 1  
EAL Bases

**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**

Spent fuel pool level  $\leq$  -25 ft. (746 ft. ele.) (KFP5350 or NVPG6530)

**Mode Applicability:**

All

**Definition(s):**

None

**MNS 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 primary channel (1(2)KFP5350) and back-up channel (1(2)NVPG6530) each spanning approximately 30 ft. (-25 ft. – +5 ft.) (745 ft. ele. – 775 ft. ele.). Level 3 is a SFP level of -25 ft. (746' ft. ele.) or approximately the top of the SFP racks (ref. 2, 3).

**NEI 99-01 Basis:**

This **IC-EAL** addresses a significant loss of spent fuel pool inventory control and makeup capability leading to IMMEDIATE 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 **AG1-RG1** or **AG2-RG2**.

**MNS Basis Reference(s):**

1. NRC EA-12-051 Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation
2. MNS-14-023 Second Six-Month Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)

ATTACHMENT 1  
EAL Bases

3. Engineering Change Packages #109073 and #109074
4. NEI 99-01 AS2



ATTACHMENT 1  
EAL Bases

**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 > -25 ft. (746 ft. ele.) (KFP5350 or NVPG6530) for ≥ 60 min. (Note 1)

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

**Mode Applicability:**

All

**Definition(s):**

None

**MNS 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 primary channel (1(2)KFP5350) and back-up channel (1(2)NVPG6530) each spanning approximately 30 ft. (-25 ft. – +5 ft.) (745 ft. ele. – 775 ft. ele.). Level 3 is a SFP level of -25 ft. (746' ft. ele.) or approximately the top of the SFP racks (ref. 2, 3).

**NEI 99-01 Basis:**

This IC-EAL addresses a significant loss of spent fuel pool inventory control and makeup capability leading to a prolonged uncover 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.

**MNS Basis Reference(s):**

1. NRC EA-12-051 Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation

ATTACHMENT 1  
EAL Bases

2. MNS-14-023 Second Six-Month Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)
3. Engineering Change Packages #109073 and #109074
4. NEI 99-01 AG2

ATTACHMENT 1  
EAL Bases

**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 (1EMF12)

**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).

**MNS Basis:**

Areas that meet this threshold include the Control Room and the Central Alarm Station (CAS). 1EMF Channel 12 monitors the Control room for area radiation (ref. 1). 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.

**NEI 99-01 Basis:**

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 Director** **Emergency Coordinator** should consider the cause of the increased radiation levels and determine if another IC may be applicable. **For EAL #2, an Alert declaration is warranted if entry into the affected room/area is, or may be, procedurally required during the plant**

ATTACHMENT 1  
EAL Bases

~~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~~ applies.

- ~~• 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.~~

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

**MNS Basis Reference(s):**

1. UFSAR Table 12-11 Area Radiation Monitors
2. NEI 99-01 AA3

**ATTACHMENT 1  
EAL Bases**

**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-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.

<b>Table R-2 Safe Operation &amp; Shutdown Rooms/Areas</b>			
<b>Bldg. Elevation</b>	<b>Unit 1 Room/Area</b>	<b>Unit 2 Room/Area</b>	<b>Modes</b>
Auxiliary 716'	P/C, RHole, near 1NI-185, Outside CAD 212	ABPC thru CAD Door, FF59	4
Auxiliary 750'	800 (1EMXA)	820 (2EMXA)	3, 4
	803 (1ETA)	805 (2ETA)	3, 4
Auxiliary 733'	702 (Elec. Pene.)	713 (Elec. Pene.)	3
	722 (1EMXB-1)	724 (2EMXB-1)	3, 4
	705 (1ETB)	716 (2ETB)	3, 4

**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.

**MNS 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

ATTACHMENT 1  
EAL Bases

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).

**NEI 99-01 Basis:**

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 Director** **Emergency Coordinator** should consider the cause of the increased radiation levels and determine if another IC may be applicable.

For **EAL #2RA3.2**, 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**

ATTACHMENT 1  
EAL Bases

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 AR, C or F ICs.

**MNS Basis Reference(s):**

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

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EAL Bases

**Category C – Cold Shutdown / Refueling System Malfunction**

EAL Group: Cold Conditions (NCS temperature  $\leq 200^{\circ}\text{F}$ ); 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 NCS integrity, containment closure, and fuel clad integrity for the applicable operating modes (5 - Cold Shutdown, 6 - Refueling, NM – No Mode).

The events of this category pertain to the following subcategories:

1. NCS Level

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

2. Loss of Essential AC Power

Loss of essential 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 4160 VAC essential buses.

3. NCS 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 vital buses.



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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.

ATTACHMENT 1  
EAL Bases

**Category:** C – Cold Shutdown / Refueling System Malfunction

**Subcategory:** 1 – NCS Level

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

**EAL:**

**CU1.1 Unusual Event**

UNPLANNED loss of reactor coolant results in NCS water level less than a required lower limit for  $\geq 15$  min. (Note 1)

Note 1: The Emergency Coordinator/EOF Director 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.

**MNS Basis:**

NCS 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, NCS water level is normally maintained above the pressurizer low level setpoint of 17% (ref. 1). However, if NCS 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 NCS that is the concern.

With the plant in Refueling mode, NCS water level is normally maintained at or above the reactor vessel flange (Technical Specification LCO 3.9.7 requires at least 23 ft of water above the top of the reactor vessel flange in the refueling cavity during refueling operations) (ref. 2).

**NEI 99-01 Basis:**

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 **NCS (reactor vessel/RCS [PWR] or RPV [BWR])** 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.

ATTACHMENT 1  
EAL Bases

Refueling evolutions that decrease **NCS** 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-#1 recognizes that the minimum required **NCS (reactor vessel/RCS [PWR] or RPV [BWR])** 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.

