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10 CFR 50.4,10 CFR 50.54(q),10 CFR 72.44(f)

United States Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555-0001

Perry Nuclear Power Plant
Docket No. 50-440, License No. NPF-58
EMERGENCY PLAN FOR PERRY NUCLEAR POWER PLANT DOCKET No. 50-440

Pursuant to 10 CFR 50.4, enclosed is a summary of changes for the Perry Nuclear Power Plant (PNPP) EAL Matrix Revision 22.

The changes have been reviewed in accordance with 10 CFR 50.54(q), and it has been determined that the changes do not result in a reduction of the effectiveness of the Emergency Plan. It has also been determined that the Plan, as changed, continues to meet the standards of 10 CFR 50.47(b) and 10 CFR 50 Appendix E.

There are no regulatory commitments contained in this submittal. If there are any questions or if additional information is required, please contact Mr. Glendon Burnham, Manager, Regulatory Compliance, at (440) 280-7538.

Sincerely,

Rod L. Penfield
Vice President

Enclosure:
Summary of Changes
Emergency Action Level (EAL) Bases Document – PSI-0019
EAL Classification Matrix – PNPP Form 10565

cc: NRC Document Control Desk
NRC Resident Inspector
NRC Project Manager
United States Environmental Protection Agency, Mr. Steve Ostrodka, Chief Division of Spent Fuel Storage and Transportation Office of Nuclear Material Safety and Safeguards NRC Regional Response Center
NRC Region III Regional Administrator - Incident Response Center

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ENCLOSURE

Perry Nuclear Power Plant
PSI-0019 Revision 22
Change Summary

Revision 22 of the Emergency Plan Emergency Action Level Bases Document for the Perry Nuclear Power Plant Docket No. 50-440 contained the following changes:

1. Aligned document with Energy Harbor procedure guidelines.

   Corrected sections numbers and headers to align with site standards for procedures. Editorial changes made to align the procedure to proper site standards. Two Fission Barrier Containment Potential Loss Threshold D.1 typographical errors identified during an Engineering review of the procedure were corrected as editorial changes.

2. Added new guidance for the new fuel storage cask.

   There is a new fuel storage cask in use and the EAL was updated to include a table incorporating both limit setpoints for each cask in use at PNPP. Description and reference information for the new dry fuel cask style were incorporated.

3. Removed reference to the EPIs being replaced by Fleet NOPs.

   The Emergency Plan Implementing Procedures (EPIs) were removed from the Emergency Plan and the Fleet NOPs were added. The Fleet NOPs are Nuclear Operating Procedures and will fulfill the requirements of the Emergency Plan. References to the EPIs were found and removed.

These changes were evaluated in 10 CFR 50.54 (q) PY-2020-017-00 and found to be compliant with 10 CFR 50.47 (b) and 10 CFR 50, Appendix E.

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Emergency Action Level (EAL) Bases Document – PSI-0019
231 Pages to follow

EMERGENCY ACTION LEVEL (EAL) BASES DOCUMENT

Preparedness Support Instruction

Effective Date: 10-28-22

Preparer: Patrick M. Harkins / 10-17-22
Date

Approver: Jeffrey Archer / 10-27-22
Date

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SECTION PAGE

1.0 PURPOSE

This document provides an explanation and rationale for each Emergency Action Level (EAL) included in the EAL Upgrade Project for the Perry Nuclear Power Plant. It should be used to facilitate review of the Perry EALs and provide historical documentation for future reference. Decision-makers responsible for implementation of NOP-LP-5502, Event Classification, may use this document as a technical reference in support of EAL interpretation. This information may assist the Emergency Coordinator in making classifications, particularly those involving judgment or multiple events. The basis information may also be useful in training and for explaining event classifications to off-site officials.

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

Because the information in a basis document can affect emergency classification decision-making (e.g., the Emergency Coordinator refers to it during an event), the NRC staff expects that changes to the basis document will be evaluated in accordance with the provisions of 10 CFR 50.54(q).

2.0 SCOPE

This document applies to all individuals whose emergency plan functions include assessing, classifying or peer checking of Emergency Actions Levels (EALs) to determine whether Emergency Classification Level (ECL) thresholds have been met or exceeded such that an emergency classification is warranted.

3.0 DEFINITIONS, ACRONYMS & ABBREVIATIONS

3.1 Definitions (ref. 6.1.1 except as noted)

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

3.1.1 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 PAG exposure levels.

3.1.2 Can/Cannot Be Maintained Above/Below

The value of an identified parameter is/is not able to be held within the specified limit. The determination requires an evaluation of system performance and availability in relation to parameter values and trends. An instruction prescribing action when a parameter cannot be maintained above or below a specified limit neither requires nor prohibits anticipatory action-depending upon plant conditions, the action may be taken as soon as it is determined that the limit will ultimately be exceeded, or delayed until the limit is actually reached. Once the parameter does exceed the limit, however, the action must be performed; it may not be delayed while attempts are made to restore the parameter to within the desired control band.

3.1.3 Can/Cannot Be Restored Above/Below

The value of an identified parameter is/is not able to be brought within the specified limit. The determination requires an evaluation of system performance and availability in relation to parameter values and trends. An instruction prescribing action when a value cannot be restored and maintained above or below a specified limit does not require immediate action simply because the current values is outside the range, but does not permit extended operation beyond the limit; the action must be taken as soon as it is apparent that the specified range cannot be attained.

3.1.4 Confinement Boundary

The barrier(s) between spent fuel and the environment once the spent fuel is processed for dry storage. As related to the Perry ISFSI, Confinement Boundary is defined as the Multi-Purpose Canister (MPC) (ref. 4.1.7).

3.1.5 Containment Closure

The procedurally defined conditions or actions taken to secure Containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions. Containment Closure is established when the Containment requirements of ONI-SPI E-1 (ref. 4.1.8) are met with the following exception: a functional barrier must exist at the time of the event (i.e., cannot rely on contingency methods to establish a functional barrier).

3.1.6 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.

3.1.7 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)

3.1.8 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.

3.1.9 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.

3.1.10 Fission Product Barrier Threshold

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

3.1.11 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.

3.1.12 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.

3.1.13 Hostage

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

3.1.14 Hostile Action

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

3.1.15 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.

3.1.16 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.

3.1.17 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.

3.1.18 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).

3.1.19 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.

3.1.20 Owner Controlled Area

Areas owned by Energy Harbor which are located within or adjacent to the SITE BOUNDARY security fence (ref. 4.2.2).

3.1.21 Projectile

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

3.1.22 Protected Area

The area encompassing the Vital Areas, all areas inside the double perimeter barrier fence and the Primary Access Facility (PAF) (ref. 4. 2.2).

3.1.23 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).

3.1.24 Refueling Pathway

Reactor cavity (well), CNTMT fuel storage pool, CNTMT fuel transfer pool, FHB Fuel Storage Preparation Pool, FHB fuel transfer pool, FHB spent fuel storage pool, and FHB Cask Pit comprise the refueling pathway (ref. 4.1.11).

3.1.25 Restore

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

3.1.26 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.

3.1.27 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.

3.1.28 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.

3.1.29 Site Boundary

The area within the OWNER CONTROLLED AREA which is encompassed by a security fence surrounding the Perry Plant (ref. 4.2.2).

3.1.30 Unisolable

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

3.1.31 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.

3.1.32 Unusual Event

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

3.1.33 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.

3.1.34 Visible Damage

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

3.2 Abbreviations/Acronyms

°F .... Degrees Fahrenheit
° .... Degrees
AC .... Alternating Current
ADHR .... Alternate Decay Heat Removal
APRM .... Average Power Range Meter
ATWS .... Anticipated Transient Without Scram
AX .... Auxiliary Building
BWR .... Boiling Water Reactor
BWROG .... Boiling Water Reactor Owners Group
CC .... Control Complex
CDE .... Committed Dose Equivalent
CFR .... Code of Federal Regulations
CNTMT .... Containment
CS .... Core Spray

DBA .... Design Basis Accident
DC .... Direct Current
EAL .... Emergency Action Level
ECCS .... Emergency Core Cooling System
ECL .... Emergency Classification Level
EC .... Emergency Coordinator
EOF .... Emergency Operations Facility
EOP .... Emergency Operating Procedure
EPA .... Environmental Protection Agency
EPG .... Emergency Procedure Guideline
ESF .... Engineered Safety Feature
FAA .... Federal Aviation Administration
FBI .... Federal Bureau of Investigation
FEMA .... Federal Emergency Management Agency
FHB .... Fuel Handling Building
GE .... General Emergency
HCTL .... Heat Capacity Temperature Limit
IB .... Intermediate Building
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 Radwaste
LWR .... Light Water Reactor
MPC .... Maximum Permissible Concentration/Multi-Purpose Canister
MPH .... Miles Per Hour
MSIV .... Main Steam Isolation Valve
MSL .... Main Steam Line
mR, mRem, mrem, mREM .... milli-Roentgen Equivalent Man
MW .... Megawatt
NEI .... Nuclear Energy Institute
NESP .... National Environmental Studies Project
NPP .... Nuclear Power Plant
NRC .... Nuclear Regulatory Commission
NSSS .... Nuclear Steam Supply System
NORAD .... North American Aerospace Defense Command
(NO)UE .... Notification of Unusual Event

OBE .... Operating Basis Earthquake
OCA .... OWNER CONTROLLED AREA
ODCM .... Off-site Dose Calculation Manual
ONI .... Off-Normal Instruction
ORO .... Offsite Response Organization
PA .... PROTECTED AREA
PAF .... Primary Access Facility
PAG .... Protective Action Guideline
PRA/PSA .... Probabilistic Risk Assessment / Probabilistic Safety Assessment
PSIG .... Pounds per Square Inch Gauge
R .... Roentgen
RCIC .... Reactor Core Isolation Cooling
RCS .... Reactor Coolant System
Rem, rem, REM .... Roentgen Equivalent Man
RETS .... Radiological Effluent Technical Specifications
RHR .... Residual Heat Removal
RPS .... Reactor Protection System
RPV .... Reactor Pressure Vessel
RWCU .... Reactor Water Cleanup
SAMG .... Severe Accident Management Guidelines
SAR .... Safety Analysis Report
SBO .... Station Blackout
SCBA .... Self-Contained Breathing Apparatus
SFDS .... Spent Fuel Dry Storage
SPDS .... Safety Parameter Display System
SRO .... Senior Reactor Operator
SRV .... Safety Relief Valve
SW .... Service Water
TEDE .... Total Effective Dose Equivalent
TAF .... Top of Active Fuel
TSC .... Technical Support Center
USAR .... Updated Safety Analysis Report

4.0 PROCEDURE DETAILS

4.1 Background

EALs are the plant-specific indications, conditions or instrument readings that are utilized to classify emergency conditions defined in the Emergency Plan for Perry Nuclear Power Plant (ref. 4.2.2).

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. 6.1.1), FirstEnergy conducted an EAL implementation upgrade project that produced the EALs discussed herein.

4.2 Fission Product Barriers

Fission product barrier thresholds represent threats to the defense in depth design concept that precludes the release of radioactive fission products to the environment. This concept relies on multiple physical barriers, any one of which, if maintained intact, precludes the release of significant amounts of radioactive fission products to the environment.

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

The primary fission product barriers are:

A. <u>Fuel Clad (FC):</u> The Fuel Clad Barrier consists of the cladding material that contains the fuel pellets.

B. <u>Reactor Coolant System (RCS):</u> The RCS Barrier is the reactor coolant system pressure boundary and includes the RPV and all reactor coolant system piping out to and including the isolation valves.

C. <u>Containment (CNTMT):</u> The Containment Barrier includes the drywell, the containment, their respective interconnecting paths, and other connections up to and including the outermost containment isolation valves. Containment Barrier thresholds are used as criteria for escalation of the Emergency Classification Level (ECL) from Alert to a Site Area Emergency or a General Emergency.

4.3 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

4.4 EAL Organization

The Perry EAL scheme includes the following features:

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

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

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

Category and subcategory titles are selected to represent conditions that are operationally significant to the EAL-user. The Perry EAL categories are aligned to and represent the NEI 99-01 Recognition Categories. Subcategories are used in the Perry scheme as necessary to further divide the EALs of a category into logical sets of possible emergency classification thresholds. The Perry EAL categories and subcategories are listed in Table 4.4-1.

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 bases in order to obtain additional information concerning the EALs under classification consideration. The user should consult Section 3.0 and Attachments 1 and 2 of this document for such information.

Table 4.4-1 EAL Groups, Categories and Subcategories

EAL Group/Category	EAL Subcategory
Any Operating Mode:	
R – Abnormal **R**ad 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 Coordinator 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 Essential DC Power 3 – Loss of Control Room Indications 4 – RCS Activity 5 – RCS Leakage 6 – RPS Failure 7 – Loss of Communications 8 – Hazardous Event Affecting Safety Systems
F – Fission Product Barrier Degradation	None
Cold Conditions:	
C – **C**old Shutdown / Refueling System Malfunction	1 – RPV Level 2 – Loss of Essential AC Power 3 – RCS Temperature 4 – Loss of Essential DC Power 5 – Loss of Communications 6 – Hazardous Event Affecting Safety Systems

4.5 Technical Bases Information

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

<u>Category Letter & Title</u>

<u>Subcategory Number & Title</u>

<u>Initiating Condition (IC)</u>

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

<u>EAL Identifier (enclosed in rectangle)</u>

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

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

   G = General Emergency
   S = Site Area Emergency
   A = Alert
   U = Unusual Event
3. Third character (number): Subcategory number within the given category. Subcategories are sequentially numbered beginning with the number one (1). If a category does not have a subcategory, this character is assigned the number one (1).
4. Fourth character (number): The numerical sequence of the EAL within the EAL subcategory. If the subcategory has only one EAL, it is given the number one (1).

<u>Classification (enclosed in rectangle):</u>

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

<u>EAL (enclosed in rectangle)</u>

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

<u>Mode Applicability</u>

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 Shutdown, 4 - Cold Shutdown, 5 - Refueling, D - Defueled, or All. (See Section 2.6 for operating mode definitions).

<u>Definitions:</u>

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

Basis:

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

Basis Reference(s):

Site-specific source documentation from which the EAL is derived

4.6 Operating Mode Applicability (ref. 4.1.2)

1 Power Operation
Reactor is critical and the mode switch is in RUN

2 Startup
The mode switch is in REFUEL (with all reactor vessel head closure bolts fully tensioned) or STARTUP/HOT STANDBY

3 Hot Shutdown
The mode switch is in SHUTDOWN and average reactor coolant temperature is >200ºF

4 Cold Shutdown
The mode switch is in SHUTDOWN and average reactor coolant temperature is ≤ 200ºF

5 Refueling
The mode switch is in REFUEL or SHUTDOWN with one or more reactor vessel head closure bolts are less than fully tensioned

D Defueled
RPV contains no irradiated fuel

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

4.7 Guidance on Making Emergency Classifications

4.7.1 General Considerations

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

4.7.1.1 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. 4.1.3).

4.7.1.2 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 indicator operability, the condition existence, or the report accuracy is removed. Implicit in this definition is the need for timely assessment.

4.7.1.3 IMMINENT Conditions

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

4.7.1.4 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).

4.7.1.5 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).

4.7.1.6 Emergency Coordinator Judgment

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

4.8 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. 4.1.3).

4.8.1 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, 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, an Alert should be declared.

Related guidance concerning classification of rapidly escalating events or conditions is provided in Regulatory Issue Summary (RIS) 2007-02, Clarification of NRC Guidance for Emergency Notifications During Quickly Changing Events (ref. 4.1.5).

4.8.2 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.

4.8.3 Classification of IMMINENT Conditions

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

4.8.4 Emergency Classification Level Upgrading and Downgrading

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

As noted above, guidance concerning classification of rapidly escalating events or conditions is provided in RIS 2007-02 (ref. 4.1.5).

4.8.5 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 scram the reactor followed by a successful manual scram.

4.8.6 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.

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

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

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

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

4.8.7 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. 4.1.6) 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.

4.8.8 Retraction of an Emergency Declaration

Guidance on the retraction of an emergency declaration reported to the NRC is discussed in NUREG-1022 (ref. 4.1.6).

5.0 RECORDS

5.1 Records Capture

The following records are completed/generated by this document:

Quality Records

None

Non-Quality Records

None

6.0 REFERENCES

6.1 Developmental

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

6.1.2 Technical Specifications Table 1.1-1, Modes

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

6.1.4 10 CFR 50.72, Immediate Notification Requirements for Operating Nuclear Power Reactors

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

6.1.6 NUREG-1022, Event Reporting Guidelines: 10 CFR 50.72 and 10 CFR 50.73

6.1.7 USAR 9.1.4.2.10.14, Onsite Spent Fuel Dry Storage (SFDS)

6.1.8 ONI-SPI E-1, Containment/Fuel Handling Building Closure

6.1.9 PAP-1925, Shutdown Defense in Depth Assessment and Management

6.1.10 10 CFR 50.73, License Event Report System

6.1.11 USAR Section 9.1.4.2.10, Description of Fuel Transfer

6.1.12 Certificate of Compliance No. 1014, Appendix A, Technical Specifications for the HI-STORM 100 Cask System, Section 1.1, Definitions

6.1.13 Certificate of Compliance No. 1032, Appendix A, Technical Specifications for the HI-STORM FW Cask System

6.2 Implementing

6.2.1 NOP-LP-5502, Event Classification

6.2.2 EP, Emergency Plan for Perry Nuclear Power Plant

6.2.3 NEI 99-01, Revision 6 to Perry EAL Comparison Matrix

6.2.4 Perry EAL Matrix

7.0 SCOPE OF REVISION

Rev. 22

1. Attachment 1: Modified EAL EU1.1 from; “EU1.1, Notification of Unusual Event - Damage to a loaded canister (MPC) CONFINEMENT BOUNDARY as indicated by measured dose rates on a loaded overpack > EITHER: 60 mrem/hr (gamma + neutron) on the top of the overpack 600 mrem/hr (gamma + neutron) on the side of the overpack, excluding inlet and outlet ducts” to “EU1.1, Notification of Unusual Event - Damage to a loaded Multi-Purpose Canister (MPC) CONFINEMENT BOUNDARY as indicated by measured dose rates on the top or side of a loaded overpack, excluding inlet and outlet vents, reading > ANY Table E-1 ISFSI Cask On-contact Dose Rate Limit”.

2. Attachment 1: Added table E-1 under EAL EU1.1. which incorporates dose rate limit setpoints for both the Holtec HI-STORM 100S dry fuel storage cask used prior to 2022 and the newly procured HI-STORM FW (Flood/Wind) cask. A description of the HI-STORM FW cask system was also added to this section.
3. Attachment 1: Added Figure E-2, ISFSI Pad Layout, under EAL EU1.1 to identify which fuel casks are the HI-STORM 100S model vice the HI-STORM FW model.
4. Attachment 1: Added ISFSI Certificate of Compliance No. 1032, Technical Specification Section 5.3.4.a&b, for the HI-STORM FW system to the EAL basis and basis references.
5. Added procedure scope statement as section 2.0 to conform with current procedure writers' guidelines.
6. Moved definitions to section 3.0 to conform with current procedure writers' guidelines.
7. Consolidated section 2, Discussion, and section 3, Guidance on Making Emergency Classifications, into a single section 4.0, Procedure Details. Section 4.0 was re-numbered to reflect the following sections; 4.1, Background, 4.2, Fission Product Barriers, 4.3, Fission Product Barrier Classification Criteria, 4.4 EAL Organization, 4.5, Technical Bases Information, 4.6, Operating Mode Applicability, 4.7, Guidance on Making Emergency Classifications, and 4.6, Classification Methodology in order to conform with current procedure writers' guidelines.
8. Added records section 5.0 to conform with current procedure writers' guidelines.
9. Moved references to section 6.0 to conform with current procedure writers' guidelines.
10. Moved scope of revision to section 7.0 to conform with current procedure writers' guidelines.
11. Removed "Section 7.0" from Attachments Section Title to conform with current procedure writers' guidelines.
12. Moved the "Perry to NEI 99-01 Rev. 6 Cross Reference" Table from Section 6.0 to attachment 1 to conform with current procedure writers' guidelines.
13. Re-numbered existing Attachments 1, 2, and 3 to new Attachments 2, 3, and 4.
14. Replaced reference EPI-A1, Emergency Action Levels with NOP-LP-5502, Event Classification, in Section 1.0 and 4.2.1.
15. Corrected FirstEnergy to Energy Harbor in Section 5.1.
16. Corrected the following typographical errors on Fission Barrier Containment Potential Loss Threshold D.1; "SVI-D19-TS5353" in the "Basis" section was corrected to "SVI-D19-T5353" and reference number 2 was changed from "NEI 99-01, Primary Containment Radiation Fuel Clad Potential Loss 1.D" to "NEI 99-01, Primary Containment Conditions PC Potential Loss 4.A."

ATTACHMENTS:

1. Perry to NEI 99-01 EAL Cross Reference
2. Emergency Action Level Technical Bases
3. Fission Product Barrier Matrix and Bases
4. Safe Operation & Shutdown Areas Tables R-2 & H-2 Bases

ATTACHMENT 1: Perry to NEI 99-01 Rev. 6 EAL Cross Reference

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

Perry EAL	NEI 99-01 Rev. 6	
	IC	Example EAL
RU1.1	AU1	1, 2
RU1.2	AU1	3
RU2.1	AU2	1
RA1.1	AA1	1
RA1.2	AA1	2
RA1.3	AA1	3
RA1.4	AA1	4
RA2.1	AA2	1
RA2.2	AA2	2
RA2.3	AA2	3
RG2.1	AG2	1
RA3.1	AA3	1
RA3.2	AA3	2
RS1.1	AS1	1
RS1.2	AS1	2
RS1.3	AS1	3
RS2.1	AS2	1
RG1.1	AG1	1
RG1.2	AG1	2

ATTACHMENT 1: Perry to NEI 99-01 Rev. 6 EAL Cross Reference

RG1.3	AG1	3
RG2.1	AG2	1
CU1.1	CU1	1
CU1.2	CU1	2
CU2.1	CU2	1
CU3.1	CU3	1
CU3.2	CU3	2
CU4.1	CU4	1
CU5.1	CU5	1
CU5.2	CU5	2
CU5.3	CU5	1, 2, 3
CA1.1	CA1	1
CA1.2	CA1	2
CA2.1	CA2	1
CA3.1	CA3	1, 2
CA6.1	CA6	1
CS1.1	CS1	1
CS1.2	CS1	2
CS1.3	CS1	3
CG1.1	CG1	1
CG1.2	CG1	2
FA1.1	FA1	1
FS1.1	FS1	1
FG1.1	FG1	1
HU1.1	HU1	1, 2, 3

ATTACHMENT 1: Perry to NEI 99-01 Rev. 6 EAL Cross Reference

HU2.1	HU2	1
HU3.1	HU3	1
HU3.2	HU3	2
HU3.3	HU3	3
HU3.4	HU3	4
N/A	HU3	5
HU4.1	HU4	1
HU4.2	HU4	2
HU4.3	HU4	3
HU4.4	HU4	4
HU7.1	HU7	1
HA1.1	HA1	1, 2
HA5.1	HA5	1
HA6.1	HA6	1
HA7.1	HA7	1
HS1.1	HS1	1
HS6.1	HS6	1
HS7.1	HS7	1
HG1.1	HG1	1
HG7.1	HG7	1
SU1.1	SU1	1
SU3.1	SU2	1
SU4.1	SU3	1
SU4.2	SU3	2
SU5.1	SU4	1, 2, 3
SU6.1	SU5	1

ATTACHMENT 1: Perry to NEI 99-01 Rev. 6 EAL Cross Reference

SU6.2	SU5	2
SU7.1	SU6	1, 2, 3
SA1.1	SA1	1
SA3.1	SA2	1
SA6.1	SA5	1
SA8.1	SA9	1
SS1.1	SS1	1
SS2.1	SS8	1
SS6.1	SS5	1
SG1.1	SG1	1
SG1.2	SG8	1
EU1.1	E-HU1	1

Category R – Abnormal Rad Release / Rad Effluent

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

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

At lower levels, abnormal radioactivity releases may be indicative of a failure of containment systems or precursors to more significant releases. At higher release rates, offsite radiological conditions may result which require offsite protective actions. Elevated area radiation levels in the 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 2: EAL Bases

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

RU1.1 Unusual Event

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

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

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

Note 3: If the effluent flow past an effluent monitor is known to have stopped, indicating that the release path is isolated, the effluent monitor reading is no longer VALID for classification purposes.

Table R-1 Effluent Monitor Classification Thresholds

	Release Point	Monitor	GE	SAE	Alert	UE
Gaseous	Unit 1 Plant Vent	1D17-K786 1D19-K300	---- 1.3E+00 µCi/cc	---- 1.3E-01 µCi/cc	---- 1.3E-02 µCi/cc	2 x High alarm ----
	OG Vent Pipe	1D17-K836 1D19-K400	---- 4.7E+00 µCi/cc	---- 4.7E-01 µCi/cc	---- 4.7E-02 µCi/cc	2 x High alarm ----
	TB/HB Vent	1D17-K856	7.7E+04 cpm	7.7E+03 cpm	7.7E+02 cpm	2 x High alarm
	Unit 2 Plant Vent	2D17-K786 2D19-K300	---- 3.0E+00 µCi/cc	---- 3.0E-01 µCi/cc	---- 3.0E-02 µCi/cc	2 x High alarm ----
Liquid	Emergency Service Water Loop A	D17-K604	----	----	----	High alarm
	Emergency Service Water Loop B	D17-K605	----	----	----	High alarm

Mode Applicability:

All

Definition(s):

None

Basis:

Per NEI 99-01, this EAL addresses normally occurring continuous radioactivity releases from monitored gaseous or liquid effluent pathways and planned batch releases from releases from non-continuous release pathways.

Gaseous Releases

There are four separate gaseous effluent environmental release points at PNPP:

- Unit 1 Vent: This vent is located on the top of the Intermediate Building, Elevation 753’9”.
- Unit 2 Vent: This vent is located on the top of the Intermediate Building, Elevation 753’9”.
- Off-Gas Vent: This vent is located on the top of the Off-Gas Building, Elevation 723’0”.
- Turbine Building/Heater Bay Vent: This vent is located on the top of the Heater Bay Building, Elevation 722’0”.

The PNPP RU1.1 gaseous effluent EAL threshold values have been established as the 2 x High Alarm level for the monitor and will equate to 2 times the ODCM limit (ref. 5).

The Unit 2 Plant Vent radiation monitor is included because the second train of the Unit 1 Annulus Exhaust and the Control Complex and Intermediate Building ventilations are exhausted through the Unit 2 Vent (ref. 3).

Liquid Releases

Batch Releases – Batch releases from the liquid radwaste system may occur from the waste sample tank, floor drain sample tank, chemical waste distillate tank, and detergent drain tank. All of the liquid radwaste releases from these tanks go to the Emergency Service Water (ESW) discharge.

Continuous Releases – PNPP does not perform continuous radioactive liquid releases. Potential leakage pathways that could result in continuous leakage to the environment at PNPP are:

- Residual Heat Removal (RHR) heat exchanger leakage into the ESW system.
- Alternate Decay Heat Removal (ADHR) heat exchanger leakage into the Service Water system.
- Tritium activity from outside air (via plant vent) condensing in the M35 Supply Plenum (Turbine Building Ventilation System) routed into storm drains.

These pathways may include installed monitors or are checked by periodic grab sample. However, these sources are not engineered discharge pathways used for normally occurring continuous liquid radioactivity releases and thus are not applicable for use as a routine discharge liquid release point for EAL threshold development.

The PNPP RU1.1 liquid effluent EAL threshold values have been established as the High Alarm level for the monitor and equates to 2 times the ODCM limit (ref. 5).

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

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

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

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

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

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

This EAL also addresses radioactivity releases that cause effluent radiation monitor readings to exceed 2 times the ODCM limit for non-continuous releases associated with planned batch releases from non-continuous release pathways (e.g., radwaste).

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

Basis Reference(s):

1. CHI-0006, Radiation Monitoring Alarm Setpoint Determination
2. ARI-H13-P680-0007-A10, Airborne Rad P804
3. USAR Section 11.5.3, Effluent Monitoring and Sampling
4. ARI-H13-P604-0001, Process Radiation Monitoring Panel
5. Calculation EP-EALCALC-PNPP-1401, Radiological Effluent EAL Values
6. NEI 99-01 AU1

ATTACHMENT 2: EAL Bases

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

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

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

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

Mode Applicability:

All

Definition(s):

None

Basis:

For a radiological liquid release, the calculated effluent concentration from a chemistry sample is compared to the emergency action level.

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

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

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

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

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

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

Basis Reference(s):

1. USAR Section 11.5.3 Effluent Monitoring and Sampling
2. ODCM 3.3.7.9, Radioactive Liquid Effluent Monitoring Instrumentation
3. NEI 99-01 AU1

ATTACHMENT 2: EAL Bases

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

RA1.1 Alert

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

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

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

Note 3: If the effluent flow past an effluent monitor is known to have stopped, indicating that the release path is isolated, the effluent monitor reading is no longer VALID for classification purposes.

Note 4 The pre-calculated effluent monitor values presented in EALs RA1.1, RS1.1 and RG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Table R-1 Effluent Monitor Classification Thresholds

	Release Point	Monitor	GE	SAE	Alert	UE
Gaseous	Unit 1 Plant Vent	1D17-K786	----	----	----	2 x High alarm
		1D19-K300	1.3E+00 μCi/cc	1.3E-01 μCi/cc	1.3E-02 μCi/cc	----
	OG Vent Pipe	1D17-K836	----	----	----	2 x High alarm
		1D19-K400	4.7E+00 μCi/cc	4.7E-01 μCi/cc	4.7E-02 μCi/cc	----
	TB/HB Vent	1D17-K856	7.7E+04 cpm	7.7E+03 cpm	7.7E+02 cpm	2 x High alarm
	Unit 2 Plant Vent	2D17-K786	----	----	----	2 x High alarm
		2D19-K300	3.0E+00 μCi/cc	3.0E-01 μCi/cc	3.0E-02 μCi/cc	----
Liquid	Emergency Service Water Loop A	D17-K604	----	----	----	High alarm
	Emergency Service Water Loop B	D17-K605	----	----	----	High alarm

Mode Applicability:

All

Definition(s):

None

Basis:

This EAL address gaseous radioactivity releases, that for whatever reason, cause effluent radiation monitor readings corresponding to SITE BOUNDARY doses that exceed either (ref. 1, 2):

- 10 mRem TEDE
- 50 mRem child thyroid CDE

The column “Alert” gaseous effluent release values in Table R-1 correspond to calculated doses of 1% of the EPA Protective Action Guidelines (TEDE or child thyroid CDE) (ref. 1).

