Riley D. Keele, Jr.
Manager, Regulatory Assurance
Arkansas Nuclear One
Tel 479-858-7826

0CAN062201

10 CFR 50.4(b)(5)
10 CFR 50.54(q)(5)
10 CFR 72.4
10 CFR 72.44(f)

June 16, 2022

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

Subject: Emergency Plan Implementing Procedure Revision
Arkansas Nuclear One – Units 1 and 2
Docket Nos. 50-313, 50-368, and 72-13
License Nos. DPR-51 and NPF-6

In accordance with 10 CFR 50.4(b)(5), 10 CFR 50.54(q)(5), 10 CFR 72.4, and 10 CFR 72.44(f), the Arkansas Nuclear One (ANO) Emergency Plan (EPlan) Emergency Action Level Classification procedure has been revised and is enclosed. A summary of the changes to the implementing procedure is included in Attachment 1 of the enclosure.

In accordance with 10 CFR 50.54(q), a screening and/or evaluation of the changes to the associated EAL procedure was performed. The screening and/or evaluation concluded that the changes do not reduce the effectiveness of the EPlan, and the EPlan continues to meet the standards of 10 CFR 50.47(b) and 10 CFR 50, Appendix E.

This correspondence contains no new commitments. Should you have any questions regarding this submittal, please contact Riley Keele, Manager, Regulatory Assurance, at 479-858-7826.

Sincerely,

Riley D. Keele, Jr.
RDK/mar

Enclosure: Procedure OP-1903.010, Revision 60, Emergency Action Level Classification

Attachments to Enclosure:

1. Summary of Changes to ANO Emergency Plan Implementing Document

cc: NRC Region IV Regional Administrator
NRC Senior Resident Inspector – Arkansas Nuclear One
NRC Project Manager – Arkansas Nuclear One
NRC Director, Division of Spent Fuel Storage and Transportation
NRC Region IV Senior Emergency Preparedness Inspector
Designated Arkansas State Official

Enclosure

0CAN062201

Procedure OP-1903.010, Revision 60, Emergency Action Level Classification

[247 pages]

ENTERGY OPERATIONS INCORPORATED
ARKANSAS NUCLEAR ONE

TITLE: Emergency Action Level Classification SET #	DOCUMENT NO. 1903.010	CHANGE NO. 060
	SAFETY-RELATED ☒YES ☐NO	REACTIVITY IMPACT ☐YES ☐INPR ☒NO
	TEMP MOD ☐YES ☒NO	IPTE ☐YES ☒NO
		LEVEL OF USE ☐ CONTINUOUS ☒ REFERENCE ☐ INFORMATIONAL ☐ MULTI-USE
	PROGRAMMATIC EXCLUSION PER EN-LI-100 ☐YES ☐NO	

When you see these ***TRAPS***	Get these ***TOOLS***
Time Pressure	**Effective Communication**
Distraction/Interruption	**Questioning Attitude**
Multiple Tasks	**Placekeeping**
Overconfidence	**Self Check**
Vague or Interpretive Guidance	**Peer Check**
First Shift/Last Shift	**Knowledge**
Peer Pressure	**Procedures**
Change/Off Normal	**Job Briefing**
Physical Environment	**Coaching**
Mental Stress (Home or Work)	**Turnover**

CHECKED BY	DATE	TIME

Table of Contents

1.0 INTRODUCTION

This document provides an explanation and rationale for each Emergency Action Level (EAL) included in the EAL Upgrade Project for Arkansas Nuclear One (ANO). It should be used to facilitate review of the ANO EALs and provide historical documentation for future reference. Decision-makers responsible for implementation of 1903.010, Emergency Action Level Classification, may use this document as a technical reference in support of EAL interpretation. This information may assist the Emergency 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 when conditions are present and have been recognized. 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 Director 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 ANO 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 (ref. 4.1.1), ANO 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 a greater probability of barrier loss and reduced certainty of maintaining the barrier.

The primary fission product barriers are:

A. Fuel Clad Barrier (FCB): The Fuel Clad Barrier consists of the cladding material that contains the fuel pellets.

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

C. Containment Barrier (CNB): The Containment Barrier includes the Reactor 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 Reactor Building up to and including the outermost secondary side isolation valve. Containment Barrier thresholds are used as criteria for escalation of the Emergency Classification Level (ECL) from an Alert to a Site Area Emergency or a General Emergency.

2.3 Fission Product Barrier Classification Criteria

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

Alert:

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

Site Area Emergency:

Loss or potential loss of any two barriers

General Emergency:

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

2.4 EAL Organization

The ANO EAL scheme includes the following features:

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

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

- Within each group, assignment of EALs to categories and subcategories:

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

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 in order to obtain additional information concerning the EALs under classification consideration. The user should consult Section 3.0 and Attachment 1 of this document for such information.

EAL Groups, Categories and Subcategories

EAL Group/Category	EAL Subcategory
Any Operating Mode:	
A – **A**bnormal Rad Levels / Rad Effluent	1 – Radiological Effluent 2 – Irradiated Fuel Event 3 – Area Radiation Levels
H – **H**azards 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 Director Judgment
E – Independent Spent Fuel Storage Installation (ISFSI)	1 – Confinement Boundary
Hot Conditions:	
S – **S**ystem Malfunction	1 – Loss of Essential AC Power 2 – Loss of Vital DC Power 3 – Loss of Control Room Indications 4 – RCS Activity 5 – RCS Leakage 6 – RPS Failure 7 – Loss of Communications 8 – Containment Failure 9 – Hazardous Event Affecting Safety Systems
F – **F**ission Product Barrier Degradation	None
Cold Conditions:	
C – **C**old Shutdown / Refueling System Malfunction	1 – RCS Level 2 – Loss of Essential AC Power 3 – RCS Temperature 4 – Loss of Vital DC Power 5 – Loss of Communications 6 – Hazardous Event Affecting Safety Systems

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 (A, C, E, F, H and S) 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 (A, C, E, F, H or S)
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. If an ANO Unit 2 EAL threshold value differs from Unit 1, the Unit 2 threshold is enclosed in brackets. For example, in the EAL threshold “RVLMS Levels 1 through 8 indicate DRY [RVLMS Levels 1 through 5 indicate DRY]”, “RVLMS Levels 1 through 5 indicate DRY” apply only to Unit 2.

Mode Applicability

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

Definitions:

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

Basis:

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

Reference(s):

Source documentation from which the EAL is derived.

2.6 Operating Mode Applicability

Unit 1 (ref. 4.1.6):

1 Power Operation

$K_{eff} \geq 0.99$, reactor power > 5%

2 Startup

$K_{eff} \geq 0.99$, reactor power $\leq$ 5%

3 Hot Standby

$K_{eff} < 0.99$, reactor coolant temperature ≥ 280°F

4 Hot Shutdown

$K_{eff} < 0.99$, reactor coolant temperature 280°F > T_{avg} > 200°F and all reactor vessel head closure bolts fully tensioned

5 Cold Shutdown

$K_{eff} < 0.99$, reactor coolant temperature $\leq$ 200°F and all reactor vessel head closure bolts fully tensioned

6 Refueling

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

DEF Defueled

All fuel assemblies have been removed from Containment and placed in the spent fuel pool.

Unit 2 (ref. 4.1.6):

1 Power Operation

$K_{eff} \geq 0.99$, reactor power > 5%, average coolant temperature ≥ 300°F

2 Startup

$K_{eff} \geq 0.99$, reactor power ≤ 5%, average coolant temperature ≥ 300°F

3 Hot Standby

$K_{eff} < 0.99$, average coolant temperature ≥ 300°F

4 Hot Shutdown

$K_{eff} < 0.99$, average coolant temperature 300°F > T_{avg} > 200°F

5 Cold Shutdown

$K_{eff} < 0.99$, average coolant temperature ≤ 200°F

6 Refueling

$K_{eff} \leq 0.95$, average coolant temperature ≤ 140°F, reactor vessel head unbolted or removed, and fuel in the vessel.

DEF Defueled

All fuel assemblies have been removed from Containment and placed in the spent fuel pool.

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 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.

EAL matrices should be read from left to right, from General Emergency to Unusual Event, and top to bottom. Declaration decisions should be independently verified before declaration is made except when gaining this verification would exceed the 15 minute declaration requirement. Place keeping should be used on all EAL matrices.

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. 4.1.8).

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

3.1.6 Emergency Director 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 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 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. 4.1.8).

3.2.1 Classification of Multiple Events and Conditions

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

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

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 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 IMMINENT). If, in the judgment of the Emergency Director, meeting an EAL is IMMINENT, the emergency classification should be made as if the EAL has been met. While applicable to all emergency classification levels, this approach is particularly important at the higher emergency classification levels since it provides additional time for implementation of protective measures.

3.2.4 Emergency Classification Level Upgrading and Termination

An ECL may be terminated when the event or condition that meets the classified IC and EAL no longer exists, and other site-specific termination requirements are met.

3.2.5 Classification of Short-Lived Events

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

3.2.6 Classification of Transient Conditions

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

EAL momentarily met during expected plant response - In instances in which 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. The plant enters an inadequate core cooling condition (a potential loss of both the Fuel Clad and RCS Barriers). If an operator manually starts a high pressure ECCS system in accordance with an EOP step and clears the inadequate core cooling condition prior to an emergency declaration, then the classification should be based on the ATWS only.

It is important to stress that the 15-minute emergency classification assessment period (process clock) is not a “grace period” during which a classification may be delayed to allow the performance of a corrective action that would obviate the need to classify the event. Emergency classification assessments must be deliberate and timely, with no undue delays. The provision discussed above addresses only those rapidly evolving situations when an operator is able to take a successful corrective action prior to the Emergency 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 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 Unit 1[2] Technical Specifications Table 1.1-1[1.1], Modes[Operational Modes]

4.1.7 Arkansas Nuclear One Offsite Dose Calculation Manual (ODCM)

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

4.1.9 Arkansas Nuclear One Emergency Plan

4.1.10 1015.008 Unit 2 SDC Control

4.2 Implementing

4.2.1 1903.010 Emergency Action Level Classification

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

4.2.3 ANO EAL Matrix

5.0 DEFINITIONS, ACRONYMS & ABBREVIATIONS

5.1 Definitions (ref. 4.1.1 except as noted)

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

Alert

Events are in progress, or have occurred, which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. **Any** releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.

Confinement Boundary

The barrier(s) between spent fuel and the environment once the spent fuel is processed for dry storage. As related to the ANO ISFSI, the Confinement Boundary is comprised of either the Multi-assembly Sealed Basket (MSB) (SNC System) or Multi-Purpose Canister (MPC) (Holtec System).

Containment Closure

The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions (ref. 4.1.10).

As applied to ANO, Containment Closure must be capable of being set within 30 minutes. Containment Closure is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

Emergency Action Level (EAL)

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

Emergency Classification Level (ECL)

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

Unusual Event (UE)

Alert

Site Area Emergency (SAE)

General Emergency (GE)

Explosion

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

Faulted

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

Fire

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

Fission Product Barrier Threshold

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

Flooding

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

General Emergency

Events are in progress or have occurred which involve actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA PAG exposure levels offsite for more than the immediate site area.

Hostage

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

Hostile Action

An act toward ANO 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 ANO. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the SECURITY 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).

Independent Spent Fuel Storage Installation (ISFSI)

A complex that is designed and constructed for the interim storage of spent nuclear fuel and other radioactive materials associated with spent fuel storage.

Initiating Condition (IC)

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

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 clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access (ref. 4.1.9).

RCS Intact

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

Refueling Pathway

All the cavities, tubes, canals and pools through which irradiated fuel may be moved, but **not** including the reactor vessel.

Ruptured

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

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 10 CFR 50.2):

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.

Security Owner Controlled Area (SOCA)

The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary (ref. 4.1.9).

Site Area Emergency

Events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or HOSTILE ACTION that results in intentional damage or malicious acts; (1) toward site personnel or equipment that could lead to the likely failure of or; (2) that prevent effective access to equipment needed for the protection of the public. **Any** releases are **not** expected to result in exposure levels which exceed EPA PAG exposure levels beyond the SITE BOUNDARY.

Site Boundary

That boundary defined by a 1046 meter (0.65 mile) radius around the plant (ref. 4.1.7).

Unisolable

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

Unplanned

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

Unusual Event

Events are in progress or have occurred which indicate a potential degradation in the level of safety of the plant or indicate a security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of SAFETY SYSTEMS occurs.

Valid

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

Visible Damage

Damage to a SAFETY SYSTEM train 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 SAFETY SYSTEM train.

5.2 Abbreviations/Acronyms

°F ..... Degrees Fahrenheit
° ..... Degrees
AC ..... Alternating Current
ANO ..... Arkansas Nuclear One
AOP ..... Abnormal Operating Procedure
ATWS ..... Anticipated Transient Without Scram
BMS ..... Boron Management System
BWST ..... Borated Water Storage Tank
CDE ..... Committed Dose Equivalent
CET ..... Core Exit Thermocouple
CFR ..... Code of Federal Regulations
CIAS ..... Containment Isolation Actuation Signal
CMT, CNTMT, CTMT ..... Containment
CNB ..... Containment Barrier
DBA ..... Design Basis Accident
DBE ..... Design Basis Earthquake
DC ..... Direct Current
DEF ..... Defueled

D/G ..... Diesel Generator
DHR ..... Decay Heat Removal
DROPS ..... Diverse Reactor Overpressure Protection System
DSC ..... Dry Shielded Canister
DSS ..... Diverse Scram System
EAL ..... Emergency Action Level
ECCS ..... Emergency Core Cooling System
ECL ..... Emergency Classification Level
DEF ..... Defueled
ENS ..... Emergency Notification System
EOF ..... Emergency Operations Facility
EOP ..... Emergency Operating Procedure
EPA ..... Environmental Protection Agency
ERG ..... Emergency Response Guideline
EPIP ..... Emergency Plan Implementing Procedure
ESAS ..... Engineered Safeguards Actuation System
ESF ..... Engineered Safety Feature
ESFAS ..... Engineered Safety Features Actuation System
FAA ..... Federal Aviation Administration
FBI ..... Federal Bureau of Investigation
FCB ..... Fuel Clad Barrier
FEMA ..... Federal Emergency Management Agency
GE ..... General Emergency
HPI ..... High Pressure Injection
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
LRW ..... Liquid Rad Waste
LTOP ..... Low Temperature Overpressure
LWR ..... Light Water Reactor

MCC ..... Motor Control Center
MPC..... Maximum Permissible Concentration/Multi-Purpose Canister
mR, mRem, mrem, mREM ..... milli-Roentgen Equivalent Man
MSL ..... Main Steam Line
MTS ..... Margin to Saturation
MW ..... Megawatt
NDTT ..... Nil Ductility Transition Temperature
NEI..... Nuclear Energy Institute
NEIC ..... National Earthquake Information Center
NESP ..... National Environmental Studies Project
NORAD..... North American Aerospace Defense Command
NOT ..... Normal Operating Temperature
(NO)UE ..... Notification of Unusual Event
NPP ..... Nuclear Power Plant
NRC..... Nuclear Regulatory Commission
NSSS..... Nuclear Steam Supply System
OBE ..... Operating Basis Earthquake
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
P-T..... Pressure-Temperature
PTS..... Pressurized Thermal Shock
PWR ..... Pressurized Water Reactor
PSIG ..... Pounds per Square Inch Gauge
R..... Roentgen
RB..... Reactor Building
RCC..... Reactor Control Console
RCB ..... Reactor Coolant System Barrier
RCP ..... Reactor Coolant Pump
RCS ..... Reactor Coolant System
Rem, rem, REM ..... Roentgen Equivalent Man
Rep CET ..... Representative Core Exit Thermocouples

RETS ..... Radiological Effluent Technical Specifications
RPS ..... Reactor Protection System
RV ..... Reactor Vessel
RVLMS ..... Reactor Vessel Level Monitoring System
RWT ..... Refueling Water Tank
SAR ..... Safety Analysis Report
SBO ..... Station Blackout
SCBA ..... Self-Contained Breathing Apparatus
SDC ..... Shutdown Cooling
SOCA ..... Security Owner Controlled Area
SG ..... Steam Generator
SI ..... Safety Injection
SPDS ..... Safety Parameter Display System
SPING ..... Super Particulate Iodine Noble Gas
SRO ..... Senior Reactor Operator
TEDE ..... Total Effective Dose Equivalent
TOAF ..... Top of Active Fuel
TSC ..... Technical Support Center
USGS ..... United States Geological Survey
VBS ..... Vehicle Barrier System

6.0 ANO-TO-NEI 99-01 REV. 6 EAL CROSS-REFERENCE

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

ANO	NEI 99-01 Rev. 6	
EAL	IC	Example EAL
AU1.1	AU1	1, 2
AU1.2	AU1	3
AU2.1	AU2	1
AA1.1	AA1	1
AA1.2	AA1	2
AA1.3	AA1	3
AA1.4	AA1	4
AA2.1	AA2	1
AA2.2	AA2	2
AA2.3	AA2	3
AA3.1	AA3	1
AA3.2	AA3	2
AS1.1	AS1	1
AS1.2	AS1	2
AS1.3	AS1	3
AS2.1	AS2	1
AG1.1	AG1	1
AG1.2	AG1	2
AG1.3	AG1	3
AG2.1	AG2	1
CU1.1	CU1	1
CU1.2	CU1	2
CU2.1	CU2	1
CU3.1	CU3	1
CU3.2	CU3	2
CU4.1	CU4	1

ANO	NEI 99-01 Rev. 6	
EAL	IC	Example EAL
CU5.1	CU5	1, 2, 3
CA1.1	CA1	1
CA1.2	CA1	2
CA2.1	CA2	1
CA3.1	CA3	1, 2
CA6.1	CA6	1
CS1.1	CS1	1
CS1.2	CS1	2
CG1.1	CG1	1
CG1.2	CG1	2
EU1.1	EU1	1
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
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

ANO	NEI 99-01 Rev. 6	
EAL	IC	Example EAL
HS6.1	HS6	1
HS7.1	HS7	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
SS1.1	SS1	1
SS2.1	SS8	1
SS6.1	SS5	1
SG1.1	SG1	1
SG1.2	SG8	1

7.0 ATTACHMENTS

7.1 Attachment 1, Emergency Action Level Technical Bases

7.2 Attachment 2, Safe Operation & Shutdown Areas Tables 1[2]A-3 & 1[2]H-2 Bases

Attachment 1 – Emergency Action Level Technical Bases

Category A – Abnormal Rad Levels / 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 – Emergency Action Level Technical Bases

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AU1.1 Unusual Event

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

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is 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 due to actions to isolate the release path, then the effluent monitor reading is **no** longer VALID for classification purposes.

Table 1A-1 Unit 1 Effluent Monitor Classification Thresholds (2 min. avg reading)

Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	RX-9820 (SPING 1)	4.15E+01 µCi/cc	4.15E+00 µCi/cc	4.15E-01 µCi/cc	1.21E-03 µCi/cc
Gaseous	Radwaste Area	RX-9825 (SPING 2)	2.67E+01 µCi/cc	2.67E+00 µCi/cc	2.67E-01 µCi/cc	4.94E-04 µCi/cc
Gaseous	Fuel Handling Area	RX-9830 (SPING 3)	6.20E+02 µCi/cc	6.20E+01 µCi/cc	6.20E+00 µCi/cc	5.44E-04 µCi/cc
Gaseous	Emergency Penetration Room	RX-9835 (SPING 4)	6.55E+02 µCi/cc	6.55E+01 µCi/cc	6.55E+00 µCi/cc	1.21E-02 µCi/cc
Liquid	Liquid Radwaste	RE-4642	----	----	----	2.46E+05 cpm

Attachment 1 – Emergency Action Level Technical Bases

Table 2A-1 Unit 2 Effluent Monitor Classification Thresholds (2 min. avg reading)

	Release Point	Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	2RX-9820 (SPING 5)	1.88E+01 µCi/cc	1.88E+00 µCi/cc	1.88E-01 µCi/cc	5.48E-04 µCi/cc
Gaseous	Radwaste Area	2RX-9825 (SPING 6)	2.35E+01 µCi/cc	2.35E+00 µCi/cc	2.35E-01 µCi/cc	4.35E-04 µCi/cc
Gaseous	Fuel Handling Area	2RX-9830 (SPING 7)	6.86E+02 µCi/cc	6.86E+01 µCi/cc	6.86E+00 µCi/cc	6.04E-04 µCi/cc
Gaseous	Emergency Penetration Room	2RX-9835 (SPING 8)	5.88E+02 µCi/cc	5.88E+01 µCi/cc	5.88E+00 µCi/cc	1.09E-02 µCi/cc
Liquid	BMS Liquid Discharge	2RE-2330	----	----	----	2.45E+04 cpm
Liquid	Regenerative Waste Discharge	2RE-4423	----	----	----	2.45E+05 cpm

Mode Applicability:

All

Definition(s):

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

Basis:

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

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

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

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

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

This EAL addresses normally occurring continuous radioactivity releases from monitored gaseous or liquid effluent pathways as well as radioactivity releases that cause effluent radiation monitor readings to exceed 2 times the limit established by a radioactivity discharge permit. Such releases are typically associated with planned batch releases from non-continuous release pathways (e.g., radwaste, waste gas).

Escalation of the emergency classification level would be via IC AA1.

Reference(s):

1. OP-1604.051 Ventilation Radiation Monitor System
2. Offsite Dose Calculation Manual
3. EP-CALC-ANO-1701 Radiological Effluent EAL Values
4. NEI 99-01 AU1

Attachment 1 – Emergency Action Level Technical Bases

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AU1.2 Unusual Event

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

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Mode Applicability:

All

Definition(s):

None

Basis:

This IC addresses a potential reduction 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.

Attachment 1 – Emergency Action Level Technical Bases

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

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

Escalation of the emergency classification level would be via IC AA1.

Reference(s):

1. Offsite Dose Calculation Manual
2. NEI 99-01 AU1

Attachment 1 – Emergency Action Level Technical Bases

Category: A – 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:

AA1.1 Alert

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

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is 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 due to actions to isolate the release path, then the effluent monitor reading is **no** longer VALID for classification purposes.