~~————EAL #2 addresses a condition where all means to determine (reactor vessel/RCS [PWR] or RPV [BWR]) 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 (reactor vessel/RCS [PWR] or RPV [BWR]).~~

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

**MNS Basis Reference(s):**

1. EP/1(2)/A/5000/F-0 Critical Safety Function Status Tree - Inventory
2. MNS Technical Specifications Section 3.9.7 Refueling Cavity Water Level
3. NEI 99-01 CU1

ATTACHMENT 1  
EAL Bases

**Category:** C – Cold Shutdown / Refueling System Malfunction  
**Subcategory:** 1 – NCS Level  
**Initiating Condition:** UNPLANNED loss of NCS inventory for 15 minutes or longer

**EAL:**

**CU1.2 Unusual Event**

NCS water level cannot be monitored

**AND EITHER**

- UNPLANNED increase in Containment Floor and Equipment Sump due to a loss of NCS inventory
- Visual observation of unisolable NCS leakage

**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.

**MNS Basis:**

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

In this EAL, all water level indication is unavailable and the NCS 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 NCS leakage. If the make-up rate to the NCS unexplainably rises above the pre-established rate, a loss of NCS inventory may be occurring even if the source of the leakage cannot be immediately identified. Visual observation of leakage from systems connected to the NCS that cannot be isolated could also be indicative of a loss of NCS inventory (ref. 1, 2).

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EAL Bases

**NEI 99-01 Basis:**

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 ~~(reactor vessel/RCS [PWR] or RPV [BWR])~~ 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 NCS 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.

~~———— EAL #1 recognizes that the minimum required (reactor vessel/RCS [PWR] or RPV [BWR]) 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.~~

This EAL #2 addresses a condition where all means to determine ~~(reactor vessel/RCS [PWR] or RPV [BWR])~~ 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 ~~(reactor vessel/RNCS [PWR] or RPV [BWR])~~.

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

**MNS Basis Reference(s):**

1. AP/1(2)/A/5500/10 NC System Leakage Within the Capacity of Both NV Pumps
2. PT/1(2)/A/4150/001D Identifying NC System Leakage
3. NEI 99-01 CU1

ATTACHMENT 1  
EAL Bases

**Category:** C – Cold Shutdown / Refueling System Malfunction

**Subcategory:** 1 – NCS Level

**Initiating Condition:** Loss of NCS inventory

**EAL:**

**CA1.1 Alert**

Loss of NCS inventory as indicated by NCS water level < 5 in. above hotleg centerline

**Mode Applicability:**

5 - Cold Shutdown, 6 – Refueling

**Definition(s):**

None

**MNS Basis:**

5.1 in. above hotleg centerline (reounded to 5 in.) NCS level indication is the lowest level to assure adequate net positive suction head and prevent ND pump cavitation and air entrainment for all flow rates (ref. 1).

**NEI 99-01 Basis:**

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 #1, a lowering of NCS water level below 5 in. above hotleg centerline (site-specific level) ft. indicates that operator actions have not been successful in restoring and maintaining NCS (reactor vessel/RCS [PWR] or RPV [BWR]) 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 uncover.

Although related, this EAL #1 is concerned with the loss of NCS inventory and not the potential concurrent effects on systems needed for decay heat removal (e.g., loss of a Residual Decay Heat Removal suction point). An increase in RCS-NCS temperature caused by a loss of decay heat removal capability is evaluated under IC CA3.

~~For EAL #2, the inability to monitor (reactor vessel/RCS [PWR] or RPV [BWR]) 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~~

ATTACHMENT 1  
EAL Bases

~~flow to ensure they are indicative of leakage from the (reactor vessel/RCS [PWR] or RPV [BWR]).~~

~~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 NCS the (reactor vessel/RCS [PWR] or RPV [BWR]) inventory water level continues to lower, then escalation to Site Area Emergency would be via IC CS1.

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**MNS Basis Reference(s):**

1. EP Calculation File MCC-1552.08-00-0208
2. NEI 99-01 CA1



ATTACHMENT 1  
EAL Bases

**Category:** C – Cold Shutdown / Refueling System Malfunction

**Subcategory:** 1 – NCS Level

**Initiating Condition:** Loss of NCS inventory

**EAL:**

**CA1.2 Alert**

NCS water level cannot be monitored for  $\geq 15$  min. (Note 1)

**AND EITHER**

- UNPLANNED increase in Containment Floor and Equipment Sump due to a loss of NCS inventory
- Visual observation of unisolable NCS leakage

Note 1: The Emergency Coordinator/EOF Director 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.

**MNS Basis:**

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

In this EAL, all NCS water level indication would be unavailable for greater than 15 minutes, and the NCS 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 NCS unexplainably rises above the pre-established rate, a loss of NCS inventory may be occurring even if the source of the leakage cannot be immediately identified. Visual observation of leakage from systems connected to the NCS that cannot be isolated could also be indicative of a loss of NCS inventory (ref. 1, 2).

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EAL Bases

**NEI 99-01 Basis:**

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 EAL #1, a lowering of water level below (site-specific level) indicates that operator actions have not been successful in restoring and maintaining (reactor vessel/RCS [PWR] or RPV [BWR]) 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 uncover.~~

~~Although related, EAL #1 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.~~

For this EAL #2, the inability to monitor NCS (reactor vessel/RCS [PWR] or RPV [BWR]) 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 (reactor vessel/RCSNCS [PWR] or RPV [BWR]).

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 (reactor vessel/RCSNCS [PWR] or RPV [BWR]) inventory level continues to lower, then escalation to Site Area Emergency would be via IC CS1.

**MNS Basis Reference(s):**

1. AP/1(2)/A/5500/10 NC System Leakage Within the Capacity of Both NV Pumps
2. PT/1(2)/A/4150/001D Identifying NC System Leakage
3. NEI 99-01 CA1

ATTACHMENT 1  
EAL Bases

**Category:** C – Cold Shutdown / Refueling System Malfunction

**Subcategory:** 1 – NCS Level

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

**EAL:**

**CS1.1 Site Area Emergency**

NCS water level cannot be monitored for  $\geq 30$  min. (Note 1)

**AND**

Core uncover is indicated by **any** of the following:

- UNPLANNED increase in Containment Floor and Equipment Sump due to a loss of NCS inventory
- Visual observation of unisolable NCS leakage
- Reactor Building Refueling Bridge Monitor 1EMF16 (2EMF3) reading  $> 9000$  mR/hr (Mode 6)
- Erratic Source Range or Wide Range Flux Monitor indication

Note 1: The Emergency Coordinator/EOF Director 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.

