Attachment 2

HCGS EAL Technical Bases Document

(Clean Version)

PSEG Nuclear LLC

Hope Creek Generating Station

Event Classification Guide (ECG)

Emergency Action Level Technical Bases

NRC Submittal
Draft "E"

HOPE CREEK EVENT CLASSIFICATION GUIDE (ECG)
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Draft E
7/30/10

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1. PURPOSE

This document provides an explanation and rationale for each Hope Creek Generating Station (HCGS) Emergency Action Level (EAL). It should be used to facilitate review of the HCGS EALs, provide historical documentation for future reference and serve as a training aid. Decision-makers responsible for implementation of the Event Classification Guide (ECG) 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 information may also be useful in training, for explaining event classifications to offsite officials, and facilitate regulatory review and approval of the classification scheme.

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.

This document is controlled pursuant to 10 CFR 50.54(q).

2. Emergency Classification Descriptions

The NRC and Federal Emergency Management Agency (FEMA) established four emergency classes for fixed nuclear facilities.

An emergency class is used for grouping off-normal nuclear power plant conditions according to their relative radiological seriousness and the time sensitive onsite and offsite actions needed to respond to such conditions.

The four emergency classes are (in order of less severe to most severe):

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

2.1 Unusual Event

Events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicates a security threat to facility protection has been initiated.

- The lowest level of emergency at the plant, which can usually be handled by the normal operating shift.
- No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs. Dose consequences in Unrestricted Areas would not reach 20 mRem TEDE.

2.2 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**.

- Emergency Response personnel are required in addition to the normal operating shift. The entire emergency response organization is called in. The TSC is activated, and the EOF and ENC are manned and may activate if needed for support.
- Any release of radioactive material is expected to be limited to a small fraction of the EPA Protective Action Guideline exposure levels. Dose consequences in Unrestricted Areas would not reach 100 mRem TEDE.

2.3 Site Area Emergency

Events are in progress or have occurred which involve an actual or likely failure of plant functions needed for protection of the public or **HOSTILE ACTION** that result 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.

- The entire emergency response organization is activated.
- Any release of radioactive material is not expected to exceed EPA Protective Action Guideline exposure levels beyond the plant boundary. Dose consequences in Unrestricted Areas not to exceed 1000 mRem TEDE.

2.4 General Emergency

Events are in process or have occurred which involve actual or **IMMINENT** substantial core degradation or melting with potential for loss of containment integrity or **HOSTILE ACTIONS** that result in an actual loss of physical control of the facility.

- The entire emergency response organization is activated.
- Release of radioactive material can be expected to exceed EPA Protective Action Guideline exposure levels of 1000 mRem TEDE in Unrestricted Areas.

3. Fission Product Barriers

Many of the EALs derived from the NEI 99-01 methodology are fission product barrier based. That is, the conditions that define the EALs pertain to 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. "Loss" means the barrier no longer assures containment of radioactive materials; "Potential Loss" infers an increased probability of barrier loss and decreased certainty of maintaining the barrier.

3.1 Barrier Descriptions

The EAL fission product barriers are:

Fuel Clad Barrier (FB): The Fuel Clad barrier consists of the zirconium tubes which house the ceramic uranium oxide pellets along with the end plugs which are welded into each end of the fuel rods comprise the Fuel Clad barrier.

Reactor Coolant System Barrier (RB): The Reactor Coolant System barrier includes the reactor vessel shell, vessel head, CRD housings, vessel nozzles and penetrations, and all primary systems directly connected to the RPV up to the outermost primary containment isolation valves.

Containment (CB): The Containment barrier includes the drywell, the torus, their respective interconnecting paths, and other connections up to and including the outermost containment isolation valves.

3.2 Emergency Classification Based on Fission Product Barrier Degradation

The following criteria for event classification relate to fission product barrier loss or potential loss:

UNUSUAL EVENT

ANY *loss or* ***ANY*** *potential loss of Containment*

ALERT

ANY *loss or* ***ANY*** *potential loss of either Fuel Clad or RCS*

SITE AREA EMERGENCY

Loss or potential loss of ***ANY*** *two barriers* ***OR***

Potential loss of 2 barriers with the loss of the 3rd barrier

GENERAL EMERGENCY

Loss of ***ANY*** *two barriers and loss or potential loss of third barrier*

Discrete threshold values associated with fission product barrier loss and potential loss are given in Attachment 1, Use of Fission Product Barrier Table. The bases for the thresholds are discussed in the following ECG sections:

- EP-HC-111-221 EAL Bases for Fuel Clad Barrier
- EP-HC-111-222 EAL Bases for RCS Barrier
- EP-HC-111-223 EAL Bases for Containment Barrier

A point system (described in Attachment 1) is used to determine fission product barrier emergency classification levels as well as Protective Action Recommendations (PARs) if a General Emergency is declared.