Note 4 The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Table 1A-1 Unit 1 Effluent Monitor Classification Thresholds (2 min. avg reading)

	Release Point	Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	RX-9820 (SPING 1)	4.15E+01 µCi/cc	4.15E+00 µCi/cc	4.15E-01 µCi/cc	1.21E-03 µCi/cc
Gaseous	Radwaste Area	RX-9825 (SPING 2)	2.67E+01 µCi/cc	2.67E+00 µCi/cc	2.67E-01 µCi/cc	4.94E-04 µCi/cc
Gaseous	Fuel Handling Area	RX-9830 (SPING 3)	6.20E+02 µCi/cc	6.20E+01 µCi/cc	6.20E+00 µCi/cc	5.44E-04 µCi/cc
Gaseous	Emergency Penetration Room	RX-9835 (SPING 4)	6.55E+02 µCi/cc	6.55E+01 µCi/cc	6.55E+00 µCi/cc	1.21E-02 µCi/cc
Liquid	Liquid Radwaste	RE-4642	----	----	----	2.46E+05 cpm

Attachment 1 – Emergency Action Level Technical Bases

Table 2A-1 Unit 2 Effluent Monitor Classification Thresholds (2 min. avg reading)

	Release Point	Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	2RX-9820 (SPING 5)	1.88E+01 µCi/cc	1.88E+00 µCi/cc	1.88E-01 µCi/cc	5.48E-04 µCi/cc
Gaseous	Radwaste Area	2RX-9825 (SPING 6)	2.35E+01 µCi/cc	2.35E+00 µCi/cc	2.35E-01 µCi/cc	4.35E-04 µCi/cc
Gaseous	Fuel Handling Area	2RX-9830 (SPING 7)	6.86E+02 µCi/cc	6.86E+01 µCi/cc	6.86E+00 µCi/cc	6.04E-04 µCi/cc
Gaseous	Emergency Penetration Room	2RX-9835 (SPING 8)	5.88E+02 µCi/cc	5.88E+01 µCi/cc	5.88E+00 µCi/cc	1.09E-02 µCi/cc
Liquid	BMS Liquid Discharge	2RE-2330	----	----	----	2.45E+04 cpm
Liquid	Regenerative Waste Discharge	2RE-4423	----	----	----	2.45E+05 cpm

Mode Applicability:

All

Definition(s):

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

Basis:

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 – Emergency Action Level Technical 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.

Escalation of the emergency classification level would be via IC AS1.

Reference(s):

1. OP-1604.051 Ventilation Radiation Monitor System
2. EP-CALC-ANO-1701 Radiological Effluent EAL Values
3. NEI 99-01 AA1

Attachment 1 – Emergency Action Level Technical Bases

Category: A – 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:

AA1.2 Alert

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

Note 4: The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 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 - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

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.

Escalation of the emergency classification level would be via IC AS1.

Reference(s):

1. OP-1904.002 Offsite Dose Projections

2. NEI 99-01 AA1

Attachment 1 – Emergency Action Level Technical Bases

Category: A – 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:

AA1.3 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 Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is 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 - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

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.

This EAL is assessed per the ODCM (ref. 2).

Attachment 1 – Emergency Action Level Technical Bases

Escalation of the emergency classification level would be via IC AS1.

Reference(s):

1. OP-1904.002 Offsite Dose Projections
2. Offsite Dose Calculation Manual
3. NEI 99-01 AA1

Attachment 1 – Emergency Action Level Technical Bases

Category: A – 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:

AA1.4 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 Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is 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 - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

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.

Escalation of the emergency classification level would be via IC AS1.

Reference(s):

1. OP-1905.002 Offsite Emergency Monitoring
2. NEI 99-01 AA1

Attachment 1 – Emergency Action Level Technical Bases

Category: A – 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:

AS1.1 Site Area Emergency

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

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is 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 due to actions to isolate the release path, then the effluent monitor reading is **no** longer VALID for classification purposes.

Note 4: The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Table 1A-1 Unit 1 Effluent Monitor Classification Thresholds (2 min. avg reading)

	Release Point	Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	RX-9820 (SPING 1)	4.15E+01 µCi/cc	4.15E+00 µCi/cc	4.15E-01 µCi/cc	1.21E-03 µCi/cc
Gaseous	Radwaste Area	RX-9825 (SPING 2)	2.67E+01 µCi/cc	2.67E+00 µCi/cc	2.67E-01 µCi/cc	4.94E-04 µCi/cc
Gaseous	Fuel Handling Area	RX-9830 (SPING 3)	6.20E+02 µCi/cc	6.20E+01 µCi/cc	6.20E+00 µCi/cc	5.44E-04 µCi/cc
Gaseous	Emergency Penetration Room	RX-9835 (SPING 4)	6.55E+02 µCi/cc	6.55E+01 µCi/cc	6.55E+00 µCi/cc	1.21E-02 µCi/cc
Liquid	Liquid Radwaste	RE-4642	----	----	----	2.46E+05 cpm

Attachment 1 – Emergency Action Level Technical Bases

Table 2A-1 Unit 2 Effluent Monitor Classification Thresholds (2 min. avg reading)

	Release Point	Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	2RX-9820 (SPING 5)	1.88E+01 µCi/cc	1.88E+00 µCi/cc	1.88E-01 µCi/cc	5.48E-04 µCi/cc
Gaseous	Radwaste Area	2RX-9825 (SPING 6)	2.35E+01 µCi/cc	2.35E+00 µCi/cc	2.35E-01 µCi/cc	4.35E-04 µCi/cc
Gaseous	Fuel Handling Area	2RX-9830 (SPING 7)	6.86E+02 µCi/cc	6.86E+01 µCi/cc	6.86E+00 µCi/cc	6.04E-04 µCi/cc
Gaseous	Emergency Penetration Room	2RX-9835 (SPING 8)	5.88E+02 µCi/cc	5.88E+01 µCi/cc	5.88E+00 µCi/cc	1.09E-02 µCi/cc
Liquid	BMS Liquid Discharge	2RE-2330	----	----	----	2.45E+04 cpm
Liquid	Regenerative Waste Discharge	2RE-4423	----	----	----	2.45E+05 cpm

Mode Applicability:

All

Definition(s):

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

Basis:

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.

Attachment 1 – Emergency Action Level Technical Bases

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 AG1.

Reference(s):

1. OP-1604.051 Ventilation Radiation Monitor System
2. EP-CALC-ANO-1701 Radiological Effluent EAL Values
3. NEI 99-01 AS1

Attachment 1 – Emergency Action Level Technical Bases

Category: A – 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:

AS1.2 Site Area Emergency

Dose assessment using actual meteorology indicates doses > 100 mrem TEDE or 500 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

Note 4 The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 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 - That boundary defined by a 1046 meter (0.65 mile) radius around the plant).

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.

Escalation of the emergency classification level would be via IC AG1.

Reference(s):

1. OP-1904.002 Offsite Dose Projections

2. NEI 99-01 AS1

Attachment 1 – Emergency Action Level Technical Bases

Category: A – 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:

AS1.3 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 Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is 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 - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

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.

Escalation of the emergency classification level would be via IC AG1.

Reference(s):

1. OP-1905.002 Offsite Emergency Monitoring
2. NEI 99-01 AS1

Attachment 1 – Emergency Action Level Technical Bases

Category: A – 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:

AG1.1 General Emergency

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

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is 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 due to actions to isolate the release path, then the effluent monitor reading is **no** longer VALID for classification purposes.

Note 4: The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Table 1A-1 Unit 1 Effluent Monitor Classification Thresholds (2 min. avg reading)

	Release Point	Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	RX-9820 (SPING 1)	4.15E+01 µCi/cc	4.15E+00 µCi/cc	4.15E-01 µCi/cc	1.21E-03 µCi/cc
Gaseous	Radwaste Area	RX-9825 (SPING 2)	2.67E+01 µCi/cc	2.67E+00 µCi/cc	2.67E-01 µCi/cc	4.94E-04 µCi/cc
Gaseous	Fuel Handling Area	RX-9830 (SPING 3)	6.20E+02 µCi/cc	6.20E+01 µCi/cc	6.20E+00 µCi/cc	5.44E-04 µCi/cc
Gaseous	Emergency Penetration Room	RX-9835 (SPING 4)	6.55E+02 µCi/cc	6.55E+01 µCi/cc	6.55E+00 µCi/cc	1.21E-02 µCi/cc
Liquid	Liquid Radwaste	RE-4642	----	----	----	2.46E+05 cpm

Attachment 1 – Emergency Action Level Technical Bases

Table 2A-1 Unit 2 Effluent Monitor Classification Thresholds (2 min. avg reading)

	Release Point	Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	2RX-9820 (SPING 5)	1.88E+01 µCi/cc	1.88E+00 µCi/cc	1.88E-01 µCi/cc	5.48E-04 µCi/cc
Gaseous	Radwaste Area	2RX-9825 (SPING 6)	2.35E+01 µCi/cc	2.35E+00 µCi/cc	2.35E-01 µCi/cc	4.35E-04 µCi/cc
Gaseous	Fuel Handling Area	2RX-9830 (SPING 7)	6.86E+02 µCi/cc	6.86E+01 µCi/cc	6.86E+00 µCi/cc	6.04E-04 µCi/cc
Gaseous	Emergency Penetration Room	2RX-9835 (SPING 8)	5.88E+02 µCi/cc	5.88E+01 µCi/cc	5.88E+00 µCi/cc	1.09E-02 µCi/cc
Liquid	BMS Liquid Discharge	2RE-2330	----	----	----	2.45E+04 cpm
Liquid	Regenerative Waste Discharge	2RE-4423	----	----	----	2.45E+05 cpm

Mode Applicability:

All

Definition(s):

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

Basis:

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.

Attachment 1 – Emergency Action Level Technical Bases

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.

Reference(s):

1. OP-1604.051 Ventilation Radiation Monitor System
2. EP-CALC-ANO-1701 Radiological Effluent EAL Values
3. NEI 99-01 AG1

Attachment 1 – Emergency Action Level Technical Bases

Category: A – 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:

AG1.2 General Emergency

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

Note 4 The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 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 - That boundary defined by a 1046 meter (0.65 mile) radius around the plant).

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.

Reference(s):

1. OP-1904.002 Offsite Dose Projections
2. NEI 99-01 AG1

Attachment 1 – Emergency Action Level Technical Bases

Category: A – 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:

AG1.3 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 Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is 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 - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

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 – Emergency Action Level Technical Bases

Reference(s):

1. OP-1905.002 Offsite Emergency Monitoring
2. NEI 99-01 AG1

Attachment 1 – Emergency Action Level Technical Bases

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

Initiating Condition: UNPLANNED loss of water level above irradiated fuel

EAL:

AU2.1 Unusual Event

UNPLANNED water level drop in the REFUELING PATHWAY as indicated by low water level alarm, visual observation, or BWST[RWT] level drop due to makeup demands

AND

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

- **Unit 1**
  - RE-8009 Spent Fuel Area
  - RE-8017 Fuel Handling Area
- **Unit 2**
  - 2RE-8914 Spent Fuel Area
  - 2RE-8915 Spent Fuel Area
  - 2RE-8916 Spent Fuel Area
  - 2RE-8912 Containment Incore Instrumentation

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 – All the cavities, tubes, canals and pools through which irradiated fuel may be moved, but **not** including the reactor vessel.

Attachment 1 – Emergency Action Level Technical Bases

Basis:

This IC addresses a drop 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 drop 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 a rise 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 rise 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 AA2.

Reference(s):

1. OP-1203.050 Unit 1 Spent Fuel Pool Emergencies
2. OP-2203.002 Spent Fuel Pool Emergencies
3. 1SAR 11.2.5 Area Radiation Monitoring Systems Table 11-15 Area Radiation Monitors
4. 2SAR 12.1.4 Area Radiation Monitoring System
5. NEI 99-01 AU2

Attachment 1 – Emergency Action Level Technical Bases

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

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

EAL:

AA2.1 Alert

IMMINENT uncovery of irradiated fuel in the REFUELING PATHWAY.

Mode Applicability:

All

Definition(s):

CONFINEMENT BOUNDARY – The barrier(s) between spent fuel and the environment once the spent fuel is processed for dry storage. As related to the ANO ISFSI, the Confinement Boundary is comprised of either the Multi-assembly Sealed Basket (MSB) (SNC System) or Multi-Purpose Canister (MPC) (Holtec System).

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.

REFUELING PATHWAY – All the cavities, tubes, canals and pools through which irradiated fuel may be moved, but **not** including the reactor vessel.

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 REFUELING PATHWAY. 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 EU1.

This EAL escalates from AU2.1 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 a rise 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 with Recognition Category C during the Cold Shutdown and Refueling modes.

Escalation of the emergency classification level would be via IC AS1.

Reference(s):

1. NEI 99-01 AA2

Attachment 1 – Emergency Action Level Technical Bases

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

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

EAL:

AA2.2 Alert

Damage to irradiated fuel resulting in a release of radioactivity

AND

High alarm on **any** Table 1[2]A-2 radiation monitor.

Table 1A-2 Unit 1 Fuel Damage Radiation Monitors

- RE-8009 Spent Fuel Area
- RE-8017 Fuel Handling
- RE-8060 Containment High Range Radiation Monitor
- RE-8061 Containment High Range Radiation Monitor
- RX-9820 (SPING 1) Containment Purge
- RX-9825 (SPING 2) Radwaste Area
- RX-9830 (SPING 3) Fuel Handling Area

Table 2A-2 Unit 2 Fuel Damage Radiation Monitors
• 2RE-8905 Containment Equipment Hatch Area • 2RE-8909 Containment Personnel Access Area • 2RE-8912 Containment Incore Inst. • 2RE-8914 Spent Fuel Area • 2RE-8915 Spent Fuel Area • 2RE-8916 Spent Fuel Area • 2RE-8925-1 Containment High Range Radiation Monitor • 2RE-8925-2 Containment High Range Radiation Monitor • 2RX-9820 (SPING 5) Containment Purge • 2RX-9825 (SPING 6) Radwaste Area • 2RX-9830 (SPING 7) Fuel Handling Area

Mode Applicability:

All

Definition(s):

CONFINEMENT BOUNDARY – The barrier(s) between spent fuel and the environment once the spent fuel is processed for dry storage. As related to the ANO ISFSI, the Confinement Boundary is comprised of either the Multi-assembly Sealed Basket (MSB) (SNC System) or Multi-Purpose Canister (MPC) (Holtec System).

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

Basis:

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

This EAL 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 EU1.

Attachment 1 – Emergency Action Level Technical Bases

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

Escalation of the emergency classification level would be via IC AS1.

Reference(s):

1. OP-1203.050 Unit 1 Spent Fuel Pool Emergencies
2. OP-1305.001 Radiation Monitoring System Check and Test
3. OP-2203.002 Spent Fuel Pool Emergencies
4. OP-1604.051 Ventilation Radiation Monitoring System
5. OP-2304.133 Containment High Range Radiation Monitor Calibration
6. Offsite Dose Calculation Manual
7. NEI 99-01 AA2

Attachment 1 – Emergency Action Level Technical Bases

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

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

EAL:

AA2.3 Alert

Lowering of spent fuel pool level to 387.0 ft.[389.5 ft.] (Alarm 2) on LIT-2020-3(4) [2LIT-2020-1(2)]

Mode Applicability:

All

Definition(s):

None

Basis:

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

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

Escalation of the emergency classification level would be via IC AS1 or AS2.

Post-Fukushima order EA-12-051 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) (ref. 1, 2).

Reference(s):

1. MOHR-ANO-1, ANO-1 SFPI (Level) Configuration, Sheet 1, Revision 0
2. MOHR-ANO-2, ANO-2 SFPI (Level) Configuration, Sheet 1, Revision 0
3. NEI 99-01 AA2

Attachment 1 – Emergency Action Level Technical Bases

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

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

EAL:

AS2.1 Site Area Emergency

Lowering of spent fuel pool level to 377.0 ft.[379.5 ft.] (Alarm 3) on LIT-2020-3(4) [2LIT-2020-1(2)]

Mode Applicability:

All

Definition(s):

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

Basis:

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

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

Escalation of the emergency classification level would be via IC AG1 or AG2.

Post-Fukushima order EA-12-051 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) (ref. 1, 2).

Reference(s):

1. MOHR-ANO-1, ANO-1 SFPI (Level) Configuration, Sheet 1, Revision 0
2. MOHR-ANO-2, ANO-2 SFPI (Level) Configuration, Sheet 1, Revision 0
3. NEI 99-01 AS2

Attachment 1 – Emergency Action Level Technical Bases

Category: A – 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:

AG2.1 General Emergency

Spent fuel pool level **cannot** be restored to at least 377.0 ft.[379.5 ft.] (Alarm 3) on LIT-2020-3(4)[2LIT-2020-1(2)] for ≥ 60 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

All

Definition(s):

None

Basis:

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

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

Post-Fukushima order EA-12-051 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) (ref. 1, 2).

Reference(s):

1. MOHR-ANO-1, ANO-1 SFPI (Level) Configuration, Sheet 1, Revision 0
2. MOHR-ANO-2, ANO-2 SFPI (Level) Configuration, Sheet 1, Revision 0
3. NEI 99-01 AG2

Attachment 1 – Emergency Action Level Technical Bases

Category: A – 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:

AA3.1 Alert

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

- Control Room
- Central Alarm Station (by survey)

Mode Applicability:

All

Definition(s):

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

Basis:

Areas that meet this threshold include the Control Room (CR) and the Central Alarm Station (CAS). The Control Room envelope (Unit 1 and Unit 2) is monitored for excessive radiation by five detectors. These radiation detectors are RE-8001, 2RE-8001A, 2RE-8001B, 2RE-8750-1A, and 2RE-8750-1B (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 are no permanently installed area radiation monitors in CAS that may be used to assess this EAL threshold. Therefore, this threshold is evaluated using local radiation survey for this area.

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 should consider the cause of the rise in radiation levels and determine if another IC may be applicable.

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

Attachment 1 – Emergency Action Level Technical Bases

Reference(s):

1. STM 1-62 Radiation Monitoring
2. NEI 99-01 AA3

Attachment 1 – Emergency Action Level Technical Bases

Category: A – 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:

AA3.2 Alert

An UNPLANNED event results in radiation levels that prohibit or IMPEDE access to **any** Table 1[2]A-3 room or area (Note 5)

Note 5: If the equipment in the listed room or area was already inoperable or out-of-service before the event occurred, then **no** emergency classification is warranted.

Table 1A-3 Unit 1 Safe Operation & Shutdown Rooms/Areas	
Room/Area	**Mode**
A-4 Switchgear Room	3, 4
Upper North Electrical Penetration Room	3, 4
Lower South Electrical Equipment Room	3, 4

Table 2A-3 Unit 2 Safe Operation & Shutdown Rooms/Areas	
Room/Area	**Mode**
Aux Building 317’ Emergency Core Cooling Rooms	3, 4
Aux Building 317’ Tendon Gallery Access	3, 4
Aux Building 335’ Charging Pumps / MCC 2B-52	3, 4
Aux Building 354’ MCC 2B-62 Area	3, 4
Emergency Diesel Generator Corridor	3, 4
Lower South Piping Penetration Room	3, 4
Aux Building 386’ Containment Hatch	3, 4

Attachment 1 – Emergency Action Level Technical Bases

Mode Applicability:

3 – Hot Standby, 4 – Hot Shutdown

Definition(s):

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

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

Basis:

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 should consider the cause of the rise in radiation levels and determine if another IC may be applicable.

For AA3.2, 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 higher 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 rise occurs, and the procedures used for normal operation, cooldown and shutdown do not require entry into the affected room until Mode 3.
- The higher 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 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 A, C or F ICs.

Attachment 1 – Emergency Action Level Technical Bases

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

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

EAL AA3.2 mode applicability has been limited to the mode limitations of Table 1[2]A-3 (Modes 3 and 4 **only**).

Reference(s):

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

Category C – Cold Shutdown / Refueling System Malfunction

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

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

The events of this category pertain to the following subcategories:

1. RCS Level

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

2. Loss of Vital AC Power

Loss of vital 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 4.16 KV vital buses.

3. RCS Temperature

Uncontrolled or inadvertent temperature or pressure rises 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 125V DC vital buses.

5. Loss of Communications

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

6. Hazardous Event Affecting Safety Systems

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

Attachment 1 – Emergency Action Level Technical Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: UNPLANNED loss of RCS inventory

EAL:

CU1.1 Unusual Event

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

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

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

Basis:

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

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

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

Attachment 1 – Emergency Action Level Technical Bases

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

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

Reference(s):

1. OP-1015.002 Decay Heat Removal and LTOP System
2. OP-1015.008 Unit 2 SDC Control
3. NEI 99-01 CU1

Attachment 1 – Emergency Action Level Technical Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: UNPLANNED loss of RCS inventory

EAL:

CU1.2 Unusual Event

RCS level **cannot** be monitored

AND EITHER:

- UNPLANNED rise in **any** Table 1[2]C-1 sump/tank level due to loss of RCS inventory
- Visual observation of UNISOLABLE RCS leakage

Table 1C-1 Unit 1 Sumps / Tanks
• Reactor Building Sump • Dirty Waste Drain Tank T-20A/B • Aux. Building Equipment Drain Tank T-11 • Aux. Building Sump • Quench Tank T-42

Table 2C-1 Unit 2 Sumps / Tanks
• CNTMT Sump 2T56 • Reactor Drain Tank 2T-68 • LRW Waste Tank (2T-20) • Holdup Tank • Aux. Building Sump • Quench Tank 2T-42

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Attachment 1 – Emergency Action Level Technical Bases

Definition(s):

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

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

Basis:

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

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

This EAL addresses a condition where all means to determine RCS 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 (Table C-1). Sump and/or tank level changes must be evaluated against other potential sources of water flow to ensure they are indicative of leakage from the RCS.

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

Reference(s):

1. OP-1203.039 Excess RCS Leakage
2. OP-2203.016 Excess RCS Leakage
3. NEI 99-01 CU1

Attachment 1 – Emergency Action Level Technical Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Significant Loss of RCS inventory

EAL:

CA1.1 Alert

Loss of RCS inventory as indicated by **EITHER**:

- RVLMS Levels 1 through 8[1 through 5] indicate DRY
- Reactor vessel level < 370.2 ft. (LT-1195/LT-1196)[< 24 in. (L4791/L4792)] (minimum level for DHR operation @ 1000 gpm)[(minimum level for SDC operation)]

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

None

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, a lowering of RPV water level below the specified level indicates that operator actions have not been successful in restoring and maintaining RCS water level. The heat-up rate of the coolant will rise as the available water inventory is reduced. A continuing drop in water level will lead to core uncovery.