**MNS Basis:**

The lowest measurable NCS level is the elevation of the NCS hot leg mid-loop. Therefore, NCS inventory loss relative to the NCS level elevation corresponding to the top of active fuel 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 NCS unexplainably rises above the pre-established rate, a loss of NCS inventory may be occurring even if the source of the leakage cannot be immediately identified. Visual observation of leakage from systems connected to the NCS in areas outside the containment that cannot be isolated could also be indicative of a loss of NCS inventory (ref. 1, 2).

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EAL Bases

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. 1EMF16 (2EMF3), Reactor Building Refueling Bridge Monitor is located in the containment in proximity to the reactor cavity and is designed to provide monitoring of radiation due to a fuel handling event or loss of shielding during refueling operations. If this radiation monitor reaches and exceeds 9,000 mR/hr (90% of instrument scale), a loss of inventory with potential to uncover the core is likely to have occurred. Radiation monitors 1EMF16 and 2EMF3 are only required to be operable in Mode 6.

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.

**NEI 99-01 Basis:**

This IC addresses a significant and prolonged loss of ~~(reactor vessel/RCS-NCS [PWR] or RPV [BWR])~~ inventory control and makeup capability leading to IMMEDIATE fuel damage. The lost inventory may be due to a NCS 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/reactor vessel NCS~~ 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/reactor vessel levels of EALs 1.b and 2.b reflect the fact that with CONTAINMENT CLOSURE established, there is a lower probability of a fission product release to the environment.~~

~~In EAL 3.a,~~ 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 uncovering 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 ~~NCS (reactor vessel/RCS [PWR] or RPV [BWR])~~ 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 ~~NCS (reactor vessel/RCS [PWR] or RPV [BWR])~~.

~~These~~ This EALs 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

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EAL Bases

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 **AG1RG1**

**MNS Basis Reference(s):**

1. AP/1(2)/A/5500/10 NC System Leakage Within the Capacity of Both NV Pumps
2. PT/1(2)/A/4150/001D Identifying NC System Leakage
3. NEI 99-01 CS1

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EAL Bases

**Category:** C – Cold Shutdown / Refueling System Malfunction  
**Subcategory:** 1 – NCS Level  
**Initiating Condition:** Loss of NCS inventory affecting fuel clad integrity with containment challenged

**EAL:**

**CG1.1 General Emergency**

NCS level **cannot** be monitored for  $\geq 30$  min. (Note 1)

**AND**

Core uncover is indicated by **any** of the following:

- UNPLANNED increase in Containment Floor and Equipment Sump level due to a loss of NCS inventory
- Visual observation of UNISOLABLE NCS leakage
- Reactor Building Refueling Bridge Monitor 1EMF16 (2EMF3) reading  $> 9,000$  mR/hr
- Erratic Source Range or Wide Range Flux Monitor indication

**AND**

**Any** Containment Challenge indication, Table C-1

Note 1: The Emergency Coordinator/EOF Director 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.

<b>Table C-1 Containment Challenge Indications</b>
<ul style="list-style-type: none"><li>• CONTAINMENT CLOSURE <b>not</b> established (Note 6)</li><li>• Containment hydrogen concentration <math>&gt; 6\%</math></li><li>• UNPLANNED rise in containment pressure</li></ul>



**Mode Applicability:**

5 - Cold Shutdown, 6 – Refueling

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**Definition(s):**

*CONTAINMENT CLOSURE* - The procedurally defined conditions or actions taken to secure Primary or Secondary Containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions.

As applied to MNS, Containment Closure is established when the requirements of PT/1(2)/A/4200/002 C are met.

*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.

**MNS Basis:**

The lowest measurable NCS level is the elevation of the NCS hot leg mid-loop. Therefore, NCS inventory loss relative to the NCS level elevation corresponding to the top of active fuel 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 NCS unexplainably rises above the pre-established rate, a loss of NCS inventory may be occurring even if the source of the leakage cannot be immediately identified. Visual observation of leakage from systems connected to the NCS in areas outside the containment that cannot be isolated could also be indicative of a loss of NCS inventory (ref. 1, 2).

1EMF16 (2EMF3), Reactor Building Refueling Bridge Monitor is located in the containment in proximity to the reactor cavity and is designed to provide monitoring of radiation due to a fuel handling event or loss of shielding during refueling operations. If this radiation monitor reaches and exceeds 9,000 mR/hr (90% of instrument scale), a loss of inventory with potential to uncover the core is likely to have occurred. Radiation monitors 1EMF16 and 2EMF3 are only required to be operable in Mode 6.

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 (ref. 3).
- In the early stages of a core uncover event, it is unlikely that hydrogen buildup due to a core uncover 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 6% (upper limit of for operability of hydrogen recombiners) by volume in the presence of oxygen (>5%) (ref. 4).

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- 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.

**NEI 99-01 Basis:**

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 IMMEDIATE 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 **NCS RGS/reactor vessel** 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 uncover event, it is unlikely that hydrogen buildup due to a core uncover 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.

**In EAL 2.b, t**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 uncover 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 **(reactor vessel/RCS [PWR] or RPV-NCS [BWR])** 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



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tank level changes must be evaluated against other potential sources of water flow to ensure they are indicative of leakage from the ~~(reactor vessel/RNCS [PWR] or RPV [BWR])~~.

~~This~~ ~~ese~~ EALs ~~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*.

**MNS Basis Reference(s):**

1. AP/1(2)/A/5500/10 NC System Leakage Within the Capacity of Both NV Pumps
2. PT/1(2)/A/4150/001D Identifying NC System Leakage
3. PT/1(2)/A/4200/002 C Containment Closure
4. CALC MCC-1552-08-00-0208 Emergency Procedure Setpoints
5. NEI 99-01 CG1

ATTACHMENT 1  
EAL Bases

**Category:** C – Cold Shutdown / Refueling System Malfunction

**Subcategory:** 2 – Loss of Essential AC Power

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

**EAL:**

**CU2.1 Unusual Event**

AC power capability, Table C-2, to essential 4160V buses 1(2)ETA and 1(2)ETB reduced to a single power source for  $\geq 15$  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/EOF Director should declare the event promptly upon determining that time limit has been exceeded, or will likely be exceeded.