4. EAL Relationship to EOPs

Where possible, the EALs have been made consistent with and utilize the conditions defined in the HCGS Emergency Operating Procedures (EOPs). While the symptoms that drive operator actions specified in the EOPs are not indicative of all possible conditions which warrant emergency classification, they define the symptoms, independent of initiating events, for which reactor plant safety and/or fission product barrier integrity are threatened. When these symptoms are clearly representative of one of the NEI Initiating Conditions, they have been utilized as an EAL. This permits rapid classification of emergency situations based on plant conditions without the need for additional evaluation or event diagnosis. Although some of the EALs presented here are based on conditions defined in the EOPs, classification of emergencies using these EALs is not dependent upon EOP entry or execution. The EALs can be utilized independently or in conjunction with the EOPs.

5. Symptom-Based vs. Event-Based Approach

To the extent possible, the EALs are symptom-based; that is, the action level threshold is defined by values of key plant operating parameters that identify emergency or potential emergency conditions. This approach is appropriate because it allows the full scope of variations in the types of events to be classified as emergencies. However, a purely symptom-based approach is not sufficient to address all events for which emergency classification is appropriate. Particular events to which no predetermined symptoms can be ascribed have also been utilized as EALs since they may be indicative of potentially more serious conditions not yet fully realized.

6. EAL Organization

6.1 EAL Groups

The EAL scheme is divided into three broad groups:

- EALs applicable under all plant Operational Conditions (OPCONs) – This group would be reviewed by the EAL-user any time emergency classification is considered.
- EALs applicable only under hot OPCONs – This group would only be reviewed by the EAL-user when the plant is in Hot Shutdown, Startup or Power Operations OPCONs.
- EALs applicable only under cold OPCONs – This group would only be reviewed by the EAL-user when the plant is in Cold Shutdown or Refueling OPCONs or when the RPV is defueled.

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.

6.2 EAL Categories and Subcategories

Within each EAL group, EALs are assigned to categories/subcategories. Category titles generally align with the EAL Recognition Categories of NEI 99-01.

Subcategory titles are selected to represent conditions that are operationally significant to the EAL-user. Subcategories are used as necessary to further divide the EALs of a category into logical sets of possible emergency classification thresholds.

The HCGS EAL categories/subcategories and their relationship to NEI Recognition Categories are listed below.

HCGS EALs	
Category	**Subcategory**
Group: Any Operating Mode:	
R – Abnormal Rad Release / Rad Effluent	1 – Offsite Rad Conditions 2 – Onsite Rad Conditions/Fuel Pool Events 3 - CR/CAS Rad
E - ISFSI	Spent Fuel Transit & Storage
H – Hazards & Other Conditions Affecting Plant Safety	1 – Natural & Destructive Phenomena 2 – Fire or Explosion 3 – Hazardous Gas 4 – Security 5 – Control Room Evacuation 6 – EC Judgment
Group: Hot Conditions:	
S – System Malfunction	1 – Loss of AC Power 2 – Loss of DC Power 3 – ATWS / Criticality 4 – Inability to Reach or Maintain Shutdown Conditions 5 – Instrumentation 6 – Communications 7 – Fuel Clad Degradation 8 – RCS Leakage
F – Fission Product Barrier Degradation	None
Group: Cold Conditions:	
C – Cold Shutdown / Refuel System Malfunction	1 – Loss of AC Power 2 – Loss of DC Power 3 – RPV Level 4 – RCS Temperature 5 – Communications 6 – Inadvertent Criticality

7. Operational Condition Applicability

With the exception of **ISFSI** (which is not assigned an OPCON), NEI 99-01 assigns one or more operational conditions to each EAL. The **ISFSI** EAL will be applicable in all OPCONs at Hope Creek Generating Station; as such, OPCON applicability is N/A for the ISFSI EAL.