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

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

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

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

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

Basis Reference(s):

1. Calculation EP-EALCALC-PNPP-1401, Radiological Effluent EAL Values
2. USAR Section 11.5.3, Effluent Monitoring and Sampling
3. NEI 99-01 AA1

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

RA1.2	**Alert**
Dose assessment using actual meteorology indicates doses > 10 mrem TEDE or > 50 mrem child thyroid CDE at or beyond the SITE BOUNDARY (Note 4)	

Note 4: The pre-calculated effluent monitor values presented in EALs RA1.1, RS1.1 and RG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - The area within the OWNER CONTROLLED AREA which is encompassed by a security fence surrounding the Perry Plant.

Basis:

Dose assessments are performed by computer-based methods. Per the ODCM, liquid and gaseous doses are calculated at least once every thirty-one days (ref. 1, 2).

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

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

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

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

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

Basis Reference(s):

1. Offsite Dose Calculation Manual, Figure 3.2-1, PNPP Site Boundary and Unrestricted Area
2. CHI-0007, MIDAS
3. NEI 99-01 AA1

ATTACHMENT 2: EAL Bases

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

RA1.3	**Alert**
Analysis of a liquid effluent sample indicates a concentration or release rate that would result in doses > 10 mrem TEDE or > 50 mrem child thyroid CDE at or beyond the SITE BOUNDARY for 60 min. of exposure (Notes 1, 2)	

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

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

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - The area within the OWNER CONTROLLED AREA which is encompassed by a security fence surrounding the Perry 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 child thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and child thyroid CDE.

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

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

Basis Reference(s):

1. NEI 99-01 AA1

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

RA1.4 Alert

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

- Closed window dose rates > 10 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate child thyroid CDE > 50 mrem for 60 min. of inhalation.

(Notes 1, 2)

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

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

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - The area within the OWNER CONTROLLED AREA which is encompassed by a security fence surrounding the Perry Plant.

Basis:

NOP-LP-5015, Field Monitoring Team - Radiation Monitoring Team Field Surveys, provides guidance for emergency or post-accident radiological environmental monitoring (ref. 1).

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

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

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

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

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

Basis Reference(s):

1. NOP-LP-5015, Field Monitoring Team - Radiation Monitoring Team Field Surveys
2. NEI 99-01 AA1

ATTACHMENT 2: EAL Bases

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

RS1.1 Site Area Emergency

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

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

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

Note 3: If the effluent flow past an effluent monitor is known to have stopped, indicating that the release path is isolated, the effluent monitor reading is no longer VALID for classification purposes.

Note 4: The pre-calculated effluent monitor values presented in EALs RA1.1, RS1.1 and RG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Table R-1 Effluent Monitor Classification Thresholds

Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Unit 1 Plant Vent	1D17-K786	----	----	----	2 x High alarm
		1D19-K300	1.3E+00 µCi/cc	1.3E-01 µCi/cc	1.3E-02 µCi/cc	----
	OG Vent Pipe	1D17-K836	----	----	----	2 x High alarm
		1D19-K400	4.7E+00 µCi/cc	4.7E-01 µCi/cc	4.7E-02 µCi/cc	----
	TB/HB Vent	1D17-K856	7.7E+04 cpm	7.7E+03 cpm	7.7E+02 cpm	2 x High alarm
	Unit 2 Plant Vent	2D17-K786	----	----	----	2 x High alarm
		2D19-K300	3.0E+00 µCi/cc	3.0E-01 µCi/cc	3.0E-02 µCi/cc	----
Liquid	Emergency Service Water Loop A	D17-K604	----	----	----	High alarm
	Emergency Service Water Loop B	D17-K605	----	----	----	High alarm

Mode Applicability:

All

Definition(s):

None

Basis:

This EAL address gaseous radioactivity releases, that for whatever reason, cause effluent radiation monitor readings corresponding to SITE BOUNDARY doses that exceed either (ref. 1, 2):

- 100 mRem TEDE
- 500 mRem child thyroid CDE

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

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

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

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

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

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

Basis Reference(s):

1. Calculation EP-EALCALC-PNPP-1401, Radiological Effluent EAL Values
2. USAR Section 11.5.3, Effluent Monitoring and Sampling
3. NEI 99-01 AS1

ATTACHMENT 2: EAL Bases

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

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

Note 4: The pre-calculated effluent monitor values presented in EALs RA1.1, RS1.1 and RG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - The area within the OWNER CONTROLLED AREA which is encompassed by a security fence surrounding the Perry Plant.

Basis:

Dose assessments are performed by computer-based methods. Per the ODCM, liquid and gaseous doses are calculated at least once every thirty-one days (ref. 1, 2).

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

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

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

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

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

ATTACHMENT 2: EAL Bases

Basis Reference(s):

1. Offsite Dose Calculation Manual, Figure 3.2-1, PNPP Site Boundary and Unrestricted Area
2. CHI-0007, MIDAS
3. NEI 99-01 AS1

ATTACHMENT 2: EAL Bases

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

RS1.3 Site Area Emergency

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

- Closed window dose rates > 100 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate child thyroid CDE > 500 mrem for 60 min. of inhalation.

(Notes 1, 2)

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

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

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - The area within the OWNER CONTROLLED AREA which is encompassed by a security fence surrounding the Perry Plant.

Basis:

NOP-LP-5015, Field Monitoring Team - Radiation Monitoring Team Field Surveys, provides guidance for emergency or post-accident radiological environmental monitoring (ref. 1).

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

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

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

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

Basis Reference(s):

1. NOP-LP-5015, Field Monitoring Team - Radiation Monitoring Team Field Surveys
2. NEI 99-01 AS1

ATTACHMENT 2: EAL Bases

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

RG1.1 General Emergency

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

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

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

Note 3: If the effluent flow past an effluent monitor is known to have stopped, indicating that the release path is isolated, the effluent monitor reading is no longer VALID for classification purposes.

Note 4: The pre-calculated effluent monitor values presented in EALs RA1.1, RS1.1 and RG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Table R-1 Effluent Monitor Classification Thresholds

	Release Point	Monitor	GE	SAE	Alert	UE
Gaseous	Unit 1 Plant Vent	1D17-K786	----	----	----	2 x High alarm
		1D19-K300	1.3E+00 µCi/cc	1.3E-01 µCi/cc	1.3E-02 µCi/cc	----
	OG Vent Pipe	1D17-K836	----	----	----	2 x High alarm
		1D19-K400	4.7E+00 µCi/cc	4.7E-01 µCi/cc	4.7E-02 µCi/cc	----
	TB/HB Vent	1D17-K856	7.7E+04 cpm	7.7E+03 cpm	7.7E+02 cpm	2 x High alarm
	Unit 2 Plant Vent	2D17-K786	----	----	----	2 x High alarm
		2D19-K300	3.0E+00 µCi/cc	3.0E-01 µCi/cc	3.0E-02 µCi/cc	----
Liquid	Emergency Service Water Loop A	D17-K604	----	----	----	High alarm
	Emergency Service Water Loop B	D17-K605	----	----	----	High alarm

Mode Applicability:

All

Definition(s):

None

Basis:

This EAL address gaseous radioactivity releases, that for whatever reason, cause effluent radiation monitor readings corresponding to SITE BOUNDARY doses that exceed either (ref. 1, 2):

- 1000 mRem TEDE
- 5000 mRem child thyroid CDE

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

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

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

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

Basis Reference(s):

1. Calculation EP-EALCALC-PNPP-1401, Radiological Effluent EAL Values
2. USAR Section 11.5.3, Effluent Monitoring and Sampling
3. NEI 99-01 AG1

ATTACHMENT 2: EAL Bases

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

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

Note 4: The pre-calculated effluent monitor values presented in EALs RA1.1, RS1.1 and RG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - The area within the OWNER CONTROLLED AREA which is encompassed by a security fence surrounding the Perry Plant.

Basis:

Dose assessments are performed by computer-based methods. Per the ODCM, liquid and gaseous doses are calculated at least once every thirty-one days (ref. 1, 2).

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

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

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

Basis Reference(s):

1. Offsite Dose Calculation Manual, Figure 3.2-1, PNPP Site Boundary and Unrestricted Area
2. CHI-0007, MIDAS
3. NEI 99-01 AG1

ATTACHMENT 2: EAL Bases

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

RG1.3 General Emergency

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

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

(Notes 1, 2)

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

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

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - The area within the OWNER CONTROLLED AREA which is encompassed by a security fence surrounding the Perry Plant.

Basis:

NOP-LP-5015, Field Monitoring Team - Radiation Monitoring Team Field Surveys, provides guidance for emergency or post-accident radiological environmental monitoring (ref. 1).

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

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

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

Basis Reference(s):

1. NOP-LP-5015, Field Monitoring Team - Radiation Monitoring Team Field Surveys
2. NEI 99-01 AG1

ATTACHMENT 2: EAL Bases

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

Initiating Condition: UNPLANNED loss of water level above irradiated fuel

EAL:

RU2.1 Unusual Event

UNPLANNED water level drop above irradiated fuel in the REFUELING PATHWAY as indicated by **EITHER** of the following:

- Fuel Pool Water low level alarm
- FPCC Surge Tank low level alarm

AND

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

- SPENT FUEL POOL D21-K332
- UPPER POOL AREA 1D21-K083
- FUEL PREP POOL D21-K322

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 - Reactor cavity (well), CNTMT fuel storage pool, CNTMT fuel transfer pool, FHB Fuel Storage Preparation Pool, FHB fuel transfer pool, FHB spent fuel storage pool, and FHB Cask Pit comprise the refueling pathway.

Basis:

Each fuel storage pool is designed to MAINTAIN the water level in the pool above the top of active fuel providing cooling for the fuel bundles. Redundant level sensors are used to alarm high and low water levels in the upper and spent fuel pools and the system surge tank (ref. 1, 2). A separate level indicator is provided for the cask pool. Redundant level instrumentation is provided for the surge tanks which alarm on high or low water level, and which alarm and trip the circulating pumps on a low-low level. With the exception of limited time periods for maintenance or non-refueling operations, administrative controls maintain gates in the open position between: the fuel storage and preparation pool, fuel transfer pool, spent fuel storage pool, and the cask pit (ref. 3, 4).

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

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

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

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

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

Basis Reference(s):

1. ARI-H13-P970-001 C-4, Spent Fuel Pool Low Level
2. ARI-H13-P970-001 D-3(D-4), FPCC Surge Tank A(B) Level HI/LO
3. USAR Section 9.1.3.2 System Description
4. ONI-D17, High Radiation Levels within Plant
5. NEI 99-01 AU2

ATTACHMENT 2: EAL Bases

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

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

EAL:

RA2.1 Alert

Uncovery of irradiated fuel in the REFUELING PATHWAY

Mode Applicability:

All

Definition(s):

REFUELING PATHWAY - Reactor cavity (well), CNTMT fuel storage pool, CNTMT fuel transfer pool, FHB Fuel Storage Preparation Pool, FHB fuel transfer pool, FHB spent fuel storage pool, and FHB Cask Pit comprise the refueling pathway.

Basis:

Each fuel storage pool is designed to maintain the water level in the pool above the top of active fuel providing cooling for the fuel bundles. Redundant level sensors are used to alarm high and low water levels in the upper and spent fuel pools and the system surge tank. A separate level indicator is provided for the cask pool. Redundant level instrumentation is provided for the surge tanks which alarm on high or low water level, and which alarm and trip the circulating pumps on a low-low level. With the exception of limited time periods for maintenance or non-refueling operations, administrative controls maintain gates in the open position between: the fuel storage and preparation pool, fuel transfer pool, spent fuel storage pool, and the cask pit (ref. 1).

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

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

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

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

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

Basis Reference(s):

1. USAR Section 9.1.3.2 System Description
2. NEI 99-01 AA2

ATTACHMENT 2: EAL Bases

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

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

EAL:

RA2.2 Alert

Damage to irradiated fuel resulting in a release of radioactivity

AND

Any of the following radiation monitor indications:

- SPENT FUEL POOL D21-K332 (high alarm)
- UPPER POOL AREA 1D21-K083 (high alarm)
- FUEL PREP POOL D21-K322 (high alarm)
- FHB VENT EXH GAS D17-K716 (high alarm)
- CNTMT ATMOS GAS 1D17-K686 (high alarm)

Mode Applicability:

All

Definition(s):

None

Basis:

Permanent area and airborne gas channel radiation monitors in Containment and the Fuel Handling Building (FHB) are utilized as indication for increased radiation levels caused by damage to irradiate fuel (ref. 1).

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

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

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).

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 EAL EU1.1.

Basis Reference(s):

1. ONI-D17, High Radiation Levels within Plant
2. NEI 99-01 AA2

ATTACHMENT 2: EAL Bases

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

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

EAL:

RA2.3	**Alert**
Lowering of spent fuel pool level to 23.5 ft	

Mode Applicability:

All

Definition(s):

None

Basis:

The spent fuel storage pool is designed to maintain the water level in the pool above the top of irradiated fuel and thus providing cooling for the fuel assemblies. Post-Fukushima order EA-12-051 required the installation of reliable SFP level indication capable of identifying normal level (Level 1: 619’-6” el), SFP level providing personnel shielding (Level 2: 614’-6” el or 23.4 ft indicated rounded to 23.5 ft), and SFP level at the top of the fuel racks, which for Perry has been defined as the bottom sill of the gates (Level 3: or 594’-6” el or 3.4 ft indicated rounded to 3.5 ft). The spent fuel pool is equipped with primary and backup guided wave radar probes to measure pool level. The range is continuous from the high pool level elevation (619’-6”) to the top of the spent fuel racks (591’-2”) (ref. 1).

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

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.

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 RS1.

Basis Reference(s):

1. Perry Specific Technical Guideline
2. NEI 99-01 AA2

ATTACHMENT 2: EAL Bases

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

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

EAL:

RS2.1	**Site Area Emergency**
Lowering of spent fuel pool level to 3.5 ft	

Mode Applicability:

All

Definition(s):

None

Basis:

The spent fuel storage pool is designed to maintain the water level in the pool above the top of irradiated fuel and thus providing cooling for the fuel assemblies. Post-Fukushima order EA-12-051 required the installation of reliable SFP level indication capable of identifying normal level (Level 1: 619’-6” el), SFP level providing personnel shielding (Level 2: 614’-6” el or 23.4 ft indicated rounded to 23.5 ft), and SFP level at the top of the fuel racks, which for Perry has been defined as the bottom sill of the gates (Level 3: or 594’-6” el or 3.4 ft indicated rounded to 3.5 ft). The spent fuel pool is equipped with primary and backup guided wave radar probes to measure pool level. The range is continuous from the high pool level elevation (619’-6”) to the top of the spent fuel racks (591’-2”) (ref. 1).

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

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

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

Basis Reference(s):

1. Perry Specific Technical Guideline
2. NEI 99-01 AA2

ATTACHMENT 2: EAL Bases

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

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

EAL:

RG2.1	**General Emergency**
Spent fuel pool level cannot be restored to at least 3.5 ft for ≥ 60 min. (Note 1)	

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

Mode Applicability:

All

Definition(s):

None

Basis:

The spent fuel storage pool is designed to maintain the water level in the pool above the top of irradiated fuel and thus providing cooling for the fuel assemblies. Post-Fukushima order EA-12-051 required the installation of reliable SFP level indication capable of identifying normal level (Level 1: 619'-6" el), SFP level providing personnel shielding (Level 2: 614'-6" el or 23.4 ft indicated rounded to 23.5 ft), and SFP level at the top of the fuel racks, which for Perry has been defined as the bottom sill of the gates (Level 3: or 594'-6" el or 3.4 ft indicated rounded to 3.5 ft). The spent fuel pool is equipped with primary and backup guided wave radar probes to measure pool level. The range is continuous from the high pool level elevation (619'-6") to the top of the spent fuel racks (591'-2") (ref. 1).

This IC 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.

Basis Reference(s):

1. Perry Specific Technical Guideline
2. NEI 99-01 AG2

ATTACHMENT 2: EAL Bases

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 3 – Area Radiation Levels

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

EAL:

RA3.1 Alert

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

- Control Room
- CAS (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:

The Central Alarm Station (CAS) is included in this EAL because of its importance in permitting access to areas required to assure safe plant operations.

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

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

Basis Reference(s):

1. NEI 99-01 AA3

Category: R – Abnormal Rad Levels / Rad Effluent

Subcategory: 3 – Area Radiation Levels

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

EAL:

RA3.2 **Alert**
An UNPLANNED event results in radiation levels that prohibit or IMPEDE access to **any** Table R-2 rooms or areas (Note 5)

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

Table R-2 Safe Shutdown Rooms/Areas	
Room/Area	**Modes**
• AX Elevation 574' RHR B	3, 4, 5
• AX Elevation 620' West Hallway	3, 4, 5
• CC Elevation 620' Division 1 AC	3, 4, 5
• CC Elevation 620' Division 2 AC	3, 4, 5

Mode Applicability:

3 – Hot Shutdown, 4 – Cold Shutdown, 5 – Refueling

Definition(s):

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

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

Basis:

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

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

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

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

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

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

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

NOTE: EAL RA3.2 mode applicability has been limited to the applicable modes identified in Table R-2 Safe Operation & Shutdown Rooms/Areas. If due to plant operating procedure or plant configuration changes, the applicable plant modes specified in Table R-2 are changed, a corresponding change to Attachment 3 ‘Safe Operation & Shutdown Areas Tables R-2 & H-2 Bases’ and to EAL RA3.2 mode applicability is required.

Basis Reference(s):

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

ATTACHMENT 2: EAL Bases

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 (4 - Cold Shutdown, 5 - Refueling, D – Defueled).

The events of this category pertain to the following subcategories:

1. RPV Level

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

2. Loss of Essential AC Power

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

3. RCS Temperature

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

4. Loss of Essential DC Power

Loss of essential plant electrical power can compromise plant SAFETY SYSTEM operability including decay heat removal and emergency core cooling systems which may be necessary to ensure fission product barrier integrity. This category includes loss of power to or degraded voltage on the 125 VDC essential 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 2: EAL Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RPV Level

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

EAL:

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

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

Mode Applicability:

4 - Cold Shutdown, 5 - 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:

Perry is equipped with multiple RPV water level instruments including: Wide Range, Fuel Zone, Shutdown Range, Upset Range, and Narrow Range (ref. 1). Multiple instruments on different reference and variable legs should be monitored. The Upset Range and Shutdown Range instruments share a common reference leg; therefore, Narrow Range instruments should be routinely monitored when relying on Shutdown or Upset Range instrument as the primary indication (ref. 2).

With the plant in Cold Shutdown, RPV water level is normally maintained above the RPV low level scram setpoint of 178 in. (ref. 1). However, if RPV level is being controlled below the RPV low level scram setpoint, or if level is being maintained in a designated band in the reactor vessel it is the inability to maintain level above the low end of the designated control band due to a loss of inventory resulting from a leak in the RCS that is the concern.

With the plant in Refueling mode, RPV water level is normally maintained at or above the reactor vessel flange. Technical Specifications require at least 22 ft 9 in. of water above the top of the reactor vessel flange in the refueling cavity during refueling operations (ref. 3). The RPV flange is at approximately 364 in. The Control Room indication for RPV water level may be +/- 7" from actual level (ref. 2).

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

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

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

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

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

Basis Reference(s):

1. EOP-01, RPV Control
2. IOI-0009, Refueling
3. Technical Specifications 3.9.6
4. NEI 99-01 CU1

ATTACHMENT 2: EAL Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RPV Level

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

EAL:

CU1.2 Unusual Event

RPV level **cannot** be monitored

AND

UNPLANNED increase in **any** Table C-1 sump or pool levels due to a loss of RPV inventory

Table C-1 Sumps/Pool
• Drywell equipment drain sump • Drywell floor drain sump • CNTMT equipment drain sump • CNTMT floor drain sump • Suppression Pool • RHR A, B, C, HPCS, LPCS, RCIC cubicle drain sumps • Auxiliary Building floor drain sump • IB / FHB floor drain sump • Visual observation

Mode Applicability:

4 - Cold Shutdown, 5 – 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:

In Cold Shutdown mode, the RCS will normally be intact and standard RPV level monitoring means are available. RPV level in the Refueling mode is normally monitored using the Shutdown Range instrument with a reference pressure source installed to expand the water level range to the refuel floor. I&C also installs a temporary level indicator at local panel 1H22-P027C (ref. 1).

In this EAL, all water level indication is unavailable and the RPV inventory loss must be detected by the leakage indications listed in Table C-1. Level increases must be evaluated against other potential sources of leakage such as cooling water sources inside the drywell to ensure they are indicative of

RPV leakage. Rise in drywell equipment drain sump level and drywell floor sump level is the normal method of monitoring and calculating leakage from the RPV (ref. 2). An Auxiliary Building sump level rise may also be indicative of RCS inventory losses external to the Containment from systems connected to the RPV. With RHR System operating in the Shutdown Cooling mode, an unexplained rise in suppression pool water level could be indicative of RHR valve misalignment or leakage]. If the make-up rate to the RPV unexplainably rises above the pre-established rate, a loss of RPV inventory may be occurring even if the source of the leakage cannot be immediately identified. Visual observation of leakage from systems connected to the RCS that cannot be isolated could be indicative of a loss of RPV inventory.

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 RPV level concurrent with indications of coolant leakage. Either of these conditions is considered to be a potential degradation of the level of safety of the plant.

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

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

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

Basis Reference(s):

1. IOI-0009, Refueling
2. ARI-H13-P601-0018-A1, Drywell Identified Leak Rate High
3. NEI 99-01 CU1

ATTACHMENT 2: EAL Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RPV Level

Initiating Condition: Loss of RPV inventory

EAL:

CA1.1 **Alert**
Loss of RPV inventory as indicated by RPV level < 130 in. (Level 2)

Mode Applicability:

4 - Cold Shutdown, 5 – Refueling

Definition(s):

None

Basis:

The threshold RPV water level of 129.8 in. (rounded to 130 in.) is the Level 2 actuation setpoint for HPCS and RCIC. Although RCIC cannot restore RCS inventory in the cold condition, the Level 2 actuation setpoint is operationally significant and is indicative of a loss of RCS inventory significantly below the low RPV water level scram setpoint specified in CU1.1 (ref. 1-3).

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

For this EAL, a lowering of water level below 129.8 in. indicates that operator actions have not been successful in restoring and maintaining RPV water level. The heat-up rate of the coolant will increase as the available water inventory is reduced. A continuing decrease in water level will lead to core uncovery.

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

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

Basis Reference(s):

1. Technical Specifications Table 3.3.5.1-1, Emergency Core Cooling System Instrumentation
2. ARI-H13-P601-0016-C5, HPCS RX LEVEL LO L2
3. ARI-H13-P601-0021-A5, RCIC START SIGNAL RECEIVED
4. NEI 99-01 CA1

ATTACHMENT 2: EAL Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RPV Level

Initiating Condition: Loss of RPV inventory

EAL:

CA1.2 Alert

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

AND

UNPLANNED increase in **any** Table C-1 sump or pool levels due to a loss of RPV inventory

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

Table C-1 Sumps/Pool
• Drywell equipment drain sump • Drywell floor drain sump • CNTMT equipment drain sump • CNTMT floor drain sump • Suppression Pool • RHR A, B, C, HPCS, LPCS, RCIC cubicle drain sumps • Auxiliary Building floor drain sump • IB / FHB floor drain sump • Visual observation

Mode Applicability:

4 - Cold Shutdown, 5 – 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:

In Cold Shutdown mode, the RCS will normally be intact and standard RPV level monitoring means are available. RPV level in the Refueling mode is normally monitored using the Shutdown Range instrument with a reference pressure source installed to expand the water level range to the refuel floor. I&C also installs a temporary level indicator at local panel 1H22-P027C (ref. 1).

In this EAL, all water level indication is unavailable and the RPV inventory loss must be detected by the leakage indications listed in Table C-1. Level increases must be evaluated against other potential sources of leakage such as cooling water sources inside the drywell to ensure they are indicative of RPV leakage. Rise in drywell equipment drain sump level and drywell floor sump level is the normal method of monitoring and calculating leakage from the RPV (ref. 2). An Auxiliary Building sump level rise may also be indicative of RCS inventory losses external to the Containment from systems connected to the RPV. With RHR System operating in the Shutdown Cooling mode, an unexplained rise in suppression pool water level could be indicative of RHR valve misalignment or leakage. If the make-up rate to the RPV unexplainably rises above the pre-established rate, a loss of RPV inventory may be occurring even if the source of the leakage cannot be immediately identified. Visual observation of leakage from systems connected to the RCS that cannot be isolated could be indicative of a loss of RPV inventory.

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 RPV 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.

Basis Reference(s):

1. IOI-0009, Refueling
2. ARI-H13-P601-0018-A1, Drywell Identified Leak Rate High
3. NEI 99-01 CA1

ATTACHMENT 2: EAL Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RPV Level

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

EAL:

CS1.1 Site Area Emergency

CONTAINMENT CLOSURE **not** established

AND

RPV level < 16.5 in. (Level 1)

Mode Applicability:

4 - Cold Shutdown, 5 - Refueling

Definition(s):

CONTAINMENT CLOSURE - The procedurally defined conditions or actions taken to secure Containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions. Containment Closure is established when the Containment requirements of ONI-SPI E-1 (ref. 4.1.8) are met with the following exception: a functional barrier must exist at the time of the event (i.e., cannot rely on contingency methods to establish a functional barrier).

Basis:

The threshold RPV water level of 16.5 in. is the low-low-low ECCS actuation setpoint (Level 1). The magnitude of this loss of water indicates that makeup systems have not been effective and may not be capable of preventing further RPV water level decrease and potential core uncovery. The inability to restore and maintain level after reaching this setpoint infers a failure of the RCS barrier and Potential Loss of the Fuel Clad barrier (ref. 1, 2).

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

Following an extended loss of core decay heat removal and inventory makeup, decay heat will cause reactor coolant boiling and a further reduction in reactor vessel level. If RPV 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 RPV levels of CS1.1 and CS1.2 reflect the fact that with CONTAINMENT CLOSURE established, there is a lower probability of a fission product release to the environment.

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

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

Basis Reference(s):

1. Technical Specifications Table 3.3.5.1-1, Emergency Core Cooling System Instrumentation
2. ARI-H13-P601-0017-C4, LPCI B&C RX LEVEL LO L1
3. NEI 99-01 CS1

ATTACHMENT 2: EAL Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RPV Level

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

EAL:

CS1.2 Site Area Emergency

CONTAINMENT CLOSURE established

AND

RPV level < 0 in. (TAF)

Mode Applicability:

4 - Cold Shutdown, 5 - Refueling

Definition(s):

CONTAINMENT CLOSURE - The procedurally defined conditions or actions taken to secure Containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions. Containment Closure is established when the Containment requirements of ONI-SPI E-1 (ref. 4.1.8) are met with the following exception: a functional barrier must exist at the time of the event (i.e., cannot rely on contingency methods to establish a functional barrier).

Basis:

When RPV level drops to the top of active fuel (TAF) (an indicated RPV level of 0 in.), core uncovery starts to occur (ref. 1).

This IC addresses a significant and prolonged loss of RPV level 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 RPV level cannot be restored, fuel damage is probable.

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

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

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

Basis Reference(s):

1. EOP-01, RPV Control
2. NEI 99-01 CS1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RPV Level

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

EAL:

CS1.3 Site Area Emergency

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

AND

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

- UNPLANNED increase in **any** Table C-1 sump or pool levels of sufficient magnitude to indicate core uncovery
- UPPER POOL AREA 1D21-K083 high alarm

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

Table C-1 Sumps/Pool
• Drywell equipment drain sump • Drywell floor drain sump • CNTMT equipment drain sump • CNTMT floor drain sump • Suppression Pool • RHR A, B, C, HPCS, LPCS, RCIC cubicle drain sumps • Auxiliary Building floor drain sump • IB / FHB floor drain sump • Visual observation

Mode Applicability:

4 - Cold Shutdown, 5 - 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:

In Cold Shutdown mode, the RCS will normally be intact and standard RPV level monitoring means are available. RPV level in the Refueling mode is normally monitored using the Shutdown Range instrument with a reference pressure source installed to expand the water level range to the refuel floor. I&C also installs a temporary level indicator at local panel 1H22-P027C (ref. 1).

In this EAL, all water level indication is unavailable and the RPV inventory loss must be detected by the leakage indications listed in Table C-1. Level increases must be evaluated against other potential sources of leakage such as cooling water sources inside the drywell to ensure they are indicative of RPV leakage. Rise in drywell equipment drain sump level and drywell floor sump level is the normal method of monitoring and calculating leakage from the RPV (ref. 2). An Auxiliary Building sump level rise may also be indicative of RCS inventory losses external to the Containment from systems connected to the RPV. With RHR System operating in the Shutdown Cooling mode, an unexplained rise in suppression pool water level could be indicative of RHR valve misalignment or leakage. If the make-up rate to the RPV unexplainably rises above the pre-established rate, a loss of RPV inventory may be occurring even if the source of the leakage cannot be immediately identified. Visual observation of leakage from systems connected to the RCS that cannot be isolated could be indicative of a loss of RPV inventory.

In the Refueling Mode, as water level in the RPV lowers, the dose rate above the core will increase. The dose rate due to this core shine should result in indications on area radiation monitors. 1D21-K083 is located on the containment refuel floor near the upper pool and is designed to provide monitoring of radiation due to a fuel handling event or loss of shielding during refueling operations. If this radiation monitor reaches the high alarm setpoint, a loss of inventory with potential to uncover the core is likely to have occurred.

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 RPV level cannot be restored, fuel damage is probable.