<b>Table C-2 AC Power Sources</b>
<b>Offsite:</b> <ul style="list-style-type: none"><li>• ATC (Train A)</li><li>• SATA (Train A)</li><li>• ATD (Train B)</li><li>• SATB (Train B)</li></ul>
<b>Onsite:</b> <ul style="list-style-type: none"><li>• D/G 1(2) A (Train A)</li><li>• D/G 1(2) B (Train B)</li></ul>

**Mode Applicability:**

5 - Cold Shutdown, 6 – Refueling, NM - No Mode

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EAL Bases

**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.

**MNS Basis:**

The 4160 VAC System provides the power requirements for operation and safe shutdown of the plant. The essential switchgear are buses ETA (Train A) and ETB (Train B) (ref. 1).

The essential buses are normally powered from the 6.9KV offsite power system through their respective 6.9KV/4160V Station Auxiliary Transformers (1ATC & 1ATD). Additionally, a standby source of power to each 4160V essential bus is provided from the 6.9KV offsite power system via two separate and independent 6.9KV/4160V transformers (SATA & SATB). These transformers are shared between the two units (ref. 1, 2).

Each essential bus has a dedicated diesel generator (D/G 1(2) A & D/G 1(2) B) to supply an onsite essential source of power to safe shutdown loads in the event of a loss of the normal power source or loss of off-site power. The D/Gs will automatically start and tie onto the essential buses if the normal power source or off-site power is lost (ref. 1).

An Alternate AC power source, the Standby Shutdown Diesel Generator, which provides power to the Standby Shutdown System, is located in the Standby Shutdown Facility (SSF). This AC power source must be started locally from the SSF Control Room. The SSF Diesel Generator has sufficient capability to operate equipment necessary to maintain a safe shutdown condition for the 4 hour SBO event but is not credited as an AC power source by Technical Specifications (ref. 1).

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

**NEI 99-01 Basis:**

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.

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EAL Bases

When in the cold shutdown, refueling, or ~~defueled-no~~ 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 essential 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.

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.

**MNS Basis Reference(s):**

1. UFSAR Section 8.0 Electric Power
2. AP/1(2)/A/5500/07 Loss of Electrical Power
3. ECA-0.0 EP/1(2)/A/5000/ECA-0.0 Loss of All AC Power
4. NEI 99-01 CU2

ATTACHMENT 1  
EAL Bases

**Category:** C – Cold Shutdown / Refueling System Malfunction  
**Subcategory:** 2 – Loss of Essential AC Power  
**Initiating Condition:** Loss of **all** offsite and **all** onsite AC power to essential buses for 15 minutes or longer

**EAL:**

**CA2.1 Alert**

Loss of **all** offsite and **all** onsite AC power capability, Table C-2, to essential 4160V buses 1(2)ETA and 1(2)ETB for  $\geq 15$  min. (Note 1)

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

<b>Table C-2 AC Power Sources</b>
<p><b>Offsite:</b></p> <ul style="list-style-type: none"><li>• ATC (Train A)</li><li>• SATA (Train A)</li><li>• ATD (Train B)</li><li>• SATB (Train B)</li></ul> <p><b>Onsite:</b></p> <ul style="list-style-type: none"><li>• D/G 1(2) A (Train A)</li><li>• D/G 1(2) B (Train B)</li></ul>

**Mode Applicability:**

5 - Cold Shutdown, 6 - Refueling, NM - No Mode

**MNS Basis:**

The 4160 VAC System provides the power requirements for operation and safe shutdown of the plant. The essential switchgear are buses ETA (Train A) and ETB (Train B) (ref. 1).

The essential buses are normally powered from the 6.9KV offsite power system through their respective 6.9KV/4160V Station Auxiliary Transformers (1ATC & 1ATD). Additionally, a standby source of power to each 4160V essential bus is provided from the 6.9KV offsite power system via two separate and independent 6.9KV/4160V transformers (SATA & SATB). These transformers are shared between the two units (ref. 1, 2).

Each essential bus has a dedicated diesel generator (D/G 1(2) A & D/G 1(2) B) to supply an onsite emergency source of power to safe shutdown loads in the event of a loss of the normal

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EAL Bases

power source or loss of off-site power. The D/Gs will automatically start and tie onto the essential buses if the normal power source or off-site power is lost (ref. 1).

An Alternate AC power source, the Standby Shutdown Diesel Generator, which provides power to the Standby Shutdown System, is located in the Standby Shutdown Facility (SSF). This AC power source must be started locally from the SSF Control Room. The SSF Diesel Generator has sufficient capability to operate equipment necessary to maintain a safe shutdown condition for the 4 hour SBO event but is not credited as an AC power source by Technical Specifications (ref. 1).

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

**NEI 99-01 Basis:**

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-no~~ mode, this condition is not classified as a Site Area Emergency because of the increased time available to restore an **emergency essential** 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 **AS4RS1**.

**MNS Basis Reference(s):**

1. UFSAR Section 8.0 Electric Power
2. AP/1(2)/A/5500/07 Loss of Electrical Power
3. ECA-0.0 EP/1(2)/A/5000/ECA-0.0 Loss of All AC Power
4. NEI 99-01 CA2

ATTACHMENT 1  
EAL Bases

**Category:** C – Cold Shutdown / Refueling System Malfunction

**Subcategory:** 3 – NCS Temperature

**Initiating Condition:** UNPLANNED increase in NCS temperature

**EAL:**

**CU3.1 Unusual Event**

UNPLANNED increase in NCS temperature to > 200°F due to loss of decay heat removal capability

**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.

**MNS Basis:**

Several instruments are capable of providing indication of NCS temperature with respect to the Technical Specification cold shutdown temperature limit (200°F, ref. 1) including both hot leg and cold leg RTDs and core exit T/Cs (ref. 2, 3).

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

**NEI 99-01 Basis:**

This IC addresses an UNPLANNED increase in **RCS-NCS** temperature above the Technical Specification cold shutdown temperature limit, ~~or the inability to determine RCS temperature and level,~~ and represents a potential degradation of the level of safety of the plant. If the **RCS NCS** is not intact and CONTAINMENT CLOSURE is not established during this event, the ~~Emergency Director~~ **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.