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

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

A loss of DHR/SDC will occur at approximately RLVMS Level 8 (Unit 1) or RVLMS Level 5 (Unit 2). However, RVLMS may not be available in the cold shutdown modes. Redundant means of level indication is provided in these modes and included in this EAL. The point at which a loss of DHR/SDC is likely to occur is 370.2 ft. (Unit 1) or 24 in. (Unit 2) as indicated in the respective Control Rooms. The value selected for ANO-1 is based on 1000 gpm DHR flow

which is the flow rate at which the low flow alarm is received. The ANO-2 value is the proceduralized minimum value. Below these levels, a loss of suction to decay heat removal systems will occur (ref. 1, 2, 3). The inability to restore and maintain level after reaching this value would be indicative of a failure of the RCS barrier.

Reference(s):

1. OP-1104.004 Decay Heat Removal Operating Procedure
2. OP-1105.008 Inadequate Core Cooling Monitor and Display
3. OP-2105.003 Reactor Vessel Level Monitoring System Operations
4. OP-2203.029 Loss of Shutdown Cooling
5. Calculation No. 90-E-0116-01 ANO-2 EOP Setpoint Basis Document, Setpoints R.3 and R.9
6. NEI 99-01 CA1

Attachment 1 – Emergency Action Level Technical Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Significant Loss of RCS inventory

EAL:

CA1.2 Alert

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

AND EITHER:

- UNPLANNED rise in **any** Table 1[2]C-1 sump/tank level due to a loss of RCS inventory
- Visual observation of UNISOLABLE RCS leakage

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1C-1 Unit 1 Sumps / Tanks

- Reactor Building Sump
- Dirty Waste Drain Tank T-20A/B
- Aux. Building Equipment Drain Tank T-11
- Aux. Building Sump
- Quench Tank T-42

Table 2C-1 Unit 2 Sumps / Tanks

- CNTMT Sump 2T56
- Reactor Drain Tank 2T-68
- LRW Waste Tank (2T-20)
- Holdup Tank
- Aux. Building Sump
- Quench Tank 2T-42

Attachment 1 – Emergency Action Level Technical Bases

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

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

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

Basis:

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

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

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

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

Reference(s):

1. OP-1203.039 Excess RCS Leakage
2. OP-2203.016 Excess RCS Leakage
3. NEI 99-01 CA1

Attachment 1 – Emergency Action Level Technical Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

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

EAL:

CS1.1 Site Area Emergency

CONTAINMENT CLOSURE **not** established

AND

RVLMS Levels 1 through 9[1 through 6] indicate DRY

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE - The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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

Basis:

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

Following an extended loss of core decay heat removal and inventory makeup, decay heat will cause reactor coolant boiling and a further reduction in reactor vessel level. If RCS/reactor vessel 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.

Attachment 1 – Emergency Action Level Technical Bases

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

Escalation of the emergency classification level would be via IC CG1 or AG1.

Reference(s):

1. OP-1105.008 Inadequate Core Cooling Monitor and Display
2. OP-2105.003 Reactor Vessel Level Monitoring System Operations
3. NEI 99-01 CS1

Attachment 1 – Emergency Action Level Technical Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

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

EAL:

CS1.2 Site Area Emergency

[RVLMS Levels 1 through 7 indicate DRY

OR]

RCS level **cannot** be monitored for ≥ 30 min. (Note 1)

AND

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

- UNPLANNED rise in **any** Table 1[2]C-1 sump/tank level of sufficient magnitude to indicate core uncovery
- Containment high range radiation monitor RE-8060/8061[2RE-8925-1/8925-2] reading > 10 R/hr
- Erratic Source Range Monitor indication

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1C-1 Unit 1 Sumps / Tanks
• Reactor Building Sump • Dirty Waste Drain Tank T-20A/B • Aux. Building Equipment Drain Tank T-11 • Aux. Building Sump • Quench Tank T-42

Table 2C-1 Unit 2 Sumps / Tanks
• CNTMT Sump 2T56 • Reactor Drain Tank 2T-68 • LRW Waste Tank (2T-20) • Holdup Tank • Aux. Building Sump • Quench Tank 2T-42

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE - The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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.

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

Basis:

When in service, the Unit 2 RVLMS can measure RCS level below the top of active fuel. Level 7 DRY on this system is an indication of core uncovery.

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

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

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

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

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

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

Containment High Range Radiation Monitors RE-8060/8061 [2RE-8925-1/8925-2] are the site-specific radiation monitors that would be indicative of possible core uncovery in the Refueling mode. The dose rate due to core shine when the top of the core becomes uncovered should result in dose rates > 10 R/hr.

Escalation of the emergency classification level would be via IC CG1 or AG1.

Reference(s):

1. OP-1203.039 Excess RCS Leakage
2. OP-2203.016 Excess RCS Leakage
3. OP-2105.003 Reactor Vessel Level Monitoring System Operations
4. 1SAR Table 7-11
5. 2SAR 12.1.4.2
6. NEI 99-01 CS1

Attachment 1 – Emergency Action Level Technical Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

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

EAL:

CG1.1 General Emergency – UNIT 2 ONLY

RVLMS Levels 1 through 7 indicate DRY

AND

Any Containment Challenge indication, Table 1[2]C-2

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

Table 1[2]C-2 Containment Challenge Indications

- CONTAINMENT CLOSURE **not** established (Note 6)
- Containment hydrogen concentration > 4%
- UNPLANNED rise in containment pressure

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE - The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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.

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

Basis:

When in service, the Unit 2 RVLMS can measure RCS level below the top of active fuel. Level 7 DRY on this system is an indication of core uncovery.

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

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

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

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

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

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

Attachment 1 – Emergency Action Level Technical Bases

Reference(s):

1. OP-1203.039 Excess RCS Leakage
2. OP-2203.016 Excess RCS Leakage
3. OP-2105.003 Reactor Vessel Level Monitoring System Operations
4. 1SAR Table 7-11
5. 2SAR 12.1.4.2
6. Unit 1 SAMG Figure III-1B
7. Unit 2 SAMG Phase 1 Instructions, Containment Flowchart
8. NEI 99-01 CG1

Attachment 1 – Emergency Action Level Technical Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

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

EAL:

CG1.2 General Emergency

RCS level **cannot** be monitored for ≥ 30 min. (Note 1)

AND

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

- UNPLANNED rise in **any** Table 1[2]C-1 sump/tank level of sufficient magnitude to indicate core uncovery
- Containment High Range Radiation Monitor RE-8060/8061[2RE-8925-1/8925-2] reading > 10 R/hr
- Erratic Source Range Monitor indication

AND

Any Containment Challenge indication, Table 1[2]C-2

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

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

Table 1C-1 Unit 1 Sumps / Tanks

- Reactor Building Sump
- Dirty Waste Drain Tank T-20A/B
- Aux. Building Equipment Drain Tank T-11
- Aux. Building Sump
- Quench Tank T-42

Attachment 1 – Emergency Action Level Technical Bases

Table 2C-1 Unit 2 Sumps / Tanks
• CNTMT Sump 2T56 • Reactor Drain Tank 2T-68 • LRW Waste Tank (2T-20) • Holdup Tank • Aux. Building Sump • Quench Tank 2T-42

Table 1[2]C-2 Containment Challenge Indications
• CONTAINMENT CLOSURE **not** established (Note 6) • Containment hydrogen concentration > 4% • UNPLANNED rise in containment pressure

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE - The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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.

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.

Attachment 1 – Emergency Action Level Technical Bases

Basis:

When in service, the Unit 2 RVLMS can measure RCS level below the top of active fuel. Level 7 DRY on this system is an indication of core uncovery.

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

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

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

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

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

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

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

Containment High Range Radiation Monitor RE-8060/8061 [2RE-8925-1/8925-2] are the site-specific radiation monitors that would be indicative of possible core uncovery in the Refueling mode. The dose rate due to core shine when the top of the core becomes uncovered should result in dose rates > 10 R/hr.

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

Reference(s):

1. OP-1203.039 Excess RCS Leakage
2. OP-2203.016 Excess RCS Leakage
3. OP-2105.003 Reactor Vessel Level Monitoring System Operations
4. 1SAR Table 7-11
5. 2SAR 12.1.4.2
6. Unit 1 SAMG Figure III-1B
7. Unit 2 SAMG Phase 1 Instructions, Containment Flowchart
8. NEI 99-01 CG1

Attachment 1 – Emergency Action Level Technical Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 2 – Loss of Vital AC Power

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

EAL:

CU2.1 Unusual Event

AC power capability, Table 1[2]C-3, to vital 4.16 KV buses A3[2A3] and A4[2A4] reduced to a single power source for ≥ 15 min. (Note 1)

AND

Any additional single power source failure will result in loss of **all** AC power to SAFETY SYSTEMS

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1C-3 Unit 1 AC Power Sources

Offsite

- Startup Transformer No. 1
- Startup Transformer No. 2
- Unit Auxiliary Transformer (from 22 KV switchyard)

Onsite

- DG1
- DG2
- AAC Gen

Table 2C-3 Unit 2 AC Power Sources
Offsite • Startup Transformer No. 3 • Startup Transformer No. 2 • Unit Auxiliary Transformer (from 22 KV switchyard) **Onsite** • 2DG1 • 2DG2 • AAC Gen

Mode Applicability:

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

Definition(s):

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10 CFR 50.2):

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

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

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

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

Basis:

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

When in the cold shutdown, refueling, or defueled mode, this condition is not classified as an Alert because of the greater 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.

Attachment 1 – Emergency Action Level Technical Bases

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

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

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

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations
5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. NEI 99-01 CU2

Attachment 1 – Emergency Action Level Technical Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 2 – Loss of Vital AC Power

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

EAL:

CA2.1 Alert

Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3[2A3] and A4[2A4] for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

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

Definition(s):

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10 CFR 50.2):

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

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

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

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

Basis:

Although the AAC may be considered available, it will not prevent declaration of this EAL unless it is powering a vital bus within the 15-minute time period of the EAL.

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. Mitigative strategies using non-safety related power sources (FLEX generators, etc.) may be effective in supplying power to these buses. These power sources must be controlled in

accordance with abnormal or emergency operating procedures, or beyond design basis accident response guidelines (e.g., FLEX support guidelines) and must be capable (alone or in combination) of supplying power for long term decay heat removal systems.

When in the cold shutdown, refueling, or defueled mode, this condition is not classified as a Site Area Emergency because of the greater time available to restore a vital 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 AS1.

This EAL is the cold condition equivalent of the hot condition EAL SS1.1.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations
5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. NEI 99-01 CU2

Attachment 1 – Emergency Action Level Technical Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 3 – RCS Temperature

Initiating Condition: UNPLANNED rise in RCS temperature

EAL:

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

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE – The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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

Basis:

This IC addresses an UNPLANNED rise in RCS temperature above the Technical Specification cold shutdown temperature limit and represents a potential degradation of the level of safety of the plant. If the RCS is not intact and CONTAINMENT CLOSURE is not established during this event, the Emergency Director should also refer to EAL CA3.1.

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

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

Attachment 1 – Emergency Action Level Technical 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 lowered inventory may result in a rapid rise in reactor coolant temperature depending on the time after shutdown.

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

Reference(s):

1. Unit 1 and Unit 2 Technical Specifications Table 1.1-1
2. NEI 99-01 CU3

Attachment 1 – Emergency Action Level Technical Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 3 – RCS Temperature

Initiating Condition: UNPLANNED rise in RCS temperature

EAL:

CU3.2 Unusual Event

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

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE – The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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

Basis:

This EAL addresses the inability to determine RCS temperature and level, and represents a potential degradation of the level of safety of the plant. If the RCS is not intact and CONTAINMENT CLOSURE is not established during this event, the Emergency Director should also refer to EAL CA3.1.

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

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

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

Reference(s):

1. NEI 99-01 CU3

Attachment 1 – Emergency Action Level Technical Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 3 – RCS Temperature

Initiating Condition: Inability to maintain plant in cold shutdown

EAL:

CA3.1 Alert

UNPLANNED rise in RCS temperature to > 200°F for > Table 1[2]C-4 duration (Note 1)

OR

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

Note 1: The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1[2]C-4 RCS Heat-up Duration Thresholds

RCS Status	CONTAINMENT CLOSURE Status	Heat-up Duration
Intact (but **not** lowered inventory)	N/A	60 min.*
Not intact **OR** lowered inventory	established	20 min.*
	not established	0 min.

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

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE – The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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

Basis:

In the absence of reliable RCS temperature indication, classification should be based on the RCS pressure rise criteria when the RCS is intact in Mode 5 or based on time to boil data when in Mode 6 or the RCS is not intact in Mode 5.

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

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

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

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

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

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

Escalation of the emergency classification level would be via IC CS1 or AS1.

Reference(s):

1. Unit 1 and Unit 2 Technical Specifications Table 1.1-1
2. NEI 99-01 CA3

Attachment 1 – Emergency Action Level Technical 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:

CU4.1 Unusual Event

Indicated voltage is < 105 VDC on required vital 125 VDC buses for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

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 10 CFR 50.2).

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

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

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

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

Basis:

Unit 1 batteries D06 and D07 and Unit 2 batteries 2D11 and 2D12 contain 58 cells each with a minimum cell voltage of 1.81 V or 105 VDC.

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 raise the time available to restore a vital DC bus to service. Thus, this condition is considered to be a potential degradation of the level of safety of the plant.

Attachment 1 – Emergency Action Level Technical Bases

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 A.

This EAL is the cold condition equivalent of the hot condition EAL SS2.1.

Reference(s):

1. 1SAR 8.3.2.1.1 Batteries
2. 2SAR 8.3.2.1.1 Batteries
3. NEI 99-01 CU4

Attachment 1 – Emergency Action Level Technical 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 1[2]C-5 onsite communication methods

OR

Loss of **all** Table 1[2]C-5 State and local agency communication methods

OR

Loss of **all** Table 1[2]C-5 NRC communication methods

Table 1[2]C-5 Communication Methods

System	Onsite	ORO	NRC
Station radio system	X		
ANO plant phone system	X		
Gaitronics	X		
Telephone Systems: • Commercial • Microwave • Satellite • VOIP		X	X
Emergency Notification System (ENS)			X

Mode Applicability:

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

Definition(s):

None

Attachment 1 – Emergency Action Level Technical Bases

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 State and local agencies and the NRC.

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

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

The second EAL condition addresses a total loss of the communications methods used to notify all State and local agencies of an emergency declaration. The State and local agencies referred to here are the Arkansas Department of Health, Arkansas Department of Emergency Management, Pope, Yell, Johnson, and Logan County offsite agencies.

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

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

Reference(s):

1. OP-1903.062 Communications System Operating Procedure
2. NEI 99-01 CU5

Attachment 1 – Emergency Action Level Technical Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 6 – Hazardous Event Affecting Safety Systems

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

EAL:

CA6.1 Alert

The occurrence of **any** Table 1[2]C-6 hazardous event

AND

Event damage has caused indications of degraded performance on one train of a SAFETY SYSTEM needed for the current operating mode

AND EITHER:

- Event damage has caused indications of degraded performance to the second train of the SAFETY SYSTEM needed for the current operating mode
- Event damage has resulted in VISIBLE DAMAGE to the second train of the SAFETY SYSTEM needed for the current operating mode

(Notes 10, 11)

Note 10: If the affected SAFETY SYSTEM train was already inoperable or out of service before the hazardous event occurred, then emergency classification is **not** warranted.

Note 11: If the hazardous event **only** resulted in VISIBLE DAMAGE, with **no** indications of degraded performance to at least one train of a SAFETY SYSTEM, then this emergency classification is **not** warranted.

Table 1[2]C-6 Hazardous Events

- Seismic event (earthquake)
- Internal or external FLOODING event
- High winds or tornado strike
- FIRE
- EXPLOSION
- Other events with similar hazard characteristics as determined by the Shift Manager

Attachment 1 – Emergency Action Level Technical Bases

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.

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 10 CFR 50.2).

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 SAFETY SYSTEM train 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 SAFETY SYSTEM train.

Basis:

This IC addresses a hazardous event that causes damage to SAFETY SYSTEMS needed for the current operating mode. In order to provide the appropriate context for consideration of an ALERT classification, the hazardous event must have caused indications of degraded SAFETY SYSTEM performance in one train, and there must be either indications of performance issues with the second SAFETY SYSTEM train or VISIBLE DAMAGE to the second train such that the potential exists for this second SAFETY SYSTEM train to have performance issues. In other words, in order for this EAL to be classified, the hazardous event must occur, at least one SAFETY SYSTEM train must have indications of degraded performance, and the second SAFETY SYSTEM train must have indications of degraded performance or VISIBLE DAMAGE

such that the potential exists for performance issues. Note that this second SAFETY SYSTEM train is from the same SAFETY SYSTEM that has indications of degraded performance; commercial nuclear power plants are designed to be able to support single system issues without compromising public health and safety from radiological events.

Indications of degraded performance 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.

VISIBLE DAMAGE addresses damage to a SAFETY SYSTEM train that is not in service/operation and that potentially could cause performance issues. 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. This VISIBLE DAMAGE should be significant enough to cause concern regarding the operability or reliability of the SAFETY SYSTEM train.

Escalation of the emergency classification level would be via IC CS1 or AS1.

This EAL is the cold condition equivalent of the hot condition EAL SA9.1.

Reference(s):

1. EP FAQ 2016-002
2. NEI 99-01 CA6
3. EP FAQ 2018-04

Category E – Independent Spent Fuel Storage Installation (ISFSI)

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

An independent spent fuel storage installation (ISFSI) is a complex that is designed and constructed for the interim storage of spent nuclear fuel and other radioactive materials associated with spent fuel storage. A significant amount of the radioactive material contained within a canister must escape its packaging and enter the biosphere for there to be a significant environmental effect resulting from an accident involving the dry storage of spent nuclear fuel.

An Unusual Event is declared on the basis of the occurrence of an event of sufficient magnitude that a loaded cask CONFINEMENT BOUNDARY is damaged or violated.

The ANO ISFSI is located wholly within the plant PROTECTED AREA. Therefore any security event related to the ISFSI is classified under Category H1 security event related EALs.

Attachment 1 – Emergency Action Level Technical Bases

Category: E – ISFSI

Subcategory: Confinement Boundary

Initiating Condition: Damage to a loaded cask CONFINEMENT BOUNDARY

EAL:

EU1.1 Unusual Event

Damage to a loaded cask CONFINEMENT BOUNDARY as indicated by an on-contact radiation reading on the surface of a loaded spent fuel cask (VSC-24 VCC or HI-STORM overpack) > **any** Table 1[2]E-1 value

Table 1[2]E-1 ISFSI Dose Rates

VSC-24 VCC	HI-STORM
• 200 mrem/hr on the sides • 400 mrem/hr on the top • 700 mrem/hr at the air inlet • 200 mrem/hr at the air outlet	• 60 mrem/hr (gamma + neutron) on the top or outlet vent • 600 mrem/hr (gamma + neutron) on the side of the overpack (excluding inlet and outlet ducts)

Mode Applicability:

All

Definition(s):

CONFINEMENT BOUNDARY – The barrier(s) between spent fuel and the environment once the spent fuel is processed for dry storage. As related to the ANO ISFSI, the Confinement Boundary is comprised of either the Multi-assembly Sealed Basket (MSB) (SNC System) or Multi-Purpose Canister (MPC) (Holtec System).

INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI) – A complex that is designed and constructed for the interim storage of spent nuclear fuel and other radioactive materials associated with spent fuel storage.

Basis:

This IC addresses an event that results in damage to the CONFINEMENT BOUNDARY of a storage cask containing spent fuel. It applies to irradiated fuel that is licensed for dry storage

beginning at the point that the loaded storage cask is sealed. The issues of concern are the creation of a potential or actual release path to the environment, degradation of one or more fuel assemblies due to environmental factors, and configuration changes which could cause challenges in removing the cask or fuel from storage.

The existence of “damage” is determined by radiological survey. The specified EAL threshold values correspond to 2 times the cask technical specification values (ref. 1, 2). The technical specification (licensing bases document) multiple of “2 times”, which is also used in Recognition Category A IC AU1, is used here to distinguish between non-emergency and emergency conditions. The emphasis for this classification is the degradation in the level of safety of the spent fuel cask and not the magnitude of the associated dose or dose rate. It is recognized that in the case of extreme damage to a loaded cask, the fact that the “on-contact” dose rate limit is exceeded may be determined based on measurement of a dose rate at some distance from the cask.

Security-related events for ISFSIs are covered under ICs HU1 and HA1.

Reference(s):

1. Certificate of Compliance Appendix A Technical Specifications for the HI-STORM 100 Cask System Section 5.7.4
2. VSC-24 Storage Cask Final Safety Analysis Report Section 1.2.4 Maximum External Surface Dose Rate
3. NEI 99-01 E-HU1

Category F – Fission Product Barrier Degradation

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

EALs in this category represent threats to the defense in depth design concept that precludes the release of highly radioactive fission products to the environment. This concept relies on multiple physical barriers any one of which, if maintained intact, precludes the release of significant amounts of radioactive fission products to the environment. The primary fission product barriers are:

A. Fuel Clad Barrier (FCB): The Fuel Clad Barrier consists of the cladding material that contains the fuel pellets.

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

C. Containment Barrier (CNB): The Containment Barrier includes the Reactor 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 Reactor Building up to and including the outermost secondary side isolation valve. Containment Barrier thresholds are used as criteria for escalation of the Emergency Classification Level (ECL) from an Alert to a Site Area Emergency or a General Emergency.

The EALs in this category require evaluation of the loss and potential loss thresholds listed in the fission product barrier matrix of Table F-1. “Loss” and “Potential Loss” signify the relative damage and threat of damage to the barrier. “Loss” means the barrier no longer assures containment of radioactive materials. “Potential Loss” means integrity of the barrier is threatened and could be lost if conditions continue to degrade. The number of barriers that are lost or potentially lost and the following criteria determine the appropriate emergency classification level:

Alert:

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

Attachment 1 – Emergency Action Level Technical Bases

The logic used for emergency classification based on fission product barrier monitoring should reflect the following considerations:

- The Fuel Clad Barrier and the RCS Barrier are weighted more heavily than the Containment Barrier.
- Unusual Event ICs associated with RCS and Fuel Clad Barriers are addressed under System Malfunction ICs.
- For accident conditions involving a radiological release, evaluation of the fission product barrier thresholds will need to be performed in conjunction with dose assessments to ensure correct and timely escalation of the emergency classification. For example, an evaluation of the fission product barrier thresholds may result in a Site Area Emergency classification while a dose assessment may indicate that an EAL for General Emergency IC AG1 has been exceeded.
- The fission product barrier thresholds specified within a scheme reflect plant-specific ANO design and operating characteristics.
- As used in this category, the term RCS leakage encompasses not just those types defined in Technical Specifications but also includes the loss of RCS mass to any location – inside the containment, an interfacing system, or outside of the containment. The release of liquid or steam mass from the RCS due to the as-designed/expected operation of a relief valve is not considered to be RCS leakage.
- At the Site Area Emergency level, EAL users should maintain cognizance of how far present conditions are from meeting a threshold that would require a General Emergency declaration. For example, if the Fuel Clad and RCS fission product barriers were both lost, then there should be frequent assessments of containment radioactive inventory and integrity. Alternatively, if both the Fuel Clad and RCS fission product barriers were potentially lost, the Emergency Director would have more assurance that there was no immediate need to escalate to a General Emergency.