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

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

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

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

Basis Reference(s):

1. IOI-0009, Refueling
2. ARI-H13-P601-0018-A1, Drywell Identified Leak Rate High
3. NEI 99-01 CS1

ATTACHMENT 2: EAL Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RPV Level

Initiating Condition: Loss of RPV inventory affecting fuel clad integrity with Containment challenged

EAL:

CG1.1 General Emergency

RPV level < 0 in. (TAF) for ≥ 30 min. (Note 1)

AND

Any of the following indication of Containment Challenge:

- CONTAINMENT CLOSURE **not** established (Note 6)
- Drywell or containment hydrogen concentration > 4%
- UNPLANNED rise in containment pressure
- Exceeding one or more Secondary Containment Control MAX SAFE area radiation levels that can be read in the control room (EOP-03)

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

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

Mode Applicability:

4 - Cold Shutdown, 5 – Refueling

Definition(s):

CONTAINMENT CLOSURE - The procedurally defined conditions or actions taken to secure Containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions. Containment Closure is established when the Containment requirements of ONI-SPI E-1 (ref. 4.1.8) are met with the following exception: a functional barrier must exist at the time of the event (i.e., cannot rely on contingency methods to establish a functional barrier).

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 RPV level drops below 0 in., core uncovery starts to occur (ref. 1).

Four conditions are associated with a challenge to Containment integrity:

- CONTAINMENT CLOSURE is not established.
- In the early stages of a core uncovery event, it is unlikely that hydrogen buildup due to a core uncovery could result in an explosive mixture of dissolved gases in the containment. However, containment monitoring and/or sampling should be performed to verify this assumption and a General Emergency declared if it is determined that hydrogen concentration has exceeded the minimum necessary to support a hydrogen burn (4%). The Igniter System is designed to prevent hydrogen accumulation by locally burning hydrogen in a controlled manner as soon as the hydrogen enters the containment atmosphere and reaches the igniters. For high rates of hydrogen production, ignition occurs at the lowest concentration that can support ignition. Following ignition, hydrogen is consumed through formation of diffusion flames where the gas enters the containment, thus controlling hydrogen concentration at approximately 4% (ref. 2).
- Any UNPLANNED increase in containment pressure in the Cold Shutdown or Refueling mode indicates a potential loss of CONTAINMENT CLOSURE capability. UNPLANNED containment pressure increase indicates CONTAINMENT CLOSURE cannot be assured and the containment cannot be relied upon as a barrier to fission product release.
- Secondary Containment radiation monitors should provide indication of increased release that may be indicative of a challenge to CONTAINMENT CLOSURE. The MAX SAFE radiation levels are indicative of problems in the secondary containment that are spreading. The locations into which the primary system discharge is of concern correspond to the areas addressed in EOP-03, Secondary Containment Control, (ref. 3).

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 RPV level cannot be restored, fuel damage is probable.

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

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

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

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

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

Basis Reference(s):

1. EOP-01, RPV Control
2. SAMG-2 RPV, Containment, and Radioactivity Release Control
3. EOP-03, Secondary Containment Control
4. NEI 99-01 CG1

ATTACHMENT 2: EAL Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RPV Level

Initiating Condition: Loss of RPV inventory affecting fuel clad integrity with Containment challenged

EAL:

CG1.2 General Emergency

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

AND

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

- UNPLANNED increase in **any** Table C-1 sump or pool levels of sufficient magnitude to indicate core uncovery
- UPPER POOL AREA 1D21-K083 high alarm

AND

Any of the following indication of Containment Challenge:

- CONTAINMENT CLOSURE **not** established (Note 6)
- Drywell or containment hydrogen concentration > 4%
- UNPLANNED rise in containment pressure
- Exceeding one or more Secondary Containment Control MAX SAFE area radiation levels that can be read in the control room (EOP-03)

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

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

Table C-1 Sumps/Pool
• Drywell equipment drain sump • Drywell floor drain sump • CNTMT equipment drain sump • CNTMT floor drain sump • Suppression Pool • RHR A, B, C, HPCS, LPCS, RCIC cubicle drain sumps • Auxiliary Building floor drain sump • IB / FHB floor drain sump • Visual observation

Mode Applicability:

4 - Cold Shutdown, 5 – 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.

CONTAINMENT CLOSURE - The procedurally defined conditions or actions taken to secure Containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions. Containment Closure is established when the Containment requirements of ONI-SPI E-1 (ref. 4.1.8) are met with the following exception: a functional barrier must exist at the time of the event (i.e., cannot rely on contingency methods to establish a functional barrier).

Basis:

In Cold Shutdown mode, the RCS will normally be intact and standard RPV level monitoring means are available. RPV level in the Refueling mode is normally monitored using the Shutdown Range instrument with a reference pressure source installed to expand the water level range to the refuel floor. I&C also installs a temporary level indicator at local panel 1H22-P027C (ref. 1).

In this EAL, all water level indication is unavailable and the RPV inventory loss must be detected by the leakage indications listed in Table C-1. Level increases must be evaluated against other potential sources of leakage such as cooling water sources inside the drywell to ensure they are indicative of RPV leakage. Rise in drywell equipment drain sump level and drywell floor sump level is the normal method of monitoring and calculating leakage from the RPV (ref. 2). An Auxiliary Building sump level rise may also be indicative of RCS inventory losses external to the Containment from systems connected to the RPV. With RHR System operating in the Shutdown Cooling mode, an unexplained rise in suppression pool water level could be indicative of RHR valve misalignment or leakage. If the make-up rate to the RPV unexplainably rises above the pre-established rate, a loss of RPV inventory may be occurring even if the source of the leakage cannot be immediately identified. Visual observation of leakage from systems connected to the RCS that cannot be isolated could be indicative of a loss of RPV inventory.

In the Refueling Mode, as water level in the RPV lowers, the dose rate above the core will increase. The dose rate due to this core shine should result in indications on area radiation monitors. 1D21-K083 is located on the containment refuel floor near the upper pool and is designed to provide monitoring of radiation due to a fuel handling event or loss of shielding during refueling operations. If the radiation monitor reaches the high alarm setpoint, a loss of inventory with potential to uncover the core is likely to have occurred.

Four conditions are associated with a challenge to containment integrity:

- CONTAINMENT CLOSURE is not established.
- In the early stages of a core uncovery event, it is unlikely that hydrogen buildup due to a core uncovery could result in an explosive mixture of dissolved gases in the containment. However, containment monitoring and/or sampling should be performed to verify this assumption and a General Emergency declared if it is determined that hydrogen concentration has exceeded the minimum necessary to support a hydrogen burn (4%) (ref. 3).

Any UNPLANNED increase in containment pressure in the Cold Shutdown or Refueling mode indicates a potential loss of CONTAINMENT CLOSURE capability. UNPLANNED containment pressure increase indicates CONTAINMENT CLOSURE cannot be assured and the containment cannot be relied upon as a barrier to fission product release.

- Secondary Containment radiation monitors should provide indication of increased release that may be indicative of a challenge to CONTAINMENT CLOSURE. The MAX SAFE radiation levels are indicative of problems in the secondary containment that are spreading. The locations into which the primary system discharge is of concern correspond to the areas addressed in EOP-03, Secondary Containment Control (ref. 4). The MAX SAFE radiation levels specified are limited to those that can be read remotely in the control room.

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 RPV level cannot be restored, fuel damage is probable.

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

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

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

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

The inability to monitor RPV 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*.

Basis Reference(s):

1. IOI-0009, Refueling
2. ARI-H13-P601-0018-A1, Drywell Identified Leak Rate High
3. SAMG-2 RPV, Containment, and Radioactivity Release Control
4. EOP-03, Secondary Containment Control
5. NEI 99-01 CG1

ATTACHMENT 2: EAL Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 2 – Loss of Essential AC Power

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

EAL:

CU2.1 Unusual Event

AC power capability, Table C-2, to essential buses EH-11 and EH-12 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 essential buses EH-11 and EH-12

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

Table C-2 AC Power Sources
Offsite: • Unit 1 Startup Transformer • Unit 2 Startup Transformer • Auxiliary Transformer backfeed (**only** if already aligned) **Onsite:** • DG 1 (Division I) • DG 2 (Division II)

Mode Applicability:

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

Definition(s):

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

The EH buses provide the distribution point for Class 1E, 4.16 kV, power. Class 1E loads are loads necessary for safe shutdown and maintenance of safe shutdown. The EH buses receive power from the Preferred supply (via Interbus Transformer LH-1-A), the Alternate preferred supply (via Unit 2 Interbus Transformer LH-2-A), or each division's respective diesel generator. Normal AC service power is supplied from the Unit Auxiliary Transformer connected to the Main Generator. When one of two Startup Transformers is unavailable, the Unit Auxiliary Transformer is considered an offsite power supply. This is accomplished by backfeeding the Main Transformer and feeding the Unit Auxiliary Transformer (ref. 2-4). Main Transformer backfeed is only credited if already aligned due the time required for alignment.

The HPCS bus (EH-13) is not credited because it only supplies power to the HPCS pump and associated loads, not any long term decay heat removal systems. In particular, suppression pool cooling mechanisms would be essential subsequent to a station blackout.

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

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

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

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

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

Basis Reference(s):

1. Drawing D-206-010, Main One Line Diagram 13.8 kV and 4.16 kV
2. Technical Specifications 3.8
3. USAR Section 8.3, Onsite Power Systems
4. ONI-R10, Loss of AC Power
5. NEI 99-01 CU2

ATTACHMENT 2: EAL Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 2 – Loss of Essential AC Power

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

EAL:

CA2.1 Alert

Loss of **all** offsite and **all** onsite AC power capability to essential buses EH-11 and EH-12 for ≥ 15 min. (Note 1)

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

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

Basis:

The Class 1E 4.16 kV system supplies all the Engineered Safety Feature (ESF) loads and other loads The EH buses provide the distribution point for Class 1E, 4.16 kV, power. Class 1E loads are loads necessary for safe shutdown and maintenance of safe shutdown. The EH buses receive power from the Preferred supply (via Interbus Transformer LH-1-A), the Alternate preferred supply (via Unit 2 Interbus Transformer LH-2-A), or each division's respective diesel generator. Normal AC service power is supplied from the Unit Auxiliary Transformer connected to the Main Generator. When one of two Startup Transformers is unavailable, the Unit Auxiliary Transformer is considered an offsite power supply. This is accomplished by backfeeding the Main Transformer and feeding the Unit Auxiliary Transformer (ref. 2-4).

The HPCS bus (EH-13) is not credited because it only supplies power to the HPCS pump and associated loads, not any long term decay heat removal systems. In particular, suppression pool cooling mechanisms would be essential subsequent to a station blackout.

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

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

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

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

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

Basis Reference(s):

1. Drawing D-206-010, Main One Line Diagram 13.8 kV and 4.16 kV
2. Technical Specifications 3.8
3. USAR Section 8.3, Onsite Power Systems
4. ONI-R10, Loss of AC Power
5. NEI 99-01 CA2

ATTACHMENT 2: EAL Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 3 – RCS Temperature

Initiating Condition: UNPLANNED increase in RCS temperature

EAL:

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

Mode Applicability:

4 - Cold Shutdown, 5 - 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:

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

Several methods are available for determining RCS temperature with respect to the Technical Specification cold shutdown temperature limit (200°F, ref. 1). Appropriate Group Trend plots (from Group Trend 4 Pts on 1 Plot Menu) may be used instead of the specified computer points. These include (ref. 2) the following:

- RCS temperature may be read directly as RCIRC SUCTION temperature located on panel 1H13-P614 or using computer point, Recirc Suction, if the applicable recirculation loop is in operation with a recirculation pump running.
- RCS temperature may be read directly as BOTTOM HEAD DRAIN temperature on REACTOR VESSEL TEMP MONITORING recorder located on 1H13-P614 or using computer point Bottom Head Drain, if RWCU is in operation taking a suction from the bottom head drain and a reactor recirculation pump is running.
- With RHR operating in the shutdown cooling mode and 1E12-F003 is throttled sufficiently to cause RHR HX WATER DISCHARGE temperature to be less than RHR INLET TO HX, RCS temperature may be read as RHR INLET TO HX Pts. 1&2 on RHR TEMPERATURES recorder or using computer point RHR Temp into Hx.
- With RHR operating in the shutdown cooling mode and all flow is bypassed through 1E12-F048, then RHR HX WATER DISCHARGE Pts. 5&6 on the RHR TEMPERATURES recorder or computer point RHR Injection Temperature must be used for the RCS temperature indication.
- If Suppression Pool Feed and Bleed Alternate Shutdown Cooling is in operation per ONI-E12-2,, the highest reading temperature on the ADS TEMP MONITORING point which corresponds to an open SRV will provide the best indication of reactor water temperature.

ATTACHMENT 2: EAL Bases

If reactor water temperature cannot be determined by any of the above, the following points may provide temperature trend information:

- If RWCU is in operation, HX TUBE IN (RWC TEMP SELETOR SWITCH 1G33-N601 in position 3).
- ADS TEMP MONITORING Points which correspond to open SRVs.
- REACTOR VESSEL TEMP MONITORING Point 1, Vessel Head Flange.
- REACTOR VESSEL TEMP MONITORING Point 2, Vessel Bottom Flange.
- REACTOR VESSEL TEMP MONITORING Point 3, Shell Flange.
- Available Reactor Pressure instruments
- ADS TEMP MONITORING, B21-R614, Point 20, Reactor Vent

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

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

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

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

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

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

Basis Reference(s):

1. Technical Specifications Table 1.1-1
2. IOI-0012, Maintaining Cold Shutdown
3. NEI 99-01 CU3

ATTACHMENT 2: EAL Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 3 – RCS Temperature

Initiating Condition: UNPLANNED increase in RCS temperature

EAL:

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

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

Mode Applicability:

4 - Cold Shutdown, 5 - Refueling

Definition(s):

None

Basis:

Perry is equipped with multiple RPV water level instruments including: Wide Range, Fuel Zone, Shutdown Range, Upset Range, and Narrow Range (ref. 1). Multiple instruments on different reference and variable legs should be monitored. The Upset Range and Shutdown Range instruments share a common reference leg; therefore, Narrow Range instruments should be routinely monitored when relying on Shutdown or Upset Range instrument as the primary indication (ref. 2).

Several methods are available for determining RCS temperature with respect to the Technical Specification cold shutdown temperature limit (200°F, ref. 1). Appropriate Group Trend plots (from Group Trend 4 Pts on 1 Plot Menu) may be used instead of the specified computer points. These include (ref. 2) the following:

- RCS temperature may be read directly as RCIRC SUCTION temperature located on panel 1H13-P614 or using computer point, Recirc Suction, if the applicable recirculation loop is in operation with a recirculation pump running.
- RCS temperature may be read directly as BOTTOM HEAD DRAIN temperature on REACTOR VESSEL TEMP MONITORING recorder located on 1H13-P614 or using computer point Bottom Head Drain, if RWCU is in operation taking a suction from the bottom head drain and a reactor recirculation pump is running.
- With RHR operating in the shutdown cooling mode and 1E12-F003 is throttled sufficiently to cause RHR HX WATER DISCHARGE temperature to be less than RHR INLET TO HX, RCS temperature may be read as RHR INLET TO HX Pts. 1&2 on RHR TEMPERATURES recorder or using computer point RHR Temp into Hx.
- With RHR operating in the shutdown cooling mode and all flow is bypassed through 1E12-F048, then RHR HX WATER DISCHARGE Pts. 5&6 on the RHR TEMPERATURES recorder or computer point RHR Injection Temperature must be used for the RCS temperature indication.

- If Suppression Pool Feed and Bleed Alternate Shutdown Cooling is in operation per ONI-E12-2, the highest reading temperature on the ADS TEMP MONITORING point which corresponds to an open SRV will provide the best indication of reactor water temperature.

If reactor water temperature cannot be determined by any of the above, the following points may provide temperature trend information:

- If RWCU is in operation, HX TUBE IN (RWC TEMP SELETOR SWITCH 1G33-N601 in position 3).
- ADS TEMP MONITORING Points which correspond to open SRVs.
- REACTOR VESSEL TEMP MONITORING Point 1, Vessel Head Flange.
- REACTOR VESSEL TEMP MONITORING Point 2, Vessel Bottom Flange.
- REACTOR VESSEL TEMP MONITORING Point 3, Shell Flange.
- Available Reactor Pressure instruments
- ADS TEMP MONITORING, B21-R614, Point 20, Reactor Vent

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

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

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

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

Basis Reference(s):

1. EOP-01, RPV Control
2. IOI-0012, Maintaining Cold Shutdown
3. Technical Specifications Table 1.1-1
4. NEI 99-01 CU3

ATTACHMENT 2: EAL 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 increase in RCS temperature to > 200°F for > Table C-3 duration (Notes 1, 9)

OR

UNPLANNED RPV pressure increase > 10 psig

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

Note 9: In the absence of reliable RCS temperature indication caused by the loss of decay heat removal capability, classification should be based on the RCS pressure increase criteria when the RCS is INTACT in Mode 4 or based on time to boil data when in Mode 5 or the RCS is not INTACT in Mode 4.

Table C-3: RCS Heat-up Duration Thresholds

RCS Status	CONTAINMENT CLOSURE Status	Heat-up Duration
RCS INTACT	N/A	60 min.*
RCS **Not** INTACT	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:

4 - Cold Shutdown, 5 – Refueling

Definition(s):

CONTAINMENT CLOSURE - The procedurally defined conditions or actions taken to secure Containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions. Containment Closure is established when the Containment requirements of ONI-SPI E-1 (ref. 4.1.8) are met with the following exception: a functional barrier must exist at the time of the event (i.e., cannot rely on contingency methods to establish a functional barrier).

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 caused by the loss of decay heat removal capability, classification should be based on the RCS pressure increase criteria when the RCS is intact in Mode 4 or based on time to boil data when in Mode 5 or the RCS is not intact in Mode 4.

A 10 psig RPV pressure increase can be read using the SPDS turn-on code “RPR” (RPV Pressure Validation) (ref. 1).

Several methods are available for determining RCS temperature with respect to the Technical Specification cold shutdown temperature limit (200°F, ref. 1). Appropriate Group Trend plots (from Group Trend 4 Pts on 1 Plot Menu) may be used instead of the specified computer points. These include (ref. 2) the following:

- RCS temperature may be read directly as RCIRC SUCTION temperature located on panel 1H13-P614 or using computer point, Recirc Suction, if the applicable recirculation loop is in operation with a recirculation pump running.
- RCS temperature may be read directly as BOTTOM HEAD DRAIN temperature on REACTOR VESSEL TEMP MONITORING recorder located on 1H13-P614 or using computer point Bottom Head Drain, if RWCU is in operation taking a suction from the bottom head drain and a reactor recirculation pump is running.
- With RHR operating in the shutdown cooling mode and 1E12-F003 is throttled sufficiently to cause RHR HX WATER DISCHARGE temperature to be less than RHR INLET TO HX, RCS temperature may be read as RHR INLET TO HX Pts. 1&2 on RHR TEMPERATURES recorder or using computer point RHR Temp into Hx.
- With RHR operating in the shutdown cooling mode and all flow is bypassed through 1E12-F048, then RHR HX WATER DISCHARGE Pts. 5&6 on the RHR TEMPERATURES recorder or computer point RHR Injection Temperature must be used for the RCS temperature indication.
- If Suppression Pool Feed and Bleed Alternate Shutdown Cooling is in operation per ONI-E12-2,, the highest reading temperature on the ADS TEMP MONITORING point which corresponds to an open SRV will provide the best indication of reactor water temperature.

If reactor water temperature cannot be determined by any of the above, the following points may provide temperature trend information:

- If RWCU is in operation, HX TUBE IN (RWC TEMP SELETOR SWITCH 1G33-N601 in position 3).
- ADS TEMP MONITORING Points which correspond to open SRVs.
- REACTOR VESSEL TEMP MONITORING Point 1, Vessel Head Flange.
- REACTOR VESSEL TEMP MONITORING Point 2, Vessel Bottom Flange.
- REACTOR VESSEL TEMP MONITORING Point 3, Shell Flange.
- Available Reactor Pressure instruments
- ADS TEMP MONITORING, B21-R614, Point 20, Reactor Vent

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

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

The RCS Heat-up Duration Thresholds table addresses an increase in RCS temperature when CONTAINMENT CLOSURE is established but the RCS is not intact.. The 20-minute criterion was included to allow time for operator action to address the temperature increase.

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

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

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

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

Basis Reference(s):

1. USAR Section 7.5.1.4.3, Safety Parameter Display System (SPDS)
2. Technical Specifications Table 1.1-1
3. IOI-0012, Maintaining Cold Shutdown
4. NEI 99-01 CA3

ATTACHMENT 2: EAL Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 4 – Loss of Essential DC Power

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

EAL:

CU4.1	**Unusual Event**
Indicated voltage on required vital DC buses ED-1-A < 116 VDC and ED-1-B < 112 VDC for ≥ 15 min. (Note 1)	

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

Mode Applicability:

4 - Cold Shutdown, 5 - Refueling

Definition(s):

None

Basis:

Essential DC bus ED-1-A feeds Division 1 loads. The Division 1 battery has 61 cells with a design minimum of 1.875 volts/cell and the Division 2 battery has 60 cells with a design minimum of 1.863 volts/cell. These cell voltages yield minimum design bus voltages of 114.4 VDC for Division 1 (rounded to 116 VDC) and 111.8 VDC (rounded to 112 VDC) for Division 2 (ref. 1, 2, 3).

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

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

As used in this EAL, “required” means the essential DC buses necessary to support operation of the in-service, or operable, train or trains of SAFETY SYSTEM equipment. For example, if Division I is out-of-service (inoperable) for scheduled outage maintenance work and Division II is in-service (operable), then a loss of essential DC power affecting Division II would require the declaration of an Unusual Event. A loss of essential DC power to Division I would not warrant an emergency classification.

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

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

Basis Reference(s):

1. Calculation PRDC-0014 (Division 1)
2. Calculation PRDC-0015 (Division 2)
3. Technical Specifications Section B.3.8.4 DC Sources Operating
3. NEI 99-01 CU4

ATTACHMENT 2: EAL Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 5 – Loss of Communications

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

EAL:

CU5.1 Unusual Event

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

OR

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

OR

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

Table C-4 Communication Methods

System	Onsite	ORO	NRC
Plant Public Address System	X		
Plant Radio System Channels 1, 2 and 3	X		
State and County Notification Circuit (5-way)		X	
Control Room private (259-) lines		X	X
Private Branch Exchange, Service Building (“5000”) Switch		X	X
Private Branch Exchange, Warehouse Building (“6000”) Switch		X	X
Company Off-Premise Exchange		X	X
Commercial Telephone Systems	X	X	X
Emergency Telecommunications System (ETS)			X

Mode Applicability:

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

Definition(s):

None

Basis:

PSI-0007 provides communications failure scenarios and a listing of circuit power supplies. Onsite/offsite communications include one or more of the systems listed in Table C-4 (ref. 1, 2).

Plant Public Address System

Voice communications between various plant buildings and locations is provided by a page/party, public address (PA) system. The Plant Public Address System is specifically designed for utility and heavy industrial applications where intelligible communication in areas of high ambient noise is desired.

Plant Radio System Channels 1, 2 and 3

The Plant Radio System consists of radio transceivers operating through an antenna system, to provide radio coverage outdoors and in the plant. This system provides multiple voice or data channels for communications to various portable and mobile radio devices for Operations, Instrumentation and Controls, Maintenance, Fire Brigade, Emergency, and Security. These channels may also support other site organizations and functions as needed. Use of Plant Radio System channels 4 and 5 is restricted to Site Protection activities. Therefore, credit for Channels 4 and 5 is not taken in support of plant operations.

State and County Notification Circuit (5-way)

The primary communications link between Perry and the offsite State and local county EOCs or 24-hour notification points is through a telephone conference loop, referred to as the “5-Way”. The State and local county EOCs are the Ohio emergency management Agency (OEMA), Ashtabula County, Geauga County, and Lake County. A loss of the “5-Way” Circuit refers to the inability to contact one or more of the four offsite contacts.

Control Room private (259-) lines

All direct (259-) off-site calling capability from the Control Room via private lines refers to:

- Autodialer at the US console
- Private (259-) line on the superphones
- Private (259-) line at the SAS console.

Private Branch Exchange, Service Building (“5000”) Switch and Warehouse Building (“6000”) Switch

Voice communication between administration office areas, selected plant areas, the control room, and points outside the plant, is provided by a commercial Private Branch Exchange (PBX) telephone system. Sufficient lines are provided to ensure adequate availability for all normal requirements. The PBX system is powered from a battery charging system, which is capable of being fed from a diesel generator backed power supply. The battery capacity of the system has been designed to sustain operation of the PBX system for four hours in the event of a loss of power.

Company Off-Premise Exchange

The Off Premise Exchange (OPX) telephone system provides an alternate voice communication system between the plant and locations offsite. This offsite communication system consists of telephones strategically located in the emergency response facilities and various areas within the plant. In the event of a power outage, the telephone system has a diesel generator backup power supply and battery backup with a capacity to sustain operation for three hours. Intra-company communication links, which employ backup power systems, provides communications channels to the commercial OPX carrier.

Commercial Telephone Systems

In the event that one or more of the dedicated line networks are inoperative, commercial telephone lines, the Perry Plant PBX, and Company OPX systems provide a back-up means of communications between the Perry Plant and Federal, State and local governments with primary responsibilities during an emergency. These do not include cell or satellite telephones.

Emergency Telecommunications System (ETS)

The Emergency Telecommunications System (ETS) provides a network for essential communications functions. The system uses the licensee’s communication network to provide communications links to the NRC Operations Center on a regular basis and when normal telephone service (business dial tone) is unavailable. These communications functions are identified by the NRC as essential, particularly in the early phases of an accident, until an augmented response effort by NRC personnel and other agencies is established at the scene of the emergency.

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

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

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

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

The second EAL condition addresses a total loss of the communications methods used to notify all OROs of an emergency declaration. The OROs referred to here are Ashtabula County, Geauga County, and Lake County

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

Basis Reference(s):

1. Emergency Plan for Perry Nuclear Power Plant, Docket No. 50-440, Section 7.2 and Figure 7-5
2. USAR Section 9.5.2 Communications Systems
3. NEI 99-01 CU5

ATTACHMENT 2: EAL Bases

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 6 – Hazardous Event Affecting Safety Systems

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

EAL:

CA6.1 Alert

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

AND EITHER:

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

OR

The event has caused VISIBLE DAMAGE to a SAFETY SYSTEM component or structure needed for the current operating mode

Table C-5 Hazardous Events
• Seismic event • Internal or external FLOODING event • High winds • Tornado strike • FIRE • EXPLOSION • Other events with similar hazard characteristics as determined by the Shift Manager

Mode Applicability:

4 - Cold Shutdown, 5 - 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 component or structure that is readily observable without measurements, testing, or analysis. The visual impact of the damage is sufficient to cause concern regarding the operability or reliability of the affected component or structure.

Basis:

- The significance of a seismic event is discussed under EAL HU2.1 (ref. 1, 2).
- Internal FLOODING may be caused by events such as component failures, equipment misalignment, or outage activity mishaps (ref. 3, 4).
- Seismic Category I structures are analyzed to withstand a sustained, design wind velocity of at least 90 mph (ref. 5, 6).
- Areas containing functions and systems required for safe shutdown of the plant are identified by Fire Zone in the fire response procedure (ref. 7).
- An EXPLOSION that degrades the performance of a SAFETY SYSTEM train or visibly damages a SAFETY SYSTEM component or structure would be classified under this EAL.

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

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

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

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

Basis Reference(s):

1. USAR Section 2.5.2.7, Operating Basis Earthquake
2. ONI-D51, Earthquake
3. USAR Section 3.3.1 Wind Loadings
4. ONI-ZZZ-1, Tornado or High Winds
5. ONI-P54, Fire
6. Appendix R - Evaluation, Safe Shutdown Capability Report
7. USAR Section 9A, Fire Protection Evaluation Report
8. NEI 99-01 CA6

ATTACHMENT 2: EAL 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 Technology Hazard

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

4. Fire

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

5. Hazardous Gas

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

6. Control Room Evacuation

If the Control Room must be evacuated, additional support for monitoring and controlling plant functions is necessary through the emergency response facilities.

7. Emergency Coordinator Judgment

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

Category: H – Hazards

Subcategory: 1 – Security

Initiating Condition: Confirmed SECURITY CONDITION or threat

EAL:

HU1.1 Unusual Event

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

OR

Notification of a credible security threat directed at the site

OR

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

Mode Applicability:

All

Definition(s):

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

HOSTILE ACTION - An act toward Perry 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 Perry. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the OWNER CONTROLLED AREA).

Basis:

The Security Shift Supervision is defined to be the Security Shift Supervisor.

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

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

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

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

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

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

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

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

Basis Reference(s):

1. PNPP Physical Security Plan
2. ONI-P56-2, Land Based Security Threat
3. ONI-P56-3, Aircraft Security Threat
4. NEI 99-01 HU1

ATTACHMENT 2: EAL Bases

Category: H – Hazards

Subcategory: 1 – Security

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

EAL:

HA1.1 Alert

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

OR

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

Mode Applicability:

All

Definition(s):

HOSTILE ACTION - An act toward Perry 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 Perry. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the OWNER CONTROLLED AREA).

OWNER CONTROLLED AREA - Includes the area within the expanded security perimeter, i.e., the areas that are bordered by the Vehicle Barriers System. The OWNER CONTROLLED AREA also includes the Monitored OWNER CONTROLLED AREA (MOCA) as defined in the Physical Security Plan.

PROTECTED AREA - The area encompassing the Vital Areas, all areas inside the double perimeter barrier fence and the Primary Access Facility (PAF).

Basis:

The Security Shift Supervision is defined to be the Security Shift Supervisor.

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

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

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

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

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

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

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

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

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

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

Basis Reference(s):

1. PNPP Physical Security Plan
2. ONI-P56-2, Land Based Security Threat
3. ONI-P56-3, Aircraft Security Threat
4. NEI 99-01 HA1

ATTACHMENT 2: EAL 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 the Security Shift Supervisor

Mode Applicability:

All

Definition(s):

HOSTILE ACTION - An act toward Perry 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 Perry. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the OWNER CONTROLLED AREA).

PROTECTED AREA - The area encompassing the Vital Areas, all areas inside the double perimeter barrier fence and the Primary Access Facility (PAF).

Basis:

The Security Shift Supervision is defined to be the Security Shift Supervisor.

This individual is the designated on-site personnel qualified and trained to confirm that a security event is occurring or has occurred. Training on security event classification confirmation is closely controlled due to the strict secrecy controls placed on the PNPP Physical Security Plan (Safeguards) information (ref. 1).

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.