7.1 OPCON Definitions

1 <u>Power Operations</u>

Reactor mode switch is in RUN

2 <u>Startup</u>

The mode switch is in STARTUP/HOT STANDBY

3 Hot Shutdown

The mode switch is in SHUTDOWN and reactor coolant temperature is > 200°F

4 Cold Shutdown

The mode switch is in SHUTDOWN and reactor coolant temperature is ≤ 200°F

5 Refueling

The mode switch is in REFUEL or SHUTDOWN and reactor coolant temperature is ≤ 140°F with fuel in the vessel and vessel head closure bolts less than fully tensioned or head removed

7.2 Added NEI 99-01 condition

D Defueled

All reactor fuel removed from RPV. (Full core off load during refueling or extended outage).

(Although Defueled is not a Technical Specification defined OPCON, it corresponds to the Refueling OPCON when all reactor fuel is removed from the RPV.)

7.3 Applicability

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

For events that occur in Cold Shutdown or Refueling, escalation is via EALs that have Cold Shutdown or Refueling for OPCON applicability, even if Hot Shutdown (or a higher OPCON) is entered during any subsequent heat-up. In particular, the fission product barrier EALs are applicable only to events that initiate in Hot Shutdown or higher.

8. EAL Technical Bases Organization

EAL technical bases are provided for each EAL according to:

- EAL category (R, E, H, S, F and C)
- EAL subcategory

Figures cited in EAL basis discussions are provided in Attachment 2. EAL defined terms and abbreviations and acronyms are listed in Attachments 3 and 4, respectively.

For each EAL, the following information is provided:

- EAL Category Letter & Title

- EAL Subcategory Number & Title

- Initiating Condition

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

- OPCON Applicability

  One or more of the following OPCONs comprise the conditions to which each EAL is applicable: 1 - Power Operations, 2 – Startup, 3 - Hot Shutdown, 4 - Cold Shutdown, 5 - Refueling, D - Defueled, N/A - Not Applicable or All.

  For Fission Product Barrier Table bases, OPCON Applicability is always OPCON 1, 2 and 3. For these EALs, the barrier threat (Loss or Potential Loss) is listed.

- EAL# and Classification Level (EAL# & Point Value for Fission Product Barrier Table EAL bases):

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

  Category R, E, H, S and C EALs: (Example: SU7.1)

  1. First character (letter) – Corresponds to the EAL category (R, E, H, S or C)

  2. Second character (letter) – Emergency classification level: U for Unusual Event, A for Alert, S for Site Area Emergency, or G for General Emergency

  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).

Selected EALs in Category H have been designated as "Common Site" events. These events are annotated with the phrase "(Common Site)" immediately following the classification level.

Category F Fission Product Barrier EALs: (Example CB4-P)

1. First and second characters (letters) identify the barrier to which the EAL applies.

   FB: Fuel Clad Barrier

   RB: Reactor Coolant Barrier

   CB: Containment Barrier

2. Third character (number) – Sequential number beginning with the number one (1) for the first threshold in the barrier loss or potential loss of the Fission Product Barrier Table (Attachment 1)

3. Last character (letter) preceded by a dash (-) designates if EAL is for a potential loss or loss of the barrier in question.

   P: Potential Loss

   L: Loss

- EAL (enclosed in rectangle)

  Exact wording of the EAL as it appears in the EAL wallcharts.

- Basis

  The basis discussion applicable to the EAL taken from NEI 99-01.

- Explanation/Discussion/Definitions

  Description of the site-specific rationale for the EAL.

- EAL Basis Reference(s)

  Source documentation from which the EAL is derived. The first reference in each list gives the NEI 99-01 IC and example EAL number. A cross-reference of HCGS EALs and NEI 99-01 ICs/EALs is given in Attachment 5.