Attachment 1 – Emergency Action Level Technical Bases

Category: F – Fission Product Barrier Degradation

Subcategory: N/A

Initiating Condition: **Any** loss or **any** potential loss of either Fuel Clad or RCS

EAL:

FA1.1 Alert

Any loss or **any** potential loss of either Fuel Clad or RCS barrier (Table 1[2]F-1)

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

Fuel Clad, RCS and Containment comprise the fission product barriers. Table 1[2]F-1 lists the fission product barrier thresholds, bases and references.

At the Alert classification level, Fuel Clad and RCS barriers are weighted more heavily than the Containment barrier. Unlike the Containment barrier, loss or potential loss of either the Fuel Clad or RCS barrier may result in the relocation of radioactive materials or degradation of core cooling capability. Note that the loss or potential loss of Containment barrier in combination with loss or potential loss of either Fuel Clad or RCS barrier results in declaration of a Site Area Emergency under EAL FS1.1.

Reference(s):

1. NEI 99-01 FA1

Attachment 1 – Emergency Action Level Technical Bases

Category: F – Fission Product Barrier Degradation

Subcategory: N/A

Initiating Condition: Loss or potential loss of **any** two barriers

EAL:

FS1.1 Site Area Emergency

Loss or potential loss of **any** two barriers (Table 1[2]F-1)

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

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

Basis:

Fuel Clad, RCS and Containment comprise the fission product barriers. Table 1[2]F-1 lists the fission product barrier thresholds, bases and references.

At the Site Area Emergency classification level, each barrier is weighted equally. A Site Area Emergency is therefore appropriate for any combination of the following conditions:

- One barrier loss and a second barrier loss (i.e., loss - loss)
- One barrier loss and a second barrier potential loss (i.e., loss - potential loss)
- One barrier potential loss and a second barrier potential loss (i.e., potential loss - potential loss)

At the Site Area Emergency classification level, the ability to dynamically assess the proximity of present conditions with respect to the threshold for a General Emergency is important. For example, the existence of Fuel Clad and RCS Barrier loss thresholds in addition to offsite dose assessments would require continual assessments of radioactive inventory and Containment integrity in anticipation of reaching a General Emergency classification. Alternatively, if both Fuel Clad and RCS potential loss thresholds existed, the Emergency Director would have greater assurance that escalation to a General Emergency is less IMMINENT.

Reference(s):

1. NEI 99-01 FS1

Attachment 1 – Emergency Action Level Technical Bases

Category: F – Fission Product Barrier Degradation

Subcategory: N/A

Initiating Condition: Loss of **any** two barriers and loss or potential loss of third barrier

EAL:

FG1.1 General Emergency

Loss of **any** two barriers

AND

Loss or potential loss of the third barrier (Table 1[2]F-1)

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

Fuel Clad, RCS and Containment comprise the fission product barriers. Table 1[2]F-1 lists the fission product barrier thresholds, bases and references.

At the General Emergency classification level each barrier is weighted equally. A General Emergency is therefore appropriate for any combination of the following conditions:

- Loss of Fuel Clad, RCS and Containment Barriers
- Loss of Fuel Clad and RCS Barriers with potential loss of Containment Barrier
- Loss of RCS and Containment Barriers with potential loss of Fuel Clad Barrier
- Loss of Fuel Clad and Containment Barriers with potential loss of RCS Barrier

Reference(s):

1. NEI 99-01 FG1

Table 1[2]F-1 Fission Product Barrier Threshold Matrix & Bases

Table 1[2]F-1 lists the threshold conditions that define the Loss and Potential Loss of the three fission product barriers (Fuel Clad, Reactor Coolant System, and Containment). The table is structured so that each of the three barriers occupies adjacent columns. Each fission product barrier column is further divided into two columns; one for Loss thresholds and one for Potential Loss thresholds.

The first column of the table (to the left of the Fuel Clad Loss column) lists the categories (types) of fission product barrier thresholds. The fission product barrier categories are:

A. RCS or S/G Tube Leakage
B. Inadequate Heat removal
C. Containment Radiation / RCS Activity
D. Containment Integrity or Bypass
E. Emergency Director Judgment

Each category occupies a row in Table 1[2]F-1 thus forming a matrix defined by the categories. The intersection of each row with each Loss/Potential Loss column forms a cell in which one or more fission product barrier thresholds appear. If NEI 99-01 does not define a threshold for a barrier Loss/Potential Loss, the word “None” is entered in the cell.

Thresholds are assigned sequential numbers within each barrier column beginning with number one (ex., FCB1, FCB2…FCB9).

If a cell in Table 1[2]F-1 contains more than one numbered threshold, each of the numbered thresholds, if exceeded, signifies a Loss or Potential Loss of the barrier. It is not necessary to exceed all of the thresholds in a category before declaring a barrier Loss/Potential Loss.

Subdivision of Table 1[2]F-1 by category facilitates association of plant conditions to the applicable fission product barrier Loss and Potential Loss thresholds. This structure promotes a systematic approach to assessing the classification status of the fission product barriers.

When equipped with knowledge of plant conditions related to the fission product barriers, the EAL-user first scans down the category column of Table 1[2]F-1, locates the likely category and then reads across the fission product barrier Loss and Potential Loss thresholds in that category to determine if a threshold has been exceeded. If a threshold has not been exceeded, the EAL-user proceeds to the next likely category and continues review of the thresholds in the new category.

If the EAL-user determines that any threshold has been exceeded, by definition, the barrier is lost or potentially lost – even if multiple thresholds in the same barrier column are exceeded, only that one barrier is lost or potentially lost. The EAL-user must examine each of the three fission product barriers to determine if other barrier thresholds in the category are lost or potentially lost. For example, if containment radiation is sufficiently high, a Loss of the Fuel

Attachment 1 – Emergency Action Level Technical Bases

Clad and RCS Barriers and a Potential Loss of the Containment Barrier can occur. Barrier Losses and Potential Losses are then applied to the algorithms given in EALs FG1.1, FS1.1, and FA1.1 to determine the appropriate emergency classification.

In the remainder of this Attachment, the Fuel Clad Barrier threshold bases appear first, followed by the RCS Barrier and finally the Containment Barrier threshold bases. In each barrier, the bases are given according category Loss followed by category Potential Loss beginning with Category A, then B,…, E.

Attachment 1 – Emergency Action Level Technical Bases

Table 1[2]F-1 Fission Product Barrier Threshold Matrix

	Fuel Clad Barrier (FCB)		Reactor Coolant System Barrier (RCB)		Containment Barrier (CNB)	
Category	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**
A **RCS or S/G Tube Leakage**	None	FCB1 RVLMS Levels 1 through 9 [1 through 7] indicate DRY	RCB1 An automatic or manual ESAS [ESFAS] actuation required by EITHER: • UNISOLABLE RCS leakage • S/G tube RUPTURE	RCB2 • UNISOLABLE RCS leakage or S/G tube leakage > 50[44] gpm excluding normal reductions in RCS inventory (e.g., letdown, RCP seal leakoff) RCB3 Unit 1: PTS limits apply (RT14) **AND** RCS pressure and temperature are left of the NDTT/LTOP limit lines on EOP Figure 3 (Note 12) Unit 2: Uncontrolled RCS cooldown (> 50 °F step change or > 100 °F change in less than a one-hour period) **AND** RCS pressure and temperature are to the left of line B (200 degrees MTS), Standard Attachment 1, P-T Limits (Note 12)	CNB1 A S/G that is leaking > 50[44] gpm (excluding normal reductions in RCS inventory) or that is RUPTURED is also FAULTED outside of containment	None
B **Inadequate Heat Removal**	FCB2 CETs > 1200°F	FCB3 CETs > 700°F FCB4 RCS heat removal **cannot** be established using steam generators **AND** An on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling	None	RCB4 RCS heat removal **cannot** be established using steam generators **AND** An on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling	None	CNB2 CETs > 1200°F **AND** Restoration procedures **not** effective within 15 min. (Note 1)
C **CTMT Radiation / RCS Activity**	FCB5 Containment High Range Radiation Monitor RE-8060/8061 [2RE-8925-1/ 8925-2] > 750 [700] R/hr FCB6 Coolant activity > 300 µCi/gm dose equivalent I-131	None	RCB5 Containment High Range Radiation Monitor RE-8060/8061 [2RE-8925-1/ 8925-2] > 40[50] R/hr	None	None	CNB3 Containment High Range Radiation Monitor RE-8060/8061 [2RE-8925-1/ 8925-2] > 10,000[12,000] R/hr

Attachment 1 – Emergency Action Level Technical Bases

Table 1[2]F-1 Fission Product Barrier Threshold Matrix

	Fuel Clad Barrier (FCB)		Reactor Coolant System Barrier (RCB)		Containment Barrier (CNB)	
Category	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**
D **CTMT Integrity or Bypass**	None	None	None	None	CNB4 Containment isolation is required **AND EITHER:** • Containment integrity has been lost based on Emergency Director judgment • UNISOLABLE pathway from Containment to the environment exists CNB5 Indications of RCS leakage outside of Containment	CNB6 Containment pressure > 73.7 psia CNB7 Containment hydrogen concentration > 4% CNB8 Containment pressure > 44.7 psia [23.3 psia] with < one full train of containment heat removal systems (Note 9) operating per design for ≥ 15 min. (Note 1)
E **Emergency Director Judgment**	FCB7 **Any** condition in the opinion of the Emergency Director that indicates loss of the Fuel Clad barrier	FCB8 **Any** condition in the opinion of the Emergency Director that indicates potential loss of the Fuel Clad barrier	RCB6 **Any** condition in the opinion of the Emergency Director that indicates loss of the RCS barrier	RCB7 **Any** condition in the opinion of the Emergency Director that indicates potential loss of the RCS barrier	CNB9 **Any** condition in the opinion of the Emergency Director that indicates loss of the Containment barrier	CNB10 **Any** condition in the opinion of the Emergency Director that indicates potential loss of the Containment barrier

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Fuel Clad

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Loss

Threshold:

None

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Fuel Clad

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Potential Loss

Threshold:

FCB1

RVLMS Levels 1 through 9[1 through 7] indicate DRY

Definition(s):

None

Basis:

This reading indicates a reduction in reactor vessel water level sufficient to allow the onset of heat-induced cladding damage.

There is no Fuel Clad Barrier Loss threshold associated with RCS or S/G Tube Leakage.

Reference(s):

1. ULD-1-SYS-24 Unit 1 Inadequate Core Cooling System
2. Calculation 84-EQ-0080-02 Loop Error Analysis for Reactor Vessel Level Monitoring System
3. ULD-2-SYS-24 Unit 2 Inadequate Core Cooling Monitoring System
4. Calculation 90-E-0116-01 Unit 2 EOP Setpoint Document, Setpoint R.3
5. NEI 99-01 RCS or SG Tube Leakage Potential Loss 1.A

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Fuel Clad

Category: B – Inadequate Heat Removal

Degradation Threat: Loss

Threshold:

FCB2

CETs > 1200°F

Definition(s):

None

Basis:

This reading indicates temperatures within the core are sufficient to cause significant superheating of reactor coolant.

Reference(s):

1. NEI 99-01 Inadequate Heat Removal Loss 2.A

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Fuel Clad

Category: B – Inadequate Heat Removal

Degradation Threat: Potential Loss

Threshold:

FCB3

CETs > 700°F

Definition(s):

None

Basis:

This reading indicates a reduction in reactor vessel water level sufficient to allow the onset of heat-induced cladding damage.

Reference(s):

1. NEI 99-01 Inadequate Heat Removal Potential Loss 2.A

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Fuel Clad

Category: B – Inadequate Heat Removal

Degradation Threat: Potential Loss

Threshold:

FCB4

RCS heat removal **cannot** be established using steam generators

AND

An on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling

Definition(s):

None

Basis:

This condition indicates an extreme challenge to the ability to remove RCS heat using the steam generators (i.e., loss of an effective secondary-side heat sink). This condition represents a potential loss of the Fuel Clad Barrier. In accordance with EOPs, there may be unusual accident conditions during which operators intentionally reduce the heat removal capability of the steam generators; during these conditions, classification using this threshold is not warranted.

In combination with Potential Loss RCB4, meeting this threshold results in a Site Area Emergency.

Reference(s):

1. OP-1202.004 Overheating
2. OP-1202.013 Figure 4, Core Exit Thermocouple for Inadequate Core Cooling
3. OP-2202.006 Loss of Feedwater
4. OP-2202.009 Functional Recovery, Safety Function Status Check 5
5. NEI 99-01 Inadequate Heat Removal Potential Loss 2.B

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Fuel Clad

Category: C – CTMT Radiation / RCS Activity

Degradation Threat: Loss

Threshold:

FCB5

Containment High Range Radiation Monitor RE-8060/8061[2RE-8925-1/8925-2]
> 750[700] R/hr

Definition(s):

None

Basis:

The containment radiation monitor reading (768[682] R/hr rounded to 750[700] R/hr for readability) corresponds to an instantaneous release of all reactor coolant mass into the containment, assuming that reactor coolant activity equals 300 µCi/gm dose equivalent I-131. Reactor coolant activity above this level is greater than that expected for iodine spikes and corresponds to 1.49[1.13]% fuel clad damage. Since this condition indicates that a significant amount of fuel clad damage has occurred, it represents a loss of the Fuel Clad Barrier.

The radiation monitor reading in this threshold is higher than that specified for RCS Barrier Loss threshold RCB5 since it indicates a loss of both the Fuel Clad Barrier and the RCS Barrier. Note that a combination of the two monitor readings appropriately escalates the ECL to a Site Area Emergency.

There is no Potential Loss threshold associated with CTMT Radiation/RCS Activity.

Reference(s):

1. EP-CALC-ANO-1702 Containment High Range Radiation Monitor EAL Values
2. NEI 99-01 RCS Activity/Containment Radiation FC Loss 3.A

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Fuel Clad

Category: C – CTMT Radiation / RCS Activity

Degradation Threat: Loss

Threshold:

FCB6

Coolant activity > 300 µCi/gm dose equivalent I-131

Definition(s):

None

Basis:

This threshold indicates that RCS radioactivity concentration is greater than 300 µCi/gm dose equivalent I-131. Reactor coolant activity above this level is greater than that expected for iodine spikes and corresponds to an approximate range of 2% to 5% fuel clad damage. Since this condition indicates that a significant amount of fuel clad damage has occurred, it represents a loss of the Fuel Clad Barrier.

It is recognized that sample collection and analysis of reactor coolant with highly elevated activity levels could require several hours to complete. Nonetheless, a sample-related threshold is included as a backup to other indications.

There is no Potential Loss threshold associated with CTMT Radiation/RCS Activity.

Reference(s):

1. NEI 99-01 RCS Activity/Containment Radiation Fuel Clad Loss 3.B

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Fuel Clad

Category: C – CTMT Radiation / RCS Activity

Degradation Threat: Potential Loss

Threshold:

None

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Fuel Clad

Category: D – CTMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

None

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Fuel Clad

Category: D – CTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

None

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Fuel Clad

Category: E – Emergency Director Judgment

Degradation Threat: Loss

Threshold:

FCB7

Any condition in the opinion of the Emergency Director that indicates loss of the Fuel Clad barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that are to be used by the Emergency Director in determining whether the Fuel Clad barrier is lost.

Reference(s):

1. NEI 99-01 Emergency Director Judgment Fuel Clad Loss 6.A

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Fuel Clad

Category: E – Emergency Director Judgment

Degradation Threat: Potential Loss

Threshold:

FCB8

Any condition in the opinion of the Emergency Director that indicates potential loss of the Fuel Clad barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that are to be used by the Emergency Director in determining whether the Fuel Clad barrier is potentially lost. The Emergency Director should also consider whether or not to declare the barrier potentially lost in the event that barrier status cannot be monitored.

Reference(s):

1. NEI 99-01 Emergency Director Judgment Potential Fuel Clad Loss 6.A

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Reactor Coolant System

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Loss

Threshold:

RCB1

An automatic or manual ESAS[ESFAS] actuation required by **EITHER:**

- UNISOLABLE RCS leakage
- S/G tube RUPTURE

Definition(s):

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

RUPTURED - The condition of a steam generator in which primary-to-secondary leakage is of sufficient magnitude to require a safety injection (automatic or manual).

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

Basis:

Failure to isolate the leak (from the Control Room or locally), within 15 minutes or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification.

This threshold is based on an UNISOLABLE RCS leak of sufficient size to require an automatic or manual actuation of the Emergency Core Cooling System (ECCS). This condition clearly represents a loss of the RCS Barrier.

The procedure requirement to manually initiate SIAS for a RCS or tube leak with a Loss of Offsite Power (LOOP) that may be taken for small leaks is not applicable to this threshold when the RCS leakage is not of sufficient size to require initiation of SIAS based upon loss of inventory and size of the leak alone.

This threshold is applicable to unidentified and pressure boundary leakage, as well as identified leakage. It is also applicable to UNISOLABLE RCS leakage through an interfacing system. The mass loss may be into any location – inside containment, to the secondary-side (i.e., steam generator tube leakage) or outside of containment.

A steam generator with primary-to-secondary leakage of sufficient magnitude to require a safety injection is considered to be RUPTURED. If a RUPTURED steam generator is also FAULTED

outside of containment, the declaration escalates to a Site Area Emergency since the Containment Barrier Loss threshold CNB1 will also be met.

Attachment 1 – Emergency Action Level Technical Bases

Reference(s):

1. OP-1202.010 ESAS
2. OP-2202.003 Loss of Coolant Accident
3. NEI 99-01 RCS or SG Tube Leakage Reactor Coolant System Loss 1.A

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Reactor Coolant System

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Potential Loss

Threshold:

RCB2

UNISOLABLE RCS leakage or S/G tube leakage > 50[44] gpm excluding normal reductions in RCS inventory (e.g., letdown, RCP seal leakoff)

Definition(s):

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

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

Basis:

Failure to isolate the leak (from the Control Room or locally), within 15 minutes or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification.

This threshold is based on an UNISOLABLE RCS leak that results in the inability to maintain pressurizer level within specified limits by operation of a normally used makeup [charging] pump, but an ESAS [ESFAS] actuation has not occurred.

This threshold is applicable to unidentified and pressure boundary leakage, as well as identified leakage. It is also applicable to UNISOLABLE RCS leakage through an interfacing system. The mass loss may be into any location – inside containment, to the secondary-side (i.e., steam generator tube leakage) or outside of containment.

If a leaking steam generator is also FAULTED outside of containment, the declaration escalates to a Site Area Emergency since the Containment Barrier Loss threshold CNB1 will also be met.

Reference(s):

1. 1SAR 9.1 Makeup and Purification System
2. 2SAR 9.3.4 Chemical and Volume Control System
3. NEI 99-01 RCS or SG Tube Leakage Reactor Coolant System Potential Loss 1.A

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Reactor Coolant System

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Potential Loss

Threshold:

RCB3

Unit 1:

PTS limits apply (RT14)

AND

RCS pressure and temperature are left of the NDTT/LTOP limit lines, on EOP Figure 3 (Note 12)

Unit 2:

Uncontrolled RCS cooldown (> 50 °F step change or > 100 °F change in less than a one-hour period)

AND

RCS pressure and temperature are to the left of line B (200 degrees MTS), Standard Attachment 1, P-T Limits (Note 12)

Note 12: Once PTS limits are first invoked, if RCS temperature and pressure are not brought within the limits within 15 minutes, this threshold is met and an immediate declaration is warranted. This threshold is met immediately upon exceeding the limits after this initial 15 minute period until PTS limits no longer apply.

Definition(s):

None

Basis:

This condition indicates an extreme challenge to the integrity of the RCS pressure boundary due to pressurized thermal shock – a transient that causes rapid RCS cooldown while the RCS is in Mode 3 or higher (i.e., hot and pressurized).

Attachment 1 – Emergency Action Level Technical Bases

Reference(s):

1. OP-1202.012 Repetitive Task 14 Control RCS Pressure
2. OP-1202.013 EOP Figures, Figure 3 RCS Pressure vs Temperature Limits
3. OP-1202.011 HPI Cooldown
4. Calculation No: 90-E-0116-01 ANO- EOP Setpoint Basis Document OP Setpoint P.2, RCS Pressure-Temperature
5. OP-2202.010 Standard Attachments, Attachment 1, P-T Limits
6. NEI 99-01 RCS or SG Tube Leakage Reactor Coolant System Potential Loss 1.B

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Reactor Coolant System

Category: B – Inadequate Heat Removal

Degradation Threat: Loss

Threshold:

None

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Reactor Coolant System

Category: B – Inadequate Heat Removal

Degradation Threat: Potential Loss

Threshold:

RCB4

RCS heat removal **cannot** be established using steam generators

AND

An on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling

Definition(s):

None

Basis:

This condition indicates an extreme challenge to the ability to remove RCS heat using the steam generators (i.e., loss of an effective secondary-side heat sink). This condition represents a potential loss of the RCS Barrier. In accordance with EOPs, there may be unusual accident conditions during which operators intentionally reduce the heat removal capability of the steam generators; during these conditions, classification using this threshold is not warranted.

In combination with Potential Loss FCB4, meeting this threshold results in a Site Area Emergency.

This condition warrants a Site Area Emergency declaration because inadequate RCS heat removal may result in fuel heat-up sufficient to damage the cladding and raise RCS pressure to the point where mass will be lost from the system.

There is no RCS barrier Loss threshold associated with Inadequate Heat Removal.