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

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

This IC does not apply to a HOSTILE ACTION directed at an ISFSI PROTECTED AREA located outside the plant PROTECTED AREA; such an attack should be assessed using IC HA1. It also does not apply to incidents that are accidental events, acts of civil disobedience, or otherwise are not a HOSTILE ACTION perpetrated by a HOSTILE FORCE. Examples include the crash of a small aircraft, shots from hunters, physical disputes between employees, etc. Reporting of these types of events is adequately addressed by other EALs, or the requirements of 10 CFR 73.71 or 10 CFR 50.72.

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

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

Basis Reference(s):

1. PNPP Physical Security Plan
2. ONI-P56-2, Land Based Security Threat
3. NEI 99-01 HS1

ATTACHMENT 2: EAL Bases

Category: H – Hazards

Subcategory: 1 – Security

Initiating Condition: HOSTILE ACTION resulting in loss of physical control of the facility

EAL:

HG1.1 General Emergency

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

AND EITHER of the following has occurred:

Any of the following safety functions cannot be controlled or maintained

- Reactivity
- RPV water level
- RCS heat removal

OR

Damage to spent fuel has occurred or is IMMINENT

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.

HOSTILE ACTION - An act toward Perry 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 Perry. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the OWNER CONTROLLED AREA).

PROTECTED AREA - The area encompassing the Vital Areas, all areas inside the double perimeter barrier fence and the Primary Access Facility (PAF).

Basis:

The Security Shift Supervision is defined to be the Security Shift Supervisor.

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

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

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

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

Basis Reference(s):

1. PNPP Physical Security Plan
2. ONI-P56-2, Land Based Security Threat
3. NEI 99-01 HG1

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 2 – Seismic Event

Initiating Condition: Seismic event greater than OBE levels

EAL:

HU2.1	**Unusual Event**
Seismic event greater than Operating Basis Earthquake (OBE) as indicated by seismic instrumentation in the Control Room recording level greater than an OBE	

Mode Applicability:

All

Definition(s):

None

Basis:

The OBE is 50% of the Safe Shutdown Earthquake (SSE) or 0.075g in either of the horizontal directions or in the vertical direction (ref. 1).

The Seismic Monitoring System Display Panel is located on Control Room panel 1H13P0969. When one of the six seismic accelerometers senses motion that exceeds its trigger setpoint the AMBER Trigger light on the annunciator panel will energize. If the OBE and Cumulative Absolute Velocity (CAV) setpoints for the Free-field sensor (PY-0D51N0240) are exceeded, then the RED OBE light on the annunciator panel will be energized. If the Free-field senor is Inoperable, then if the OBE setpoint is exceeded for the Containment Basemat sensor (PY-0D51N0232), the RED OBE light will be energized (reference Reg. guide 1.166 rev 0). Any alarm received on the 1H13P0969 panel or an alarm from the local Seismic Instrument panel (PY-0H51P0021) will energize the SEISMIC ALARM P969 alarm on the Control Room panel 1H13P0680 panel, window 08A-C3 (ref. 2, 3, 5).

The third light on the 1H13P0969 panel is a Trouble alarm. This RED light will indicate if the system has experienced a Warning or Error condition. Operations will investigate the issue at the local Seismic Instrument panel (PY-0H51P0021) upon receiving this indicator. This indicator will also initiate the P680 indicator window 08A-C3.

The fourth light on the 1H13P0969 panel is a Red light that verifies that power is available to the P969 panel faceplate.

To avoid inappropriate emergency classification resulting from spurious actuation of the seismic instrumentation or felt motion not attributable to seismic activity, an offsite agency (USGS, National Earthquake Information Center) can confirm that an earthquake has occurred in the area of the plant. Such confirmation should not, however, preclude a timely emergency declaration. The NEIC can be contacted by calling **(303) 273-8500**. Select **option #3** and inform the analyst you wish to confirm recent seismic activity in the vicinity of Perry. Provide the analyst with the following Perry coordinates: **41°46′4.2″ north latitude, 81°8′36.6″ west longitude** (ref. 4). Alternatively, near real-time seismic activity can be accessed via the NEIC website:

http://earthquake.usgs.gov/

This IC addresses a seismic event that results in accelerations at the plant site greater than those specified for an Operating Basis Earthquake (OBE). An earthquake greater than an OBE but less than a Safe Shutdown Earthquake (SSE) should have no significant impact on safety-related systems, structures and components; however, some time may be required for the plant staff to ascertain the actual post-event condition of the plant (e.g., performs walk-downs and post-event inspections). Given the time necessary to perform walk-downs and inspections, and fully understand any impacts, this event represents a potential degradation of the level of safety of the plant.

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

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA8.

Basis Reference(s):

1. USAR Section 2.5.2.7, Operating Basis Earthquake
2. USAR Section 3.7.4.2, Location and Description of Instrumentation
3. ONI-D51, Earthquake
4. USAR Section 2.1.1, Site Location and Description
5. ARI-H13-P680-0008 Turbine B3 SEISMIC ALARM P969
6. NEI 99-01 HU2

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 3 – Natural or Technology Hazard

Initiating Condition: Hazardous event

EAL:

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

Mode Applicability:

All

Definition(s):

PROTECTED AREA - The area encompassing the Vital Areas, all areas inside the double perimeter barrier fence and the Primary Access Facility (PAF).

Basis:

If damage is confirmed visually or by other in-plant indications, the event may be escalated to an Alert under EAL CA6.1 or SA8.1.

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

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

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

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

Basis Reference(s):

1. NEI 99-01 HU3

ATTACHMENT 2: EAL Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 3 – Natural or Technology Hazard

Initiating Condition: Hazardous event

EAL:

HU3.2 Unusual Event

Internal room or area FLOODING of a magnitude sufficient to require manual or automatic electrical isolation of a SAFETY SYSTEM component needed for the current operating mode

Mode Applicability:

All

Definition(s):

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

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

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

Basis Reference(s):

1. NEI 99-01 HU3

ATTACHMENT 2: EAL Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 3 – Natural or Technology Hazard

Initiating Condition: Hazardous event

EAL:

HU3.3	**Unusual Event**
Movement of personnel within the PROTECTED AREA is IMPEDED due to an offsite event involving hazardous materials (e.g., an offsite chemical spill or toxic gas release)	

Mode Applicability:

All

Definition(s):

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

PROTECTED AREA - The area encompassing the Vital Areas, all areas inside the double perimeter barrier fence and the Primary Access Facility (PAF).

Basis:

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

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

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

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

Basis Reference(s):

1. NEI 99-01 HU3

ATTACHMENT 2: EAL Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 3 – Natural or Technology Hazard

Initiating Condition: Hazardous event

EAL:

HU3.4 Unusual Event

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

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

Mode Applicability:

All

Definition(s):

None

Basis:

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

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

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

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

Basis Reference(s):

1. NEI 99-01 HU3

ATTACHMENT 2: EAL Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 4 – Fire

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

EAL:

HU4.1 Unusual Event

A FIRE is **not** extinguished within 15 min. of **any** of the following FIRE detection indications (Note 1):

- Report from the field (i.e., visual observation)
- Receipt of multiple (more than 1) fire alarms or indications
- Field verification of a single fire alarm

AND

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

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

Table H-1 Fire Areas
• Control Complex (all elevations) • Auxiliary Building (all elevations) • Intermediate Building (all elevations) • Fuel Handling Building (all elevations) • Reactor Building (all elevations) • Emergency Service Water Pump House (all elevations) • Electrical Duct Chase Leading to ESW Building • Diesel Generator Building (all areas except the Unit 2 Division 1, 2, and 3 DG Rooms) • Steam Tunnel (all elevations) • Diesel Generator Fuel Oil Storage Area • Condensate Storage Tank • Intake/Discharge Structure

Mode Applicability:

All

Definition(s):

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

Basis:

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

Table H-1 Fire Areas are based on the Safe Shutdown Capability Report . Table H-1 Fire Areas include those structures containing functions and systems required to achieve and maintain cold shutdown (including all auxiliary equipment such as AC/DC power, cooling water and instrumentation) (ref. 1, 2).

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

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

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

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA8.

Basis Reference(s):

1. Appendix R - Evaluation, Safe Shutdown Capability Report
2. USAR Section 9A, Fire Protection Evaluation Report
3. NEI 99-01 HU4

ATTACHMENT 2: EAL Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 4 – Fire

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

EAL:

HU4.2 Unusual Event

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

AND

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

AND

The existence of a FIRE is **not** verified within 30 min. of alarm receipt (Note 1)

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

Table H-1 Fire Areas
• Control Complex (all elevations) • Auxiliary Building (all elevations) • Intermediate Building (all elevations) • Fuel Handling Building (all elevations) • Reactor Building (all elevations) • Emergency Service Water Pump House (all elevations) • Electrical Duct Chase Leading to ESW Building • Diesel Generator Building (all areas except the Unit 2 Division 1, 2, and 3 DG Rooms) • Steam Tunnel (all elevations) • Diesel Generator Fuel Oil Storage Area • Condensate Storage Tank • Intake/Discharge Structure

Mode Applicability:

All

Definition(s):

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

Basis:

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

Table H-1 Fire Areas are based on the Safe Shutdown Capability Report . Table H-1 Fire Areas include those structures containing functions and systems required to achieve and maintain cold shutdown (including all auxiliary equipment such as AC/DC power, cooling water and instrumentation) (ref. 1, 2).

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

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

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

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

Basis-Related Requirements from Appendix R

Appendix R to 10 CFR 50, states in part:

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

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

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA8.

Basis Reference(s):

1. Appendix R - Evaluation, Safe Shutdown Capability Report
2. USAR Section 9A, Fire Protection Evaluation Report
3. NEI 99-01 HU4

ATTACHMENT 2: EAL Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 4 – Fire

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

EAL:

HU4.3	**Unusual Event**
A FIRE within the plant PROTECTED AREA **not** extinguished within 60 min. of the initial report, alarm or indication (Note 1)	

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

Mode Applicability:

All

Definition(s):

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

PROTECTED AREA - The area encompassing the Vital Areas, all areas inside the double perimeter barrier fence and the Primary Access Facility (PAF).

Basis:

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

In addition to a FIRE addressed by EAL HU4.1 or HU4.2, a FIRE within the plant PROTECTED AREA not extinguished within 60-minutes may also potentially degrade the level of plant safety.
Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA8.

Basis Reference(s):

1. NEI 99-01 HU4

ATTACHMENT 2: EAL Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 4 – Fire

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

EAL:

HU4.4	**Unusual Event**
A FIRE within the plant PROTECTED AREA that requires firefighting support by an offsite fire response agency to extinguish	

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

Mode Applicability:

All

Definition(s):

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

PROTECTED AREA - The area encompassing the Vital Areas, all areas inside the double perimeter barrier fence and the Primary Access Facility (PAF).

Basis:

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

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

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA8.

Basis Reference(s):

1. NEI 99-01 HU4

ATTACHMENT 2: EAL Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 5 – Hazardous Gases

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

EAL:

HA5.1 Alert

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

AND

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

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

Table H-2 Safe Shutdown Rooms/Areas	
Room/Area	**Modes**
• AX Elevation 574’ RHR B	3, 4, 5
• AX Elevation 620’ West Hallway	3, 4, 5
• CC Elevation 620’ Division 1 AC	3, 4, 5
• CC Elevation 620’ Division 2 AC	3, 4, 5

Mode Applicability:

3 – Hot Shutdown, 4 – Cold Shutdown, 5 – Refueling

Definition(s):

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

Basis:

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

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

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

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

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

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

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

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

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

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

NOTE: EAL HA5.1 mode applicability has been limited to the applicable modes identified in Table H-2 Safe Operation & Shutdown Rooms/Areas. If due to plant operating procedure or plant configuration changes, the applicable plant modes specified in Table H-2 are changed, a corresponding change to Attachment 3 'Safe Operation & Shutdown Areas Tables R-2 & H-2 Bases' and to EAL HA5.1 mode applicability is required.

Basis Reference(s):

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

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 6 – Control Room Evacuation

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

EAL:

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

Mode Applicability:

All

Definition(s):

None

Basis:

The Shift Manager (SM) determines if the Control Room is inoperable and requires evacuation. Control Room inhabitability may be caused by FIRE, dense smoke, noxious fumes, bomb threat in or adjacent to the Control Room, or other life threatening conditions (Ref. 1, 2).

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

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

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

Basis Reference(s):

1. ONI-C61, Evacuation of the Control Room
2. ARI-C61-P001-0001, Remote Shutdown Panel
3. NEI 99-01 HA6

ATTACHMENT 2: EAL 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 the Remote Shutdown Panels

AND

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

- Reactivity
- RPV water level
- RCS heat removal

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

Mode Applicability:

All

Definition(s):

None

Basis:

The Shift Manager determines if the Control Room is inoperable and requires evacuation. Control Room inhabitability may be caused by FIRE, dense smoke, noxious fumes, bomb threat in or adjacent to the Control Room, or other life threatening conditions (Ref. 1, 2).

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

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

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

Basis Reference(s):

1. ONI-C61, Evacuation of the Control Room
2. ARI-C61-P001-0001, Remote Shutdown Panel
3. NEI 99-01 HS6

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Coordinator Judgment

Initiating Condition: Other conditions existing that in the judgment of the Emergency Coordinator warrant declaration of an Unusual Event

EAL:

HU7.1 Unusual Event

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

Mode Applicability:

All

Definition(s):

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

The Emergency Coordinator is the designated onsite individual having the responsibility and authority for implementing the Emergency Response Plan. The Shift Manager (SM) initially acts in the capacity of the Emergency Coordinator and takes actions as outlined in the Emergency Plan implementing procedures. If required by the emergency classification or if deemed appropriate by the Emergency Coordinator, emergency response personnel are notified and instructed to report to their emergency response locations. In this manner, the individual usually in charge of activities in the Control Room is responsible for initiating the necessary emergency response, but Plant Management is expected to manage the emergency response as soon as available to do so in anticipation of the possible wide-ranging responsibilities associated with managing a major emergency (ref. 4.2.2).

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Coordinator to fall under the emergency classification level description for an Unusual Event.

Basis Reference(s):

1. NEI 99-01 HU7

ATTACHMENT 2: EAL Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Coordinator Judgment

Initiating Condition: Other conditions exist that in the judgment of the Emergency Coordinator warrant declaration of an Alert

EAL:

HA7.1	**Alert**
Other conditions exist which, in the judgment of the Emergency Coordinator, indicate that events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. Any releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.	

Mode Applicability:

All

Definition(s):

HOSTILE ACTION - An act toward Perry 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 Perry. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the OWNER CONTROLLED AREA).

Basis:

The Emergency Coordinator is the designated onsite individual having the responsibility and authority for implementing the Emergency Response Plan. The Shift Manager (SM) initially acts in the capacity of the Emergency Coordinator and takes actions as outlined in the Emergency Plan implementing procedures. If required by the emergency classification or if deemed appropriate by the Emergency Coordinator, emergency response personnel are notified and instructed to report to their emergency response locations. In this manner, the individual usually in charge of activities in the Control Room is responsible for initiating the necessary emergency response, but Plant Management is expected to manage the emergency response as soon as available to do so in anticipation of the possible wide-ranging responsibilities associated with managing a major emergency (ref. 4.2.2).

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Coordinator to fall under the emergency classification level description for an Alert.

Basis Reference(s):

1. NEI 99-01 HA7

ATTACHMENT 2: EAL Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Coordinator Judgment

Initiating Condition: Other conditions existing that in the judgment of the Emergency Coordinator warrant declaration of a Site Area Emergency

EAL:

HS7.1 Site Area Emergency

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

Mode Applicability:

All

Definition(s):

HOSTILE ACTION - An act toward Perry 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 Perry. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the OWNER CONTROLLED AREA).

SITE BOUNDARY - The area within the OWNER CONTROLLED AREA which is encompassed by a security fence surrounding the Perry Plant.

Basis:

The Emergency Coordinator is the designated onsite individual having the responsibility and authority for implementing the Emergency Response Plan. The Shift Manager (SM) initially acts in the capacity of the Emergency Coordinator and takes actions as outlined in the Emergency Plan implementing procedures. If required by the emergency classification or if deemed appropriate by the Emergency Coordinator, emergency response personnel are notified and instructed to report to their emergency response locations. In this manner, the individual usually in charge of activities in the Control Room is responsible for initiating the necessary emergency response, but Plant Management is expected to manage the emergency response as soon as available to do so in anticipation of the possible wide-ranging responsibilities associated with managing a major emergency (ref. 4.2.2).

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Coordinator to fall under the emergency classification level description for a Site Area Emergency.

Basis Reference(s):

1. NEI 99-01 HS7

ATTACHMENT 2: EAL Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – SEC Judgment

Initiating Condition: Other conditions exist which in the judgment of the Emergency Coordinator warrant declaration of a General Emergency

EAL:

HG7.1 General Emergency

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

Mode Applicability:

All

Definition(s):

HOSTILE ACTION - An act toward Perry 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 Perry. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the OWNER CONTROLLED AREA).
IMMINENT - The trajectory of events or conditions is such that an EAL will be met within a relatively short period of time regardless of mitigation or corrective actions.

Basis:

The Emergency Coordinator is the designated onsite individual having the responsibility and authority for implementing the Emergency Response Plan. The Shift Manager(SM) initially acts in the capacity of the Emergency Coordinator and takes actions as outlined in the Emergency Plan implementing procedures. If required by the emergency classification or if deemed appropriate by the Emergency Coordinator, emergency response personnel are notified and instructed to report to their emergency response locations. In this manner, the individual usually in charge of activities in the Control Room is responsible for initiating the necessary emergency response, but Plant Management is expected to manage the emergency response as soon as available to do so in anticipation of the possible wide-ranging responsibilities associated with managing a major emergency (ref. 4.2.2). Releases can reasonably be expected to exceed EPA PAG plume exposure levels outside the Site Boundary.
This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Coordinator to fall under the emergency classification level description for a General Emergency.

Basis Reference(s):

1. NEI 99-01 HG7

ATTACHMENT 2: EAL Bases

Category S – System Malfunction

EAL Group: Hot Conditions (RCS temperature > 200ºF); 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 Essential AC Power

Loss of essential 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 buses.

2. Loss of Essential DC Power

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

3. Loss of Control Room Indications

Certain events that degrade plant operator ability to effectively assess plant conditions within the plant warrant emergency classification. Losses of indicators are in this subcategory.

4. RCS Activity

During normal operation, reactor coolant fission product activity is very low. Small concentrations of fission products in the coolant are primarily from the fission of tramp uranium in the fuel clad or minor perforations in the clad itself. Any significant increase from these base-line levels (2% - 5% clad failures) is indicative of fuel failures and is covered under the Fission Product Barrier Degradation category. However, lesser amounts of clad damage may result in coolant activity exceeding Technical Specification limits. These fission products will be circulated with the reactor coolant and can be detected by coolant sampling.

5. RCS Leakage

The reactor pressure 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 scrams. In the plant licensing basis, postulated failures of the RPS to complete a reactor scram 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. 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 2: EAL Bases

Category: S – System Malfunction

Subcategory: 1 – Loss of Essential AC Power

Initiating Condition: Loss of **all** offsite AC power capability to essential buses for 15 minutes or longer

EAL:

SU1.1 Unusual Event

Loss of **all** offsite AC power capability, Table S-6, to essential buses EH-11 and EH-12 for ≥ 15 min. (Note 1)

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

Table S-6 AC Power Sources
Offsite:
• Unit 1 Startup Transformer
• Unit 2 Startup Transformer
• Auxiliary Transformer backfeed (**only** if already aligned)
Onsite:
• DG 1 (Division I)
• DG 2 (Division II)

Mode Applicability:

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

Definition(s):

None

Basis:

The EH buses provide the distribution point for Class 1E, 4.16 kV, power. Class 1E loads are loads necessary for safe shutdown and maintenance of safe shutdown. The EH buses receive power from the Preferred supply (via Interbus Transformer LH-1-A), the Alternate preferred supply (via Unit 2 Interbus Transformer LH-2-A), or each division's respective diesel generator (ref. 2-4).

The HPCS bus (EH-13) is not credited because it only supplies power to the HPCS pump and associated loads, not any long term decay heat removal systems. In particular, suppression pool cooling mechanisms would be essential subsequent to a station blackout.

The 15-minute interval was selected as a threshold to exclude transient or momentary power losses.

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 essential 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 essential buses, whether or not the buses are powered from it.

Escalation of the emergency classification level would be via IC SA1.

Basis Reference(s):

1. Drawing D-206-010, Main One Line Diagram 13.8 kV and 4.16 kV
2. Technical Specifications 3.8
3. USAR Section 8.3, Onsite Power Systems
4. ONI-R10, Loss of AC Power
5. NEI 99-01 SU1

ATTACHMENT 2: EAL Bases

Category: S – System Malfunction

Subcategory: 1 – Loss of Essential AC Power

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

EAL:

SA1.1 Alert

AC power capability, Table S-6, to essential buses EH-11 and EH-12 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 essential buses EH-11 and EH-12

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

Table S-6 AC Power Sources
Offsite: • Unit 1 Startup Transformer • Unit 2 Startup Transformer • Auxiliary Transformer backfeed (**only** if already aligned) **Onsite:** • DG 1 (Division I) • DG 2 (Division II)

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - 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:

The EH buses provide the distribution point for Class 1E, 4.16 kV, power. Class 1E loads are loads necessary for safe shutdown and maintenance of safe shutdown. The EH buses receive power from the Preferred supply (via Interbus Transformer LH-1-A), the Alternate preferred supply (via Unit 2 Interbus Transformer LH-2-A), or each division's respective diesel generator (ref. 2-4).

The HPCS bus (EH-13) is not credited because it only supplies power to the HPCS pump and associated loads, not any long term decay heat removal systems. In particular, suppression pool cooling mechanisms would be essential subsequent to a station blackout.

The 15-minute interval was selected as a threshold to exclude transient or momentary power losses. If the capability of a second source of essential bus power is not restored within 15 minutes, an Alert is declared under this EAL.

This hot condition EAL is equivalent to the cold condition EAL CU2.1.

This IC describes a significant degradation of offsite and onsite AC power sources such that any additional single failure would result in a loss of all AC power to SAFETY SYSTEMS. In this condition, the sole AC power source may be powering one, or more than one, train of safety-related equipment. This IC provides an escalation path from IC SU1.

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

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

Escalation of the emergency classification level would be via IC SS1.

Basis Reference(s):

1. Drawing D-206-010, Main One Line Diagram 13.8 kV and 4.16 kV
2. Technical Specifications 3.8
3. USAR Section 8.3, Onsite Power Systems
4. ONI-R10, Loss of AC Power
5. NEI 99-01 SA1

Category: S – System Malfunction

Subcategory: 1 – Loss of Essential AC Power

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

EAL:

SS1.1	**Site Area Emergency**
Loss of **all** offsite and **all** onsite AC power capability to essential buses EH-11 and EH-12 for ≥ 15 min. (Note 1)	

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

Mode Applicability:

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

Definition(s):

None

Basis:

The EH buses provide the distribution point for Class 1E, 4.16 kV, power. Class 1E loads are loads necessary for safe shutdown and maintenance of safe shutdown. The EH buses receive power from the Preferred supply (via Interbus Transformer LH-1-A), the Alternate preferred supply (via Unit 2 Interbus Transformer LH-2-A), or each division's respective diesel generator (ref. 2-4).

The HPCS bus (EH-13) is not credited because it only supplies power to the HPCS pump and associated loads, not any long term decay heat removal systems. In particular, suppression pool cooling mechanisms would be essential subsequent to a station blackout.

The 15-minute interval was selected as a threshold to exclude transient or momentary power losses. The interval begins when both offsite and onsite AC power are lost.

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

In addition, fission product barrier monitoring capabilities may be degraded under these conditions. This IC represents a condition that involves actual or likely major failures of plant functions needed for the protection of the public.

Escalation of the emergency classification level would be via ICs RG1, FG1 or SG1.

Basis Reference(s):

1. Drawing D-206-010, Main One Line Diagram 13.8 kV and 4.16 kV
2. Technical Specifications 3.8
3. USAR Section 8.3, Onsite Power Systems
4. ONI-R10, Loss of AC Power
5. NEI 99-01 SS1

Category: S – System Malfunction

Subcategory: 1 – Loss of Essential AC Power

Initiating Condition: Prolonged loss of **all** offsite and **all** onsite AC power to essential buses

EAL:

SG1.1 General Emergency

Loss of **all** offsite and **all** onsite AC power capability to essential buses EH-11 and EH-12

AND EITHER:

Restoration of essential bus EH-11 or EH-12 in < 4 hours is **not** likely (Note 1)

OR

RPV water level **cannot** be restored and maintained > -25 in.

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

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

Definition(s):

None

Basis:

The EH buses provide the distribution point for Class 1E, 4.16 kV, power. Class 1E loads are loads necessary for safe shutdown and maintenance of safe shutdown. The EH buses receive power from the Preferred supply (via Interbus Transformer LH-1-A), the Alternate preferred supply (via Unit 2 Interbus Transformer LH-2-A), or each division's respective diesel generator (ref. 2-4).

The HPCS bus (EH-13) is not credited because it only supplies power to the HPCS pump and associated loads, not any long term decay heat removal systems. In particular, suppression pool cooling mechanisms would be essential subsequent to a station blackout.

Four hours is the station blackout coping time (ref. 5).

Indication of continuing core cooling degradation is manifested by the inability to restore and maintain RPV water level above the Minimum Steam Cooling Reactor Water Level (-25 in.) (ref. 6). Core submergence is the most desirable means of core cooling, however when RPV level is below TAF, the uncovered portion of the core can be cooled by less reliable means (i.e., steam cooling or spray cooling).

This IC addresses a prolonged loss of all power sources to AC emergency buses. A loss of all AC power compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink. A prolonged loss of these buses will lead to a loss of one or more fission product barriers. In addition, fission product barrier monitoring capabilities may be degraded under these conditions.

The EAL should require declaration of a General Emergency prior to meeting the thresholds for IC FG1. This will allow additional time for implementation of offsite protective actions.

Escalation of the emergency classification from Site Area Emergency will occur if it is projected that power cannot be restored to at least one AC essential bus by the end of the analyzed station blackout coping period. Beyond this time, plant responses and event trajectory are subject to greater uncertainty, and there is an increased likelihood of challenges to multiple fission product barriers.

The estimate for restoring at least one essential 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.

Basis Reference(s):

1. Drawing D-206-010, Main One Line Diagram 13.8 kV and 4.16 kV
2. Technical Specifications 3.8
3. USAR Section 8.3, Onsite Power Systems
4. ONI-R10, Loss of AC Power
5. USAR Section 15.8.2, Station Blackout
6. EOP-01, RPV Control
7. NEI 99-01 SG1

ATTACHMENT 2: EAL Bases

Category: S – System Malfunction

Subcategory: 1 – Loss of Essential AC Power

Initiating Condition: Loss of **all** essential AC and vital DC power sources for 15 minutes or longer

EAL:

SG1.2 General Emergency

Loss of **all** offsite and **all** onsite AC power capability to essential buses EH-11 and EH-12 for ≥ 15 min.

AND

Indicated voltage is < 116 VDC on ED-1-A and < 112 VDC on ED-1-B for ≥ 15 min. (Note 1)

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

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

Definition(s):

None

Basis:

This EAL addresses operating experience from the March 2011 accident at Fukushima Daiichi.

The EH buses provide the distribution point for Class 1E, 4.16 kV, power. Class 1E loads are loads necessary for safe shutdown and maintenance of safe shutdown. The EH buses receive power from the Preferred supply (via Interbus Transformer LH-1-A), the Alternate preferred supply (via Unit 2 Interbus Transformer LH-2-A), or each division's respective diesel generator (ref. 2, 4).

The HPCS bus (EH-13) is not credited because it only supplies power to the HPCS pump and associated loads, not any long term decay heat removal systems. In particular, suppression pool cooling mechanisms would be essential subsequent to a station blackout.

Essential DC bus ED-1-A feeds Division 1 loads. The Division 1 battery has 61 cells with a design minimum of 1.875 volts/cell and the Division 2 battery has 60 cells with a design minimum of 1.863 volts/cell. These cell voltages yield minimum design bus voltages of 114.4 VDC for Division 1 and 111.8 VDC for Division 2 (ref. 2, 5, 6). Voltage thresholds have been rounded to the nearest readable values of 116 VDC for Division 1 and 112 VDC for Division 2.

This IC addresses a concurrent and prolonged loss of both emergency AC and Vital DC power. A loss of all emergency AC power compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink. A loss of vital DC power compromises the ability to monitor and control SAFETY SYSTEMS. A sustained loss of both emergency AC and vital DC power will lead to multiple challenges to fission product barriers.

Fifteen minutes was selected as a threshold to exclude transient or momentary power losses. The 15-minute emergency declaration clock begins at the point when both EAL thresholds are met.

Basis Reference(s):

1. Drawing D-206-010, Main One Line Diagram 13.8 kV and 4.16 kV
2. Technical Specifications 3.8
3. USAR Section 8.3, Onsite Power Systems
4. ONI-R10, Loss of AC Power
5. Calculation PRDC-0014 (Division 1)
6. Calculation PRDC-0015 (Division 2)
7. NEI 99-01 SG8

ATTACHMENT 2: EAL 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 on ED-1-A < 116 VDC and ED-1-B < 112 VDC for ≥ 15 min. (Note 1)

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

Mode Applicability:

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

Definition(s):

None

Basis:

Essential DC bus ED-1-A feeds Division 1 loads. The Division 1 battery has 61 cells with a design minimum of 1.875 volts/cell and the Division 2 battery has 60 cells with a design minimum of 1.863 volts/cell. These cell voltages yield minimum design bus voltages of 114.4 VDC for Division 1 and 111.8 VDC for Division 2 (ref. 1, 2, 3). Voltage thresholds have been rounded to the nearest readable values of 116 VDC for Division 1 and 112 VDC for Division 2.

This IC addresses a loss of vital DC power which compromises the ability to monitor and control SAFETY SYSTEMS. In modes above Cold Shutdown, this condition involves a major failure of plant functions needed for the protection of the public.

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

Escalation of the emergency classification level would be via ICs RG1, FG1 or SG1.