~~EAL #1~~ **This EAL** involves a loss of decay heat removal capability, or an addition of heat to the **RCS-NCS** 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.

ATTACHMENT 1  
EAL Bases

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.

~~———— EAL #2 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.

**MNS Basis Reference(s):**

1. MNS Technical Specifications Table 1.1-1
2. MNS UFSAR Section 7.0 Instrumentation and Controls
3. AP/1(2)/A/5500/19 Loss of ND or ND System Leakage System
4. NEI 99-01 CU3



ATTACHMENT 1  
EAL Bases

**Category:** C – Cold Shutdown / Refueling System Malfunction

**Subcategory:** 3 – NCS Temperature

**Initiating Condition:** UNPLANNED increase in NCS temperature

**EAL:**

**CU3.2 Unusual Event**

Loss of **all** NCS temperature and NCS level indication for  $\geq 15$  min. (Note 1)

Note 1: The Emergency Coordinator/EOF Director 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

**MNS Basis:**

Several instruments are capable of providing indication of NCS temperature with respect to the Technical Specification cold shutdown temperature limit (200°F, ref. 1) including both hot leg and cold leg RTDs and core exit T/Cs (ref. 2, 3).

NCS water level is normally monitored using various instruments including NC System narrow range and wide range monitors, RVLIS, NC System sightglass, tygon tube and Pressurizer level instruments (ref. 4).

**NEI 99-01 Basis:**

This ~~IC-EAL~~ addresses ~~an UNPLANNED increase in RCS temperature above the Technical Specification cold shutdown temperature limit, or~~ the inability to determine NCS temperature and level, ~~and~~ represents a potential degradation of the level of safety of the plant. If the NCS is not intact and CONTAINMENT CLOSURE is not established during this event, the ~~Emergency Director~~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.~~

~~——— EAL #1 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~~

ATTACHMENT 1  
EAL Bases

~~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 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.~~

**EAL #2** This EAL reflects a condition where there has been a significant loss of instrumentation capability necessary to monitor NCS 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.

**MNS Basis Reference(s):**

1. MNS Technical Specifications Table 1.1-1
2. MNS UFSAR Section 7.0 Instrumentation and Controls
3. AP/1(2)/A/5500/19 Loss of ND or ND System Leakage System
4. OP/1(2)/A/6100/SD-20 Draining the NC System
5. NEI 99-01 CU3

ATTACHMENT 1  
EAL Bases

**Category:** C – Cold Shutdown / Refueling System Malfunction

**Subcategory:** 3 – NCS Temperature

**Initiating Condition:** Inability to maintain plant in cold shutdown

**EAL:**

**CA3.1 Alert**

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

**OR**

UNPLANNED NCS pressure increase > 20 psig due to a loss of NCS cooling (this does **not** apply during water-solid plant conditions)

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

<b>Table C-3: NCS Heat-up Duration Thresholds</b>		
<b>NCS Status</b>	<b>Containment Closure Status</b>	<b>Heat-up Duration</b>
Intact (but <b>not</b> reduced inventory)	N/A	60 min.*
<b>Not intact</b> <b>OR</b> At reduced inventory	established	20 min.*
	<b>not established</b>	0 min.
* If an NCS heat removal system is in operation within this time frame and NCS temperature is being reduced, the EAL is <b>not</b> applicable.		

**Mode Applicability:**

5 - Cold Shutdown, 6 – Refueling

**Definition(s):**

**CONTAINMENT CLOSURE** - The procedurally defined conditions or actions taken to secure Primary or Secondary Containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions.

As applied to MNS, Containment Closure is established when the requirements of PT/1(2)/A/4200/002 C are met.

ATTACHMENT 1  
EAL Bases

*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.

**MNS Basis:**

Several instruments are capable of providing indication of NCS temperature with respect to the Technical Specification cold shutdown temperature limit (200°F, ref. 1) including both hot leg and cold leg RTDs and core exit T/Cs (ref. 2, 3).

A 20 psig RPV pressure increase can be read on various instruments during outage (1NCLP5122 and 5142) (ref. 4).

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

**NEI 99-01 Basis:**

This IC addresses conditions involving a loss of decay heat removal capability or an addition of heat to the **RCS-NCS** 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-NCS** Heat-up Duration Thresholds table addresses an increase in **RCS-NCS** temperature when **CONTAINMENT CLOSURE** is established but the **RCS-NCS** is not intact, or **RCS-NCS** inventory is reduced (e.g., mid-loop operation ~~in PWRs~~). The 20-minute criterion was included to allow time for operator action to address the temperature increase.

The **RCS-NCS** Heat-up Duration Thresholds table also addresses an increase in **RCS-NCS** temperature with the **RCS-NCS** intact. The status of **CONTAINMENT CLOSURE** is not crucial in this condition since the intact **RCS-NCS** 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-NCS** temperature, the **RCS-NCS** is not intact or is at reduced inventory ~~[PWR]~~, 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.

**EAL #2**The **RCS-NCS** pressure increase threshold provides a pressure-based indication of **RCS-NCS** heat-up in the absence of **RCS-NCS** temperature monitoring capability.

Escalation of the emergency classification level would be via IC CS1 or **AS4RS1**.

ATTACHMENT 1  
EAL Bases

**MNS Basis Reference(s):**

1. MNS Technical Specifications Table 1.1-1
2. MNS UFSAR Section 7.0 Instrumentation and Controls
3. AP/1(2)/A/5500/19 Loss of ND or ND System Leakage System
4. MCC-1210.04-00-0040
5. NEI 99-01 CA3

ATTACHMENT 1  
EAL Bases

**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:**

<b>CU4.1 Unusual Event</b>
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< 105 VDC bus voltage indications on Technical Specification <b>required</b> 125 VDC buses for ≥ 15 min. (Note 1)
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Note 1: The Emergency Coordinator/EOF Director 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

**MNS Basis:**

The 125 VDC electrical power system consists of two independent and redundant safety related Class 1E DC electrical power subsystems (Train A or EVDA, and Train B or EVDD). Each subsystem consists of two channels of 125 VDC batteries (each battery 100% capacity), the associated battery charger(s) for each battery, and all the associated control equipment and interconnecting cabling. (ref. 1).