Reference(s):

1. OP-1202.004 Overheating
2. OP-1202.013 Figure 4, Core Exit Thermocouple for Inadequate Core Cooling
3. OP-2202.006 Loss of Feedwater
4. OP-2202.009 Functional Recovery, Safety Function Status Check 5
5. NEI 99-01 Inadequate Heat Removal RCS Potential Loss 2.B

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Reactor Coolant System

Category: C – CTMT Radiation/ RCS Activity

Degradation Threat: Loss

Threshold:

RCB5

Containment High Range Radiation Monitor RE-8060/8061[2RE-8925-1/8925-2] > 40[50] R/hr

Definition(s):

None

Basis:

NRC Information Notice 97-045, Supplement 1, identifies the potential for erratic indications from the high range radiation monitors (HRRMs) as a result of thermally induced currents (TIC) which may cause the HRRM to read falsely high (for approximately 15 minutes) on a rapid temperature rise, and fail low intermittently on a rapid temperature fall. Because of this phenomenon, any trends or alarms on the HRRM's should be validated by comparison to the containment low range/area radiation monitors and Air Monitoring Systems trends before actions are taken.

The containment radiation monitor reading (42.8[50.4] R/hr rounded to 40[50] R/hr for readability) corresponds to an instantaneous release of all reactor coolant mass into the containment, assuming that reactor coolant activity equals Technical Specification allowable limits. This value is lower than that specified for Fuel Clad Barrier Loss threshold FCB5 since it indicates a loss of the RCS Barrier only.

Note: IF radiation levels reach > 40[50] R/hr, regardless of the loss of reactor coolant mass, the EAL declaration will be made.

There is no Potential Loss threshold associated with CTMT Radiation/RCS Activity.

Reference(s):

1. EP-CALC-ANO-1702 Containment High Range Radiation Monitor EAL Values
2. NEI 99-01 CMT Radiation / RCS Activity RCS Loss 3.A

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Reactor Coolant System

Category: B – CTMT Radiation/ RCS Activity

Degradation Threat: Potential Loss

Threshold:

None

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Reactor Coolant System

Category: D – CTMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

None

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Reactor Coolant System

Category: D – CTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

None

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Reactor Coolant System

Category: E – Emergency Director Judgment

Degradation Threat: Loss

Threshold:

RCB6

Any condition in the opinion of the Emergency Director that indicates loss of the RCS barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the RCS Barrier is lost.

Reference(s):

1. NEI 99-01 Emergency Director Judgment RCS Loss 6.A

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Reactor Coolant System

Category: E – Emergency Director Judgment

Degradation Threat: Potential Loss

Threshold:

RCB7

Any condition in the opinion of the Emergency Director that indicates potential loss of the RCS barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the RCS Barrier is potentially lost. The Emergency Director should also consider whether or not to declare the barrier potentially lost in the event that barrier status cannot be monitored.

Reference(s):

1. NEI 99-01 Emergency Director Judgment RCS Potential Loss 6.A

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Containment

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Loss

Threshold:

CNB1

A S/G that is leaking > 50[44] gpm (excluding normal reductions in RCS inventory) or that is RUPTURED is also FAULTED outside of containment

Definition(s):

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

RUPTURED - The condition of a steam generator in which primary-to-secondary leakage is of sufficient magnitude to require a safety injection (automatic or manual).

Basis:

This threshold addresses a leaking or RUPTURED Steam Generator (SG) that is also FAULTED outside of containment. The condition of the SG, whether leaking or RUPTURED, is determined in accordance with the thresholds for RCS Barrier Potential Loss RCB2 and Loss RCB1, respectively. This condition represents a bypass of the containment barrier.

FAULTED is a defined term within the NEI 99-01 methodology; this determination is not necessarily dependent upon entry into, or diagnostic steps within, an EOP. For example, if the pressure in a steam generator is dropping uncontrollably (part of the FAULTED definition) and the FAULTED steam generator isolation procedure is not entered because EOP user rules are dictating implementation of another procedure to address a higher priority condition, the steam generator is still considered FAULTED for emergency classification purposes.

The FAULTED criterion establishes an appropriate lower bound on the size of a steam release that may require an emergency classification. Steam releases of this size are readily observable with normal Control Room indications. The lower bound for this aspect of the containment barrier is analogous to the lower bound criteria specified in IC SU4 for the fuel clad barrier (i.e., RCS activity values) and IC SU5 for the RCS barrier (i.e., RCS leak rate values).

Attachment 1 – Emergency Action Level Technical Bases

This threshold also applies to prolonged steam releases necessitated by operational considerations such as the forced steaming of a leaking or RUPTURED steam generator directly to atmosphere to cooldown the plant or to drive Emergency Feedwater Pump P-7A[2P-7A]. These conditions may exist when one steam generator is leaking or ruptured, AND the opposite steam generator is also faulted. These types of conditions will result in a significant and sustained release of radioactive steam to the environment (and are thus similar to a FAULTED condition). The inability to isolate the steam flow without an adverse effect on plant cooldown meets the intent of a loss of containment.

Execution of an RCS cooldown to less than 540°F[535°F] Hot Leg temperature using both Atmospheric Dump valves, as directed by emergency operating procedures, does not meet this intent, provided the affected steam generator Atmospheric Dump valve can be closed when isolation of the RUPTURED steam generator is directed at less than 540°F[535°F]. Steaming of Emergency Feedwater Pump P-7A[2P-7A] prior to isolation of the RUPTURED steam generator does not meet this intent, provided the steam supply from the RUPTURED steam generator can be closed when isolation of the RUPTURED steam generator is directed per emergency operating procedures. These short term radiological releases should be evaluated using Category A ICs

Steam releases associated with the expected operation of a SG power operated relief valve or safety relief valve do not meet the intent of this threshold. Such releases may occur intermittently for a short period of time following a reactor trip as operators process through emergency operating procedures to bring the plant to a stable condition and prepare to initiate a plant cooldown. Steam releases associated with the unexpected operation of a valve (e.g., a stuck-open safety valve) do meet this threshold.

Following a SG tube leak or rupture, there may be minor radiological releases through a secondary-side system component (e.g., air ejectors, glad seal exhausters, valve packing, etc.). These types of releases do not constitute a loss or potential loss of containment but should be evaluated using the Recognition Category A ICs.

The ECLs resulting from primary-to-secondary leakage, with or without a steam release from the FAULTED SG, are summarized below.

	Affected SG is FAULTED Outside of Containment?	
P-to-S Leak Rate	**Yes**	**No**
Less than or equal to 25 gpm	No classification	No classification
Greater than 25 gpm	Unusual Event per SU5.1	Unusual Event per SU5.1
Greater than 50[44] gpm (*RCS Barrier Potential Loss*)	Site Area Emergency per FS1.1	Alert per FA1.1

Requires an automatic or manual ESAS[ESFAS] actuation (*RCS Barrier Loss*)	Site Area Emergency per FS1.1	Alert per FA1.1

There is no Potential Loss threshold associated with RCS or S/G Tube Leakage.

Reference(s):

1. NEI 99-01 RCS or SG Tube Leakage Containment Loss 1.A

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Containment

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Potential Loss

Threshold:

None

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Containment

Category: B – Inadequate Heat Removal

Degradation Threat: Loss

Threshold:

None

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Containment

Category: B – Inadequate Heat Removal

Degradation Threat: Potential Loss

Threshold:

CNB2

CETs > 1200°F

AND

Restoration procedures **not** effective within 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Definition(s):

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

Basis:

The restoration procedure is considered “effective” if core exit thermocouple readings are dropping and/or if reactor vessel level is rising. Whether or not the procedure(s) will be effective should be apparent within 15 minutes. The Emergency Director should escalate the emergency classification level as soon as it is determined that the procedure(s) will not be effective.

This condition represents an IMMINENT core melt sequence which, if not corrected, could lead to vessel failure and an increased potential for containment failure. For this condition to occur, there must already have been a loss of the RCS Barrier and the Fuel Clad Barrier. If implementation of a procedure(s) to restore adequate core cooling is not effective (successful) within 15 minutes, it is assumed that the event trajectory will likely lead to core melting and a subsequent challenge of the Containment Barrier.

Severe accident analyses (e.g., NUREG-1150) have concluded that function restoration procedures can arrest core degradation in a significant fraction of core damage scenarios, and that the likelihood of containment failure is very small in these events. Given this, it is appropriate to provide 15 minutes beyond the required entry point to determine if procedural actions can reverse the core melt sequence.

Reference(s):

1. NEI 99-01 Inadequate Heat Removal Containment Potential Loss 2.A

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Containment

Category: C – CTMT Radiation/RCS Activity

Degradation Threat: Loss

Threshold:

None

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Containment

Category: C – CTMT Radiation/RCS Activity

Degradation Threat: Potential Loss

Threshold:

CNB3

Containment High Range Radiation Monitor RE-8060/8061[2RE-8925-1/8925-2]
> 10,000[12,000] R/hr

Definition(s):

None

Basis:

The containment radiation monitor reading (10,300[12,100] R/hr rounded to 10,000[12,000] R/hr for readability) corresponds to an instantaneous release of all reactor coolant mass into the containment, assuming that 20% of the fuel cladding has failed. This level of fuel clad failure is well above that used to determine the analogous Fuel Clad Barrier Loss and RCS Barrier Loss thresholds.

NUREG-1228, Source Estimations During Incident Response to Severe Nuclear Power Plant Accidents, indicates the fuel clad failure must be greater than approximately 20% in order for there to be a major release of radioactivity requiring offsite protective actions. For this condition to exist, there must already have been a loss of the RCS Barrier and the Fuel Clad Barrier. It is therefore prudent to treat this condition as a potential loss of containment which would then escalate the ECL to a General Emergency.

There is no Loss threshold associated with CTMT Radiation/RCS Activity.

Reference(s):

1. EP-CALC-ANO-1702 Containment High Range Radiation Monitor EAL Values
2. NEI 99-01 CTMT Radiation / RCS Activity Containment Potential Loss 3.A

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Containment

Category: D – CTMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

CNB4

Containment isolation is required

AND EITHER:

- Containment integrity has been lost based on Emergency Director judgment
- UNISOLABLE pathway from Containment to the environment exists

Definition(s):

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

Basis:

Failure to isolate the leak (from the Control Room or locally), within 15 minutes or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification.

The status of the containment barrier during an event involving steam generator tube leakage is assessed using Loss Threshold CNB1.

These thresholds address a situation where containment isolation is required and one of two conditions exists as discussed below. Users are reminded that there may be accident and release conditions that simultaneously meet both bulleted thresholds.

First Threshold – Containment integrity has been lost, i.e., the actual containment atmospheric leak rate likely exceeds that associated with allowable leakage (or sometimes referred to as design leakage). Following the release of RCS mass into containment, containment pressure will fluctuate based on a variety of factors; a loss of containment integrity condition may (or may not) be accompanied by a noticeable drop in containment pressure. Recognizing the inherent difficulties in determining a containment leak rate during accident conditions, it is expected that the Emergency Director will assess this threshold using judgment, and with due consideration given to current plant conditions, and available operational and radiological data (e.g., containment pressure, readings on radiation monitors outside containment, operating status of containment pressure control equipment, etc.).

Attachment 1 – Emergency Action Level Technical Bases

Refer to the middle piping run of Figure 1. Two simplified examples are provided. One is leakage from a penetration and the other is leakage from an in-service system valve. Depending upon radiation monitor locations and sensitivities, the leakage could be detected by any of the four monitors depicted in the figure.

Another example would be a loss or potential loss of the RCS barrier, and the simultaneous occurrence of two FAULTED locations on a steam generator where one fault is located inside containment (e.g., on a steam or feedwater line) and the other outside of containment. In this case, the associated steam line provides a pathway for the containment atmosphere to escape to an area outside the containment.

Following the leakage of RCS mass into containment and a rise in containment pressure, there may be minor radiological releases associated with allowable (design) containment leakage through various penetrations or system components. These releases do not constitute a loss or potential loss of containment but should be evaluated using the Recognition Category A ICs.

Second Threshold – Conditions are such that there is an UNISOLABLE pathway for the migration of radioactive material from the containment atmosphere to the environment. As used here, the term “environment” includes the atmosphere of a room or area, outside the containment, that may, in turn, communicate with the outside-the-plant atmosphere (e.g., through discharge of a ventilation system or atmospheric leakage). Depending upon a variety of factors, this condition may or may not be accompanied by a noticeable drop in containment pressure.

Refer to the top piping run of Figure 1. In this simplified example, the inboard and outboard isolation valves remained open after a containment isolation was required (i.e., containment isolation was not successful). There is now an UNISOLABLE pathway from the containment to the environment.

The existence of a filter is not considered in the threshold assessment. Filters do not remove fission product noble gases. In addition, a filter could become ineffective due to iodine and/or particulate loading beyond design limits (i.e., retention ability has been exceeded) or water saturation from steam/high humidity in the release stream.

Leakage between two interfacing liquid systems, by itself, does not meet this threshold.

Refer to the bottom piping run of Figure 1. In this simplified example, leakage in an RCP seal cooler is allowing radioactive material to enter the Auxiliary Building. The radioactivity would be detected by the Process Monitor. If there is no leakage from the closed water cooling system to the Auxiliary Building, then no threshold has been met. If the pump developed a leak that allowed steam/water to enter the Auxiliary Building, then second threshold would be met. Depending upon radiation monitor locations and sensitivities, this leakage could be detected by any of the four monitors depicted in the figure and cause the first threshold to be met as well.

Attachment 1 – Emergency Action Level Technical Bases

Following the leakage of RCS mass into containment and a rise in containment pressure, there may be minor radiological releases associated with allowable containment leakage through various penetrations or system components. Minor releases may also occur if a containment isolation valve(s) fails to close but the containment atmosphere escapes to an enclosed system. These releases do not constitute a loss or potential loss of containment but should be evaluated using the Recognition Category A ICs.

Reference(s):

1. NEI 99-01 CTMT Integrity or Bypass Containment Loss 4.A

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Containment

Category: D – CTMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

CNB5

Indications of RCS leakage outside of Containment

Definition(s):

None

Basis:

To ensure proper escalation of the emergency classification, the RCS leakage outside of containment must be related to the mass loss that is causing the RCS Loss RCB1 and/or Potential Loss RCB2 threshold to be met.

The status of the containment barrier during an event involving steam generator tube leakage is assessed using Containment Loss Threshold CNB1.

Containment sump, temperature, pressure and/or radiation levels will rise if reactor coolant mass is leaking into the containment. If these parameters have not risen, then the reactor coolant mass may be leaking outside of containment (i.e., a containment bypass sequence). Rises in sump, temperature, pressure, flow and/or radiation level readings outside of the containment may indicate that the RCS mass is being lost outside of containment.

Unexpected elevated readings and alarms on radiation monitors with detectors outside containment should be corroborated with other available indications to confirm that the source is a loss of RCS mass outside of containment. If the fuel clad barrier has not been lost, radiation monitor readings outside of containment may not rise significantly; however, other unexpected changes in sump levels, area temperatures or pressures, flow rates, etc. should be sufficient to determine if RCS mass is being lost outside of the containment.

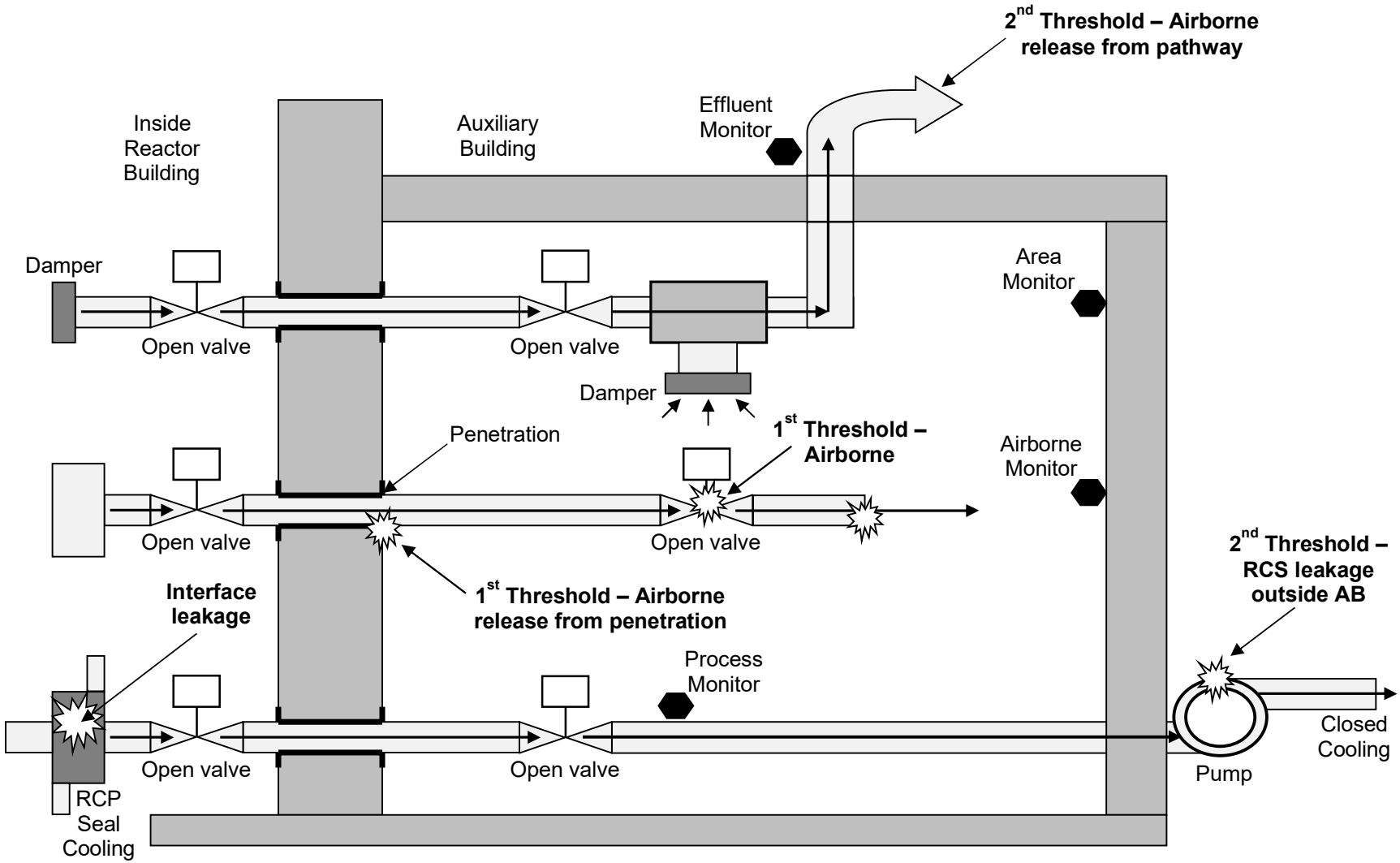
Refer to the middle piping run of Figure 1. In this simplified example, a leak has occurred at a reducer on a pipe carrying reactor coolant in the Auxiliary Building. Depending upon radiation monitor locations and sensitivities, the leakage could be detected by any of the four monitors depicted in the figure and cause threshold CNB4 to be met as well.

Reference(s):

1. NEI 99-01 CTMT Integrity or Bypass Containment Loss 4.B

Attachment 1 – Emergency Action Level Technical Bases

Figure 1: Containment Integrity or Bypass Examples



Attachment 1 – Emergency Action Level Technical Bases

Barrier: Containment

Category: D – CTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

CNB6
Containment pressure > 73.7 psia

Definition(s):

None

Basis:

If containment pressure exceeds the design pressure, there exists a potential to lose the Containment Barrier. To reach this level, there must be an inadequate core cooling condition for an extended period of time; therefore, the RCS and Fuel Clad barriers would already be lost. Thus, this threshold is a discriminator between a Site Area Emergency and General Emergency since there is now a potential to lose the third barrier.

Reference(s):

1. 1SAR 1.4.43 Criterion 50 - Containment Design Basis
2. 2SAR Table 6.2-7 Principle Containment Design Parameters
3. NEI 99-01 CTMT Integrity or Bypass Containment Potential Loss 4.A

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Containment

Category: D – CTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

CNB7

Containment hydrogen concentration > 4%

Definition(s):

None

Basis:

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). The 4% hydrogen concentration is generally considered the lower limit for hydrogen deflagrations. A hydrogen burn will raise containment pressure and could result in collateral equipment damage leading to a loss of containment integrity. It therefore represents a potential loss of the Containment Barrier.

Reference(s):

1. Unit 1 SAMG Figure III-1B
2. Unit 2 SAMG Phase 1 Instructions, Containment Flowchart
3. NEI 99-01 CTMT Integrity or Bypass Containment Potential Loss 4.B

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Containment

Category: D – CTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

CNB8

Containment pressure > 44.7 psia[23.3 psia] with < one full train of containment heat removal systems (Note 9) operating per design for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 9: One full train of containment heat removal systems consists of one train of RB [Containment] Spray and one train of RB [Containment] Cooling System.

Definition(s):

None

Basis:

This threshold describes a condition where containment pressure is greater than the setpoint at which containment energy (heat) removal systems are designed to automatically actuate, and less than one full train of equipment is capable of operating per design. The 15-minute criterion is included to allow operators time to manually start equipment that may not have automatically started, if possible. This threshold represents a potential loss of containment in that containment heat removal/depressurization systems (e.g., containment sprays but not including containment venting strategies) are either lost or performing in a degraded manner.

Reference(s):

1. 1SAR 6.2 Reactor Building Spray System
2. 1SAR 6.3 Reactor Building Cooling System
3. OP-2202.003 Loss of Coolant Accident
4. OP-2202.010 Standard Attachments, Attachment 22
5. 2SAR 6.2.2 Containment Heat Removal Systems
6. 2SAR 7.3.1.1.11.2 Containment Spray System
7. NEI 99-01 CTMT Integrity or Bypass Containment Potential Loss 4.C

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Containment

Category: E – Emergency Director Judgment

Degradation Threat: Loss

Threshold:

CNB9

Any condition in the opinion of the Emergency Director that indicates loss of the Containment barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the Containment Barrier is lost.

Reference(s):

1. NEI 99-01 Emergency Director Judgment Containment Loss 6.A

Attachment 1 – Emergency Action Level Technical Bases

Barrier: Containment

Category: E – Emergency Director Judgment

Degradation Threat: Potential Loss

Threshold:

CNB10

Any condition in the opinion of the Emergency Director that indicates potential loss of the Containment barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the Containment Barrier is potentially lost. The Emergency Director should also consider whether or not to declare the barrier potentially lost in the event that barrier status cannot be monitored.