Basis Reference(s):

1. Calculation PRDC-0014 (Division 1)
2. Calculation PRDC-0015 (Division 2)
3. Technical Specifications Section B.3.8.4, DC Sources - Operating
4. NEI 99-01 SS8

Category: S – System Malfunction

Subcategory: 3 – Loss of Control Room Indications

Initiating Condition: UNPLANNED loss of Control Room indications for 15 minutes or longer

EAL:

SU3.1	**Unusual Event**
An UNPLANNED event results in the inability to monitor one or more Table S-1 parameters from within the Control Room for ≥ 15 minutes (Note 1)	

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

Table S-1 Safety System Parameters
• Reactor power • RPV water level • RPV pressure • Containment pressure • Suppression Pool water level • Suppression Pool temperature

Mode Applicability:

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

Definition(s):

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

Basis:

SAFETY SYSTEM parameters listed in Table S-1 are monitored in the Control Room through a combination of hard control panel indicators as well as computer based information systems. The Integrated Computer System and SPDS are redundant compensatory indication which may be utilized in lieu of normal Control Room indicators (ref. 1, 2).

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, RPV level 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 RPV water level cannot be determined from the indications and recorders on a main control board, the SPDS or the plant computer, the availability of other parameter values may be compromised as well.

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

Escalation of the emergency classification level would be via IC SA3.

Basis Reference(s):

1. USAR Section 7.7.1.8, Process Computer System - Instrumentation
2. ONI-R61, Loss of Control Room Annunciators
3. EOP-01, RPV Control
4. EOP-01A, Level Power Control
5. EOP-02, Primary Containment Control
6. NEI 99-01 SU2

ATTACHMENT 2: EAL 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 S-1 parameters from within the Control Room for ≥ 15 minutes (Note 1)

AND

Any significant transient is in progress, Table S-2

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

Table S-1 Safety System Parameters
• Reactor power • RPV water level • RPV pressure • Containment pressure • Suppression Pool water level • Suppression Pool temperature

Table S-2 Significant Transients
• Reactor scram • Runback > 25% full electrical load • Electrical load rejection > 25% electrical load • ECCS injection • Thermal power oscillations > 10%

Mode Applicability:

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

Definition(s):

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

Basis:

SAFETY SYSTEM parameters listed in Table S-1 are monitored in the Control Room through a combination of hard control panel indicators as well as computer based information systems. The Integrated Computer System and SPDS are redundant compensatory indication which may be utilized in lieu of normal Control Room indicators (ref. 1, 2).

Significant transients are listed in Table S-2 and include response to automatic or manually initiated functions such as scrams, runbacks involving greater than 25% thermal power change, electrical load rejections of greater than 25% full electrical load, ECCS injections, or thermal power oscillations of 10% or greater.

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, RPV level 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 RPV water level cannot be determined from the indications and recorders on a main control board, the SPDS or the plant computer, the availability of other parameter values may be compromised as well.

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

Escalation of the emergency classification level would be via ICs FS1 or IC RS1

ATTACHMENT 2: EAL Bases

Basis Reference(s):

1. USAR Section 7.7.1.8, Process Computer System - Instrumentation
2. ONI-R61, Loss of Control Room Annunciators
3. EOP-01, RPV Control
4. EOP-01A, Level Power Control
5. EOP-02, Primary Containment Control
6. NEI 99-01 SA2

ATTACHMENT 2: EAL Bases

Category: S – System Malfunction

Subcategory: 4 – RCS Activity

Initiating Condition: Reactor coolant activity greater than Technical Specification allowable limits

EAL:

SU4.1	**Unusual Event**
Offgas Pretreatment radiation monitor 1D17-K612 high alarm	

Mode Applicability:

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

Definition(s):

None

Basis:

The Offgas Pretreatment monitors radioactivity in the Offgas system downstream of the Offgas condenser. The monitor detects the radiation level that is attributable to the fission gases produced in the reactor and transported with steam through the turbine to the condenser. The Offgas Pretreatment radiation monitor high alarm and Recorder (1D17-R0604) alert alarm setpoints are calculated to ensure compliance with Technical Specification 3.7.5. Compliance is verified by sample analysis following an increase on the Offgas Pretreatment radiation monitor of greater than 50% of the nominal steady-state fission gas release from the reactor coolant, after factoring out increases due to changes in thermal power level. Fuel condition changes, including start-up of a new core, or fuel defects, will have an effect on the alarm setpoints for this monitor. Annunciator ARI-H13-P604-0001-A1, OG PRE-TREAT PRCS RAD MON RAD HIGH, setpoint is variable and listed per the PEMS Setpoint List.

This IC addresses a reactor coolant activity value that exceeds an allowable limit specified in Technical Specifications. This condition is a precursor to a more significant event and represents a potential degradation of the level of safety of the plant.

Escalation of the emergency classification level would be via ICs FA1 or the Recognition Category R ICs.

Basis Reference(s):

1. ODCM 3.11.2.4, Gaseous Radwaste (Off Gas) Treatment
2. Technical Specification 3.7.5, Main Condenser Offgas
3. CHI-0006, Radiation Monitoring Alarm Setpoint Determination
4. ARI-H13-P604-0001, Process Radiation Monitoring Panel
5. ONI-J11-1, Gross Fuel Cladding Failure
6. NEI 99-01 SU3

ATTACHMENT 2: EAL Bases

Category: S – System Malfunction

Subcategory: 4 – RCS Activity

Initiating Condition: Reactor coolant activity greater than Technical Specification allowable limits

EAL:

SU4.2 Unusual Event

Coolant activity > 0.2 µCi/gm Dose Equivalent I-131 for > 48 hours

OR

Coolant activity > 4.0 µCi/gm Dose Equivalent I-131 instantaneous

Mode Applicability:

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

Definition(s):

None

Basis:

The specific iodine activity is limited to ≤ 0.2 µCi/gm Dose Equivalent I-131. This limit ensures the source term assumed in the safety analysis for the Main Steam Line Break (MSLB) outside containment is not exceeded, so any release of radioactivity to the environment during an MSLB is less than a small fraction of the regulatory limits (ref. 1, 2).

The upper limit of 4.0 µCi/gm Dose Equivalent I-131ensures that the thyroid dose from an MSLB will not exceed the dose guidelines of 10 CFR 50.67 or Control Room operator dose limits specified in GDC 19 of 10 CFR 50, Appendix A (ref. 1, 2).

This IC addresses a reactor coolant activity value that exceeds an allowable limit specified in Technical Specifications. This condition is a precursor to a more significant event and represents a potential degradation of the level of safety of the plant.

Escalation of the emergency classification level would be via ICs FA1 or the Recognition Category R ICs.

Basis Reference(s):

1. Technical Specifications Section 3.4.8, RCS Specific Activity
2. USAR Section 15.6.4 Steam System Piping Break Outside Containment
3. NEI 99-01 SU3

ATTACHMENT 2: EAL 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 minutes (Note 1)

OR

RCS identified leakage > 25 gpm for ≥ 15 minutes (Note 1)

OR

Leakage from the RCS to a location outside containment > 25 gpm for ≥ 15 minutes (Note 1)

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

Mode Applicability:

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

Definition(s):

None

Basis:

RCS leakage is monitored by utilizing the following techniques (ref. 1):

- Sensing excess flow in piping systems
- Sensing pressure and temperature changes in the drywell and containment
- Monitoring for high flow and temperature through selected drains
- Sampling airborne particulate and gaseous radioactivity
- Drywell floor and equipment drain sump measurement
- Containment floor and equipment sump measurement

Identified leakage is leakage into the drywell, such as that from pump seals or valve packing, that is captured and conducted to a collecting sump; or leakage into the drywell atmosphere from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be pressure boundary leakage.

Unidentified leakage is all leakage into the drywell that is not identified leakage (ref. 2, 3).

Pressure boundary leakage is leakage through a nonisolable fault in a Reactor Coolant System (RCS) component body, pipe wall, or vessel wall (ref. 2, 3).

Escalation of this EAL to the Alert level is via Category F, Fission Product Barrier Degradation, EAL FA1.1.

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, or a location outside of containment.

The leak rate values for each condition were selected because they are usually observable with normal Control Room indications. Lesser values typically require time-consuming calculations to determine (e.g., a mass balance calculation). The first condition uses a lower value that reflects the greater significance of unidentified or pressure boundary leakage.

A stuck-open Safety Relief Valve (SRV) or SRV leakage is not considered either identified or unidentified leakage by Technical Specifications and, therefore, is not applicable to this EAL.

The 15-minute threshold duration allows sufficient time for prompt operator actions to isolate the leakage, if possible.

Basis Reference(s):

1. USAR Section 5.2.5, Detection of Leakage Through Reactor Coolant Pressure Boundary
2. Technical Specifications Definitions Section 1.1
3. Technical Specifications 3.4.5
4. NEI 99-01 SU4

Category: S – System Malfunction

Subcategory: 6 – RPS Failure

Initiating Condition: Automatic or manual scram fails to shut down the reactor

EAL:

SU6.1 Unusual Event

An automatic scram did **not** shut down the reactor after **any** RPS setpoint is exceeded

AND

A subsequent automatic scram or manual scram action taken at the reactor control console (Manual PBs, Mode Switch, ARI) is successful in shutting down the reactor as indicated by reactor power < 4% (APRM downscale) (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, 2 - Startup

Definition(s):

None

Basis:

The first condition of this EAL identifies the need to cease critical reactor operations by actuation of the automatic Reactor Protection System (RPS) scram function. A reactor scram is automatically initiated by the Reactor Protection System (RPS) when certain continuously monitored parameters exceed predetermined setpoints (ref. 1).

Following a successful reactor scram, rapid insertion of the control rods occurs. Nuclear power promptly drops to a fraction of the original power level and then decays to a level several decades less with a negative period. The reactor power drop continues until reactor power reaches the point at which the influence of source neutrons on reactor power starts to be observable. A predictable post-scram response from an automatic reactor scram signal should therefore consist of a prompt drop in reactor power as sensed by the nuclear instrumentation and a lowering of power into the source range. A successful scram has therefore occurred when there is sufficient rod insertion from the trip of RPS to bring the reactor power below the APRM downscale setpoint of 4%.

For the purposes of emergency classification, successful manual scram actions are those which can be quickly performed from the reactor control console (i.e., manual scram pushbuttons, mode switch, or ARI initiation). Reactor shutdown achieved by use of alternate control rod insertion methods (i.e., EOP-SPIs 1.1 - 1.7) does not constitute a successful manual scram (ref. 2).

Following any automatic RPS scram signal, operating procedures (e.g., EOP-01A) prescribe insertion of redundant manual scram signals to back up the automatic RPS scram function and ensure reactor shutdown is achieved. Even if the first subsequent manual scram signal inserts all control rods to the full-in position immediately after the initial failure of the automatic scram, the lowest level of classification that must be declared is an Unusual Event (ref. 2).

ATTACHMENT 2: EAL Bases

Taking the mode switch to shutdown is a manual scram action. When the Mode Switch is taken out of the Run position, however, the nuclear instrumentation scram setpoint is lowered. If reactor power remains above the lowered setpoint, an automatic scram is initiated.

For the purposes of this EAL, a successful automatic initiation of ARI that reduces reactor power below 4% is not considered a successful automatic scram. If automatic initiation of ARI has occurred and caused reactor shutdown, the automatic RPS scram must have failed. ARI is a backup means of inserting control rods in the unlikely event that an automatic RPS scram signal exists but the reactor continues to generate significant power. However, a successful automatic or manual initiation of ARI is an acceptable means of establishing reactor shutdown conditions relative to the EAL threshold in the absence of any required subsequent manual scram actions.

In the event that the operator identifies a reactor scram is IMMINENT and initiates a successful manual reactor scram before the automatic scram setpoint is reached, no declaration is required. The successful manual scram of the reactor before it reaches its automatic scram setpoint or reactor scram signals caused by instrumentation channel failures do not lead to a potential fission product barrier loss. If manual reactor scram actions fail to reduce reactor power below 4%, the event escalates to the Alert under EAL SA6.1.

If by procedure, operator actions include the initiation of an immediate manual scram following receipt of an automatic scram signal and there are no clear indications that the automatic scram failed (such as a time delay following indications that a scram setpoint was exceeded), it may be difficult to determine if the reactor was shut down because of automatic scram or manual actions. If a subsequent review of the scram actuation indications reveals that the automatic scram did not cause the reactor to be shut down, then consideration should be given to evaluating the fuel for potential damage, and the reporting requirements of 50.72 should be considered for the transient event.

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor scram that results in a reactor shutdown, and either a subsequent operator manual action taken at the reactor control consoles or an automatic scram is successful in shutting down the reactor. This event is a precursor to a more significant condition and thus represents a potential degradation of the level of safety of the plant.

Following the failure on an automatic reactor scram, operators will promptly initiate manual actions at the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor scram). 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 scram 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 scram) using a different switch). Depending upon several factors, the initial or subsequent effort to manually scram the reactor, or a concurrent plant condition, may lead to the generation of an automatic reactor scram signal. If a subsequent manual or automatic scram 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 scram). 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".

Taking the reactor mode switch to shutdown is considered to be a manual scram action.

The plant response to the failure of an automatic or manual reactor scram will vary based upon several factors including the reactor power level prior to the event, availability of the condenser, performance of mitigation equipment and actions, other concurrent plant conditions, etc. If subsequent operator manual actions taken at the reactor control consoles are also unsuccessful in shutting down the reactor, then the emergency classification level will escalate to an Alert via IC SA6. Depending upon the plant response, escalation is also possible via IC FA1. Absent the plant conditions needed to meet either IC SA6 or FA1, an unusual event declaration is appropriate for this event.

A reactor shutdown is determined in accordance with applicable emergency operating procedure criteria.

Should a reactor scram signal be generated as a result of plant work (e.g., RPS setpoint testing), the following classification guidance should be applied.

- If the signal causes a plant transient that should have included an automatic reactor scram and the RPS fails to automatically shutdown the reactor, then this IC and the EALs are applicable, and should be evaluated.
- If the signal does not cause a plant transient and the scram failure is determined through other means (e.g., assessment of test results), then this IC and the EALs are not applicable and no classification is warranted.

Basis Reference(s):

1. Technical Specifications Table 3.3.1.1-1
2. EOP-01A, Level Power Control
3. NEI 99-01 SU5

Category: S – System Malfunction

Subcategory: 6 – RPS Failure

Initiating Condition: Automatic or manual scram fails to shut down the reactor

EAL:

SU6.2 Unusual Event

A manual scram did **not** shut down the reactor after **any** manual scram action was initiated

AND

A subsequent automatic scram or manual scram action taken at the reactor control console (Manual PBs, Mode Switch, ARI) is successful in shutting down the reactor as indicated by reactor power < 4% (APRM downscale) (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, 2 - Startup

Definition(s):

None

Basis:

This EAL addresses a failure of a manually initiated scram in the absence of having exceeded an automatic RPS trip setpoint and a subsequent automatic or manual scram is successful in shutting down the reactor (reactor power < 4%) (ref. 1).

Following a successful reactor scram, rapid insertion of the control rods occurs. Nuclear power promptly drops to a fraction of the original power level and then decays to a level several decades less with a negative period. The reactor power drop continues until reactor power reaches the point at which the influence of source neutrons on reactor power starts to be observable. A predictable post-scram response from a manual reactor scram signal should therefore consist of a prompt drop in reactor power as sensed by the nuclear instrumentation and a lowering of power into the source range. A successful scram has therefore occurred when there is sufficient rod insertion from the trip of RPS to bring the reactor power below the APRM downscale setpoint of 4%.

For the purposes of emergency classification, successful manual scram actions are those which can be quickly performed from the reactor control console (i.e., manual scram pushbuttons, mode switch, or ARI initiation). Reactor shutdown achieved by use of alternate control rod insertion methods (i.e., EOP-SPIs 1.1 - 1.7) does not constitute a successful manual scram (ref. 2).

Taking the mode switch to shutdown is a manual scram action. When the Mode Switch is taken out of the Run position, however, the nuclear instrumentation scram setpoint is lowered. If reactor power remains above the lowered setpoint, an automatic scram is initiated.

Successful automatic or manual initiation of ARI is an acceptable means of establishing reactor shutdown conditions relative to the EAL threshold in the absence of any required subsequent manual scram actions.

If both subsequent automatic and subsequent manual reactor scram actions in the Control Room fail to reduce reactor power below the power associated with the SAFETY SYSTEM design (< 4%) following a failure of an initial manual scram, the event escalates to an Alert under EAL SA6.1

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor scram that results in a reactor shutdown, and either a subsequent operator manual action taken at the reactor control consoles or an automatic scram is successful in shutting down the reactor. This event is a precursor to a more significant condition and thus represents a potential degradation of the level of safety of the plant.

Following the failure on an automatic reactor scram, operators will promptly initiate manual actions at the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor scram). 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 scram 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 scram) using a different switch). Depending upon several factors, the initial or subsequent effort to manually scram the reactor, or a concurrent plant condition, may lead to the generation of an automatic reactor scram signal. If a subsequent manual or automatic scram 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 scram). 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".

Taking the reactor mode switch to shutdown is considered to be a manual scram action.

The plant response to the failure of an automatic or manual reactor scram will vary based upon several factors including the reactor power level prior to the event, availability of the condenser, performance of mitigation equipment and actions, other concurrent plant conditions, etc. If subsequent operator manual actions taken at the reactor control consoles are also unsuccessful in shutting down the reactor, then the emergency classification level will escalate to an Alert via IC SA6. Depending upon the plant response, escalation is also possible via IC FA1. Absent the plant conditions needed to meet either IC SA6 or FA1, an unusual event declaration is appropriate for this event.

A reactor shutdown is determined in accordance with applicable emergency operating procedure criteria.

Should a reactor scram signal be generated as a result of plant work (e.g., RPS setpoint testing), the following classification guidance should be applied.

- If the signal causes a plant transient that should have included an automatic reactor scram and the RPS fails to automatically shutdown the reactor, then this IC and the EALs are applicable, and should be evaluated.
- If the signal does not cause a plant transient and the scram failure is determined through other means (e.g., assessment of test results), then this IC and the EALs are not applicable and no classification is warranted.

Basis Reference(s):

1. Technical Specifications Table 3.3.1.1-1
2. EOP-01A, Level Power Control
3. NEI 99-01 SU5

ATTACHMENT 2: EAL Bases

Category: S – System Malfunction

Subcategory: 2 – RPS Failure

Initiating Condition: Automatic or manual scram 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 scram fails to shut down the reactor

AND

Manual scram actions taken at the reactor control console (Manual PBs, Mode Switch, ARI) are **not** successful in shutting down the reactor as indicated by reactor power ≥ 4% (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, 2 - Startup

Definition(s):

None

Basis:

This EAL addresses any automatic or manual reactor scram signal that fails to shut down the reactor followed by a subsequent manual scram that fails to shut down the reactor to an extent the reactor is producing energy in excess of the heat load for which the SAFETY SYSTEMS were designed.

For the purposes of emergency classification, successful manual scram actions are those which can be quickly performed from the reactor control console (i.e., manual scram pushbuttons, mode switch, or ARI initiation). Reactor shutdown achieved by use of alternate control rod insertion methods (i.e., EOP-SPIs 1.1 - 1.7) does not constitute a successful manual scram (ref. 2).

For the purposes of this EAL, a successful automatic initiation of ARI that reduces reactor power below 4% is not considered a successful automatic scram. If automatic actuation of ARI has occurred and caused reactor shutdown, the automatic RPS scram must have failed. ARI is a backup means of inserting control rods in the unlikely event that an automatic RPS scram signal exists but the reactor continues to generate significant power. However, a successful automatic initiation of ARI is an acceptable means of establishing reactor shutdown conditions relative to the EAL threshold in the absence of any required subsequent manual scram actions.

The APRM downscale trip setpoint (4%) is a minimum reading on the power range scale that indicates power production. It also approximates the decay heat which the shutdown systems were designed to remove and is indicative of a condition requiring immediate response to prevent subsequent core damage. Below the APRM downscale trip setpoint, plant response will be similar to that observed during a normal shutdown. Nuclear instrumentation (APRM) indications or other reactor parameters (steam flow, RPV pressure, suppression pool temperature trend) can be used to determine if reactor power is greater than 4% power.

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor scram 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 scram). This action does not include manually driving in control rods or implementation of boron injection strategies. If this action(s) is unsuccessful, operators would immediately pursue additional manual actions at locations away from the reactor control console (e.g., locally opening breakers). Actions taken at backpanels or other locations within the control room, or any location outside the control room, are not considered to be “at the reactor control console”.

Taking the reactor mode switch to shutdown is considered to be a manual scram action.

The plant response to the failure of an automatic or manual reactor scram 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 RPV water level or RCS heat removal safety functions, the emergency classification level will escalate to a Site Area Emergency via IC SS6. Depending upon plant responses and symptoms, escalation is also possible via IC FS1. Absent the plant conditions needed to meet either IC SS6 or FS1, an Alert declaration is appropriate for this event.

It is recognized that plant responses or symptoms may also require an Alert declaration in accordance with the Recognition Category F ICs; however, this IC and EAL are included to ensure a timely emergency declaration.

A reactor shutdown is determined in accordance with applicable Emergency Operating Procedure criteria.

Basis Reference(s):

1. Technical Specifications Table 3.3.1.1-1
2. EOP-01A, Level Power Control
3. NEI 99-01 SA5

Category: S – System Malfunction

Subcategory: 2 – RPS Failure

Initiating Condition: Inability to shut down the reactor causing a challenge to RPV water level or RCS heat removal

EAL:

SS6.1 Site Area Emergency

An automatic or manual scram fails to shut down the reactor

AND

All actions to shut down the reactor are **not** successful as indicated by reactor power ≥ 4%

AND EITHER:

RPV level **cannot** be restored and maintained > -25 in. or **cannot** be determined

OR

HCL exceeded (EOP Figures)

Mode Applicability:

1 - Power Operation, 2 - Startup

Definition(s):

None

Basis:

This EAL addresses the following:

- Any automatic reactor scram signal followed by a manual scram that fails to shut down the reactor to an extent the reactor is producing energy in excess of the heat load for which the SAFETY SYSTEMS were designed (EAL SA6.1), and
- Indications that either core cooling is extremely challenged or heat removal is extremely challenged.

Reactor shutdown achieved by use of control rod insertion methods in EOP-SPIs 1.1 - 1.7 is also credited as a successful manual scram provided reactor power can be reduced below the APRM downscale trip setpoint before indications of an extreme challenge to either core cooling or heat removal exist. (ref. 1)

The APRM downscale trip setpoint (4%) is a minimum reading on the power range scale that indicates power production. It also approximates the decay heat which the shutdown systems were designed to remove and is indicative of a condition requiring immediate response to prevent subsequent core damage. Below the APRM downscale trip setpoint, plant response will be similar to that observed during a normal shutdown. Nuclear instrumentation (APRM) indications or other reactor parameters (steam flow, RPV pressure suppression pool temperature trend) can be used to determine if reactor power is greater than 4% power (ref. 1).

The combination of failure of both front line and backup protection systems to function in response to a plant transient, along with the continued production of heat, poses a direct threat to the Fuel Clad and RCS barriers.

Indication that core cooling is extremely challenged is manifested by inability to restore and maintain RPV water level above the Minimum Steam Cooling RPV Water Level (MSCRWL) (ref. 1). The MSCRWL is the lowest RPV level at which the covered portion of the reactor core will generate sufficient steam to prevent any clad temperature in the uncovered part of the core from exceeding 1500°F. This water level is utilized in the EOPs to preclude fuel damage when RPV level is below the top of active fuel. RPV level below the MSCRWL for an extended period of time without satisfactory core spray cooling could be a precursor of a core melt sequence. When RPV level cannot be determined, EOPs require entry to EOP-04-4, RPV Flooding. RPV water level indication provides the primary means of knowing if adequate core cooling is being maintained. When all means of determining RPV water level are unavailable, the fuel clad barrier is threatened and reliance on alternate means of assuring adequate core cooling must be attempted. The instructions in EOP-04-4 specify these means, which include emergency depressurization of the RPV and injection into the RPV at a rate needed to flood to the elevation of the main steam lines or hold RPV pressure above the Minimum Steam Cooling Pressure (ref. 2).

The Heat Capacity Limit (EOP HCL Figures) is the highest suppression pool water temperature from which Emergency RPV Depressurization will not raise suppression pool temperature above the maximum design suppression pool temperature.

The HCL is a function of RPV pressure and suppression pool water level. It is utilized to preclude failure of the containment and equipment in the containment necessary for the safe shutdown of the plant. This threshold is met when the final step of suppression pool temperature control in EOP-02, Primary Containment Control, is reached (ref. 3). This condition addresses loss of functions required for hot shutdown with the reactor at pressure and temperature.

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor scram that results in a reactor shutdown, all subsequent operator actions to manually shutdown the reactor are unsuccessful, and continued power generation is challenging the capability to adequately remove heat from the core and/or the RCS. This condition will lead to fuel damage if additional mitigation actions are unsuccessful and thus warrants the declaration of a Site Area Emergency.

In some instances, the emergency classification resulting from this IC/EAL may be higher than that resulting from an assessment of the plant responses and symptoms against the Recognition Category F ICs/EALs. This is appropriate in that the Recognition Category F ICs/EALs do not address the additional threat posed by a failure to shut down the reactor. The inclusion of this IC and EAL ensures the timely declaration of a Site Area Emergency in response to prolonged failure to shutdown the reactor.

A reactor shutdown is determined in accordance with applicable Emergency Operating Procedure criteria.

Escalation of the emergency classification level would be via IC RG1 or FG1.

Basis Reference(s):

1. EOP-01A, Level Power Control
2. EOP-04-4, RPV Flooding
3. EOP-02, Primary Containment Control
4. NEI 99-01 SS5

ATTACHMENT 2: EAL 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 S-3 onsite communication methods

OR

Loss of **all** Table S-3 ORO communication methods

OR

Loss of **all** Table S-3 NRC communication methods

Table S-3 Communication Methods

System	Onsite	ORO	NRC
Plant Public Address System	X		
Plant Radio System Channels 1, 2 and 3	X		
State and County Notification Circuit (5-way)		X	
Control Room private (259-) lines		X	X
Private Branch Exchange, Service Building ("5000") Switch		X	X
Private Branch Exchange, Warehouse Building ("6000") Switch		X	X
Company Off-Premise Exchange		X	X
Commercial Telephone Systems	X	X	X
Emergency Telecommunications System (ETS)			X

Mode Applicability:

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

Definition(s):

None

Basis:

PSI-0007 provides communications failure scenarios and a listing of circuit power supplies. Onsite/offsite communications include one or more of the systems listed in Table S-3 (ref. 1, 2).

Plant Public Address System

Voice communications between various plant buildings and locations is provided by a page/party, public address (PA) system. The Plant Public Address System is specifically designed for utility and heavy industrial applications where intelligible communication in areas of high ambient noise is desired.

Plant Radio System Channels 1, 2 and 3

The Plant Radio System consists of radio transceivers operating through an antenna system, to provide radio coverage outdoors and in the plant. This system provides multiple voice or data channels for communications to various portable and mobile radio devices for Operations, Instrumentation and Controls, Maintenance, Fire Brigade, Emergency, and Security. These channels may also support other site organizations and functions as needed. Use of Plant Radio System channels 4 and 5 is restricted to Site Protection activities. Therefore, credit for Channels 4 and 5 is not taken in support of plant operations.

State and County Notification Circuit (5-Way)

The primary communications link between Perry and the offsite State and local county EOCs or 24-hour notification points is through a telephone conference loop, referred to as the “5-Way”. The State and local county EOCs are the Ohio emergency management Agency (OEMA), Ashtabula County, Geauga County, and Lake County. A loss of the “5-Way” Circuit refers to the inability to contact one or more of the four offsite contacts.

Control Room private (259-) lines

All direct (259-) off-site calling capability from the Control Room via private lines refers to:

- Autodialer at the US console
- Private (259-) line on the superphones
- Private (259-) line at the SAS console.

Private Branch Exchange, Service Building (“5000”) Switch and Warehouse Building (“6000”) Switch

Voice communication between administration office areas, selected plant areas, the control room, and points outside the plant, is provided by a commercial Private Branch Exchange (PBX) telephone system. Sufficient lines are provided to ensure adequate availability for all normal requirements. The PBX system is powered from a battery charging system, which is capable of being fed from a diesel generator backed power supply. The battery capacity of the system has been designed to sustain operation of the PBX system for four hours in the event of a loss of power.

Company Off-Premise Exchange

The Off Premise Exchange (OPX) telephone system provides an alternate voice communication system between the plant and locations offsite. This offsite communication system consists of telephones strategically located in the emergency response facilities and various areas within the plant. In the event of a power outage, the telephone system has a diesel generator backup power supply and battery backup with a capacity to sustain operation for three hours. Intra-company communication links, which employ backup power systems, provides communications channels to the commercial OPX carrier.

Commercial Telephone Systems

In the event that one or more of the dedicated line networks are inoperative, commercial telephone lines, the Perry Plant PBX, and Company OPX systems provide a back-up means of communications between the Perry Plant and Federal, State and local governments with primary responsibilities during an emergency.

Emergency Telecommunications System (ETS)

The Emergency Telecommunications System (ETS) provides a network for essential communications functions. The system uses the licensee’s communication network to provide communications links to the NRC Operations Center on a regular basis and when normal telephone service (business dial tone) is unavailable. These communications functions are identified by the NRC as essential, particularly in the early phases of an accident, until an augmented response effort by NRC personnel and other agencies is established at the scene of the emergency.

This EAL is the hot condition equivalent of the cold condition EAL CU5.1.

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

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

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

The second EAL condition addresses a total loss of the communications methods used to notify all OROs of an emergency declaration. The OROs referred to here are Ashtabula County, Geauga County, and Lake County.

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

Basis Reference(s):

1. Emergency Plan for Perry Nuclear Power Plant, Docket No. 50-440, Section 7.2 and Figure 7-5
2. USAR Section 9.5.2 Communications Systems
3. NEI 99-01 SU6

Category: S – System Malfunction

Subcategory: 8 – Hazardous Event Affecting Safety Systems

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

EAL:

SA8.1 Alert

The occurrence of **any** Table S-4 hazardous event

AND EITHER:

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

OR

The event has caused VISIBLE DAMAGE to a SAFETY SYSTEM component or structure needed for the current operating mode

Table S-4 Hazardous Events
• Seismic event • Internal or external FLOODING event • High winds • Tornado strike • FIRE • EXPLOSION • Other events with similar hazard characteristics as determined by the Shift Manager

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - 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 component or structure that is readily observable without measurements, testing, or analysis. The visual impact of the damage is sufficient to cause concern regarding the operability or reliability of the affected component or structure.