The Train A and Train B DC electrical power subsystems provide the control power for its associated Class 1E AC power load group, 4.16 kV switchgear, and 600 V load centers. The DC electrical power subsystems also provide DC electrical power to the inverters, which in turn power the AC vital buses. (ref. 1).

The minimum battery discharge voltage (requiring opening the degraded battery output breaker) is 105 VDC (ref. 1, 2).

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

**NEI 99-01 Basis**

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

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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 **AR**.

**MNS Basis Reference(s):**

1. MNS Technical Specification 3.8.4 DC Sources – Operating Bases
2. AP/1/A/5500/15 Loss of Vital or Aux Control Power
3. MNS UFSAR Section 8.0 Electrical Power
4. NEI 99-01 CU4

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EAL Bases

**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
Public Address	X		
Internal Telephones	X		
Onsite Radios	X		
DEMNET		X	
Offsite Radio System		X	
Commercial Telephones		X	X
NRC Emergency Telephone System (ETS)			X

**Mode Applicability:**

5 - Cold Shutdown, 6 - Refueling, NM – No Mode

**Definition(s):**

None

**MNS Basis:**

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



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Public Address System

The McGuire Nuclear Station public address system provides paging and party line communications between stations located throughout the plant. Inside and outside type wall and desk-mounted stations are used to communicate between roaming personnel and fixed work locations. Plant-wide instructions are issued using the paging feature.

Internal Telephone System

The McGuire Nuclear Station PBX telephone system provides communication capability between telephone stations located within the plant by dialing the four-digit telephone station code.

On-site Radio System

Radio systems can be used for communication among operators, off-site monitoring teams, the control room, TSC and EOF.

DEMNET

DEMNET is the primary means of offsite communication. This circuit 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.

Offsite Radio System

A dedicated radio network can be used for communication with county and state warning points.

Commercial Telephones

Commercial telephone lines, which supply public telephone communications, are employed by Duke Energy. The local service provider provides primary and secondary power for their lines at the Central Office.

NRC Emergency Telephone System

The NRC uses a Duke Energy dedicated telephone line which allows direct telephone communications from the plant to NRC regional and national offices. The Duke Energy communications line provides a link independent of the local public telephone network. Telephones connected to this network are located in the McGuire Control Room, Technical Support Center, and Emergency Operations Facility and can be used to establish NRC Emergency Notification System (ENS) and Health Physics Network (HPN) capability.

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

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**NEI 99-01 Basis:**

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.).

**EAL #1**The first EAL condition addresses a total loss of the communications methods used in support of routine plant operations.

**EAL #2**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 ~~(see Developer Notes)~~ the State, Gaston, Catawba, Iredell, Lincoln, Cabarrus and Mecklenburg County EOCs.

**EAL #3**The third EAL addresses a total loss of the communications methods used to notify the NRC of an emergency declaration.

**MNS Basis Reference(s):**

1. MNS Emergency Plan Section F Emergency Communications
2. MNS Emergency Plan Section B On-Site Emergency Organization.
3. NEI 99-01 CU5

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**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

<b>Table C-5 Hazardous Events</b>
<ul style="list-style-type: none"><li>● Seismic event (earthquake)</li><li>● Internal or external FLOODING event</li><li>● High winds or tornado strike</li><li>● FIRE</li><li>● EXPLOSION</li><li>● Other events with similar hazard characteristics as determined by the Shift Manager</li></ul>

**Mode Applicability:**

5 - 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.

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*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.

**MNS Basis:**

- The significance of seismic events are discussed under EAL HU2.1 (ref. 1).
- Internal FLOODING may be caused by events such as component failures, equipment misalignment, or outage activity mishaps (ref. 2).
- External flooding may be due to high lake level. MNS powerhouse yard elevation is 760 ft MSL. The administration building and yard are elevation 747 ft MSL. The maximum water level elevation at the site is 760.375 ft MFL (ref. 3, 4).
- Seismic Category I structures are analyzed to withstand a sustained, design wind velocity of 95 mph. (ref. 5).
- Areas containing functions and systems required for safe shutdown of the plant are identified by fire area in the fire response procedure (ref. 5).

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- 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.

**NEI 99-01 Basis:**

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.

**EAL 1.b.1**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.

**EAL 1.b.2**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 **AS4RS1**.

**MNS Basis Reference(s):**

1. RP/0/A/5000/007 Earthquake
2. AP/0/A/5500/030 Plant Flooding
3. UFSAR Section 2.1 Site Location
4. UFSAR Section 3.4 Water Level (Flood) Design
5. UFSAR Section 3.3.1 Wind Loadings
6. AP/0/A/5500/45 Plant Fire
7. NEI 99-01 CA6

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**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 Technology 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.

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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/EOF Director the latitude to classify emergency conditions consistent with the established classification criteria based upon Emergency Coordinator/EOF Director judgment.

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**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 MNS 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 MNS. 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).

**MNS Basis:**

Security Shift Supervision is the Shift Security Supervisor or Response Team Leader. These individuals are the designated on-site personnel qualified and trained to confirm that a security event is occurring or has occurred. Training on security event classification confirmation is closely controlled due to the strict secrecy controls placed on the Duke Energy Physical Security Plan for MNS (Safeguards) information (ref. 1).



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**NEI 99-01 Basis:**

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. 2, 3, 4). 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]*.

**EAL #1** The first threshold references ~~(site-specific the security~~ Security Shift Supervision ~~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.

**EAL #2** The second threshold addresses the receipt of a credible security threat. The credibility of the threat is assessed in accordance with ~~(site-specific procedure)~~ the GMNS Security Contingency Plan (ref. 1).

**EAL #3** 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 GMNS Security Contingency Plan (ref. 1)~~ ~~(site-specific procedure)~~.

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 Duke Energy Physical Security Plan for MNS (ref. 1).