Reference(s):

1. NEI 99-01 Emergency Director Judgment Containment Potential Loss 6.A

Attachment 1 – Emergency Action Level Technical Bases

Category H – Hazards and Other Conditions Affecting Plant Safety

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

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

1. Security

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

2. Seismic Event

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

3. Natural or Technological Hazard

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

4. Fire

FIRES can pose significant hazards to personnel and reactor safety. Appropriate for classification are FIRES within the plant PROTECTED AREA or which may affect operability of equipment needed for safe shutdown.

5. Hazardous Gas

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

6. Control Room Evacuation

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

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

Attachment 1 – Emergency Action Level Technical Bases

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 ANO 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):

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 ANO 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 ANO. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the SECURITY OWNER CONTROLLED AREA).

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 clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

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 10 CFR 50.2).

Attachment 1 – Emergency Action Level Technical Bases

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.

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

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 and HS1.

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

Security plans and terminology are based on the guidance provided by NEI 03-12, *Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan [and Independent Spent Fuel Storage Installation Security Program]*.

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

The second threshold addresses the receipt of a credible security threat. The credibility of the threat is assessed in accordance with OP-1203.048 Security Event .

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 11-S-82-1 Security Contingency Events (ref. 2).

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 Security Plan for ANO (ref. 1).

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

Reference(s):

1. ANO Security Plan
2. OP-1203.048 Security Event
3. NEI 99-01 HU1

Attachment 1 – Emergency Action Level Technical Bases

Category: H – Hazards

Subcategory: 1 – Security

Initiating Condition: HOSTILE ACTION within the SECURITY OWNER CONTROLLED AREA or airborne attack threat within 30 minutes

EAL:

HA1.1 Alert

A HOSTILE ACTION is occurring or has occurred within the SECURITY OWNER CONTROLLED AREA as reported by ANO 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):

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 ANO 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 ANO. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the SECURITY 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.

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 clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

Attachment 1 – Emergency Action Level Technical Bases

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

Basis:

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

Timely and accurate communications between Security Shift Supervision and the Control Room is essential for proper classification of a security-related event.

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

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

The second threshold addresses the threat from the impact of an aircraft on the plant, and the anticipated arrival time is within 30 minutes. The intent of this EAL is to ensure that threat-related notifications are made in a timely manner so that plant personnel and OROs are in a heightened state of readiness. This EAL is met when the threat-related information has been validated in accordance with OP-1203.048 Security Event (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.

Attachment 1 – Emergency Action Level Technical Bases

In some cases, it may not be readily apparent if an aircraft impact within the SECURITY 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 Security Plan for ANO (ref. 1).

Escalation of the emergency classification level would be via IC HS1.

Reference(s):

1. ANO Security Plan
2. OP-1203.048 Security Event
3. NEI 99-01 HA1

Attachment 1 – Emergency Action Level Technical Bases

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 ANO Security Shift Supervision

Mode Applicability:

All

Definition(s):

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 ANO 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 ANO. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the SECURITY 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.

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 clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

Attachment 1 – Emergency Action Level Technical Bases

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. 1, 2).

Security plans and terminology are based on the guidance provided by NEI 03-12, *Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan [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 EAL 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 Security Plan for ANO (ref. 1).

Reference(s):

1. ANO Security Plan
2. OP-1203.048 Security Event
3. NEI 99-01 HS1

Attachment 1 – Emergency Action Level Technical Bases

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 annunciation of the 0.10 g acceleration alarm

Mode Applicability:

All

Definition(s):

None

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 Design Basis Earthquake (DBE) 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 0.1g). The Shift Manager or Emergency Director 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.

Two strong motion triaxial accelerometers, ACS-8001 and ACS-8003, located at the base slab provide alarms to the Unit 1 control room via the seismic network control center, C529-NCC. One alarm from C529-NCC is triggered when a setpoint of 0.01g has been exceeded. This alarm indicates that an earthquake has occurred and the seismic monitoring system is recording seismic data. Another alarm from C529-NCC is triggered when the pre-determined value of 0.1g, indicating the OBE has been exceeded (ref. 2, 3).

Attachment 1 – Emergency Action Level Technical Bases

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 (NEIC)) 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. If requested, provide the analyst with the following ANO coordinates: **35º 18' 36" north latitude, 93º 13' 53" west longitude** (ref. 4). Alternatively, near real-time seismic activity can be accessed via the NEIC website:

Reference(s):

1. 1SAR 2.2.1 Location
2. 1SAR 2.7.2 Site Seismic Evaluation
3. 1SAR 2.7.6 Time-History Accelerograph
4. OP-1203.025 Natural Emergencies
5. OP-2203.008 Natural Emergencies
6. NEI 99-01 HU2

Attachment 1 – Emergency Action Level Technical 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 clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

Basis:

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

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

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

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.

Reference(s):

1. OP-1203.025 Natural Emergencies
2. OP-2203.008 Natural Emergencies
3. NEI 99-01 HU3

Attachment 1 – Emergency Action Level Technical Bases

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 required by Technical Specifications for the current operating mode

Mode Applicability:

All

Definition(s):

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

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10 CFR 50.2).

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

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

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

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

Basis:

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

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

Attachment 1 – Emergency Action Level Technical Bases

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

Refer to EAL CA6.1 or SA9.1 for internal FLOODING affecting more than one SAFETY SYSTEM train.

Reference(s):

1. OP-1203.025 Natural Emergencies
2. OP-2203.008 Natural Emergencies
3. NEI 99-01 HU3

Attachment 1 – Emergency Action Level Technical 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 event external to the PROTECTED AREA 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 clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

Basis:

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

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

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

Reference(s):

1. NEI 99-01 HU3

Attachment 1 – Emergency Action Level Technical Bases

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):

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.

Basis:

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

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

This EAL is not intended 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.

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

Reference(s):

1. NEI 99-01 HU3

Attachment 1 – Emergency Action Level Technical 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 (Note 13)
- Field verification of a single fire alarm

AND

The FIRE is located within **any** Table 1[2]H-1 area

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 13 Bullet 2 of this EAL (multiple fire alarm indications) is not applicable for LOCAs or MSL breaks in containment.

Attachment 1 – Emergency Action Level Technical Bases

Table 1H-1 Unit 1 Fire Areas

Reactor Building

All elevations

Auxiliary Building

All elevations including: Penthouse/MSIV Room

Exceptions:

Boric Acid Mix Tank Room (Chem Add Area), 404' (157-B), EDG Exhaust Fan area on 386' (1-E and 2-E)

Turbine Building

All elevations on the west side of Turbine Building and including: Pipechase under ICW Coolers, CRD Pump Pit/T-28 Room/Area under ICW Pumps

372' Elevation from non-vital switchgear area to Auxiliary Building wall at DR 56

Outside Areas

Manholes adjacent to Startup #2 XFMR (MH-03/MH-04)

Manholes adjacent to Intake Structure (MH-05/MH-06)

Intake Structure (354' and 366')

Diesel Fuel Vault

Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

Table 2H-1 Unit 2 Fire Areas

Reactor Building

All elevations

Auxiliary Building

All elevations including: MG Set Room, UNEPR, LNEPR, 2B-53 Room

Auxiliary Building Extension

MSIV Room

Turbine Building

All elevations on the west side of Turbine Building and 372' Elevation from non-vital switchgear area to Auxiliary Building wall at DR 340

Outside Areas

Intake Structure (354' and 366')

Concrete Manhole East, NE of intake (2MH-01)

Concrete Manhole East of Turbine Building next to train bay (2MH-03)

Diesel Fuel Vault

Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

Attachment 1 – Emergency Action Level Technical Bases

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.

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

Basis:

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.

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.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via EAL CA6.1 or SA9.1.

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

Table 1[2]H-1 Fire Areas are those areas that contain equipment necessary for safe operation and shutdown of the plant (ref. 1, 2).

Reference(s):

1. OP-1203.049 Fires in Areas Affecting Safe Shutdown
2. OP- 2203.049 Fires in Areas Affecting Safe Shutdown
3. NEI 99-01 HU4

Attachment 1 – Emergency Action Level Technical 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:

HU4.2 Unusual Event

Receipt of a single fire alarm (i.e., **no** other indications of a FIRE) (Note 14)

AND

The fire alarm is indicating a FIRE within **any** Table 1[2]H-1 area

AND

The existence of a FIRE is **not** verified (i.e., proved or disproved) within 30 min. of alarm receipt (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 14: During Modes 1 and 2, HU4.2 is not applicable to a single fire alarm in the Reactor Building.

Table 1H-1 Unit 1 Fire Areas

Reactor Building

All elevations

Auxiliary Building

All elevations including: Penthouse/MSIV Room

Exceptions:

Boric Acid Mix Tank Room (Chem Add Area), 404' (157-B), EDG Exhaust Fan area on 386' (1-E and 2-E)

Turbine Building

All elevations on the west side of Turbine Building and including: Pipechase under ICW Coolers, CRD Pump Pit/T-28 Room/Area under ICW Pumps

372' Elevation from non-vital switchgear area to Auxiliary Building wall at DR 56

Outside Areas

Manholes adjacent to Startup #2 XFMR (MH-03/MH-04)

Manholes adjacent to Intake Structure (MH-05/MH-06)

Intake Structure (354' and 366')

Diesel Fuel Vault

Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

Table 2H-1 Unit 2 Fire Areas
Reactor Building **All** elevations
Auxiliary Building **All** elevations including: MG Set Room, UNEPR, LNEPR, 2B-53 Room
Auxiliary Building Extension MSIV Room
Turbine Building All elevations on the west side of Turbine Building and 372' Elevation from non-vital switchgear area to Auxiliary Building wall at DR 340
Outside Areas Intake Structure (354' and 366') Concrete Manhole East, NE of intake (2MH-01) Concrete Manhole East of Turbine Building next to train bay (2MH-03) Diesel Fuel Vault Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

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.

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

Basis:

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.

Attachment 1 – Emergency Action Level Technical Bases

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.

This EAL is not applicable for the Reactor Building in Modes 1 and 2. The Reactor Building air flow design and Technical Specification requirements for operation of Reactor Building Fan Coolers are such that multiple smoke detectors would be expected to alarm for a fire in the Reactor Building. A fire in the Reactor Building in these modes would therefore be classified under EAL HU4.1.

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

Basis-Related Fire Protection Requirements

Criterion 3 of 10 CFR 50, Appendix A, states, in part:

> "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."

In this respect, noncombustible and heat resistant materials are used wherever practical throughout the unit, particularly in locations such as the containment and Control Room. Fire detection and fighting systems of appropriate capacity and capability are provided and designed to minimize the adverse effects of fires on SSCs important to safety. Firefighting systems are designed to assure that the rupture or inadvertent operation of a fire system does not significantly impair the safety capability of these structures, systems, and components.

In addition, the use of 1-hour fire barriers for the enclosure of cable and equipment and associated non-safety circuits of one redundant train is employed. As used in HU4.2, 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 EAL CA6.1 or SA9.1.

Attachment 1 – Emergency Action Level Technical Bases

The 30-minute requirement begins upon receipt of a single VALID fire detection system alarm. The alarm is to be validated using available Control Room indications or alarms to prove that it is not spurious, or by reports from the field. Actual field reports must be made within the 30-minute time limit or a classification must be made. If a fire is verified to be occurring by field report, classification shall be made based on EAL HU4.1, with the 15-minute requirement beginning with the verification of the fire by field report.

Table 1[2]H-1 Fire Areas are those areas that contain equipment necessary for safe operation and shutdown of the plant (ref. 1, 2).

Reference(s):

1. OP-1203.049 Fires in Areas Affecting Safe Shutdown
2. OP- 2203.049 Fires in Areas Affecting Safe Shutdown
3. NEI 99-01 HU4

Attachment 1 – Emergency Action Level Technical 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:

HU4.3 Unusual Event

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

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

All

Definition(s):

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

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

Basis:

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

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

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via EAL CA6.1 or SA9.1.

Reference(s):

1. NEI 99-01 HU4

Attachment 1 – Emergency Action Level Technical 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:

HU4.4 Unusual Event

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

Mode Applicability:

All

Definition(s):

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

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

Basis:

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

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

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via EAL CA6.1 or SA9.1.

Reference(s):

1. NEI 99-01 HU4

Attachment 1 – Emergency Action Level Technical Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 5 – Hazardous Gas

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

EAL:

HA5.1 Alert

Release of a toxic, corrosive, asphyxiant or flammable gas into **any** Table 1[2]H-2 room or area

AND

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

Note 5: If the equipment in the listed room or area was already inoperable or out-of-service before the event occurred, then **no** emergency classification is warranted.

Table 1H-2 Unit 1 Safe Operation & Shutdown Rooms/Areas	
Room/Area	**Mode**
A-4 Switchgear Room	3, 4
Upper North Electrical Penetration Room	3, 4
Lower South Electrical Equipment Room	3, 4

Table 2H-2 Unit 2 Safe Operation & Shutdown Rooms/Areas	
Room/Area	**Mode**
Aux Building 317’ Emergency Core Cooling Rooms	3, 4
Aux Building 317’ Tendon Gallery Access	3, 4
Aux Building 335’ Charging Pumps / MCC 2B-52	3, 4
Aux Building 354’ MCC 2B-62 Area	3, 4
Emergency Diesel Generator Corridor	3, 4
Lower South Piping Penetration Room	3, 4
Aux Building 386’ Containment Hatch	3, 4

Attachment 1 – Emergency Action Level Technical Bases

Mode Applicability:

3 – Hot Standby, 4 – Hot Shutdown

Definition(s):

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

Basis:

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

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

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

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

- The plant is in an operating mode different than the mode specified for the affected room/area (i.e., entry is not required during the operating mode in effect at the time of the gaseous release). For example, the plant is in Mode 1 when the gaseous release occurs, and the procedures used for normal operation, cooldown and shutdown do not require entry into the affected room until Mode 4.

- The gas release is a planned activity that includes compensatory measures which address the temporary inaccessibility of a room or area (e.g., fire suppression system testing).

- The access control measures are of a conservative or precautionary nature, and would not actually prevent or IMPEDE a required action.

- If the equipment in the listed room or area was already inoperable, or out-of-service, before the event occurred, then no emergency should be declared since the event will

have no adverse impact beyond that already allowed by Technical Specifications at the time of the event.

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

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

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).

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

EAL HA5.1 mode applicability has been limited to the mode limitations of Table 1[2]H-2 (Modes 3 and 4 **only**).

Reference(s):

1. Attachment 2 Safe Operation & Shutdown Areas Tables 1[2]A-3 & 1[2]H-2 Bases
2. NEI 99-01 HA5

Attachment 1 – Emergency Action Level Technical Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 6 – Control Room Evacuation

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

EAL:

HA6.1 Alert

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

Mode Applicability:

All

Definition(s):

None

Basis:

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

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

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

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

Reference(s):

1. OP-1203.002 Alternate Shutdown
2. OP-2203.014 Alternate Shutdown
3. NEI 99-01 HA6

Attachment 1 – Emergency Action Level Technical Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 6 – Control Room Evacuation

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

EAL:

HS6.1 Site Area Emergency

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

AND

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

- Reactivity (Modes 1, 2 and 3 **only**)
- Core cooling
- RCS heat removal

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

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

Definition(s):

None

Basis:

This IC addresses an evacuation of the Control Room that results in transfer of plant control to alternate locations, and the control of a key safety function cannot be reestablished in a timely manner. The failure to gain control of a key safety function following a transfer of plant control to alternate locations is a precursor to a challenge to one or more fission product barriers within a relatively short period of time.

The determination of whether or not “control” is established at the remote safe shutdown location(s) is based on Emergency Director judgment. The Emergency Director is expected to make a reasonable, informed judgment within 15 minutes whether or not the operating staff has control of key safety functions from the remote safe shutdown location(s).

Attachment 1 – Emergency Action Level Technical Bases

Transfer of plant control and the time period to establish control begins when the last licensed operator leaves the Control Room.

Escalation of the emergency classification level would be via IC FG1 or CG1

Reference(s):

1. OP-1203.002 Alternate Shutdown
2. OP-2203.014 Alternate Shutdown
3. NEI 99-01 HS6

Attachment 1 – Emergency Action Level Technical Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Director Judgment

Initiating Condition: Other conditions exist that in the judgment of the Emergency Director warrant declaration of a UE

EAL:

HU7.1 Unusual Event

Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. **No** releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of SAFETY SYSTEMS occurs.

Mode Applicability:

All

Definition(s):

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10 CFR 50.2).

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

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

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

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

Basis:

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for an UNUSUAL EVENT.

Reference(s):

1. NEI 99-01 HU7

Attachment 1 – Emergency Action Level Technical Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Director Judgment

Initiating Condition: Other conditions exist that in the judgment of the Emergency Director warrant declaration of an ALERT

EAL:

HA7.1 Alert

Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. **Any** releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.

Mode Applicability:

All

Definition(s):

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 ANO 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 ANO. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the SECURITY OWNER CONTROLLED AREA).

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 clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

Attachment 1 – Emergency Action Level Technical Bases

Basis:

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for an ALERT.

Reference(s):

1. NEI 99-01 HA7

Attachment 1 – Emergency Action Level Technical Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Director Judgment

Initiating Condition: Other conditions exist that in the judgment of the Emergency Director warrant declaration of a SITE AREA EMERGENCY

EAL:

HS7.1 Site Area Emergency

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

Mode Applicability:

All

Definition(s):

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 ANO 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 ANO. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the SECURITY OWNER CONTROLLED AREA).

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 clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

SITE BOUNDARY - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

Attachment 1 – Emergency Action Level Technical Bases

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

Basis:

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for a SITE AREA EMERGENCY.

Reference(s):

1. NEI 99-01 HS7

Attachment 1 – Emergency Action Level Technical Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Director Judgment

Initiating Condition: Other conditions exist that in the judgment of the Emergency Director warrant declaration of a GENERAL EMERGENCY

EAL:

HG7.1 General Emergency

Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.

Mode Applicability:

All

Definition(s):

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 ANO 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 ANO. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the SECURITY 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.

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 clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

Attachment 1 – Emergency Action Level Technical Bases

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

Basis:

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for a GENERAL EMERGENCY.

Reference(s):

1. NEI 99-01 HG7

Attachment 1 – Emergency Action Level Technical Bases

Category S – System Malfunction

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

Numerous system-related equipment failure events that warrant emergency classification have been identified in this category. They may pose actual or potential threats to plant safety.

The events of this category pertain to the following subcategories:

1. Loss of Vital AC Power

Loss of vital electrical power can compromise plant SAFETY SYSTEM operability including decay heat removal and emergency core cooling systems which may be necessary to ensure fission product barrier integrity. This category includes loss of onsite and offsite sources for vital 4.16 KV buses.

2. Loss of Vital DC Power

Loss of emergency electrical power can compromise plant SAFETY SYSTEM operability including decay heat removal and emergency core cooling systems which may be necessary to ensure fission product barrier integrity. This category includes loss of vital plant 125V DC power sources.

3. Loss of Control Room Indications

Certain events that degrade plant operator ability to effectively assess plant conditions within the plant warrant emergency classification. Losses of indicators are in this subcategory.

4. RCS Activity

During normal operation, reactor coolant fission product activity is very low. Small concentrations of fission products in the coolant are primarily from the fission of tramp uranium in the fuel clad or minor perforations in the clad itself. Any significant rise from these base-line levels (2% - 5% clad failures) is indicative of fuel failures and is covered under the Fission Product Barrier Degradation category. However, lesser amounts of clad damage may result in coolant activity exceeding Technical Specification limits. These fission products will be circulated with the reactor coolant and can be detected by coolant sampling.

5. RCS Leakage

The reactor vessel provides a volume for the coolant that covers the reactor core. The reactor pressure vessel and associated pressure piping (reactor coolant system) together provide a barrier to limit the release of radioactive material should the reactor fuel clad integrity fail. Excessive RCS leakage greater than Technical Specification limits indicates potential pipe cracks that may propagate to an extent threatening fuel clad, RCS and containment integrity.

6. RPS Failure

This subcategory includes events related to failure of the Reactor Protection System (RPS) to initiate and complete reactor trips. In the plant licensing basis, postulated failures of the RPS to complete a reactor trip comprise a specific set of analyzed events referred to as Anticipated Transient Without Scram (ATWS) events. For EAL classification, however, ATWS is intended to mean any trip failure event that does not achieve reactor shutdown. If RPS actuation fails to assure reactor shutdown, positive control of reactivity is at risk and could cause a threat to fuel clad, RCS and containment integrity.

7. Loss of Communications

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

8. Containment Failure

Failure of containment isolation capability (under conditions in which the containment is not currently challenged) warrants emergency classification. Failure of containment pressure control capability also warrants emergency classification.

9. Hazardous Event Affecting Safety Systems

Various natural and technological events that result in degraded plant safety system performance or significant VISIBLE DAMAGE warrant emergency classification under this subcategory.

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 1 – Loss of Vital AC Power

Initiating Condition: Loss of **all** offsite AC power capability to vital buses for 15 minutes or longer

EAL:

SU1.1 Unusual Event

Loss of **all** offsite AC power capability, Table 1[2]S-1, to vital 4.16 KV buses A3[2A3] and A4[2A4] for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1S-1 Unit 1 AC Power Sources

Offsite

- Startup Transformer No. 1
- Startup Transformer No. 2
- Unit Auxiliary Transformer (from 22 KV switchyard)

Onsite

- Unit Auxiliary Transformer (main generator via main transformer)
- DG1
- DG2
- AAC Gen

Attachment 1 – Emergency Action Level Technical Bases

Table 2S-1 Unit 2 AC Power Sources
Offsite • Startup Transformer No. 3 • Startup Transformer No. 2 • Unit Auxiliary Transformer (from 22 KV switchyard) **Onsite** • Unit Auxiliary Transformer (main generator via main transformer) • 2DG1 • 2DG2 • AAC Gen

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 – Hot Shutdown

Definition(s):

None

Basis:

This IC addresses a prolonged loss of offsite power. The loss of offsite power sources renders the plant more vulnerable to a complete loss of power to AC vital buses. This condition represents a potential reduction in the level of safety of the plant.

For emergency classification purposes, “capability” means that an offsite AC power source(s) is available to the vital buses, whether or not the buses are powered from it.