Basis:

- The significance of a seismic event is discussed under EAL HU2.1 (ref. 1, 2).
- Internal FLOODING may be caused by events such as component failures, equipment misalignment, or outage activity mishaps (ref. 3, 4).
- Seismic Category I structures are analyzed to withstand a sustained, design wind velocity of at least 90 mph (ref. 5, 6).

- Areas containing functions and systems required for safe shutdown of the plant are identified by Fire Zone in the fire response procedure (ref. 7).
- An EXPLOSION that degrades the performance of a SAFETY SYSTEM train or visibly damages a SAFETY SYSTEM component or structure would be classified under this EAL.

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

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

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

Escalation of the emergency classification level would be via IC FS1 or RS1.

Basis Reference(s):

1. USAR Section 2.5.2.7, Operating Basis Earthquake
2. ONI-D51, Earthquake
3. USAR Section 3.3.1, Wind Loadings
4. ONI-ZZZ-1, Tornado or High Winds
5. ONI-P54, Fire
6. Appendix R - Evaluation, Safe Shutdown Capability Report
7. USAR Section 9A, Fire Protection Evaluation Report
8. NEI 99-01 SA9

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 cask/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.

A hostile security event that leads to a potential loss in the level of safety of the ISFSI is a classifiable event under Security category EAL HS1.1.

Minor surface damage that does not affect storage cask/canister boundary is excluded from the scope of these EALs.

Category: E - ISFSI

Sub-category: None

Initiating Condition: Damage to a loaded cask CONFINEMENT BOUNDARY

EAL:

EU1.1 Notification of Unusual Event

Damage to a loaded Multi-Purpose Canister (MPC) CONFINEMENT BOUNDARY as indicated by measured dose rates on the top or side of a loaded overpack, excluding inlet and outlet vents, reading > ANY Table E-1 ISFSI Cask On-contact Dose Rate Limit.

Table E-1 ISFSI Cask On-contact Dose Rate Limits

Type: HI-STORM 100S	Type: HI-STORM FW (Flood/Wind)
• 60 mrem/hr (gamma + neutron) on the top of the overpack • 600 mrem/hr (gamma + neutron) on the side of the overpack	• 30 mrem/hr (gamma + neutron) on the top of the overpack • 600 mrem/hr (gamma + neutron) on the side of the overpack

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 Perry ISFSI, Confinement Boundary is defined as the Multi-Purpose Canister (MPC).

Basis:

The Independent Spent Fuel Storage Installation utilizes two types of storage systems:

1. The HOLTEC International (HOLTEC) HI-STORM 100 Spent Fuel Dry Storage (SFDS) system which includes the HI-STORM 100S Version B storage cask (overpack) and the MPC-68 multi-purpose canister (MPC). A total of 68 spent fuel assemblies are permitted to be loaded in the MPC-68. A total of 25 loaded HI-STORM 100S casks are stored on the ISFSI Pad as shown in Figure E-2 below.
2. The HOLTEC International (HOLTEC) HI-STORM Flood/Wind (FW) Spent Fuel Storage Cask (SFSC) which consists of the HI-STORM FW cask (overpack) and the MPC-89 multi-purpose canister (MPC). A total of 89 spent fuel assemblies are permitted to be loaded in the MPC-89. Dry fuel casks loaded after 2021 are HI-STORM FW casks (see Figure E-2 below).

For both systems, the overpack is a steel and concrete upright cylindrical structure that provides shielding, structural protection, and passive cooling for the inserted MPC during storage. The MPC is a welded, leak-tight canister that provides the CONFINEMENT BOUNDARY and criticality protection for the stored fuel.

The EAL threshold values represent two-times the limits specified the in the applicable ISFSI Certificate of Compliance:

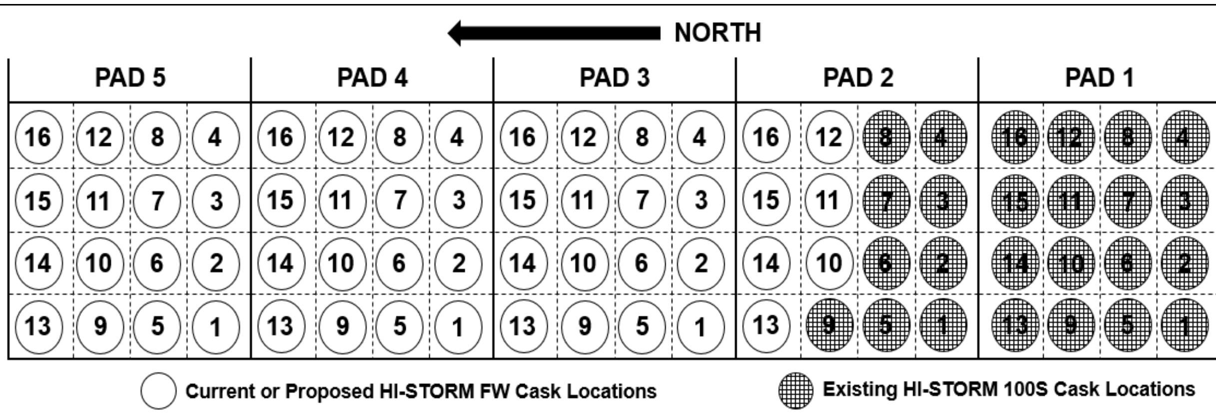
1. No. 1014, Technical Specification Section 5.7.4 a&b, for the HI-STORM 100 system (ref. 2)
2. No. 1032, Technical Specification Section 5.3.4 a&b, for the HI-STORM FW system (ref. 4).

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 technical specification multiple of “2 times”, which is also used in Recognition Category R IC RU1, 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.

Figure E-2 ISFSI Pad Cask Style



Basis Reference(s):

1. USAR 9.1.4.2.10.14, Onsite Spent Fuel Dry Storage
2. Certificate of Compliance No. 1014, Appendix A, Technical Specifications for the HI-STORM 100 Cask System, Section 5.7.4, Radiation Protection Program
3. NEI 99-01 E-HU1
4. Certificate of Compliance (CoC) No. 1032, Appendix A, Technical Specifications for the HI-STORM Flood/Wind (FW) Multipurpose Canister (MPC) Storage System, Section 5.3.4.

ATTACHMENT 2: EAL Bases

Category F – Fission Product Barrier Degradation

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

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

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

B. Reactor Coolant System (RCS): The RCS Barrier is the reactor coolant system pressure boundary and includes the RPV and all reactor coolant system piping out to and including the isolation valves.

C. Containment (CNTMT): The drywell, the wetwell, their respective interconnecting paths, and other connections up to and including the outermost containment isolation valves comprise the CNTMT barrier. Containment Barrier thresholds are used as criteria for escalation of the ECL from Alert to either a Site Area Emergency or a General Emergency.

The EALs in this category require evaluation of the loss and potential loss thresholds listed in the fission product barrier matrix of Table F-1 (Attachment 2). “Loss” and “Potential Loss” signify the relative damage and threat of damage to the barrier. “Loss” means the barrier no longer assures containment of radioactive materials. “Potential Loss” means integrity of the barrier is threatened and could be lost if conditions continue to degrade. The number of barriers that are lost or potentially lost and the following criteria determine the appropriate emergency classification level:

Alert:
Any loss or any potential loss of either Fuel Clad or RCS

Site Area Emergency:
Loss or potential loss of any two barriers

General Emergency:
Loss of any two barriers and loss or potential loss of third barrier

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

- The Fuel Clad Barrier and the RCS Barrier are weighted more heavily than the Containment Barrier.
- Unusual Event ICs associated with RCS and Fuel Clad Barriers are addressed under System Malfunction ICs.

ATTACHMENT 2: EAL Bases

- For accident conditions involving a radiological release, evaluation of the fission product barrier thresholds will need to be performed in conjunction with dose assessments to ensure correct and timely escalation of the emergency classification. For example, an evaluation of the fission product barrier thresholds may result in a Site Area Emergency classification while a dose assessment may indicate that an EAL for General Emergency IC RG1 has been exceeded.
- The fission product barrier thresholds specified within a scheme reflect Perry 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 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, there should be frequent assessments of containment radioactive inventory and integrity. Alternatively, if both the Fuel Clad and RCS fission product barriers were potentially lost, the Emergency Coordinator would have more assurance that there was no immediate need to escalate to a General Emergency.

Category: Fission Product Barrier Degradation

Subcategory: N/A

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

EAL:

FA1.1	**Alert**
Any loss or **any** potential loss of **EITHER** Fuel Clad or RCS barrier (Table F-1)	

Mode Applicability:

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

Definition(s):

None

Basis:

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

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

Basis Reference(s):

1. NEI 99-01 FA1

ATTACHMENT 2: EAL Bases

Category: Fission Product Barrier Degradation

Subcategory: N/A

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

EAL:

FS1.1	**Site Area Emergency**
Loss or potential loss of **any** two barriers (Table F-1)	

Mode Applicability:

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

Definition(s):

None

Basis:

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

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

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

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

Basis Reference(s):

1. NEI 99-01 FS1

Category: Fission Product Barrier Degradation

Subcategory: N/A

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

EAL:

FG1.1 General Emergency

Loss of **any** two barriers

AND

Loss or potential loss of third barrier (Table F-1)

Mode Applicability:

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

Definition(s):

None

Basis:

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

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

- Loss of Fuel Clad, RCS and Containment barriers
- Loss of Fuel Clad and RCS barriers with potential loss of Containment barrier
- Loss of RCS and Containment barriers with potential loss of Fuel Clad barrier
- Loss of Fuel Clad and Containment barriers with potential loss of RCS barrier

Basis Reference(s):

1. NEI 99-01 FG1

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Introduction

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

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

A. RPV Water Level

B. RCS Leak Rate

B. Containment Conditions

C. Containment Radiation / RCS Activity

D. Containment Integrity or Bypass

E. Emergency Coordinator Jugement

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

Thresholds are assigned sequential numbers within each Loss and Potential Loss column beginning with number one. In this manner, a threshold can be identified by its category title and number. For example, the first Fuel Clad barrier Loss in Category A would be assigned “FC Loss A.1,” the third Containment barrier Potential Loss would be assigned “CNTMT P-Loss B.3,” etc.

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

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

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

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

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

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,…, F.

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Table F-1 Fission Product Barrier Threshold Matrix

	Fuel Clad Barrier		Reactor Coolant System Barrier		Containment Barrier	
Category	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**
A RPV Water Level	1. SAMG entry is required	1. RPV level **cannot** be restored and maintained > 0 in. (TAF) or **cannot** be determined	1. RPV level **cannot** be restored and maintained > 0 in. (TAF) or **cannot** be determined	None	None	1. SAMG entry is required
B RCS Leak Rate	None	None	1. UNISOLABLE break in **any** of the following: • Main steam lines • RCIC steam Line • RWCU • Feedwater 2. Emergency Depressurization is required	1. UNISOLABLE primary system leakage that results in exceeding **EITHER**: One or more EOP-03 radiation entry conditions that **can** be read in the control room are met **OR** One or more EOP-03 area temperature entry conditions are met	1. UNISOLABLE primary system leakage that results in exceeding **EITHER**: One or more EOP-03 MAX SAFE area radiation conditions that **can** be read from the control room are reached **OR** One or more EOP-03 MAX SAFE area temperatures are reached	None
C CNTMT Conditions	None	None	1. Drywell pressure > 1.68 psig due to RCS leakage	None	1. UNPLANNED rapid drop in containment pressure following containment pressure rise 2. Containment pressure response **not** consistent with LOCA conditions	1. Containment pressure > 15 psig 2. Drywell or containment hydrogen concentration > 4% 3. HCL exceeded (EOP Figures)
D CNTMT Rad / RCS Activity	1. Drywell radiation > 400 R/hr **OR** Containment radiation > 600 R/hr 2. Primary coolant activity > 300 µCi/gm I-131 dose equivalent	None	1. Drywell radiation > 40 R/hr **OR** Containment radiation > 60 R/hr	None	None	1. Drywell radiation > 4,000 R/hr **OR** Containment radiation > 6,000 R/hr
E CNTMT Integrity or Bypass	None	None	None	None	1. UNISOLABLE direct downstream pathway to the environment exists after Containment isolation signal 2. Intentional Containment venting per EOPs	None
F Emergency Coordinator Judgment	1. **Any** condition in the opinion of the Emergency Coordinator that indicates loss of the fuel clad barrier	1. **Any** condition in the opinion of the Emergency Coordinator that indicates potential loss of the fuel clad barrier	1. **Any** condition in the opinion of the Emergency Coordinator that indicates loss of the RCS barrier	1. **Any** condition in the opinion of the Emergency Coordinator that indicates potential loss of the RCS barrier	1. **Any** condition in the opinion of the Emergency Coordinator that indicates loss of the Containment barrier	1. **Any** condition in the opinion of the Emergency Coordinator that indicates potential loss of the Containment barrier

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Fuel Clad

Category: A. RPV Level

Degradation Threat: Loss

Threshold:

1. SAMG entry is required

Definition(s):

N/A

Basis:

EOPs specify entry to the SAMGs when core cooling is severely challenged. These EOPs provide instructions to ensure adequate core cooling by maintaining RPV water level above prescribed limits or operating sufficient RPV injection sources when level cannot be determined. SAMG entry is required when (ref. 1, 2):

- RPV water level cannot be restored and maintained above -25 in. (MSCRWL)
- RPV water level cannot be restored and maintained above -45 in. (jet pump suction) with LPCS injection flow below 6,200 gpm and HPCS injection flow below 6,200 gpm.
- RPV water level cannot be determined and core damage is occurring

The above EOP conditions represent a challenge to core cooling and are the minimum values to assure core cooling without further degradation of the clad.

This threshold is also a Potential Loss of the Containment barrier (CNTMT P-Loss A.1). Since SAMG entry occurs after core uncovery has occurred a Loss of the RCS barrier exists (RCS Loss A.1). SAMG entry, therefore, represents a Loss of two barriers and a Potential Loss of a third, which requires a General Emergency classification.

The Loss threshold represents the EOP requirement for entry into the Severe Accident Management Guidelines (SAMGs). This is identified in the BWROG EPGs/SAMGs when adequate core cooling cannot be assured.

Basis Reference(s):

1. EOP-01, RPV Control
2. EOP-04-4, RPV Flooding
3. EP FAQ 2015-001
4. NEI 99-01, RPV Water Level Fuel Clad Loss 2.A

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Fuel Clad

Category: A. RPV Level

Degradation Threat: Potential Loss

Threshold:

1. RPV level **cannot** be restored and maintained > 0 in. (TAF) or **cannot** be determined

Definition(s):

N/A

Basis:

An RPV water level instrument reading of 0in. indicates RPV level is at the top of active fuel (TAF) (ref. 1). When RPV level is at or above the TAF, the core is completely submerged. Core submergence is the most desirable means of core cooling. When RPV level is below TAF, the uncovered portion of the core must be cooled by less reliable means (i.e., steam cooling or spray cooling). If core uncovery is threatened, the EOPs specify alternate, more extreme, RPV water level control measures in order to restore and maintain adequate core cooling. Since core uncovery begins if RPV level drops to TAF, the level is indicative of a challenge to core cooling and the Fuel Clad barrier.

When RPV water level cannot be determined, EOPs require entry to EOP-04-4, RPV Flooding. RPV water level indication provides the primary means of knowing if adequate core cooling is being maintained (ref. 2). When all means of determining RPV water level are unavailable, the fuel clad barrier is threatened and reliance on alternate means of assuring adequate core cooling must be attempted. The instructions in EOP-04-4 specify these means, which include emergency depressurization of the RPV and injection into the RPV at a rate needed to flood to the elevation of the main steam lines or hold RPV pressure above the Minimum Steam Cooling Pressure (in scram-failure events. If RPV water level cannot be determined with respect to the top of active fuel, a potential loss of the fuel clad barrier exists.

Note that EOP-01A, Level Power Control, may require intentionally lowering RPV water level to 0 in. and control level between the Minimum Steam Cooling RPV Water Level (MSCRWL) and the top of active fuel (ref. 3). Under these conditions, a high-power ATWS event exists and requires at least a Site Area Emergency classification in accordance with the System Malfunction - RPS Failure EALs.

This water level corresponds to the top of the active fuel and is used in the EOPs to indicate a challenge to core cooling.

The RPV water level threshold is the same as RCS barrier Loss threshold 1.A. Thus, this threshold indicates a Potential Loss of the Fuel Clad barrier and a Loss of the RCS barrier that appropriately escalates the emergency classification level to a Site Area Emergency.

This threshold is considered to be exceeded when, as specified in the site-specific EOPs, RPV water cannot be restored and maintained above the specified level following depressurization of the RPV (either manually, automatically or by failure of the RCS barrier) or when procedural guidance or a lack of low pressure RPV injection sources preclude Emergency RPV depressurization. EOPs allow the operator a wide choice of RPV injection sources to consider when restoring RPV water level to within prescribed limits. EOPs also specify depressurization of the RPV in order to facilitate RPV water level control with low-pressure injection sources. In some events, elevated RPV pressure may prevent restoration of RPV water level until pressure drops below the shutoff heads of available injection sources. Therefore, this Fuel Clad barrier Potential Loss is met only after either: 1) the RPV has been depressurized, or required emergency RPV depressurization has been attempted, giving the operator an opportunity to assess the capability of low-pressure injection sources to restore RPV water level or 2) no low pressure RPV injection systems are available, precluding RPV depressurization in an attempt to minimize loss of RPV inventory.

The term “cannot be restored and maintained above” means the value of RPV water level is not able to be brought above the specified limit (top of active fuel). The determination requires an evaluation of system performance and availability in relation to the RPV water level value and trend. A threshold prescribing declaration when a threshold value *cannot* be restored and maintained above a specified limit does not require immediate action simply because the current value is below the top of active fuel, but does not permit extended operation below the limit; the threshold must be considered reached as soon as it is apparent that the top of active fuel cannot be attained.

In high-power ATWS/failure to scram events, EOPs may direct the operator to deliberately lower RPV water level to the top of active fuel in order to reduce reactor power. RPV water level is then controlled between the top of active fuel and the Minimum Steam Cooling RPV Water Level (MSCRWL). Although such action is a challenge to core cooling and the Fuel Clad barrier, the immediate need to reduce reactor power is the higher priority. For such events, ICs SA6 or SS6 will dictate the need for emergency classification.

Since the loss of ability to determine if adequate core cooling is being provided presents a significant challenge to the fuel clad barrier, a potential loss of the fuel clad barrier is specified.

Basis Reference(s):

1. EOP-01, RPV Control
2. EOP-04-4, RPV Flooding
3. EOP-01A, Level Power Control
4. NEI 99-01, RPV Water Level Fuel Clad Potential Loss 2.A

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Fuel Clad

Category: B. RCS Leak Rate

Degradation Threat: Loss

Threshold:

None

Barrier: Fuel Clad

Category: B. RCS Leak Rate

Degradation Threat: Potential Loss

Threshold:

None

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Fuel Clad

Category: C. CNTMT Conditions

Degradation Threat: Loss

Threshold:

None

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Fuel Clad

Category: C. CNTMT Conditions

Degradation Threat: Potential Loss

Threshold:

None

Barrier: Fuel Clad

Category: D. CNTMT Radiation / RCS Activity

Degradation Threat: Loss

Threshold:

1. Drywell radiation > 400 R/hr

   OR

   Containment radiation > 600 R/hr

Definition(s):

None

Basis:

The Fuel Clad FPB

threshold value is based on an instantaneous release of all reactor coolant mass into the drywell and containment air spaces at a reactor coolant activity equivalent to 300 μCi/gm DEI-131 (ref. 1)

The radiation monitor reading corresponds to an instantaneous release of all reactor coolant mass into the containment, assuming that reactor coolant activity equals 300 μCi/gm dose equivalent I-131. Reactor coolant activity above this level is greater than that expected for iodine spikes and corresponds to an approximate range of 2% to 5% fuel clad damage. Since this condition indicates that a significant amount of fuel clad damage has occurred, it represents a loss of the Fuel Clad Barrier.

The radiation monitor reading in this threshold is higher than that specified for RCS Barrier Loss threshold D.1 since it indicates a loss of both the Fuel Clad Barrier and the RCS Barrier. Note that a combination of the two monitor readings appropriately escalates the emergency classification level to a Site Area Emergency.

There is no Potential Loss threshold associated with drywell radiation.

Basis Reference(s):

1. Calculation EP-EALCALC-PNPP-1402, Containment Radiation EAL Values
2. NEI 99-01, Primary Containment Radiation Fuel Clad Loss 4.A

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Fuel Clad

Category: D. CNTMT Radiation / RCS Activity

Degradation Threat: Loss

Threshold:

2. Primary coolant activity > 300 µCi/gm I-131 Dose Equivalent

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.

There is no Potential Loss threshold associated with RCS Activity.

Basis Reference(s):

1. NEI 99-01, RCS Activity Fuel Clad Loss 1.A

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Fuel Clad

Category: D. CNTMT Radiation / RCS Activity

Degradation Threat: Potential Loss

Threshold:

None

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Fuel Clad

Category: E. CNTMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

None

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Fuel Clad

Category: E. CNTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

None

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Fuel Clad

Category: F. Emergency Coordinator Judgment

Degradation Threat: Loss

Threshold:

1. **Any** condition in the opinion of the Emergency Coordinator that indicates loss of the Fuel Clad barrier

Definition(s):

None

Basis:

The Emergency Coordinator judgment threshold addresses any other factors relevant to determining if the Fuel Clad barrier is lost. Such a determination should include IMMINENT barrier degradation, barrier monitoring capability and dominant accident sequences.

- IMMINENT barrier degradation exists if the degradation will likely occur within two hours based on a projection of current SAFETY SYSTEM performance. The term "IMMINENT" refers to recognition of the inability to reach safety acceptance criteria before completion of all checks.
- Barrier monitoring capability is decreased if there is a loss or lack of reliable indicators. This assessment should include instrumentation operability concerns, readings from portable instrumentation and consideration of offsite monitoring results.
- Dominant accident sequences lead to degradation of all fission product barriers and likely entry to the EOPs. The Emergency Coordinator should be mindful of the Loss of AC power (Station Blackout) and ATWS EALs to assure timely emergency classification declarations.

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

Basis Reference(s):

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

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Fuel Clad

Category: F. Emergency Coordinator Judgment

Degradation Threat: Potential Loss

Threshold:

1. **Any** condition in the opinion of the Emergency Coordinator that indicates potential loss of the Fuel Clad barrier

Definition(s):

None

Basis:

The Emergency Coordinator judgment threshold addresses any other factors relevant to determining if the Fuel Clad barrier is potentially lost. Such a determination should include IMMINENT barrier degradation, barrier monitoring capability and dominant accident sequences.

- IMMINENT barrier degradation exists if the degradation will likely occur within two hours based on a projection of current SAFETY SYSTEM performance. The term “IMMINENT” refers to recognition of the inability to reach safety acceptance criteria before completion of all checks.
- Barrier monitoring capability is decreased if there is a loss or lack of reliable indicators. This assessment should include instrumentation operability concerns, readings from portable instrumentation and consideration of offsite monitoring results.
- Dominant accident sequences lead to degradation of all fission product barriers and likely entry to the EOPs. The Emergency Coordinator should be mindful of the Loss of AC power (Station Blackout) and ATWS EALs to assure timely emergency classification declarations.

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

Basis Reference(s):

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

Barrier: Reactor Coolant System

Category: A. RPV Water Level

Degradation Threat: Loss

Threshold:

1. RPV level **cannot** be restored and maintained > 0 in. (TAF) or **cannot** be determined

Definition(s):

None

Basis:

An RPV water level instrument reading of 0in. indicates level is at the top of active fuel (TAF) (ref. 1). TAF is significantly lower than the normal operating RPV level control band. To reach this level, RPV inventory loss would have previously required isolation of the RCS and Containment barriers, and initiation of all ECCS. If RPV water level cannot be maintained above TAF, ECCS and other sources of RPV injection have been ineffective or incapable of reversing the decreasing level trend. The cause of the loss of RPV inventory is therefore assumed to be a LOCA. By definition, a LOCA event is a Loss of the RCS barrier.

When RPV water level cannot be determined, EOPs require entry to EOP-04-4, RPV Flooding. RPV water level indication provides the primary means of knowing if adequate core cooling is being maintained (ref. 2).The instructions in EOP-04-4 specify emergency depressurization of the RPV, which is defined to be a Loss of the RCS barrier (RCS Loss C.4).

The conditions of this threshold are also a Potential Loss of the Fuel Clad barrier (FC P-Loss A.1). A Loss of the RCS barrier and Potential Loss of the Fuel Clad barrier requires a Site Area Emergency classification.

Note that EOP-01A, Level Power Control, may require intentionally lowering RPV water level to 0 in. and control level between the Minimum Steam Cooling RPV Water Level (MSCRWL) and the top of active fuel (ref. 3). Under these conditions, a high-power ATWS event exists and requires at least a Site Area Emergency classification in accordance with the System Malfunction - RPS Failure EALs.

This water level corresponds to the top of active fuel and is used in the EOPs to indicate challenge to core cooling.

The RPV water level threshold is the same as Fuel Clad barrier Potential Loss threshold 1.A. Thus, this threshold indicates a Loss of the RCS barrier and Potential Loss of the Fuel Clad barrier and that appropriately escalates the emergency classification level to a Site Area Emergency.

This threshold is considered to be exceeded when, as specified in the site-specific EOPs, RPV water cannot be restored and maintained above the specified level following depressurization of the RPV (either manually, automatically or by failure of the RCS barrier) or when procedural guidance or a lack of low pressure RPV injection sources preclude Emergency RPV depressurization. EOPs allow the operator a wide choice of RPV injection sources to consider when restoring RPV water level to within prescribed limits. EOPs also specify depressurization of the RPV in order to facilitate RPV water level control with low-pressure injection sources. In some events, elevated RPV pressure may prevent restoration of RPV water level until pressure drops below the shutoff heads of available injection sources. Therefore, this RCS barrier Loss is met only after either: 1) the RPV has been depressurized, or required emergency RPV depressurization has been attempted, giving the operator an opportunity to assess the capability of low-pressure injection sources to restore RPV water level or 2) no low pressure RPV injection systems are available, precluding RPV depressurization in an attempt to minimize loss of RPV inventory.

The term, “cannot be restored and maintained above,” means the value of RPV water level is not able to be brought above the specified limit (top of active fuel). The determination requires an evaluation of system performance and availability in relation to the RPV water level value and trend. A threshold prescribing declaration when a threshold value *cannot* be restored and maintained above a specified limit does not require immediate action simply because the current value is below the top of active fuel, but does not permit extended operation beyond the limit; the threshold must be considered reached as soon as it is apparent that the top of active fuel cannot be attained.

In high-power ATWS/failure to scram events, EOPs may direct the operator to deliberately lower RPV water level to the top of active fuel in order to reduce reactor power. RPV water level is then controlled between the top of active fuel and the Minimum Steam Cooling RPV Water Level (MSCRWL). Although such action is a challenge to core cooling and the Fuel Clad barrier, the immediate need to reduce reactor power is the higher priority. For such events, ICs SA6 or SS6 will dictate the need for emergency classification.

There is no RCS Potential Loss threshold associated with RPV Water Level.

Basis Reference(s):

1. EOP-01, RPV Control
2. EOP-04-4, RPV Flooding
3. EOP-01A, Level Power Control
4. NEI 99-01, RPV Water Level RCS Loss 2.A

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Reactor Coolant System

Category: A. RPV Water Level

Degradation Threat: Potential Loss

Threshold:

None

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Reactor Coolant System

Category: B. RCS Leak Rate

Degradation Threat: Loss

Threshold:

1. UNISOLABLE break in **ANY** of the following:
   - Main steam line
   - RCIC steam line
   - RWCU
   - Feedwater

Definition(s):

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

Basis:

The conditions of this threshold include required containment isolation failures allowing a flow path to the environment. A release pathway outside primary containment exists when flow is not prevented by downstream isolations. In the case of a failure of both isolation valves to close but in which no downstream flowpath exists, emergency declaration under this threshold would not be required. Similarly, if the emergency response requires the normal process flow of a system outside containment (e.g., EOP requirement to bypass MSIV low RPV water level interlocks and maintain the main condenser as a heat sink using main turbine bypass valves), the threshold is not met. The combination of these threshold conditions represent the loss of both the RCS and Containment (see CNTMT Loss E.1) barriers and justifies declaration of a Site Area Emergency (i.e., Loss or Potential Loss of any two barriers).

Even though RWCU and Feedwater systems do not contain steam, they are included in the list because an UNISOLABLE break could result in the high-pressure discharge of fluid that is flashed to steam from relatively large volume systems directly connected to the RCS (ref. 1).

Large high-energy lines that rupture outside primary containment can discharge significant amounts of inventory and jeopardize the pressure-retaining capability of the RCS until they are isolated. If it is determined that the ruptured line cannot be promptly isolated from the Control Room, the RCS barrier Loss threshold is met.

Basis Reference(s):

1. USAR Section 1.2.2.3.6, Nuclear Leak Detection
2. NEI 99-01, RCS Leak Rate RCS Loss 3.A

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Reactor Coolant System

Category: B. RCS Leak Rate

Degradation Threat: Loss

Threshold:

2. Emergency Depressurization is required

Definition(s):

None

Basis:

Plant symptoms requiring Emergency RPV Depressurization per the EOPs are indicative of a loss of the RCS barrier. (ref. 1, 2).

Emergency RPV Depressurization in accordance with the EOPs is indicative of a loss of the RCS barrier. If Emergency RPV Depressurization is performed, the plant operators are directed to open safety relief valves (SRVs). Even though the RCS is being vented into the suppression pool, a Loss of the RCS barrier exists due to the diminished effectiveness of the RCS to retain fission products within its boundary.