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

**MNS Basis Reference(s):**

1. Duke Energy Physical Security Plan for MNS
2. AP/0/A/5500/47 Security Events
3. AP/0/A/5500/48 Extensive Damage Mitigation
4. NEI 99-01 HU1

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EAL Bases

**Category:** H – Hazards

**Subcategory:** 1 – Security

**Initiating Condition:** Hostile action within the owner controlled area or airborne attack threat within 30 minutes

**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 MNS 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 MNS. 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* - Area outside the PROTECTED AREA fence that immediately surrounds the plant. Access to this area is generally restricted to those entering on official business.

**MNS Basis:**

Security Shift Supervision is the Shift Security Supervisor or Response Team Leader. These individuals are the designated on-site personnel qualified and trained to confirm that a security event is occurring or has occurred. Training on security event classification confirmation is closely controlled due to the strict secrecy controls placed on the Duke Energy Physical Security Plan for MNS (Safeguards) information (ref. 1).

**NEI 99-01 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

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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. 2, 3, 4).

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]*.

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.

**EAL #1**The first threshold is applicable for any HOSTILE ACTION occurring, or that has occurred, in the OWNER CONTROLLED AREA. This includes any action directed against an ISFSI that is located outside the plant PROTECTED AREA.

**EAL #2**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 (ref. 2)).

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 **Duke Energy Physical Security Plan for MNS (ref. 1)**.

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**MNS Basis Reference(s):**

1. Duke Energy Physical Security Plan for MNS
2. AP/0/A/5500/47 Security Events
3. AP/0/A/5500/48 Extensive Damage Mitigation
4. NEI 99-01 HA1

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**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 MNS 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 MNS. 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 encompassed by physical barriers and to which access is controlled. The Protected Area refers to the designated security area around the process buildings and is depicted in MNS UFSAR Figure 2-4 Plot Plan and Site Area.

**MNS Basis:**

Security Shift Supervision is the Shift Security Supervisor or Response Team Leader. These individuals are the designated on-site personnel qualified and trained to confirm that a security event is occurring or has occurred. Training on security event classification confirmation is closely controlled due to the strict secrecy controls placed on the Duke Energy Physical Security Plan for MNS (Safeguards) information (ref. 1).

**NEI 99-01 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).

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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]*.

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 a HOSTILE ACTION directed at an ISFSI PROTECTED AREA located outside the plant PROTECTED AREA; such an attack should be assessed using IC HA1. It also 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 **Duke Energy Physical Security Plan for MNS (ref. 1)**.

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

**MNS Basis Reference(s):**

1. Duke Energy Physical Security Plan for MNS
2. AP/0/A/5500/47 Security Events
3. AP/0/A/5500/48 Extensive Damage Mitigation
4. NEI 99-01 HS1

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**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 control
- Core cooling
- NCS heat removal

**OR**

Damage to spent fuel has occurred or is IMMINENT

**Mode Applicability:**

All

**Definition(s):**

*HOSTILE ACTION* - An act toward MNS 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 MNS. 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 encompassed by physical barriers and to which access is controlled. The Protected Area refers to the designated security area around the process buildings and is depicted in MNS UFSAR Figure 2-4 Plot Plan and Site Area.

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**MNS Basis:**

None.

**NEI 99-01 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. 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 [and Independent Spent Fuel Storage Installation Security Program]*.

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 *Duke Energy Physical Security Plan for MNS* (ref.1).

**MNS Basis Reference(s):**

1. Duke Energy Physical Security Plan for MNS
2. AP/0/A/5500/47 Security Events
3. AP/0/A/5500/48 Extensive Damage Mitigation
4. AP/1(2)/A/5500/17 Loss of Control Room
5. NEI 99-01 HG1



ATTACHMENT 1  
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**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 OBE EXCEEDED alarm on 1AD-13, E7

**Mode Applicability:**

All

**Definition(s):**

None

**MNS Basis:**

Ground motion acceleration of 0.08g horizontal or 0.0533g vertical is the Operating Basis Earthquake for MNS (ref. 1, 3).

Five strong motion triaxial accelerographs are used to obtain seismic event data at the station site. The seismic instrumentation system also consists of a network control center (NCC), which is used for rapid interrogation of the accelerograph data and for data transfer to a dedicated system computer for subsequent data processing and analysis. The time-history recorded at each accelerograph location can be analyzed to determine its corresponding peak acceleration values and to verify that site Operating Basis Earthquake (OBE) limits have not been exceeded. Immediate control room alarm indication of an earthquake of 0.08 g or greater is annunciated through the system's network control center (NCC), following seismic trigger actuation by at least two accelerographs (ref. 2).

RP/0/A/5700/007 Earthquake provides the guidance for determining if the OBE earthquake threshold is exceeded and any required response actions. (ref. 4)

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 MNS. Provide the analyst with the following MNS coordinates: **35° 25' 59" north latitude, 80° 56' 55" west longitude** (ref. 5). Alternatively, near real-time seismic activity can be accessed via the NEIC website:

*<http://earthquake.usgs.gov/eqcenter/>*

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An additional method to rule out spurious activation of the seismic instrumentation is to download seismic recorders stored memory on the dedicated laptop computer located in the Control Room, Elevation 767 ft., behind 1MC9. Such validation should not, however, preclude a timely emergency declaration based on receipt of OBE alarm.

**NEI 99-01 Basis:**

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 ~~Director~~ **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.

**MNS Basis Reference(s):**

1. UFSAR Section 3.1 Conformance with General Design Criteria
2. UFSAR Section 3.7.4.2 Location and Description of Instrumentation
3. OP/1/A/6100/010N Annunciator Response for Panel 1AD-13
4. RP/0/A/5700/007 Earthquake
5. UFSAR section 2.1.1 Site Location
6. NEI 99-01 HU2

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EAL Bases

**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 encompassed by physical barriers and to which access is controlled. The Protected Area refers to the designated security area around the process buildings and is depicted in MNS UFSAR Figure 2-4 Plot Plan and Site Area.

**MNS Basis:**

Response actions associated with a tornado onsite is provided in RP/0/A/5700/006 Natural Disasters (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.