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

Escalation of the emergency classification level would be via IC SA1.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations

5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. NEI 99-01 SU1

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 1 – Loss of Vital AC Power

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

EAL:

SA1.1 Alert

AC power capability, Table 1[2]S-1, to vital 4.16 KV buses A3[2A3] and A4[2A4] reduced to a single power source for ≥ 15 min. (Note 1)

AND

Any additional single power source failure will result in loss of **all** AC power to SAFETY SYSTEMS

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1S-1 Unit 1 AC Power Sources

Offsite

- Startup Transformer No. 1
- Startup Transformer No. 2
- Unit Auxiliary Transformer (from 22 KV switchyard)

Onsite

- Unit Auxiliary Transformer (main generator via main transformer)
- DG1
- DG2
- AAC Gen

Attachment 1 – Emergency Action Level Technical Bases

Table 2S-1 Unit 2 AC Power Sources
Offsite • Startup Transformer No. 3 • Startup Transformer No. 2 • Unit Auxiliary Transformer (from 22 KV switchyard) **Onsite** • Unit Auxiliary Transformer (main generator via main transformer) • 2DG1 • 2DG2 • AAC Gen

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 – Hot Shutdown

Definition(s):

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10 CFR 50.2).

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

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

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

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

Basis:

This IC describes a significant degradation of offsite and onsite AC power sources such that any additional single failure would result in a loss of all AC power to SAFETY SYSTEMS. In this condition, the sole AC power source may be powering one, or more than one, train of safety-related equipment. This IC provides an escalation path from IC SU1.

Attachment 1 – Emergency Action Level Technical Bases

An “AC power source” is a source recognized in AOPs and EOPs, and capable of supplying required power to a vital 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 vital power sources (e.g., onsite diesel generators) with a single train of vital buses being back-fed from the unit main generator.
- A loss of vital power sources (e.g., onsite diesel generators) with a single train of vital buses being back-fed from an offsite power source.

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

Escalation of the emergency classification level would be via IC SS1.

This EAL is the hot condition equivalent of the cold condition EAL CU2.1.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations
5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. NEI 99-01 SA1

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 1 – Loss of Vital AC Power

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

EAL:

SS1.1 Site Area Emergency

Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3[2A3] and A4[2A4] for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 – Hot Shutdown

Definition(s):

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10 CFR 50.2).

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

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

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

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

Basis:

Although the AAC may be considered available, it will not prevent declaration of this EAL unless it is powering a vital bus within the 15 minute time period of the EAL.

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. Mitigative strategies using non-safety related power sources (FLEX generators, etc.) may be effective in supplying power to these buses. These power sources must be controlled in accordance with abnormal or emergency operating procedures, or beyond design basis

accident response guidelines (e.g., FLEX support guidelines) and must be capable (alone or in combination) of supplying power for long term decay heat removal systems. In addition, fission product barrier monitoring capabilities may be degraded under these conditions. This IC represents a condition that involves actual or likely major failures of plant functions needed for the protection of the public.

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

Escalation of the emergency classification level would be via IC AG1, FG1 or SG1.

This EAL is the hot condition equivalent of the cold condition EAL CA2.1.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations
5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. NEI 99-01 SS1

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 1 – Loss of Vital AC Power

Initiating Condition: Prolonged loss of **all** offsite and **all** onsite AC power to vital buses

EAL:

SG1.1 General Emergency

Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3[2A3] and A4[2A4]

AND EITHER:

- Restoration of at least one vital 4.16 KV bus in < 4 hours is **not** likely (Note 1)
- CETs > 1200°F

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 – Hot Shutdown

Definition(s):

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10 CFR 50.2).

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

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

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

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

Basis:

This IC addresses a prolonged loss of all power sources to AC vital buses. A loss of all AC power compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink. Mitigative strategies using non-safety related power sources (FLEX generators, etc.) may be effective in supplying power to these buses. These power sources must be controlled in accordance with abnormal or emergency operating procedures, or beyond design basis accident response guidelines (e.g.,

Attachment 1 – Emergency Action Level Technical Bases

FLEX support guidelines) and must be capable (alone or in combination) of supplying power for long term decay heat removal systems. A prolonged loss of these buses will lead to a loss of one or more fission product barriers. In addition, fission product barrier monitoring capabilities may be degraded under these conditions.

The EAL should require declaration of a General Emergency prior to meeting the thresholds for IC FG1. This will allow additional time for implementation of offsite protective actions.

Escalation of the emergency classification from Site Area Emergency will occur if it is projected that power cannot be restored to at least one AC vital bus by the end of the analyzed station blackout coping period. Beyond this time, plant responses and event trajectory are subject to greater uncertainty, and there is a greater likelihood of challenges to multiple fission product barriers. 4 hours is the site-specific SBO coping analysis time (ref. 4, 5).

The estimate for restoring at least one vital bus should be based on a realistic appraisal of the situation. Mitigation actions with a low probability of success should not be used as a basis for delaying a classification upgrade. The goal is to maximize the time available to prepare for, and implement, protective actions for the public.

The EAL will also require a General Emergency declaration if the loss of AC power results in parameters that indicate an inability to adequately remove decay heat from the core.

Reference(s):

1. OP-1202.005 Inadequate Core Cooling
2. OP-2202.009 Functional Recovery
3. OP-2202.011 Lower Mode Functional Recovery
4. Unit 1 Calculation 85-E-0072-02 Time from Loss of All AC Power to Loss of Subcooling
5. Unit 2 Calculation 85-E-0072-01 Time from Loss of All AC Power to Loss of Subcooling
6. 1SAR Figure 8-1 Station Single Line Diagram
7. OP-1202.007 Degraded Power
8. OP-1202.008 Blackout
9. OP-2104.037 Alternate AC Diesel Generator Operations
10. 2SAR Figure 8.3-1 Station Single Line Diagram
11. OP-2202.007 Loss of Off-Site Power
12. OP-2202.008 Station Blackout
13. OP-2107.006 Backfeed of Unit Auxiliary Transformer
14. NEI 99-01 SG1

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 1 – Loss of Vital AC Power

Initiating Condition: Loss of **all** vital AC and vital DC power sources for 15 minutes or longer

EAL:

SG1.2 General Emergency

Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3[2A3] and A4[2A4] for ≥ 15 min. (Note 1)

AND

Indicated voltage is < 105 VDC on D01[2D01] and D02[2D02] vital 125 VDC buses for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 – Hot Shutdown

Definition(s):

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10 CFR 50.2).

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

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

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

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

Basis:

Unit 1 batteries D06 and D07 and Unit 2 batteries 2D11 and 2D12 contain 58 cells each with a minimum cell voltage of 1.81 V or 105 VDC (ref. 9, 10).

This IC addresses a concurrent and prolonged loss of both vital AC and Vital DC power. A loss of all vital AC power compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat

removal/pressure control, spent fuel heat removal and the ultimate heat sink. Mitigative strategies using non-safety related power sources (FLEX generators, etc.) may be effective in supplying power to these buses. These power sources must be controlled in accordance with abnormal or emergency operating procedures, or beyond design basis accident response guidelines (e.g., FLEX support guidelines) and must be capable (alone or in combination) of supplying power for long term decay heat removal systems. A loss of vital DC power compromises the ability to monitor and control SAFETY SYSTEMS. A sustained loss of both vital AC and vital DC power will lead to multiple challenges to fission product barriers.

Fifteen minutes was selected as a threshold to exclude transient or momentary power losses. The 15-minute emergency declaration clock begins at the point when both EAL thresholds are met.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations
5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. 1SAR 8.3.2.1.1 Batteries
10. 2SAR 8.3.2.1.1 Batteries
11. OP-1203.036 Loss of 125V DC
12. OP-2203.037 Loss of 125V DC
13. 2SAR Figure 8.3-6 Low Voltage Safety System Power Supplies
14. NEI 99-01 SG8

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 2 – Loss of Vital DC Power

Initiating Condition: Loss of **all** vital DC power for 15 minutes or longer

EAL:

SS2.1 Site Area Emergency

Indicated voltage is < 105 VDC on D01[2D01] and D02[2D02] vital 125 VDC buses for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10 CFR 50.2).

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

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

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

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

Basis:

Unit 1 batteries D06 and D07 and Unit 2 batteries 2D11 and 2D12 contain 58 cells each with a minimum cell voltage of 1.81 V or 105 VDC (ref. 2, 3).

This IC addresses a loss of vital DC power which compromises the ability to monitor and control SAFETY SYSTEMS. In modes above Cold Shutdown, this condition involves a major failure of plant functions needed for the protection of the public.

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

Escalation of the emergency classification level would be via IC AG1, FG1 or SG1.

This EAL is the hot condition equivalent of the cold condition EAL CU4.1.

Attachment 1 – Emergency Action Level Technical Bases

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. 1SAR 8.3.2.1.1 Batteries
3. 2SAR 8.3.2.1.1 Batteries
4. OP-1203.036 Loss of 125V DC
5. OP-2203.037 Loss of 125V DC
6. 2SAR Figure 8.3-6 Low Voltage Safety System Power Supplies
7. NEI 99-01 SS8

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 3 – Loss of Control Room Indications

Initiating Condition: UNPLANNED loss of Control Room indications for 15 minutes or longer

EAL:

SU3.1 Unusual Event

An UNPLANNED event results in the inability to monitor one or more Table 1[2]S-2 parameters from within the Control Room for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1[2]S-2 Safety System Parameters

- Reactor power
- RCS level
- RCS pressure
- CET temperature
- Level in at least one S/G
- EFW flow to at least one S/G

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10 CFR 50.2).

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.

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

Basis:

This IC addresses the difficulty associated with monitoring normal plant conditions without the ability to obtain SAFETY SYSTEM parameters from within the Control Room. This condition is a precursor to a more significant event and represents a potential degradation in the level of safety of the plant.

As used in this EAL, an “inability to monitor” means that values for one or more of the listed parameters cannot be determined from within the Control Room. This situation would require a loss of all of the Control Room sources for the given parameter(s). For example, the reactor power level cannot be determined from any analog, digital and recorder source within the Control Room.

An event involving a loss of plant indications, annunciators and/or display systems is evaluated in accordance with 10 CFR 50.72 (and associated guidance in NUREG-1022) to determine if an NRC event report is required. The event would be reported if it significantly impaired the capability to perform emergency assessments. In particular, emergency assessments necessary to implement abnormal operating procedures, emergency operating procedures, and emergency plan implementing procedures addressing emergency classification, accident assessment, or protective action decision-making.

This EAL is focused on a selected subset of plant parameters associated with the key safety functions of reactivity control, core cooling and RCS heat removal. The loss of the ability to determine one or more of these parameters from within the Control Room is considered to be more significant than simply a reportable condition. In addition, if all indication sources for one or more of the listed parameters are lost, then the ability to determine the values of other SAFETY SYSTEM parameters may be impacted as well. For example, if the value for reactor vessel level cannot be determined from the indications and recorders on a main control board, the SPDS or the plant computer, the availability of other parameter values may be compromised as well.

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

Escalation of the emergency classification level would be via EAL SA3.1.

Reference(s):

1. 1SAR 7.5 Safety-Related Display Instrumentation
2. 2SAR 7.5 Safety-Related Display Instrumentation
3. NEI 99-01 SU2

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 3 – Loss of Control Room Indications

Initiating Condition: UNPLANNED loss of Control Room indications for 15 minutes or longer with a significant transient in progress

EAL:

SA3.1 Alert

An UNPLANNED event results in the inability to monitor **one or more** Table 1[2]S-2 parameters from within the Control Room for ≥ 15 min. (Note 1)

AND

Any significant transient is in progress, Table 1[2]S-3

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1[2]S-2 Safety System Parameters
• Reactor power • RCS level • RCS pressure • CET temperature • Level in at least one S/G • EFW flow to at least one S/G

Table 1[2]S-3 Significant Transients
• Reactor trip • Runback > 25% thermal power • Electrical load rejection > 25% electrical load • Safety injection actuation

Attachment 1 – Emergency Action Level Technical Bases

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10 CFR 50.2):

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.

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

Basis:

This IC addresses the difficulty associated with monitoring rapidly changing plant conditions during a transient without the ability to obtain SAFETY SYSTEM parameters from within the Control Room. During this condition, the margin to a potential fission product barrier challenge is reduced. It thus represents a potential substantial degradation in the level of safety of the plant.

As used in this EAL, an “inability to monitor” means that values for one or more of the listed parameters cannot be determined from within the Control Room. This situation would require a loss of all of the Control Room sources for the given parameter(s). For example, the reactor power level cannot be determined from any analog, digital and recorder source within the Control Room.

An event involving a loss of plant indications, annunciators and/or display systems is evaluated in accordance with 10 CFR 50.72 (and associated guidance in NUREG-1022) to determine if an NRC event report is required. The event would be reported if it significantly impaired the capability to perform emergency assessments. In particular, emergency assessments necessary to implement abnormal operating procedures, emergency operating procedures, and emergency plan implementing procedures addressing emergency classification, accident assessment, or protective action decision-making.

This EAL is focused on a selected subset of plant parameters associated with the key safety functions of reactivity control, core cooling and RCS heat removal. The loss of the ability to determine one or more of these parameters from within the Control Room is considered to be

more significant than simply a reportable condition. In addition, if all indication sources for one or more of the listed parameters are lost, then the ability to determine the values of other SAFETY SYSTEM parameters may be impacted as well. For example, if the value for reactor vessel level cannot be determined from the indications and recorders on a main control board, the SPDS or the plant computer, the availability of other parameter values may be compromised as well.

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

Escalation of the emergency classification level would be via IC FS1 or AS1.

Reference(s):

1. 1SAR 7.1.3 Engineered Safeguards Actuation System
2. 2SAR 7.3 Engineered Safety Features Systems
3. NEI 99-01 SA2

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 4 – RCS Activity

Initiating Condition: RCS activity greater than Technical Specification allowable limits

EAL:

SU4.1 Unusual Event

Failed Fuel Iodine radiation monitor RI-1237S[2RITS-4806B] > 9.0 E5 cpm

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

This IC addresses a reactor coolant activity value that exceeds an allowable limit specified in Technical Specifications. This condition is a precursor to a more significant event and represents a potential degradation of the level of safety of the plant.

Escalation of the emergency classification level would be via IC FA1 or the Recognition Category A ICs.

Unit 1 RE-1237S, Failed Fuel Monitor, is in the letdown system to monitor the letdown line for evidence of fuel damage.

Unit 2 specific activity monitor 2RITS-4806B monitors the Letdown fluid for the presence of Iodine-131.

A monitor reading corresponding to the instantaneous dose equivalent I-131 value of 60 uCi/gm is determined by multiplying by 30 the monitor reading listed in the table in OP-1203.019[OP-2203.020] that represents a projected 2.0 uCi/gm I-131 RCS activity(ref. 2, 5). This yields values of 3.1E6 cpm for Unit 1 and 3.9E6 cpm for Unit 2. The top of scale of the monitor is 1E6. The EAL value is set at 9.0 E5 cpm for both units which is 90% of the top of the scale.

Attachment 1 – Emergency Action Level Technical Bases

Reference(s):

1. 1SAR Table 11-7
2. OP-1203-019 High Activity in Reactor Coolant
3. Unit 1 Technical Specifications LCO 3.4.12 RCS Specific Activity
4. 2SAR 9.3.5 Failed Fuel Detection System
5. OP-2203.020 High Activity in RCS
6. OP- 2203.012L ANNUNCIATOR 2K12 CORRECTIVE ACTION, A-1
7. Unit 2 Technical Specifications LCO 3.4.8 Reactor Coolant System Specific Activity
8. NEI 99-01 SU3

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 4 – RCS Activity

Initiating Condition: RCS activity greater than Technical Specification allowable limits

EAL:

SU4.2 Unusual Event

RCS sample activity > 1.0 µCi/gm dose equivalent I-131 for > 48 hours (Note 1)

OR

RCS sample activity > 60 µCi/gm dose equivalent I-131

OR

RCS sample activity > 2200[3100] µCi/gm dose equivalent Xe-133 for > 48 hours (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

This IC addresses a reactor coolant activity value that exceeds an allowable limit specified in Technical Specifications. This condition is a precursor to a more significant event and represents a potential degradation of the level of safety of the plant.

Escalation of the emergency classification level would be via IC FA1 or the Recognition Category A ICs.

Reference(s):

1. Unit 1 Technical Specifications LCO 3.4.12 RCS Specific Activity
2. Unit 2 Technical Specifications LCO 3.4.8 Reactor Coolant System Specific Activity
3. NEI 99-01 SU3

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 5 – RCS Leakage

Initiating Condition: RCS leakage for 15 minutes or longer

EAL:

SU5.1 Unusual Event

RCS unidentified or pressure boundary leakage > 10 gpm for ≥ 15 min. (Note 1)

OR

RCS identified leakage > 25 gpm for ≥ 15 min. (Note 1)

OR

Reactor coolant leakage to a location outside containment > 25 gpm for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

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

Basis:

Failure to isolate the leak (from the Control Room or locally) within 15 minutes, or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification.

Steam generator tube leakage is identified RCS leakage.

This IC addresses RCS leakage which may be a precursor to a more significant event. In this case, RCS leakage has been detected and operators, following applicable procedures, have been unable to promptly isolate the leak. This condition is considered to be a potential degradation of the level of safety of the plant.

The first and second EAL conditions are focused on a loss of mass from the RCS due to “unidentified leakage", "pressure boundary leakage" or "identified leakage” (as these leakage types are defined in the plant Technical Specifications). The third condition addresses an RCS mass loss caused by an UNISOLABLE leak through an interfacing system. These conditions thus apply to leakage into the containment, a secondary-side system (e.g., steam generator tube leakage) or a location outside of containment.

Attachment 1 – Emergency Action Level Technical Bases

The leak rate values for each condition were selected because they are usually observable with normal Control Room indications. Lesser values typically require time-consuming calculations to determine (e.g., a mass balance calculation). The first condition uses a lower value that reflects the greater significance of unidentified or pressure boundary leakage.

The release of mass from the RCS due to the as-designed/expected operation of a relief valve does not warrant an emergency classification. An emergency classification would be required if a mass loss is caused by a relief valve that is not functioning as designed/expected (e.g., a relief valve sticks open and the line flow cannot be isolated).

The 15-minute threshold duration allows sufficient time for prompt operator actions to isolate the leakage, if possible.

Escalation of the emergency classification level would be via ICs of Recognition Category A or F.

Reference(s):

1. Unit 1 and Unit 2 Technical Specifications Section 1.1 Definitions
2. NEI 99-01 SU4

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 6 – RPS Failure

Initiating Condition: Automatic or manual trip fails to shut down the reactor

EAL:

SU6.1 Unusual Event

An automatic trip did **not** shut down the reactor as indicated by reactor power > 5% after **any** RPS setpoint is exceeded

AND

A subsequent automatic trip or manual trip action taken at the reactor control console (C03 [2C03/2C14]) (manual reactor trip pushbuttons or DROPS[DSS]) is successful in shutting down the reactor as indicated by reactor power ≤ 5% (Note 8)

Note 8: A manual action is **any** operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does **not** include manually driving in control rods or implementation of boron injection strategies.

Mode Applicability:

1 - Power Operation

Definition(s):

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

Basis:

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, and either a subsequent operator manual action taken at the reactor control consoles or an automatic trip is successful in shutting down the reactor. This event is a precursor to a more significant condition and thus represents a potential degradation of the level of safety of the plant.

In the event that the operator identifies a reactor trip is IMMINENT and initiates a successful manual reactor trip before the automatic trip setpoint is reached, no declaration is required. The successful manual trip of the reactor before it reaches its automatic trip setpoint or reactor trip signals caused by instrumentation channel failures do not lead to a potential fission product barrier loss.

Attachment 1 – Emergency Action Level Technical Bases

Following the failure of an automatic reactor trip, operators will promptly initiate manual actions at the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor trip). If these manual actions are successful in shutting down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

If an initial manual reactor trip is unsuccessful, operators will promptly take manual action at another location(s) on the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor trip using a different switch). Depending upon several factors, the initial or subsequent effort to manually trip the reactor, or a concurrent plant condition, may lead to the generation of an automatic reactor trip signal. If a subsequent manual or automatic trip is successful in shutting down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

A manual action at the reactor control consoles is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core (e.g., initiating a manual reactor trip). This action does not include manually driving in control rods or implementation of boron injection strategies. Actions taken at back-panels or other locations within the Control Room, or any location outside the Control Room, are not considered to be "at the reactor control consoles."

The plant response to the failure of an automatic or manual reactor trip will vary based upon several factors including the reactor power level prior to the event, availability of the condenser, performance of mitigation equipment and actions, other concurrent plant conditions, etc. If subsequent operator manual actions taken at the reactor control consoles are also unsuccessful in shutting down the reactor, then the emergency classification level will escalate to an Alert via IC SA6. Depending upon the plant response, escalation is also possible via IC FA1. Absent the plant conditions needed to meet either IC SA6 or FA1, an Unusual Event declaration is appropriate for this event.

Should a reactor trip signal be generated as a result of plant work (e.g., RPS setpoint testing), the following classification guidance should be applied.

- If the signal generated as a result of plant work causes a plant transient that results in a condition that should have included an automatic reactor trip and the RPS fails to automatically shutdown the reactor, then this IC and associated EALs are applicable, and should be evaluated.

- If the signal generated as a result of plant work does not cause a plant transient and the trip failure is determined through other means (e.g., assessment of test results), then this IC and associated EALs are not applicable and no classification is warranted.

Attachment 1 – Emergency Action Level Technical Bases

Reference(s):

1. Unit 1 Technical Specifications Table 3.3.1-1 Reactor Protection System Instrumentation
2. Unit 2 Technical Specifications Table 3.3-1 Reactor Protective Instrumentation
3. Unit 1 and Unit 2 Technical Specifications Table 1.1-1 Modes
4. OP-1202.001 Reactor Trip
5. OP-2202.001 Standard Post Trip Actions
6. NEI 99-01 SU5

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 6 – RPS Failure

Initiating Condition: Automatic or manual trip fails to shut down the reactor

EAL:

SU6.2 Unusual Event

A manual trip did **not** shut down the reactor as indicated by reactor power > 5% after **any** manual trip action was initiated

AND

A subsequent automatic trip or manual trip action taken at the reactor control console (C03 [2C03/2C14]) (manual reactor trip pushbuttons or DROPS[DSS]) is successful in shutting down the reactor as indicated by reactor power ≤ 5% (Note 8)

Note 8: A manual scram action is **any** operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does **not** include manually driving in control rods or implementation of boron injection strategies.