Basis Reference(s):

1. EOP-04-2, Emergency Depressurization
2. EP FAQ 2015-001
3. NEI 99-01, RCS Leak Rate RCS Loss 3.B

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Reactor Coolant System

Category: B. RCS Leak Rate

Degradation Threat: Potential Loss

Threshold:

1. UNISOLABLE primary system leakage that results in exceeding **EITHER**:

   One or more EOP-03 radiation entry conditions that **can** be read in the control room are met

   OR

   One or more EOP-03 area temperature entry conditions are met

Definition(s):

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

Basis:

The presence of elevated general area temperatures or radiation levels in the secondary containment may be indicative of UNISOLABLE primary system leakage outside the containment. The EOP-03 entry condition values define this RCS threshold because they are the maximum normal operating values and signify the onset of abnormal system operation. When parameters reach this level, equipment failure or mis-operation may be occurring. Elevated parameters may also adversely affect the ability to gain access to or operate equipment within the affected area. The locations into which the primary system discharge is of concern correspond to the areas addressed in EOP-03, Secondary Containment Control (ref. 1). However, the EOP-03 radiation levels specified are limited to those that can be read remotely in the control room.

In general, multiple indications should be used to determine if a primary system is discharging outside primary Containment. For example, a high area radiation condition does not necessarily indicate that a primary system is discharging into the secondary containment since this may be caused by radiation shine from nearby steam lines or the movement of radioactive materials. Conversely, a high area radiation condition in conjunction with other indications (e.g. room FLOODING, high area temperatures, reports of steam in the secondary containment, an unexpected rise in feedwater flowrate, or unexpected main turbine control valve closure) may indicate that a primary system is discharging into the secondary containment.

Potential loss of RCS based on primary system leakage outside the primary containment is determined from EOP temperature or radiation Max Normal Operating values in areas such as main steam line tunnel, RCIC, etc., which indicate a direct path from the RCS to areas outside primary containment.

A Max Normal Operating value is the highest value of the identified parameter expected to occur during normal plant operating conditions with all directly associated support and control systems functioning properly.

The indicators reaching the threshold barriers and confirmed to be caused by RCS leakage from a primary system warrant an Alert classification. A primary system is defined to be the pipes, valves, and other equipment which connect directly to the RPV such that a reduction in RPV pressure will effect a decrease in the steam or water being discharged through an unisolated break in the system.

An UNISOLABLE leak which is indicated by Max Normal Operating values escalates to a Site Area Emergency when combined with Containment Barrier Loss threshold 3.A (after a containment isolation) and a General Emergency when the Fuel Clad Barrier criteria is also exceeded.

Basis Reference(s):

1. EOP-03, Secondary Containment Control
2. NEI 99-01, RCS Leak Rate RCS Potential Loss 3.A

Barrier: Reactor Coolant System

Category: C. CNTMT Conditions

Degradation Threat: Loss

Threshold:

1. Drywell pressure > 1.68 psig due to RCS leakage

Definition(s):

None

Basis:

The drywell high pressure scram setpoint is an entry condition to EOP-01, RPV Control, and EOP-02, Primary Containment Control (ref. 1, 2). Normal containment pressure control functions (e.g., operation of drywell and containment cooling, vent using containment vessel purge, etc.) are specified in EOP-03 in advance of less desirable but more effective functions (e.g., operation of containment sprays, etc.).

In the design basis, containment pressures above the drywell high pressure scram setpoint are assumed to be the result of a high-energy release into the containment for which normal pressure control systems are inadequate or incapable of reversing the increasing pressure trend. Pressures of this magnitude, however, can be caused by non-LOCA events such as a loss of drywell cooling or inability to control containment vent/purge (ref. 3).

The threshold phrase "…due to RCS leakage" focuses the barrier failure on the RCS instead of the non-LOCA malfunctions that may adversely affect containment pressure. Drywell pressure greater than 1.68 psig with corollary indications (e.g., drywell temperature, indications of loss of RCS inventory) should therefore be considered a Loss of the RCS barrier. Loss of drywell cooling that results in pressure greater than 1.68 psig should not be considered an RCS barrier Loss.

1.68 psig is the drywell high pressure setpoint which indicates a LOCA by automatically initiating the ECCS or equivalent makeup system.

There is no Potential Loss threshold associated with drywell Pressure.

Basis Reference(s):

1. EOP-01, RPV Control
2. EOP-02, Primary Containment Control
3. USAR Section 6.2.1, Containment Functional Design
4. NEI 99-01, Primary Containment Pressure RCS Loss 1.A

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Reactor Coolant System

Category: C. CNTMT Conditions

Degradation Threat: Potential Loss

Threshold:

None

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Reactor Coolant System

Category: D. CNTMT Radiation / RCS Activity

Degradation Threat: Loss

Threshold:

1. Drywell radiation > 40 R/hr

   OR

   Containment radiation > 60 R/hr

Definition(s):

None

Basis:

Per SVI-D19-T5353 Section 5.1.4 Note 3, the minimum reading of 1D19-K100 and 1D19-K200 is 1.21E+00 R/hr due to instrument limitations.

RCS Loss FPB threshold values based on 4 µCi/gm DEI-131 are very close to the minimum reading of the radiation monitors (5.5 R/hr Drywell and 8 R/hr Containment). An RCS Loss FPB threshold at this level would be susceptible to radiation emanating from piping and components containing elevated reactor coolant activity. Historical PNPP operations with minor pin leakage has resulted in such elevated readings.

An alternate to the TS High Limit basis is to establish the RSC Loss threshold at 1/10th the Fuel Clad Loss threshold to provide sufficient margin from potential erroneous indication due to shine and provide an escalation progression that meets the intent of NEI 99-01 generic guidance (ref. 1).

The radiation monitor reading corresponds to an instantaneous release of all reactor coolant mass into the primary containment, assuming that reactor coolant activity equals Technical Specification allowable limits. This value is lower than that specified for Fuel Clad Barrier Loss threshold D.1 since it indicates a loss of the RCS Barrier only.

There is no Potential Loss threshold associated with drywell radiation.

Basis Reference(s):

1. Calculation EP-EALCALC-PNPP-1402, Containment Radiation EAL Values
2. NEI 99-01, Primary Containment Radiation RCS Loss 4.A

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Reactor Coolant System

Category: D. CNTMT Radiation / RCS Activity

Degradation Threat: Potential Loss

Threshold:

None

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Reactor Coolant System

Category: E. CNTMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

None

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Reactor Coolant System

Category: E. CNTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

None

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Reactor Coolant System

Category: F. Emergency Coordinator Judgment

Degradation Threat: Loss

Threshold:

1. **Any** condition in the opinion of the Emergency Coordinator that indicates loss of the RCS barrier

Definition(s):

None

Basis:

The Emergency Coordinator judgment threshold addresses any other factors relevant to determining if the RCS barrier is lost. Such a determination should include IMMINENT barrier degradation, barrier monitoring capability and dominant accident sequences.

- IMMINENT barrier degradation exists if the degradation will likely occur within two hours based on a projection of current SAFETY SYSTEM performance. The term “IMMINENT” refers to the recognition of the inability to reach safety acceptance criteria before completion of all checks.
- Barrier monitoring capability is decreased if there is a loss or lack of reliable indicators. This assessment should include instrumentation operability concerns, readings from portable instrumentation and consideration of offsite monitoring results.
- Dominant accident sequences lead to degradation of all fission product barriers and likely entry to the EOPs. The Emergency Coordinator should be mindful of the Loss of AC power (Station Blackout) and ATWS EALs to assure timely emergency classification declarations.

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

Basis Reference(s):

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

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Reactor Coolant System

Category: F. Emergency Coordinator Judgment

Degradation Threat: Potential Loss

Threshold:

1. **Any** condition in the opinion of the Emergency Coordinator that indicates potential loss of the RCS barrier

Definition(s):

None

Basis:

The Emergency Coordinator judgment threshold addresses any other factors relevant to determining if the RCS barrier is potentially lost. Such a determination should include IMMINENT barrier degradation, barrier monitoring capability and dominant accident sequences.

- IMMINENT barrier degradation exists if the degradation will likely occur within two hours based on a projection of current SAFETY SYSTEM performance. The term "IMMINENT" refers to the inability to reach final safety acceptance criteria before completing all checks.
- Barrier monitoring capability is decreased if there is a loss or lack of reliable indicators. This assessment should include instrumentation operability concerns, readings from portable instrumentation and consideration of offsite monitoring results.
- Dominant accident sequences lead to degradation of all fission product barriers and likely entry to the EOPs. The Emergency Coordinator should be mindful of the Loss of AC power (Station Blackout) and ATWS EALs to assure timely emergency classification declarations.

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

Basis Reference(s):

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

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Containment

Category: A. RPV Water Level

Degradation Threat: Loss

Threshold:

None

Barrier: Containment

Category: A. RPV Water Level

Degradation Threat: Potential Loss

Threshold:

1. SAMG entry is required

Definition(s):

None

Basis:

EOPs specify entry to the SAMGs when core cooling is severely challenged. These EOPs provide instructions to ensure adequate core cooling by maintaining RPV water level above prescribed limits or operating sufficient RPV injection sources when level cannot be determined. SAMG entry is required when (ref. 1, 2):

- RPV water level cannot be restored and maintained above -25 in. (MSCRWL)
- RPV water level cannot be restored and maintained above -45 in. (jet pump suction) with LPCS injection flow below 6,200 gpm and HPCS injection flow below 6,200 gpm.
- RPV water level cannot be determined and core damage is occurring

The above EOP conditions represent a challenge to core cooling and are the minimum values to assure core cooling without further degradation of the clad.

This threshold is also a Loss of the Fuel Clad barrier (FC Loss A.1). Since SAMG entry occurs after core uncovery has occurred a Loss of the RCS barrier exists (RCS Loss A.1). SAMG entry, therefore, represents a Loss of two barriers and a Potential Loss of a third, which requires a General Emergency classification.

The Potential Loss threshold is identical to the Fuel Clad Loss RPV Water Level threshold A.1. The Potential Loss requirement for entry into the SAMGs indicates adequate core cooling cannot be assured and that core damage is possible. BWR EPGs/SAMGs specify the conditions when the EPGs are exited and SAMGs are entered. Entry into SAMGs is a logical escalation in response to the inability to assure adequate core cooling.

PRA studies indicate that the condition of this Potential Loss threshold could be a core melt sequence which, if not corrected, could lead to RPV failure and increased potential for primary containment failure. In conjunction with the RPV water level Loss thresholds in the Fuel Clad and RCS barrier columns, this threshold results in the declaration of a General Emergency.

Basis Reference(s):

1. EOP-01, RPV Control
2. EOP-04-4, RPV Flooding
3. EP FAQ 2015-001
4. NEI 99-01, RPV Water Level PC Potential Loss 2.A

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Containment

Category: B. RCS Leak Rate

Degradation Threat: Loss

Threshold:

1. UNISOLABLE primary system leakage that results in exceeding **EITHER**:

   One or more EOP-03 MAX SAFE area radiation conditions that **can** be read in the control room are reached

   OR

   One or more EOP-03 MAX SAFE area temperature conditions are reached

Definition(s):

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

Basis:

The presence of elevated general area temperatures or radiation levels in the secondary containment may be indicative of UNISOLABLE primary system leakage outside the containment. The MAX SAFE conditions define this Containment barrier threshold because they are indicative of problems in the secondary containment that are spreading and pose a threat to achieving a safe plant shutdown. This threshold addresses problematic discharges outside containment that may not originate from a high-energy line break. The locations into which the primary system discharge is of concern correspond to the areas addressed in EOP-03, Secondary Containment Control (ref. 1). However, the MAX SAFE radiation levels specified are limited to those that can be read remotely in the control room.

In general, multiple indications should be used to determine if a primary system is discharging outside containment. For example, a high area radiation condition does not necessarily indicate that a primary system is discharging into the secondary containment since this may be caused by radiation shine from nearby steam lines or the movement of radioactive materials. Conversely, a high area radiation condition in conjunction with other indications (e.g. room FLOODING, high area temperatures, reports of steam in the secondary containment, an unexpected rise in feedwater flowrate, or unexpected main turbine control valve closure) may indicate that a primary system is discharging into the secondary containment.

The Max Safe Operating Temperature and the Max Safe Operating Radiation Level are each the highest value of these parameters at which neither: (1) equipment necessary for the safe shutdown of the plant will fail, nor (2) personnel access necessary for the safe shutdown of the plant will be precluded. EOPs utilize these temperatures and radiation levels to establish conditions under which RPV depressurization is required.

The temperatures and radiation levels should be confirmed to be caused by RCS leakage from a primary system. A primary system is defined to be the pipes, valves, and other equipment which connect directly to the RPV such that a reduction in RPV pressure will effect a decrease in the steam or water being discharged through an unisolated break in the system.

In combination with RCS Potential Loss 2.A this threshold would result in a Site Area Emergency.

There is no Potential Loss threshold associated with Containment Isolation Failure.

Basis Reference(s):

1. EOP-03, Secondary Containment Control
2. NEI 99-01, RCS Leak Rate PC Loss 3.C

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Containment

Category: B. RCS Leak Rate

Degradation Threat: Potential Loss

Threshold:

None

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Containment

Category: C. CNTMT Conditions

Degradation Threat: Loss

Threshold:

1. UNPLANNED rapid drop in containment pressure following containment pressure rise

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:

Rapid UNPLANNED loss of containment pressure (i.e., not attributable to containment spray or condensation effects) following an initial pressure increase indicates a loss of containment integrity.

This threshold relies on operator recognition of an unexpected response for the condition and therefore a specific value is not assigned. The unexpected (UNPLANNED) response is important because it is the indicator for a containment bypass condition.

Basis Reference(s):

1. NEI 99-01, Primary Containment Conditions PC Loss 1.A

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Containment

Category: C. CNTMT Conditions

Degradation Threat: Loss

Threshold:

2. Containment pressure response **not** consistent with LOCA conditions

Definition(s):

None

Basis:

The calculated pressure response of the containment is listed in USAR Tables 6.2-6 and 6.2-7 (ref. 1, 2). The maximum calculated containment (wetwell) pressure (11.4 psig resulting from a main steam line break) is well below the design allowable pressure of 15 psig (ref. 3).

Due to conservatisms in LOCA analyses, actual pressure response is expected to be less than the analyzed response. For example, blowdown mass flowrate may be only 60-80% of the analyzed rate.

Containment pressure should increase as a result of mass and energy release into the primary containment from a LOCA. Thus, containment pressure not increasing under these conditions indicates a loss of containment integrity.

This threshold relies on operator recognition of an unexpected response for the condition and therefore a specific value is not assigned. The unexpected (UNPLANNED) response is important because it is the indicator for a containment bypass condition.

Basis Reference(s):

1. USAR Table 6.2-6, Summary of Short Term Containment Responses to Recirculation Line and Main Steam Line Breaks
2. USAR Table 6.2-7, Summary of Long Term Containment Responses to Recirculation Line and Main Steam Line Breaks
3. USAR Table 6.2-1, Key Design and Maximum Accident Parameters for Pressure Suppression Containment
4. NEI 99-01, Primary Containment Conditions PC Loss 1.B

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Containment

Category: C. CNTMT Conditions

Degradation Threat: Potential Loss

Threshold:

1. Containment pressure > 15 psig

Definition(s):

None

Basis:

When the containment pressure exceeds the maximum allowable value (15 psig) (ref. 1), containment venting may be required even if offsite radioactivity release rate limits will be exceeded (ref. 2). This pressure is based on the containment design pressure as identified in the accident analysis. If this threshold is exceeded, a challenge to the containment structure has occurred because assumptions used in the accident analysis are no longer VALID and an unanalyzed condition exists. This constitutes a Potential Loss of the Containment barrier even if a containment breach has not occurred.

The threshold pressure is the containment internal design pressure. Structural acceptance testing demonstrates the capability of the containment to resist pressures greater than the internal design pressure. A pressure of this magnitude is greater than those expected to result from any design basis accident and, thus, represent a Potential Loss of the Containment barrier.

Basis Reference(s):

1. USAR Table 6.2-1, Key Design and Maximum Accident Parameters for Pressure Suppression Containment
2. EOP-02, Primary Containment Control
3. NEI 99-01, Primary Containment Conditions PC Potential Loss 1.A

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Containment

Category: C. CNTMT Conditions

Degradation Threat: Potential Loss

Threshold:

2. Drywell or containment hydrogen concentration > 4%

Definition(s):

None

Basis:

In the early stages of a core uncovery event, it is unlikely that hydrogen buildup due to a core uncovery could result in an explosive mixture of dissolved gases in the containment. However, containment monitoring and/or sampling should be performed to verify this assumption and a General Emergency declared if it is determined that hydrogen concentration has exceeded the minimum necessary to support a hydrogen burn (4%). The Igniter System is designed to prevent hydrogen accumulation by locally burning hydrogen in a controlled manner as soon as the hydrogen enters the containment atmosphere and reaches the igniters. For high rates of hydrogen production, ignition occurs at the lowest concentration that can support ignition. Following ignition, hydrogen is consumed through formation of diffusion flames where the gas enters the containment, thus controlling hydrogen concentration at approximately 4% (ref. 1).

If hydrogen concentration reaches or exceeds the lower flammability limit, as defined in plant EOPs, in an oxygen rich environment, a potentially explosive mixture exists. If the combustible mixture ignites inside the containment, loss of the Containment barrier could occur.

Basis Reference(s):

1. SAMG-2 RPV, Containment, and Radioactivity Release Control
2. NEI 99-01, Primary Containment Conditions PC Potential Loss 1.B

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Containment

Category: C. CNTMT Conditions

Degradation Threat: Potential Loss

Threshold:

3. HCL exceeded (EOP Figures)

Definition(s):

None

Basis:

The Heat Capacity Temperature Limit (HCL) is the highest suppression pool temperature from which Emergency RPV Depressurization will not raise:

> Suppression chamber temperature above the maximum temperature capability of the suppression chamber and equipment within the suppression chamber which may be required to operate when the RPV is pressurized,
>
> OR
>
> Suppression chamber pressure above Primary Containment Pressure Limit A, while the rate of energy transfer from the RPV to the containment is greater than the capacity of the containment vent.

The HCL is a function of RPV pressure, suppression pool temperature and suppression pool water level. It is utilized to preclude failure of the containment and equipment in the containment necessary for the safe shutdown of the plant and therefore, the inability to maintain plant parameters below the limit constitutes a potential loss of containment.

Basis Reference(s):

1. EOP-02, Primary Containment Control
2. NEI 99-01, Primary Containment Conditions PC Potential Loss 1.C

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Containment

Category: D. CNTMT Radiation / RCS Activity

Degradation Threat: Loss

Threshold:

None

Barrier: Containment

Category: D. CNTMT Radiation / RCS Activity

Degradation Threat: Potential Loss

Threshold:

1. Drywell radiation > 4,000 R/hr

   OR

   Containment radiation > 6,000 R/hr

Definition(s):

None

Basis:

These radiation monitor readings correspond to an instantaneous release of all reactor coolant mass into the primary containment, assuming that 20% of the fuel cladding has failed (ref. 1)

In order to reach this Containment barrier Potential Loss threshold, a loss of the RCS barrier (RCS Loss D.5) and a loss of the Fuel Clad barrier (FC Loss D.2) have already occurred. This threshold, therefore, represents at a General Emergency classification.

The radiation monitor reading corresponds to an instantaneous release of all reactor coolant mass into the containment, assuming that 20% of the fuel cladding has failed. This level of fuel clad failure is well above that used to determine the analogous Fuel Clad Barrier Loss and RCS Barrier Loss thresholds.

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

Basis Reference(s):

1. Calculation EP-EALCALC-PNPP-1402, Containment Radiation EAL Values
2. NEI 99-01, Primary Containment Conditions PC Potential Loss 4.A

Barrier: Containment

Category: E. CNTMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

1. UNISOLABLE direct downstream pathway to the environment exists after Containment isolation signal

Definition(s):

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

Basis:

This threshold addresses failure of open isolation devices which should close upon receipt of a manual or automatic containment isolation signal resulting in a significant radiological release pathway directly to the environment. The concern is the UNISOLABLE open pathway to the environment. A failure of the ability to isolate any one line indicates a breach of containment integrity.

The adjective “direct” modifies “release pathway” to discriminate against release paths through interfacing liquid systems. Leakage into a closed system is to be considered only if the closed system is breached and thereby creates a significant pathway to the environment. Examples include UNISOLABLE main steam line or RCIC steam line breaks, UNISOLABLE RWCU system breaks, and UNISOLABLE containment atmosphere vent paths. If the main condenser is available with an UNISOLABLE main steam line, there may be releases through the steam jet air ejectors and gland seal exhausters. These pathways are monitored, however, and do not meet the intent of a nonisolable release path to the environment. These minor releases are assessed using the Category R, Abnormal Rad Release / Rad Effluent, EALs.

The existence of an in–line charcoal filter does not make a release path indirect since the filter is not effective at removing fission noble gases. Typical filters have an efficiency of 95-99% removal of iodine. Given the magnitude of the core inventory of iodine, significant releases could still occur. In addition, since the fission product release would be driven by boiling in the reactor vessel, the high humidity in the release stream can be expected to render the filters ineffective in a short period.

The threshold is met if the breach is not isolable from the Control Room or an attempt for isolation from the Control Room has been made and was unsuccessful. An attempt for isolation from the Control Room should be made prior to the emergency classification. If operator actions from the Control Room are successful, this threshold is not applicable. Credit is not given for operator actions taken in-plant (outside the Control Room) to isolate the breach.

EOP-02, Primary Containment Control, may specify primary containment venting and intentional bypassing of the containment isolation valve logic, even if offsite radioactivity release rate limits are exceeded (ref. 1). Under these conditions with a VALID containment isolation signal, the Containment barrier should be considered lost.

The use of the modifier "direct" in defining the release path discriminates against release paths through interfacing liquid systems or minor release pathways, such as instrument lines, not protected by the Primary Containment Isolation System (PCIS).

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.

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

Basis Reference(s):

1. EOP-02, Primary Containment Control
2. NEI 99-01, Primary Containment Isolation Failure PC Loss 3.A

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Containment

Category: E. CNTMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

2. Intentional Containment venting per EOPs

Definition(s):

None

Basis:

EOP-02, Primary Containment Control, may specify containment venting and intentional bypassing of the containment isolation valve logic, even if offsite radioactivity release rate limits are exceeded. The threshold is met when the operator begins venting the \ containment in accordance with EOP-SPIs 7.3 - 7.5, not when actions are taken to bypass interlocks prior to opening the vent valves (ref. 1).

EOPs may direct primary containment isolation valve logic(s) to be intentionally bypassed, even if offsite radioactivity release rate limits will be exceeded. Under these conditions with a VALID primary containment isolation signal, the containment should also be considered lost if primary containment venting is actually performed.

Intentional venting of primary containment for primary containment pressure control to the secondary containment and/or the environment is a Loss of the Containment. Venting for primary containment pressure control when not in an accident situation (e.g., to control pressure below the drywell high pressure scram setpoint) does not meet the threshold condition.

Basis Reference(s):

1. EOP-02, Primary Containment Control
2. NEI 99-01, Primary Containment Isolation Failure PC Loss 3.B

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Containment

Category: E. CNTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

None

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Containment

Category: F. Emergency Coordinator Judgment

Degradation Threat: Loss

Threshold:

1. **Any** condition in the opinion of the Emergency Coordinator that indicates loss of the Containment barrier

Definition(s):

None

Basis:

The Emergency Coordinator judgment threshold addresses any other factors relevant to determining if the Containment barrier is lost. Such a determination should include IMMINENT barrier degradation, barrier monitoring capability and dominant accident sequences.

- IMMINENT barrier degradation exists if the degradation will likely occur within two hours based on a projection of current SAFETY SYSTEM performance. The term “IMMINENT” refers to recognition of the inability to reach safety acceptance criteria before completion of all checks.
- Barrier monitoring capability is decreased if there is a loss or lack of reliable indicators. This assessment should include instrumentation operability concerns, readings from portable instrumentation and consideration of offsite monitoring results.
- Dominant accident sequences lead to degradation of all fission product barriers and likely entry to the EOPs. The Emergency Coordinator should be mindful of the Loss of AC power (Station Blackout) and ATWS EALs to assure timely emergency classification declarations.

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

Basis Reference(s):

1. NEI 99-01, Emergency Coordinator Judgment PC Loss 6.A

ATTACHMENT 3: Fission Product Barrier Loss/Potential Loss Matrix and Bases

Barrier: Containment

Category: F. Emergency Coordinator Judgment

Degradation Threat: Potential Loss

Threshold:

1. **Any** condition in the opinion of the Emergency Coordinator that indicates potential loss of the Containment barrier

Definition(s):

None

Basis:

The Emergency Coordinator judgment threshold addresses any other factors relevant to determining if the Containment barrier is potentially lost. Such a determination should include IMMINENT barrier degradation, barrier monitoring capability and dominant accident sequences.

- IMMINENT barrier degradation exists if the degradation will likely occur within two hours based on a projection of current SAFETY SYSTEM performance. The term "IMMINENT" refers to recognition of the inability to reach safety acceptance criteria before completion of all checks.
- Barrier monitoring capability is decreased if there is a loss or lack of reliable indicators. This assessment should include instrumentation operability concerns, readings from portable instrumentation and consideration of offsite monitoring results.
- Dominant accident sequences lead to degradation of all fission product barriers and likely entry to the EOPs. The Emergency Coordinator should be mindful of the Loss of AC power (Station Blackout) and ATWS EALs to assure timely emergency classification declarations.

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

Basis Reference(s):

1. NEI 99-01, Emergency Coordinator Judgment PC Loss 6.A

ATTACHMENT 4: Safe Operation & Shutdown Areas Tables R-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 4: Safe Operation & Shutdown Areas Tables R-2 & H-2 Bases

Tables R-2 and H-2 Bases

The following table lists the locations into which an operator may be dispatched in order to shut down the reactor and reach cold shutdown conditions in accordance with the system operating instructions for the Residual Heat Removal system (SOI-E12). The reason for these in-plant actions has been evaluated and a determination made whether or not the actions, if not performed, would prevent achieving cold shutdown. The minimum set of in-plant actions, associated locations, and operating modes to shut down and cool down the reactor are highlighted. These comprise the rooms/areas to be included in EAL Tables R-2 and H-2.