**NEI 99-01 Basis:**

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

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

~~EAL #2 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.~~

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EAL Bases

~~EAL #3 addresses a hazardous materials event originating at an offsite location and of sufficient magnitude to impede the movement of personnel within the PROTECTED AREA.~~

~~EAL #4 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.~~

~~EAL #5 addresses (site-specific description).~~

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

**MNS Basis Reference(s):**

1. RP/0/A/5700/006 Natural Disasters
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

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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.

**MNS Basis:**

Areas susceptible to internal flooding are Turbine Building, Service Building and Auxiliary from the following systems: Condenser Circulating Water, Fire Protection, Nuclear and Conventional Service Water and Condensate Storage (ref.1). Refer to EAL CA6.1 for internal flooding affecting one or more SAFETY SYSTEM trains.

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EAL Bases

**NEI 99-01 Basis:**

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

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

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.

~~EAL #3 addresses a hazardous materials event originating at an offsite location and of sufficient magnitude to impede the movement of personnel within the PROTECTED AREA.~~

~~EAL #4 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.~~

~~EAL #5 addresses (site-specific description).~~

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

**MNS Basis Reference(s):**

1. AP/0/A/5500/44 Plant Flooding
2. NEI 99-01 HU3

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EAL Bases

**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 encompassed by physical barriers and to which access is controlled. The Protected Area refers to the designated security area around the process buildings and is depicted in MNS UFSAR Figure 2-4 Plot Plan and Site Area.

**MNS Basis:**

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

**NEI 99-01 Basis:**

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

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

~~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.~~

~~EAL #3~~ 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.

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~~EAL #4 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.~~

~~EAL #5 addresses (site-specific description).~~

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

**MNS Basis Reference(s):**

1. NEI 99-01 HU3



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**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

**MNS Basis:**

None

**NEI 99-01 Basis:**

This IC addresses hazardous events that are considered to represent a potential degradation of the level of safety of the plant. ~~EAL #1 addresses a tornado striking (touching down) within the PROTECTED AREA.~~

~~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.~~

~~EAL #3 addresses a hazardous materials event originating at an offsite location and of sufficient magnitude to impede the movement of personnel within the PROTECTED AREA.~~

~~EAL #4~~ 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.

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EAL Bases

This EAL is not intended to 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.

~~EAL #5 addresses (site-specific description).~~ Escalation of the emergency classification level would be based on ICs in Recognition Categories AR, F, S or C.

**MNS Basis Reference(s):**

1. NEI 99-01 HU3

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EAL Bases

**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/EOF Director should declare the event promptly upon determining that time limit has been exceeded, or will likely be exceeded.

<b>Table H-1 Fire Areas</b>
<ul style="list-style-type: none"><li>• Containment</li><li>• Auxiliary Building</li><li>• Diesel Generator Rooms</li><li>• FWST</li><li>• Dog Houses</li><li>• Standby Shutdown Facility (SSF)</li></ul>

**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.

**MNS 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

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EAL Bases

is to be validated using available Control Room indications or alarms to prove that it is not spurious, or by reports from the field. Those actions could include visual observation or evaluation of thermal detector or pressure indicator data.

Table H-1 Fire Areas are based on MCS-1465.00-00-0022 Design Basis Specification for the Appendix R Safe Shutdown Analysis and AP/0/A/5500/45 Plant Fire. Table H-1 Fire Areas include those structures containing functions and systems required for safe shutdown of the plant (SAFETY SYSTEMS) (ref. 1, 2).

**NEI 99-01 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.

EAL #1

~~The~~ 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. EAL #2

~~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 EAL #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.~~

EAL #3

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~~In addition to a FIRE addressed by EAL #1 or EAL #2, a FIRE within the plant PROTECTED AREA not extinguished within 60 minutes may also potentially degrade the level of plant safety. This basis extends to a FIRE occurring within the PROTECTED AREA of an ISFSI located outside the plant PROTECTED AREA. [Sentence for plants with an ISFSI outside the plant Protected Area]~~

~~EAL #4~~

~~If a FIRE within the plant or ISFSI [for plants with an ISFSI outside the plant Protected Area] 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.~~

~~Basis-Related Requirements from Appendix R~~

~~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 EAL #2, the 30-minutes to verify a single alarm is well within this worst-case 1-hour time period.~~

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

**MNS Basis Reference(s):**

1. MCS-1465.00-00-0022 Design Basis Specification for the Appendix R Safe Shutdown Analysis

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2. AP/0/A/5500/45 Plant Fire
3. NEI 99-01 HU4

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**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/EOF Director should declare the event promptly upon determining that time limit has been exceeded, or will likely be exceeded.

<b>Table H-1 Fire Areas</b>
<ul style="list-style-type: none"><li>• Containment</li><li>• Auxiliary Building</li><li>• Diesel Generator Rooms</li><li>• FWST</li><li>• Dog Houses</li><li>• Standby Shutdown Facility (SSF)</li></ul>

**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.

**MNS 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

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is not spurious, or by reports from the field. Those actions could include visual observation or evaluation of thermal detector or pressure indicator data. 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 MCS-1465.00-00-0022 Design Basis Specification for the Appendix R Safe Shutdown Analysis and AP/0/A/5500/45 Plant Fire. Table H-1 Fire Areas include those structures containing functions and systems required for safe shutdown of the plant (SAFETY SYSTEMS) (ref. 1, 2).

**NEI 99-01 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.

EAL #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.~~

EAL #2

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 **EAL #1HU4.1** 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.



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EAL #3

~~In addition to a FIRE addressed by EAL #1 or EAL #2, a FIRE within the plant PROTECTED AREA not extinguished within 60 minutes may also potentially degrade the level of plant safety. This basis extends to a FIRE occurring within the PROTECTED AREA of an ISFSI located outside the plant PROTECTED AREA. [Sentence for plants with an ISFSI outside the plant Protected Area]~~

EAL #4

~~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.~~

Basis-Related Requirements from Appendix R

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 ~~EAL #2~~**this EAL**, the 30-minutes to verify a single alarm is well within this worst-case 1-hour time period.

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

**MNS Basis Reference(s):**

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1. MCS-1465.00-00-0022 Design Basis Specification for the Appendix R Safe Shutdown Analysis
2. AP/0/A/5500/45 Plant Fire
3. NEI 99-01 HU4