Mode Applicability:

1 - Power Operation

Definition(s):

None

Basis:

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, and either a subsequent operator manual action taken at the reactor control consoles or an automatic trip is successful in shutting down the reactor. This event is a precursor to a more significant condition and thus represents a potential degradation of the level of safety of the plant.

This EAL addresses a failure of a manually initiated trip in the absence of having exceeded an automatic RPS trip setpoint and a subsequent automatic or manual trip is successful in shutting down the reactor.

Following the failure on an automatic reactor trip, operators will promptly initiate manual actions at the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor trip). If these manual actions are successful in shutting down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

Attachment 1 – Emergency Action Level Technical Bases

If an initial manual reactor trip is unsuccessful, operators will promptly take manual action at another location(s) on the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor trip using a different switch). Depending upon several factors, the initial or subsequent effort to manually the reactor, or a concurrent plant condition, may lead to the generation of an automatic reactor trip signal. If a subsequent manual or automatic trip is successful in shutting down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

A manual action at the reactor control consoles is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core (e.g., initiating a manual reactor trip). This action does not include manually driving in control rods or implementation of boron injection strategies. Actions taken at back-panels or other locations within the Control Room, or any location outside the Control Room, are not considered to be "at the reactor control consoles."

The plant response to the failure of an automatic or manual reactor trip will vary based upon several factors including the reactor power level prior to the event, availability of the condenser, performance of mitigation equipment and actions, other concurrent plant conditions, etc. If subsequent operator manual actions taken at the reactor control consoles are also unsuccessful in shutting down the reactor, then the emergency classification level will escalate to an Alert via IC SA6. Depending upon the plant response, escalation is also possible via IC FA1. Absent the plant conditions needed to meet either IC SA6 or FA1, an Unusual Event declaration is appropriate for this event.

Should a reactor trip signal be generated as a result of plant work (e.g., RPS setpoint testing), the following classification guidance should be applied.

- If the signal generated as a result of plant work causes a plant transient that results in a condition that should have included an automatic reactor trip and the RPS fails to automatically shutdown the reactor, then this IC and associated EALs are applicable, and should be evaluated.

- If the signal generated as a result of plant work does not cause a plant transient and the trip failure is determined through other means (e.g., assessment of test results), then this IC and associated EALs are not applicable and no classification is warranted.

Reference(s):

1. Unit 1 Technical Specifications Table 3.3.1-1 Reactor Protection System Instrumentation
2. Unit 2 Technical Specifications Table 3.3-1 Reactor Protective Instrumentation
3. Unit 1 and Unit 2 Technical Specifications Table 1.1-1 Modes
4. OP-1202.001 Reactor Trip
5. OP-2202.001 Standard Post Trip Actions
6. NEI 99-01 SU5

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 6 – RPS Failure

Initiating Condition: Automatic or manual trip fails to shut down the reactor and subsequent manual actions taken at the reactor control consoles are **not** successful in shutting down the reactor

EAL:

SA6.1 Alert

An automatic or manual trip fails to shut down the reactor as indicated by reactor power > 5%

AND

Manual trip actions taken at the reactor control console (C03[2C03/2C14]) (manual reactor trip pushbuttons or DROPS[DSS]) are **not** successful in shutting down the reactor as indicated by reactor power > 5% (Note 8)

Note 8: A manual action is **any** operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does **not** include manually driving in control rods or implementation of boron injection strategies.

Mode Applicability:

1 - Power Operation

Definition(s):

None

Basis:

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, and subsequent operator manual actions taken at the reactor control consoles to shutdown the reactor are also unsuccessful. This condition represents an actual or potential substantial degradation of the level of safety of the plant. An emergency declaration is required even if the reactor is subsequently shutdown by an action taken away from the reactor control consoles since this event entails a significant failure of the RPS.

A manual action at the reactor control console is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core (e.g., initiating a manual reactor trip). This action does not include manually driving in control rods or implementation of boron injection strategies. If this action(s) is unsuccessful, operators would immediately pursue additional manual actions at locations away from the reactor control console (e.g., locally opening breakers). Actions taken at back panels or other locations within the Control Room, or any location outside the Control Room, are not considered to be “at the reactor control console.”

Attachment 1 – Emergency Action Level Technical Bases

The plant response to the failure of an automatic or manual reactor trip will vary based upon several factors including the reactor power level prior to the event, availability of the condenser, performance of mitigation equipment and actions, other concurrent plant conditions, etc. If the failure to shut down the reactor is prolonged enough to cause a challenge to the core cooling or RCS heat removal safety functions, the emergency classification level will escalate to a Site Area Emergency via IC SS6. Depending upon plant responses and symptoms, escalation is also possible via IC FS1. Absent the plant conditions needed to meet either IC SS6 or FS1, an Alert declaration is appropriate for this event.

It is recognized that plant responses or symptoms may also require an Alert declaration in accordance with the Recognition Category F ICs; however, this IC and EAL are included to ensure a timely emergency declaration.

Reference(s):

1. Unit 1 Technical Specifications Table 3.3.1-1 Reactor Protection System Instrumentation
2. Unit 2 Technical Specifications Table 3.3-1 Reactor Protective Instrumentation
3. Unit 1 and Unit 2 Technical Specifications Table 1.1-1 Modes
4. OP-1202.001 Reactor Trip
5. OP-2202.001 Standard Post Trip Actions
6. NEI 99-01 SA5

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 6 – RPS Failure

Initiating Condition: Inability to shut down the reactor causing a challenge to core cooling or RCS heat removal

EAL:

SS6.1 Site Area Emergency

An automatic or manual trip fails to shut down the reactor as indicated by reactor power > 5%

AND

All actions to shut down the reactor are **not** successful as indicated by reactor power > 5%

AND EITHER:

- CETs > 1200°F
- RCS heat removal **cannot** be established using steam generators and an on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling.

Mode Applicability:

1 - Power Operation

Definition(s):

None

Basis:

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, all subsequent operator actions to manually shutdown the reactor are unsuccessful, and continued power generation is challenging the capability to adequately remove heat from the core and/or the RCS. This condition will lead to fuel damage if additional mitigation actions are unsuccessful and thus warrants the declaration of a Site Area Emergency.

In some instances, the emergency classification resulting from this IC/EAL may be higher than that resulting from an assessment of the plant responses and symptoms against the Recognition Category F ICs/EALs. This is appropriate in that the Recognition Category F ICs/EALs do not address the additional threat posed by a failure to shutdown the reactor. The inclusion of this IC and EAL ensures the timely declaration of a Site Area Emergency in response to prolonged failure to shutdown the reactor.

Escalation of the emergency classification level would be via IC AG1 or FG1.

Attachment 1 – Emergency Action Level Technical Bases

Reference(s):

1. Unit 1 Technical Specifications Table 3.3.1-1 Reactor Protection System Instrumentation
2. Unit 2 Technical Specifications Table 3.3-1 Reactor Protective Instrumentation
3. Unit 1 and Unit 2 Technical Specifications Table 1.1-1 Modes
4. OP-1202.001 Reactor Trip
5. OP-2202.001 Standard Post Trip Actions
6. OP-1202.004 Overheating
7. OP-2202.006 Loss of Feedwater
8. OP-1202.013 Figure 1, Saturation and Adequate SCM
9. Calculation 90-E-0116-07 Unit 1 EOP Setpoint Document, Setpoint B.19
10. OP-2202.009 Functional Recovery
11. Calculation 90-E-0116-01 Unit 2 EOP Setpoint Document
12. NEI 99-01 SS5

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 7 – Loss of Communications

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

EAL:

SU7.1 Unusual Event

Loss of **all** Table 1[2]S-4 onsite communication methods

OR

Loss of **all** Table 1[2]S-4 State and local agency communication methods

OR

Loss of **all** Table 1[2]S-4 NRC communication methods

Table 1[2]S-4 Communication Methods

System	Onsite	State / Local	NRC
Station radio system	X		
ANO plant phone system	X		
Gaitronics	X		
Telephone Systems: • Commercial • Microwave • Satellite • VOIP		X	X
Emergency Notification System (ENS)			X

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Attachment 1 – Emergency Action Level Technical Bases

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 State and local agencies and the NRC.

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

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

The second EAL condition addresses a total loss of the communications methods used to notify all State and local agencies of an emergency declaration. The State and local agencies referred to here are the Arkansas Department of Health, Arkansas Department of Emergency Management, Pope, Yell, Johnson, and Logan County agencies.

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

This EAL is the hot condition equivalent of the cold condition EAL CU5.1.

Reference(s):

1. OP-1903.062 Communications System Operating Procedure
2. NEI 99-01 SU6

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 8 – Containment Failure

Initiating Condition: Failure to isolate containment or loss of containment pressure control

EAL:

SU8.1 Unusual Event

Any penetration is **not** closed within 15 min. of an ESAS[CIAS] actuation signal

OR

Containment pressure > 44.7 psia[23.3 psia] with < one full train of containment heat removal systems (Note 9) operating per design for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 9: One full train of containment heat removal systems consists of one train of RB [Containment] Spray and one train of RB [Containment] Cooling System.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

A penetration is closed for this EAL if either side of the penetration has a closed valve or a check valve is intact (for penetrations that only have one automatic valve and a check valve).

This EAL addresses a failure of one or more containment penetrations to automatically isolate (close) when required by an actuation signal. It also addresses an event that results in high containment pressure with a concurrent failure of containment pressure control systems. Absent challenges to another fission product barrier, either condition represents potential degradation of the level of safety of the plant.

For the first condition, the containment isolation signal must be generated as the result on an off-normal/accident condition (e.g., a safety injection or high containment pressure); a failure resulting from testing or maintenance does not warrant classification. The determination of containment and penetration status – isolated or not isolated – should be made in accordance with the appropriate criteria contained in the plant AOPs and EOPs. The 15-minute criterion is included to allow operators time to manually isolate the required penetrations, if possible.

Attachment 1 – Emergency Action Level Technical Bases

The second condition addresses a condition where containment pressure is greater than the setpoint at which containment energy (heat) removal systems are designed to automatically actuate, and less than one full train of equipment is capable of operating per design. The 15-minute criterion is included to allow operators time to manually start equipment that may not have automatically started, if possible. The inability to start the required equipment indicates that containment heat removal/depressurization systems (e.g., containment sprays) are either lost or performing in a degraded manner.

This event would escalate to a Site Area Emergency in accordance with IC FS1 if there were a concurrent loss or potential loss of either the Fuel Clad or RCS fission product barriers.

Reference(s):

1. OP-1202.010 ESAS
2. 1SAR 6.2 Reactor Building Spray System
3. 1SAR 6.3 Reactor Building Cooling System
4. OP-2202.003 Loss of Coolant Accident
5. OP-2202.010 Standard Attachments, Attachment 22
6. 2SAR 6.2.2 Containment Heat Removal Systems
7. 2SAR 7.3.1.1.11.2 Containment Spray System
8. NEI 99-01 SU7

Attachment 1 – Emergency Action Level Technical Bases

Category: S – System Malfunction

Subcategory: 9 – Hazardous Event Affecting Safety Systems

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

EAL:

SA9.1 Alert

The occurrence of **any** Table 1[2]S-5 hazardous event

AND

Event damage has caused indications of degraded performance on one train of a SAFETY SYSTEM needed for the current operating mode

AND EITHER:

- Event damage has caused indications of degraded performance to the second train of the SAFETY SYSTEM needed for the current operating mode
- Event damage has resulted in VISIBLE DAMAGE to the second train of the SAFETY SYSTEM needed for the current operating mode

(Notes 10, 11)

Note 10: If the affected SAFETY SYSTEM train was already inoperable or out of service before the hazardous event occurred, then emergency classification is **not** warranted.

Note 11: If the hazardous event **only** resulted in VISIBLE DAMAGE, with **no** indications of degraded performance to at least one train of a SAFETY SYSTEM, then this emergency classification is **not** warranted.

Table 1[2]S-5 Hazardous Events
• Seismic event (earthquake) • Internal or external FLOODING event • High winds or tornado strike • FIRE • EXPLOSION • Other events with similar hazard characteristics as determined by the Shift Manager

Attachment 1 – Emergency Action Level Technical Bases

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

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

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

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

SAFETY SYSTEM - A system required for safe plant operation, cooling down the plant and/or placing it in the cold shutdown condition, including the ECCS. These are typically systems classified as safety-related (as defined in 10 CFR 50.2).

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 SAFETY SYSTEM train 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 SAFETY SYSTEM train.

Basis:

This IC addresses a hazardous event that causes damage to SAFETY SYSTEMS needed for the current operating mode. In order to provide the appropriate context for consideration of an ALERT classification, the hazardous event must have caused indications of degraded SAFETY SYSTEM performance in one train, and there must be either indications of performance issues with the second SAFETY SYSTEM train or VISIBLE DAMAGE to the second train such that the potential exists for this second SAFETY SYSTEM train to have performance issues. In other words, in order for this EAL to be classified, the hazardous event must occur, at least one SAFETY SYSTEM train must have indications of degraded performance, and the second SAFETY SYSTEM train must have indications of degraded performance or VISIBLE DAMAGE such that the potential exists for performance issues.

Note that this second SAFETY SYSTEM train is from the same SAFETY SYSTEM that has indications of degraded performance; commercial nuclear power plants are designed to be able to support single system issues without compromising public health and safety from radiological events.

Indications of degraded performance 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.

VISIBLE DAMAGE addresses damage to a SAFETY SYSTEM train that is not in service/operation and that potentially could cause performance issues. Operators will make a determination of VISIBLE DAMAGE 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. This VISIBLE DAMAGE should be significant enough to cause concern regarding the operability or reliability of the SAFETY SYSTEM train.

Escalation of the emergency classification level would be via IC FS1 or AS1.

This EAL is the hot condition equivalent of the cold condition EAL CA6.1.

Reference(s):

1. EP FAQ 2016-002
2. NEI 99-01 SA9
3. EP FAQ 2018-04

Attachment 2 – Safe Operation & Shutdown Areas Tables 1[2]A-3 & 1[2]H-2 Bases

Background

NEI 99-01 Revision 6 ICs AA3 and HA5 prescribe declaration of an Alert based on impeded access to rooms or areas (due to either area radiation levels or hazardous gas concentrations) where equipment necessary for normal plant operations, cooldown or shutdown is located. These areas are intended to be plant operating mode dependent. Specifically the Developers Notes for AA3 and HA5 states:

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

The list should not include rooms or areas for which entry is required solely to perform actions of an administrative or record keeping nature (e.g., normal rounds or routine inspections).

Further, as specified in IC HA5:

The list need not include the Control Room if adequate engineered safety/design features are in place to preclude a Control Room evacuation due to the release of a hazardous gas. Such features may include, but are not limited to, capability to draw air from multiple air intakes at different and separate locations, inner and outer atmospheric boundaries, or the capability to acquire and maintain positive pressure within the Control Room envelope.

Attachment 2 – Safe Operation & Shutdown Areas Tables 1[2]A-3 & 1[2]H-2 Bases

ANO Table 1[2]A-3 and 1[2]H-2 Bases

A review of station operating procedures identified the following mode dependent in-plant actions and associated areas that are required for normal plant operation, cooldown or shutdown:

Unit 1

AREA	MODES	PURPOSE	REFERENCE
A-4 Switchgear Room	3, 4	Core flood tank valves, decay heat removal (DHR)	OP-1102.010 OP-1104.004
Upper North Electrical Penetration Room	3, 4	DHR alignment	OP-1104.004
Lower South Electrical Equipment Room	3, 4	DHR alignment	OP-1104.004

Unit 2

AREA	MODES	PURPOSE	REFERENCE
Aux Building 317' Emergency Core Cooling Rooms	3, 4	Shutdown Cooling (SDC) venting and alignment	OP-2104.004
Aux Building 317' Tendon Gallery Access	3, 4	SDC alignment	OP-2104.004
Aux Building 335' Charging Pumps / Motor Control Center (MCC) 2B-52	3, 4	Charging low pressure operation, T-Hot injection valves, and SDC alignment	OP-2102.010 OP-2104.004
Auxiliary Building 354' MCC 2B-62 Area	3, 4	SDC alignment and T-Hot injection valves at MCC 2B-62	OP-2102.010 OP-2104.004
Emergency Diesel Generator Corridor	3, 4	Close Safety Injection Tank (SIT) valves and SDC / Low Temperature Overpressure (LTOP) valve alignment at MCC 2B-51	OP-2102.010
Lower South Piping Penetration Room	3, 4	SDC alignment	OP-2104.004
Aux Building 386' Containment Hatch	3, 4	Close SIT valves at MCC 2B-61	OP-2102.010

Mode 3 is included above for DHR- and SDC-related activities because the procedures begin alignment in Mode 3; however, these actions could be delayed until Mode 4, if necessary. In order to ensure adequate guidance to emergency response personnel, the above areas are added to the EAL in order to provide prompt operator guidance for EAL declaration.

Both ANO-1 and ANO-2 Control Room ventilation systems have adequate engineered safety/design features in place to preclude a Control Room evacuation due to the release of a hazardous gas. Therefore the Control Room is not included in this assessment or in Tables 1[2]H-2.

Table 1[2]A-3 & 1[2]H-2 Results

Table 1[2]A-3 & 1[2]H-2 Safe Operation & Shutdown Rooms/Areas	
Unit 1	
Room/Area	**Mode Applicability**
A-4 Switchgear Room	3, 4
Upper North Electrical Penetration Room	3, 4
Lower South Electrical Equipment Room	3, 4
Unit 2	
Room/Area	**Mode Applicability**
Aux Building 317’ Emergency Core Cooling Rooms	3, 4
Aux Building 317’ Tendon Gallery Access	3, 4
Aux Building 335’ Charging Pumps / MCC 2B-52	3, 4
Auxiliary Building 354’ MCC 2B-62 Area	3, 4
Emergency Diesel Generator Corridor	3, 4
Lower South Piping Penetration Room	3, 4
Aux Building 386’ Containment Hatch	3, 4

Attachment 2 – Safe Operation & Shutdown Areas Tables 1[2]A-3 & 1[2]H-2 Bases

Enclosure, Attachment 1

0CAN062201

Summary of Changes to ANO Emergency Plan Implementing Document

Summary of Changes to ANO Emergency Plan Implementing Document

The following tables provide a brief description or summary of changes made to an Arkansas Nuclear One (ANO) Emergency Plan (EP) implementing documents included in the enclosure of this submittal.

Procedure OP-1903.010, Revision 60, "Emergency Action Level Classification"	
Section Revised	**Description of Change**
Page 23 – Table Row 9	EAL Reference to CS1.3 was removed. Per the approved and implemented NEI 99-01 Revision 6 EAL Scheme for Arkansas Nuclear One (ANO), there is not an EAL referenced as CS1.3 [PIF 20-014]
(Page 131) Attachment 1 - Basis Description for RCB1	*Added the following language between paragraph 2 and 3:* "The procedure requirement to manually initiate SIAS for a RCS or tube leak with a Loss of Offsite Power (LOOP) that may be taken for small leaks is not applicable to this threshold when the RCS leakage is not of sufficient size to require initiation of SIAS based upon loss of inventory and size of the leak alone." [CR-ANO-C-2020-03239]
(Page 139) Attachment 1 - Basis Description for RCB5	*Added the following language between paragraph 2 and 3:* "Note: IF radiation levels reach > 40 [50] R/hr, regardless of the loss of reactor coolant mass, the EAL declaration will be made." [PIF 20-036, CR-ANO-C-2020-03239]
(Page 146) Attachment 1 - Basis Description for CNB1	*Paragraph 4 From:* "This threshold also applies to prolonged steam releases necessitated by operational considerations such as the forced steaming of a leaking or RUPTURED steam generator directly to atmosphere to cooldown the plant. These types of conditions will result in a significant and sustained release of radioactive steam to the environment (and are thus similar to a FAULTED condition). The inability to isolate the steam flow without an adverse effect on plant cooldown meets the intent of a loss of containment." *Paragraph 4 To:* "This threshold also applies to prolonged steam releases necessitated by operational considerations such as the forced steaming of a leaking or RUPTURED steam generator directly to atmosphere to cooldown the plant, or to drive Emergency Feedwater Pump P-7A [2P-7A]. These conditions may exist when one steam generator is leaking or ruptured, AND the opposite steam generator is also faulted. These types of conditions will result in a significant and sustained release of radioactive steam to the environment (and are thus similar to a FAULTED condition). The inability to isolate the steam flow without an adverse effect on plant cooldown meets the intent of a loss of containment." [CR-ANO-C-2020-03239] (Italics added for identification of modified text only)
(Page 146) Attachment 1 - Basis Description for CNB1	*Added the following Language between Paragraphs 4 and 5*: "Execution of a RCS cooldown to less than 540°F [535°F] Hot Leg temperature using both Atmospheric Dump Valves, as directed by emergency operating procedures, does not meet this intent, provided the affected steam generator Atmospheric Dump Valve can be closed when isolation of the RUPTURED steam generator is directed at less than 540°F [535°F]. Steaming of Emergency Feedwater Pump P-7A [2P-7A] prior to isolation of the RUPTURED steam generator does not meet this intent, provided the steam supply from the RUPTURED steam generator can be closed when isolation of the RUPTURED steam generator is directed per emergency operating procedures. These short term radiological releases should be evaluated using Category A ICs." [CR-ANO-C-2020-03239]
(Page 186) Attachment 1 - Basis Description for HU4.3	*From:* Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via EAL CA6.1 or SA8.1. *To:* Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via EAL CA6.1 or SA9.1. [PIF 20-014]
Table of Contents pg 1	Update Page Numbers for section 6.0, 7.1 & 7.2 as required.

Procedure OP-1903.010, Revision 60, "Emergency Action Level Classification"	
Section Revised	**Description of Change**
Entire Document	Change Revision from 059 to 060 in document header.
Bases for Acceptability of Changes The described changes do not change a meaning or the intent of a description, do not change emergency response facilities or equipment, and do not change a process. The above changes have been screened and/or evaluated in accordance with 10 CFR 50.54(q). The changes continue to meet the applicable planning standards outlined in 10 CFR 50.47(b)(4). This revision does not require a change to the Emergency Plan or represent a reduction in the effectiveness to the Emergency Plan.	

List of Acronyms

EAL Emergency Action Level

IC Initiating Condition

NEI Nuclear Energy Institute

PIF Procedure Improvement Form

RCS Reactor Coolant System

SIAS Safety Injection Actuation Signal