Building	Elevation	Room	Modes	Reason	If not performed, prevents cooldown/shutdown?
AX	574	RHR A	3,4,5	Shutdown Cooling Ops	No (flush valve is motor operated and opened remotely)
	574	RHR B	3,4,5	Shutdown Cooling Ops	Yes. Manually open 1E12-F504 to flush RHR B to RW
	574	RCIC	2,3	RCIC to secured, to standby	Not required for RHR shutdown cooling
	620	RHR B	3,4,5	Shutdown Cooling Ops	Yes. Need RHR B room only to manually open 1E12-F315 SDC flush valve (AX 620 West)
		West Hallway	3,4,5	Shutdown Cooling Ops- flush valve panel	Yes. This is part of manually opening E12-F315 flush valve. The air supply and control switch is in the RHR B 620 hallway outside the room.
		East Hallway	1,2,3,4,5	ESW de-ice operation	No. Not required for RHR shutdown cooling
AB	620	All	1,2,3,4,5	Building heat	No (steam for main turbine seals)
	620	All	1,2	Aux steam for stm seals	No (steam for main turbine seals)
CC	620	Div 1 AC	3,4,5	Shutdown Cooling Ops	Yes (power up E12-F008, open E12-F064A disconnect)
	620	Div 2 AC	3,4,5	Shutdown Cooling Ops	Yes (open E12-F064B min flow vlv disconnect. Possibly not needed in emergency)
	638	Div 1 DC	2,3	RCIC to secured, to standby	No
CO	664	~50^{o}	1,2,3,4,5	RWCU filter/demin ops (b/w & precoat)	No

ATTACHMENT 4: Safe Operation & Shutdown Areas Tables R-2 & H-2 Bases

Building	Elevation	Room	Modes	Reason	If not performed, prevents cooldown/shutdown?
HB	560	RFBP	1,2,3,4	RFBP S/U & S/D	No
	580	RFBP	1,2,3,4	RFBP S/U	No
	580	Bldg Htg Pumps	1,2,3,4,5	Shifting Bldg. Htg HX's if cold outside	No
	620	Main area	1,2,3,4	Steam seals Ax & Normal ops	No
	647	All areas	1,2,3	RFPT Ops	No
IB	599	West	1,2,3,4,5	FPFD ops (b/w & precoat)	No
	620	West hallway	1	Recirc pump shift to/from fast	No
	620	Southwest	2,3,4	Mn Gen CO2 Purge	No
OG	All normal access		1,2,3,4	System S/U & S/D	No
	584		1,2,3,4	Normal Ops - drying beds	No
RW	647		1,2,3,4,5	WCF & FDF Ops (b/w & precoat)	No
TB	577	West	1,2,3,4,5	Hotwell pump S/U & S/D	No
	577	West	1,2,3,4	OG System S/U & S/D	No
	605	West	1,2,3,4	OG System S/U & S/D	No
	605	West	1,2,3,4	Mn Gen S/U & S/D	No
	624	West	1,2,3	Hood Spray Ops	No
	624	West	2,3,4	Bus Duct Cooling S/U & S/D	No
	624	West	2,3,4	Generator H2 fill & purge	No
	647	All	1,2	Turbine S/U, roll, S/D	No
	647	East	1,2	Steam seals Ax & Normal ops	No All aux boiler, steam seals: decision will be made to break vacuum and cool down with SRVs and go into SDC.
TPC	568		1,2,3,4,5	Filter & Demin Ops	No
	593		1,2,3,4,5	Demin Ops & RCIC S/U to standby	No

ATTACHMENT 4: Safe Operation & Shutdown Areas Tables R-2 & H-2 Bases

Building	Elevation	Room	Modes	Reason	If not performed, prevents cooldown/shutdown?
TPC	620		1,2,3	RCIC to secured, to standby	No

Table R-2 & H-2 Results

Table R-2 & H-2 Safe Operation & Shutdown Areas	
Room/Area	**Mode Applicability**
AX Elevation 574’ RHR B	3, 4, 5
AX Elevation 620’ West Hallway	3, 4, 5
CC Elevation 620’ Division 1 AC	3, 4, 5
CC Elevation 620’ Division 2 AC	3, 4, 5

Plant Operating Procedures Reviewed

1. SOI-E12, Residual Heat Removal System

Enclosure
L-22-254

EAL Classification Matrix – PNPP Form 10565
3 Pages to follow

GENERAL EMERGENCY | SITE AREA EMERGENCY | ALERT | UNUSUAL EVENT

R — Abnormal Rad Levels / Rad Effluent

1 — Rad Effluent

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

RG1.1 1 2 3 4 5 DEF
Reading on **any** Table R-1 effluent radiation monitor > Column "GE" for ≥ 15 min. (Notes 1, 2, 3, 4)

RG1.2 1 2 3 4 5 DEF
Dose Assessment using actual meteorology indicates doses > 1,000 mrem TEDE or > 5,000 mrem child thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

RG1.3 1 2 3 4 5 DEF
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 child thyroid CDE > 5,000 mrem for 60 min. of inhalation

(Notes 1, 2)

Site Area Emergency: Release of gaseous radioactivity resulting in offsite dose greater than 100 mrem TEDE or 500 mrem child thyroid CDE

RS1.1 1 2 3 4 5 DEF
Reading on **any** Table R-1 effluent radiation monitor > Column "SAE" for ≥ 15 min. (Notes 1, 2, 3, 4)

RS1.2 1 2 3 4 5 DEF
Dose Assessment using actual meteorology indicates doses > 100 mrem TEDE or > 500 mrem child thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

RS1.3 1 2 3 4 5 DEF
Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:
- Closed window dose rates > 100 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate child thyroid CDE > 500 mrem for 60 min. of inhalation

(Notes 1, 2)

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

RA1.1 1 2 3 4 5 DEF
Reading on **any** Table R-1 effluent radiation monitor > Column "ALERT" for ≥ 15 min. (Notes 1, 2, 3, 4)

RA1.2 1 2 3 4 5 DEF
Dose Assessment using actual meteorology indicates doses > 10 mrem TEDE or > 50 mrem child thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

RA1.3 1 2 3 4 5 DEF
Analysis of a liquid effluent sample indicates a concentration or release rate that would result in doses > 10 mrem TEDE or > 50 mrem child thyroid CDE at or beyond the SITE BOUNDARY for 60 min. of exposure (Notes 1, 2)

RA1.4 1 2 3 4 5 DEF
Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:
- Closed window dose rates > 10 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate child thyroid CDE > 50 mrem for 60 min. of inhalation

(Notes 1, 2)

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

RU1.1 1 2 3 4 5 DEF
Reading on **any** Table R-1 effluent radiation monitor > column "UE" for ≥ 60 min. (Notes 1, 2, 3)

RU1.2 1 2 3 4 5 DEF
Sample analyses for a gaseous or liquid release indicates a concentration or release rate > 2 x ODCM limits for ≥ 60 min. (Notes 1, 2)

2 — Irradiated Fuel Event

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

RG2.1 1 2 3 4 5 DEF
Spent fuel pool level cannot be restored to at least 3.5 ft for ≥ 60 min. (Note 1)

Site Area Emergency: Spent fuel pool level at the top of the fuel racks

RS2.1 1 2 3 4 5 DEF
Lowering of spent fuel pool level to 3.5 ft

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

RA2.1 1 2 3 4 5 DEF
Uncovery of irradiated fuel in the REFUELING PATHWAY

RA2.2 1 2 3 4 5 DEF
Damage to irradiated fuel resulting in a release of radioactivity
AND
Any of the following radiation monitor indications:
- SPENT FUEL POOL D21-K332 (high alarm)
- UPPER POOL AREA 1D21-K083 (high alarm)
- FUEL PREP POOL D21-K322 (high alarm)
- FHB VENT EXH GAS D17-K716 (high alarm)
- CNTMT ATMOS GAS 1D17-K686 (high alarm)

RA2.3 1 2 3 4 5 DEF
Lowering of spent fuel pool level to 23.5 ft

Unusual Event: Unplanned loss of water level above irradiated fuel

RU2.1 1 2 3 4 5 DEF
UNPLANNED water level drop above irradiated fuel in the REFUELING PATHWAY as indicated by **EITHER** of the following:
- Fuel Pool Water low level alarm
- FPCC Surge Tank low level alarm

AND
UNPLANNED rise in area radiation levels as indicated by **any** of the following radiation monitors:
- SPENT FUEL POOL D21-K332
- UPPER POOL AREA 1D21-K083
- FUEL PREP POOL D21-K322

Table R-1 Effluent Monitor Classification Thresholds

	Release Point	Monitor	GE	SAE	ALERT	UE
Gaseous	Unit 1 Plant Vent	1D17-K786 1D19-K300	---- 1.3E+00 μCi/cc	---- 1.3E-01 μCi/cc	---- 1.3E-02 μCi/cc	2 x High alarm ----
Gaseous	OG Vent Pipe	1D17-K836 1D19-K400	---- 4.7E+00 μCi/cc	---- 4.7E-01 μCi/cc	---- 4.7E-02 μCi/cc	2 x High alarm ----
Gaseous	TB/HB Vent	1D17-K856	7.7E+04 cpm	7.7E+03 cpm	7.7E+02 cpm	2 x High alarm
Gaseous	Unit 2 Plant Vent	2D17-K786 2D19-K300	---- 3.0E+00 μCi/cc	---- 3.0E-01 μCi/cc	---- 3.0E-02 μCi/cc	2 x High alarm ----
Liquid	Emergency Service Water Loop A	D17-K604	----	----	----	High alarm
Liquid	Emergency Service Water Loop B	D17-K605	----	----	----	High alarm

3 — Area Radiation Levels

General Emergency: None

Site Area Emergency: None

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

RA3.1 1 2 3 4 5 DEF
Dose rate > 15 mrem/hr in **EITHER** of the following areas:
- Control room
- CAS (by survey)

RA3.2 3 4 5
An UNPLANNED event results in radiation levels that prohibit or IMPEDE access to **any** Table R-2 rooms or areas (Note 5)

Unusual Event:

Table R-2 Safe Shutdown Rooms/Areas

Room/Area	Modes
AX 574' Elev. RHR B	3, 4, 5
AX 620' Elev. West Hallway	3, 4, 5
CC620' Elev. Div. 1 AC	3, 4, 5
CC620' Elev. Div. 2 AC	3, 4, 5

E — ISFSI

1 — Confinement Boundary

General Emergency: None

Site Area Emergency: None

Table E-1 ISFSI Cask On-contact Dose Rate Limits

Type: HI-STORM 100S	Type: HI-STORM FW (Flood/Wind)
• 60 mrem/hr (gamma + neutron) on top of the overpack	• 30 mrem/hr (gamma + neutron) on top of the overpack
• 600 mrem/hr (gamma + neutron) on the side of the overpack	• 600 mrem/hr (gamma + neutron) on the side of the overpack

Unusual Event: Damage to a loaded cask CONFINEMENT BOUNDARY

EU1.1 ALL
Damage to a loaded Multi-Purpose Canister (MPC) CONFINEMENT BOUNDARY as indicated by measured dose rates on the top or side of a loaded overpack, excluding inlet and outlet vents, reading > **any** Table E-1 ISFSI Cask On-contact Dose Rate Limit

H — Hazards

1 — Security

General Emergency: HOSTILE ACTION resulting in loss of physical control of the facility

HG1.1 1 2 3 4 5 DEF
A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by the Security Shift Supervisor
AND EITHER of the following has occurred:
Any of the following safety functions cannot be controlled or maintained:
- Reactivity
- RPV water level
- RCS heat removal

OR
Damage to spent fuel has occurred or is IMMINENT

Site Area Emergency: HOSTILE ACTION within the PROTECTED AREA

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

Alert: HOSTILE ACTION within the OWNER CONTROLLED AREA or airborne attack threat within 30 minutes

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

Unusual Event: Confirmed SECURITY CONDITION or threat

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

2 — Seismic Event

General Emergency: None

Site Area Emergency: None

Alert: None
(Refer to EAL CA6.1 or SA8.1 for escalation due to seismic event)

Unusual Event: Seismic event greater than OBE levels

HU2.1 1 2 3 4 5 DEF
Seismic event greater than Operating Basis Earthquake (OBE) as indicated by seismic instrumentation in the Control Room recording level greater than an OBE

Notes

1. The Emergency Coordinator should declare the event promptly upon determining that time limit has been exceeded, or will likely be exceeded.
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.
3. If the effluent flow past an effluent monitor is known to have stopped, indicating that the release path is isolated, the effluent monitor reading is **no** longer VALID for classification purposes.
4. The pre-calculated effluent monitor values presented in EALs RA1.1, RS1.1 and RG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.
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.
6. If CONTAINMENT CLOSURE is re-established prior to exceeding the 30-minute time limit, declaration of a General Emergency is **not** required.
7. This EAL does **not** apply to routine traffic impediments such as fog, snow, ice, or vehicle breakdowns or accidents.
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.
9. In the absence of reliable RCS temperature indication caused by the loss of decay heat removal capability, classification should be based on the RCS pressure increase criteria when the RCS is INTACT in Mode 4 or based on time to boil data when in Mode 5 or the RCS is **not** INTACT in Mode 4.

3 — Natural or Tech. Hazard

General Emergency: (none listed)

Site Area Emergency: None

Alert: None
(Refer to EAL CA6.1 or SA8.1 for escalation due to natural or technological hazard)

Unusual Event: Hazardous event

HU3.1 1 2 3 4 5 DEF
A tornado strike within the PROTECTED AREA

HU3.2 1 2 3 4 5 DEF
Internal room or area FLOODING of a magnitude sufficient to require manual or automatic electrical isolation of a SAFETY SYSTEM component needed for the current operating mode

HU3.3 1 2 3 4 5 DEF
Movement of personnel within the PROTECTED AREA is IMPEDED due to an offsite event involving hazardous materials (e.g. an offsite chemical spill or toxic gas release)

HU3.4 1 2 3 4 5 DEF
A hazardous event that results in on-site conditions sufficient to prohibit the plant staff from accessing the site via personal vehicles (Note 7)

4 — Fire

General Emergency: None

Table H-1 Fire Areas

- Control Complex (all elevations)
- Auxiliary Building (all elevations)
- Intermediate Building (all elevations)
- Fuel Handling Building (all elevations)
- Reactor Building (all elevations)
- Emergency Service Water Pump House (all elevations)
- Electrical Duct Chase Leading to ESW Building
- Diesel Generator Building (all areas except the Unit 2 Division 1, 2, and 3 DG Rooms)
- Steam Tunnel (all elevations)
- Diesel Generator Fuel Oil Storage Area
- Condensate Storage Tank
- Intake/Discharge Structure

Alert: None
(Refer to EAL CA6.1 or SA8.1 for escalation due to fire)

Unusual Event: FIRE potentially degrading the level of safety of the plant

HU4.1 1 2 3 4 5 DEF
A FIRE is **not** extinguished within 15 min. of **any** of the following FIRE detection indications (Note 1):
- Report from the field (i.e., visual observation)
- Receipt of multiple (more than 1) fire alarms or indications
- Field verification of a single fire alarm

AND
The fire is located within **any** Table H-1 area

HU4.2 1 2 3 4 5 DEF
Receipt of a single fire alarm (i.e., no other indications of a FIRE)
AND
The fire alarm is indicating a FIRE within **any** Table H-1 area
AND
The existence of a FIRE is **not** verified within 30 min. of alarm receipt (Note 1)

HU4.3 1 2 3 4 5 DEF
A FIRE within the plant PROTECTED AREA **not** extinguished within 60 min. of the initial report, alarm or indication (Note 1)

HU4.4 1 2 3 4 5 DEF
A FIRE within the plant PROTECTED AREA that requires firefighting support by an offsite fire response agency to extinguish

5 — Hazardous Gases

General Emergency: None

Site Area Emergency: None

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

HA5.1 3 4 5
Release of a toxic, corrosive, asphyxiant or flammable gas into **any** Table H-2 rooms or areas
AND
Entry into the room or area is prohibited or IMPEDED (Note 5)

Table H-2 Safe Shutdown Rooms/Areas

Room/Area	Modes
AX 574' Elev. RHR B	3, 4, 5
AX 620' Elev. West Hallway	3, 4, 5
CC 620' Elev. Div. 1 AC	3, 4, 5
CC 620' Elev. Div. 2 AC	3, 4, 5

6 — Control Room Evacuation

General Emergency: None

Site Area Emergency: Inability to control a key safety function from outside the Control Room

HS6.1 1 2 3 4 5 DEF
An event has resulted in plant control being transferred from the Control Room to the Remote Shutdown Panels
AND
Control of **any** of the following key safety functions is **not** reestablished within 15 min. (Note 1):
- Reactivity
- RPV water level
- RCS heat removal

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

HA6.1 1 2 3 4 5 DEF
An event has resulted in plant control being transferred from the Control Room to the Remote Shutdown Panels

Unusual Event: None

7 — Judgement

General Emergency: Other conditions existing that in the judgement of the Emergency Coordinator warrant declaration of General Emergency

HG7.1 1 2 3 4 5 DEF
Other conditions exist which in the judgement of the Emergency Coordinator indicate that events are in progress or have occurred which involve actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.

Site Area Emergency: Other conditions existing that in the judgement of the Emergency Coordinator warrant declaration of Site Area Emergency

HS7.1 1 2 3 4 5 DEF
Other conditions exist which in the judgement of the Emergency Coordinator indicate that events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or HOSTILE ACTION that results in intentional damage or malicious acts, (1) toward site personnel or equipment that could lead to the likely failure of or, (2) that prevent effective access to equipment needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels beyond the SITE BOUNDARY.

Alert: Other conditions existing that in the judgement of the Emergency Coordinator warrant declaration of an Alert

HA7.1 1 2 3 4 5 DEF
Other conditions exist which, in the judgement of the Emergency Coordinator, indicate that events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. Any releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.

Unusual Event: Other conditions existing that in the judgement of the Emergency Coordinator warrant declaration of an Unusual Event

HU7.1 1 2 3 4 5 DEF
Other conditions exist which in the judgement of the Emergency Coordinator indicate that events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of SAFETY SYSTEMS occurs.

Modes: 1 Power Operation | 2 Startup | 3 Hot Shutdown | 4 Cold Shutdown | 5 Refueling | DEF Defueled

The Perry Plant

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT

S System Malfunct.

1 Loss of Essential AC Power

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Prolonged loss of **all** offsite and **all** onsite AC power to essential buses **SG1.1** 1 2 3 Loss of **all** offsite and **all** onsite AC power capability to essential buses EH-11 and EH-12 **AND EITHER:** Restoration of essential bus EH-11 or EH-12 in < 4 hours is **not** likely (Note 1) **OR** RPV water level **cannot** be restored and maintained > −25 in. Loss of all essential AC and vital DC power sources for 15 minutes or longer **SG1.2** 1 2 3 Loss of **all** offsite and **all** onsite AC power capability to essential buses EH-11 and EH-12 for ≥ 15 min. **AND** Indicated voltage < 116 VDC on ED-1-A and < 112 VDC on ED-1-B for ≥ 15 min. (Note 1)	Loss of **all** offsite and **all** onsite AC power to essential buses for 15 minutes or longer **SS1.1** 1 2 3 Loss of **all** offsite and **all** onsite AC power capability to essential buses EH-11 and EH-12 for ≥ 15 min. (Note 1)	Loss of **all but one** AC power source to essential buses for 15 minutes or longer **SA1.1** 1 2 3 AC power capability, Table S-6, to essential buses EH-11 and EH-12 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 essential buses EH-11 and EH-12	Loss of **all** offsite AC power capability to essential buses for 15 minutes or longer **SU1.1** 1 2 3 Loss of **all** offsite AC power capability, Table S-6, to essential buses EH-11 and EH-12 for ≥ 15 min. (Note 1)

Table S-6 AC Power Sources

Offsite:
- Unit 1 Startup Transformer
- Unit 2 Startup Transformer
- Auxiliary Transformer Backfeed (**only** if already aligned)

Onsite:
- DG 1 (Division 1)
- DG 2 (Division 2)

2 Loss of Vital DC Power

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
(see SG1.2)	Loss of **all** vital DC power for 15 minutes or longer **SS2.1** 1 2 3 Indicated voltage on ED-1-A < 116 VDC and ED-1-B < 112 VDC for ≥ 15 min. (Note 1)	None	None

3 Loss of Control Room Indications

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
None	(Table S-1)	UNPLANNED loss of Control Room indications for 15 minutes or longer with a significant transient in progress **SA3.1** 1 2 3 An UNPLANNED event results in the inability to monitor one or more Table S-1 parameters from within the Control Room for ≥ 15 min. (Note 1) **AND** Any Significant transient is in progress, Table S-2	UNPLANNED loss of Control Room indications for 15 minutes or longer **SU3.1** 1 2 3 An UNPLANNED event results in the inability to monitor one or more Table S-1 parameters from within the Control Room for ≥ 15 min. (Note 1)

Table S-1 Safety System Parameters
- Reactor Power
- RPV water level
- RPV Pressure
- Containment pressure
- Suppression Pool water level
- Suppression Pool temperature

Table S-2 Significant Transients
- Reactor scram
- Runback > 25% full electrical load
- Electrical load rejection > 25% electrical load
- ECCS injection
- Thermal power oscillations > 10%

4 RCS Activity

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
(Notes)	(Table S-2)	None	Reactor coolant activity greater than Technical Specification allowable limits **SU4.1** 1 2 3 Offgas Pretreatment radiation monitor 1D17-K612 high alarm **SU4.2** 1 2 3 Coolant activity > 0.2 μCi/gm Dose Equivalent I-131 for > 48 hours **OR** Coolant activity > 4.0 μCi/gm Dose Equivalent I-131 instantaneous

Notes

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

5 RCS Leakage

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
None	None	None	RCS leakage for 15 minutes or longer **SU5.1** 1 2 3 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** Leakage from the RCS to a location outside containment > 25 gpm for ≥ 15 min. (Note 1)

6 RPS Failure

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
None	Inability to shut down the reactor causing a challenge to RPV water level or RCS heat removal **SS6.1** 1 2 An automatic or manual scram fails to shut down the reactor **AND** **All** actions to shut down the reactor are **not** successful as indicated by reactor power ≥ 4% **AND EITHER** RPV water level **cannot** be restored and maintained > −25 in. or **cannot** be determined **OR** HCL exceeded (EOP figures)	Automatic or manual scram fails to shut down the reactor and subsequent manual actions taken at the reactor control consoles are not successful in shutting down the reactor **SA6.1** 1 2 An automatic or manual scram fails to shut down the reactor **AND** Manual scram actions taken at the reactor control console (Manual PBs, Mode Switch, ARI) are **not** successful in shutting down the reactor as indicated by reactor power ≥ 4% (Note 8)	Automatic or manual scram fails to shut down the reactor **SU6.1** 1 2 An automatic scram did **not** shut down the reactor after **any** RPS setpoint is exceeded **AND** A subsequent automatic scram or manual scram action taken at the reactor control console (Manual PBs, Mode Switch, ARI) is successful in shutting down the reactor as indicated by reactor power < 4% (APRM downscale) (Note 8) **SU6.2** 1 2 A manual scram did **not** shut down the reactor after **any** manual scram action was initiated **AND** A subsequent automatic scram or manual scram action taken at the reactor control console (Manual PBs, Mode Switch, ARI) is successful in shutting down the reactor as indicated by reactor power < 4% (APRM downscale) (Note 8)

7 Loss of Comm.

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
(Table S-3)	None	None	Loss of **all** onsite or offsite communications capabilities **SU7.1** 1 2 3 Loss of all Table S-3 onsite communication methods **OR** Loss of all Table S-3 ORO communication methods **OR** Loss of all Table S-3 NRC communication methods

Table S-3 Communication Methods

System	Onsite	ORO	NRC
Plant Public Address System	X		
Plant Radio System Channels 1, 2, and 3	X		
State and County Notification Circuit (5-Way)		X	
Control Room private (259-) lines		X	X
Private Branch Exchange, Service Building ("5000") Switch		X	X
Private Branch Exchange, Warehouse Building ("6000") Switch		X	X
Company Off-Premise Exchange		X	X
Commercial Telephone Systems	X	X	X
Emergency Telecommuni-cations System (ETS)			X

8 Hazardous Event Affecting Safety Systems

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
(Table S-3)	(Table S-4)	Hazardous event affecting a SAFETY SYSTEM needed for the current operating mode **SA8.1** 1 2 3 The occurrence of any Table S-4 hazardous event **AND EITHER** Event damage has caused indications of degraded performance in at least one train of a SAFETY SYSTEM needed for the current operating mode **OR** The event has caused VISIBLE DAMAGE to a SAFETY SYSTEM component or structure needed for the current operating mode	None

Table S-4 Hazardous Events
- Seismic event
- Internal or external FLOODING event
- High winds
- Tornado strike
- FIRE
- EXPLOSION
- Other events with similar hazard characteristics as determined by the Shift Manager

F Fission Product Barrier Degradation

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
FG1.1 1 2 3 Loss of **any** two barriers **AND** Loss or potential loss of the third barrier (Table F-1)	**FS1.1** 1 2 3 Loss or potential loss of **any** two barriers (Table F-1)	**FA1.1** 1 2 3 **Any** loss or **any** potential loss of **EITHER** Fuel Clad or RCS barrier (Table F-1)	None

Table F-1 Fission Product Barrier Threshold Matrix

	FC – Fuel Clad Barrier		RCS – Reactor Coolant System Barrier		CNTMT – Containment Barrier	
	Loss	**Potential Loss**	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**
A RPV Water Level	1. SAMG entry is required	1. RPV level **cannot** be restored and maintained > 0 in. (TAF) or **cannot** be determined	1. RPV level **cannot** be restored and maintained > 0 in. (TAF) or **cannot** be determined	None	None	1. SAMG entry is required
B RCS Leak Rate	None	None	1. UNISOLABLE break in **any** of the following: • Main Steam Line • RCIC Steam Line • RWCU • Feedwater 2. Emergency Depressurization is required	1. UNISOLABLE primary system leakage that results in exceeding **EITHER:** One or more EOP-03 radiation entry conditions that can be read in the control room are met **OR** One or more EOP-03 area temperature entry conditions are met	1. UNISOLABLE primary system leakage that results in exceeding **EITHER:** One or more EOP-03 MAX SAFE area radiation conditions that can be read from the control room are reached **OR** One or more EOP-03 MAX SAFE area temperatures are reached	None
C CNTMT Conditions	None	None	1. Drywell pressure > 1.68 psig due to RCS leakage	None	1. UNPLANNED rapid drop in containment pressure following containment pressure rise 2. Containment pressure response **not** consistent with LOCA conditions	1. Containment pressure > 15 psig 2. Drywell or containment hydrogen concentration > 4% 3. HCL exceeded (EOP Figures)
D CNTMT Rad / RCS Activity	1. Drywell radiation > 400 R/hr **OR** Containment radiation > 600 R/hr 2. Primary coolant activity > 300 µCi/gm I-131 Dose Equivalent	None	1. Drywell radiation > 40 R/hr **OR** Containment radiation > 60 R/hr	None	None	1. Drywell radiation > 4,000 R/hr **OR** Containment radiation > 6,000 R/hr
E CNTMT Integrity or Bypass	None	None	None	None	1. UNISOLABLE direct downstream pathway to the environment exists after Containment isolation signal 2. Intentional Containment venting per EOPs	None
F EC Judgement	1. **Any** condition in the opinion of the Emergency Coordinator that indicates loss of the Fuel Clad Barrier	1. **Any** condition in the opinion of the Emergency Coordinator that indicates potential loss of the Fuel Clad Barrier	1. **Any** condition in the opinion of the Emergency Coordinator that indicates loss of the RCS Barrier	1. **Any** condition in the opinion of the Emergency Coordinator that indicates potential loss of RCS Barrier	1. **Any** condition in the opinion of the Emergency Coordinator that indicates loss of the Containment Barrier	1. **Any** condition in the opinion of the Emergency Coordinator that indicates potential loss of the Containment Barrier

Modes: 1 Power Operation | 2 Startup | 3 Hot Shutdown | 4 Cold Shutdown | 5 Refueling | DEF Defueled

HOT CONDITIONS
(RCS > 200°F)

GENERAL EMERGENCY | SITE AREA EMERGENCY | ALERT | UNUSUAL EVENT

C — Cold SD/ Refueling System Malfunct.

1 — RPV Level

GENERAL EMERGENCY — Loss of RPV Inventory affecting fuel clad integrity with Containment challenged

CG1.1 Modes: 4 5

RPV level < 0 in. (TAF) for ≥ 30 min. (Note 1)

AND

Any of the following indications of containment challenge:

- CONTAINMENT CLOSURE **not** established (Note 6)
- Drywell or containment hydrogen concentration > 4%
- UNPLANNED rise in Containment pressure
- Exceeding one or more Secondary Containment Control MAX SAFE area radiation levels that can be read in the control room (EOP-03)

CG1.2 Modes: 4 5

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

AND

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

- UNPLANNED increase in **any** Table C-1 sump or pool levels of sufficient magnitude to indicate core uncovery
- UPPER POOL AREA 1D21-K083 high alarm

AND

Any of the following indications of containment challenge:

- CONTAINMENT CLOSURE **not** established (Note 6)
- Drywell or containment hydrogen concentration > 4%
- UNPLANNED rise in Containment pressure
- Exceeding one or more Secondary Containment Control MAX SAFE area radiation levels that can be read in the control room (EOP-03)

SITE AREA EMERGENCY — Loss of RPV Inventory affecting core decay heat removal capability

CS1.1 Modes: 4 5

CONTAINMENT CLOSURE **not** established

AND

RPV level < 16.5 in. (Level 1)

CS1.2 Modes: 4 5

CONTAINMENT CLOSURE established

AND

RPV level < 0 in. (TAF)

CS1.3 Modes: 4 5

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

AND

Core uncovery is indicated by EITHER of the following:

- UNPLANNED increase in **any** Table C-1 sump or pool levels of sufficient magnitude to indicate core uncovery
- UPPER POOL AREA 1D21-K083 high alarm

ALERT — Loss of RPV inventory

CA1.1 Modes: 4 5

Loss of RPV inventory as indicated by RPV level < 130 in. (Level 2)

CA1.2 Modes: 4 5

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

AND

UNPLANNED increase in **any** Table C-1 sump or pool levels due to a loss of RPV inventory

Table C-1 Sumps/Pool

- Drywell equipment drain sump
- Drywell floor drain sump
- CNTMT equipment drain sump
- CNTMT floor drain sump
- Suppression Pool
- RHR A, B, C, HPCS, LPCS, RCIC cubicle drain sumps
- Auxiliary Building floor drain sump
- IB / FHB floor drain sump
- Visual observation

UNUSUAL EVENT — UNPLANNED loss of RPV inventory for 15 minutes or longer

CU1.1 Modes: 4 5

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

CU1.2 Modes: 4 5

RPV level **cannot** be monitored

AND

UNPLANNED increase in **any** Table C-1 sump or pool levels due to a loss of RPV inventory

2 — Loss of Essential AC Power

GENERAL EMERGENCY: None

SITE AREA EMERGENCY: None

ALERT — Loss of all offsite power and all onsite AC power to essential buses for 15 minutes or longer

CA2.1 Modes: 4 5 DEF

Loss of **all** offsite and **all** onsite AC power capability to essential buses EH-11 and EH-12 for ≥ 15 min. (Note 1)

UNUSUAL EVENT — Loss of all but one AC power source to essential buses for 15 minutes or longer

CU2.1 Modes: 4 5 DEF

AC power capability, Table C-2, to essential buses EH-11 and EH-12 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 essential buses EH-11 and EH-12

Table C-2 AC Power Sources

Offsite:

- Unit 1 Startup Transformer
- Unit 2 Startup Transformer
- Auxiliary Transformer backfeed (**only** if already aligned)

Onsite:

- DG 1 (Division 1)
- DG 2 (Division 2)

3 — RCS Temp.

GENERAL EMERGENCY: None

SITE AREA EMERGENCY:

Table C-3 RCS Heat-up Duration Thresholds

RCS Status	CONTAINMENT CLOSURE Status	Heat-up Duration
RCS Intact	N/A	60 min.*
RCS Not Intact	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

ALERT — Inability to maintain plant in cold shutdown

CA3.1 Modes: 4 5

UNPLANNED increase in RCS temperature to > 200 °F for > Table C-3 duration (Notes 1, 9)

OR

UNPLANNED RPV pressure increase > 10 psig

UNUSUAL EVENT — UNPLANNED increase in RCS temperature

CU3.1 Modes: 4 5

UNPLANNED increase in RCS temperature to > 200° F

CU3.2 Modes: 4 5

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

4 — Loss of Vital DC Power

GENERAL EMERGENCY: None

SITE AREA EMERGENCY: None

ALERT: None

UNUSUAL EVENT — Loss of vital DC power for 15 minutes or longer

CU4.1 Modes: 4 5

Indicated voltage on required vital DC buses ED-1-A < 116 VDC **and** ED-1-B < 112 VDC for ≥ 15 min. (Note 1)

5 — Loss of Comm.

GENERAL EMERGENCY:

Table C-4 Communication Methods

System	Onsite	ORO	NRC
Plant Public Address System	X		
Plant Radio System Channels 1, 2, and 3	X		
State and County Notification Circuit (5-Way)		X	
Control Room private (259-) lines		X	X
Private Branch Exchange, Service Building ("5000") Switch		X	X
Private Branch Exchange, Warehouse Building ("6000") Switch		X	X
Company Off-Premise Exchange		X	X
Commercial Telephone Systems	X	X	X
Emergency Telecommuni-cations System (ETS)			X

SITE AREA EMERGENCY: None

ALERT: None

UNUSUAL EVENT — Loss of all onsite or offsite communications capabilities

CU5.1 Modes: 4 5 DEF

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

OR

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

OR

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

6 — Hazardous Event Affecting Safety Systems

SITE AREA EMERGENCY:

Table C-5 Hazardous Events

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

ALERT — Hazardous event affecting a SAFETY SYSTEM needed for the current operating mode

CA6.1 Modes: 4 5

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

AND EITHER

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

OR

The event has caused VISIBLE DAMAGE to a SAFETY SYSTEM component or structure needed for the current operating mode

UNUSUAL EVENT: None

Notes

1. The Emergency Coordinator should declare the event promptly upon determining that time limit has been exceeded, or will likely be exceeded.
6. If CONTAINMENT CLOSURE is re-established prior to exceeding the 30-minute time limit, declaration of a General Emergency is **not** required.
9. In the absence of reliable RCS temperature indication caused by the loss of decay heat removal capability, classification should be based on the RCS pressure increase criteria when the RCS is INTACT in Mode 4 or based on time to boil data when in Mode 5 or the RCS is not INTACT in Mode 4.

Modes: 1 Power Operation | 2 Startup | 3 Hot Shutdown | 4 Cold Shutdown | 5 Refueling | DEF Defueled