9. REFERENCES

9.1 NEI 99-01 Revision 5, Methodology for Development of Emergency Action Levels, Final, February 2008 (ADAMS Accession Number of ML080450149)

9.2 NRC Regulatory Issue Summary (RIS) 2003-18, Supplement 2, Use of Nuclear Energy Institute (NEI) 99-01, Methodology for Development of Emergency Action Levels Revision 4, Dated January 2003 (December 12, 2005) (ADAMS Accession Number of ML051450482)

9.3 NRC Regulatory Issue Summary (RIS) 2007-02 Clarification of NRC Guidance for Emergency Notifications During Quickly Changing Events, Dated February 2007 (ADAMS Accession Number of ML062370311)

9.4 Hope Creek EAL Comparison Matrix – NRC submittal document that defines differences between NEI 99-01, Rev. 05 and PSEG submitted HC EALs

EVENT CLASSIFICATION GUIDE (ECG) USE

NOTE
It is expected the Shift Manager (SM) always serves as the Emergency Coordinator (EC) during the initiating event even if the SM is out of the control room. The Control Room Supervisor (CRS) assumes operational command and control responsibility for the shift crew but not as the EC. The CRS should ensure that the SM is immediately called back to the control room on any conditions that require ECG assessment. Only if the SM is not able (sick or hurt) may the CRS serve as the EC.

1. EC Judgment

The EALs described in the ECG are not all inclusive and will not identify each and every condition, parameter or event which could lead to an event classification. The following guidance should be used by the EC:

IF an EAL has been exceeded, but satisfaction of the Initiating Condition (IC) is in question,

THEN CLASSIFY the event IAW the EAL.

IF however, it is clear that the EAL has NOT been exceeded (and will not),

THEN DO NOT classify the event.

IF an IC has been satisfied, but exceeding the specific EAL is in question,

THEN CLASSIFY the event IAW the IC.

In any case,

IF the plant conditions are equivalent to one of the four emergency classes as described in Section 2 of EP-HC-111-201,

THEN CLASSIFY the event based on EC discretion IAW EALs in Category H.

2. Assessment Time

2.1 Timeliness

Assessment of an Emergency Condition should be completed in a timely manner, which is considered to be within 15 minutes of when events **are known or should have been known**. If an EAL specifies a duration time (e.g., loss of annunciators for 15 minutes or longer), the assessment time runs concurrently with the EAL duration time and is the same length.

2.2 Duration Time Exceeded

If an event is recognized or reported and the required duration time is known to have already been exceeded, the duration portion of the EAL should be considered as being satisfied and the assessment time for the remaining portions of the EAL should be within 15 minutes from the time of recognition.

3. Implementing Actions

The ECG is not a stand-alone document. At times, the ECG will refer the user to other attachments or procedures for accomplishment of specific evolutions such as: Accountability, Recovery, development of PARs, etc. The ECG should be considered an "Implementing Procedure" and used in accordance with the requirements of a Level 2 – Reference Use procedure as defined in HU-AA-104-101, Procedure Use and Adherence. The ECG classification sections allow for judgment and decision making as to whether or not an EAL is exceeded.

NOTE
Comparison of redundant instrumentation, indications, and/or alarms should be used to confirm actual plant conditions.

4. Classification

The primary tools for determining the emergency classification level are the EAL wallcharts. The user of the EAL wallcharts may (but is not required to) consult the EAL Technical Bases in order to obtain additional information concerning the EALs under classification consideration. To use the EAL wallcharts, follow this sequence:

1. Assess the event and/or plant conditions and determine which EAL Group is most appropriate.
2. Review EAL categories and subcategories on the appropriate wallcharts.
3. For each applicable subcategory, review EALs in the subcategory beginning with the highest emergency classification level to the lowest classification level (left to right).
4. If the HOT conditions wallchart is employed, also review the Fission Product Barrier (FPB) Table (Wallchart sheet 3) as follows:
   a. Examine the FPB categories in the left column of the table.
   b. Select the category that most likely coincides with event conditions.
   c. Review all thresholds in this category for each fission product barrier.
   d. For each threshold that is exceeded, identify its point value and determine the classification level in accordance with the instructions on the Fission Product Barrier Table (or in EAL Technical Basis, Attachment 1).

NOTE
The Emergency Coordinator should classify and declare an emergency before an Emergency Action Level (EAL) is exceeded if, in the EC's judgment, it is determined that the EAL will be exceeded within 2 hours

5. REVIEW the associated EALs as compared to the event and SELECT the highest appropriate emergency. If identification of an EAL is questionable refer to paragraph 1 above.

   If there is any doubt with regard to assessment of a particular EAL, the ECG EAL Technical Basis Document should be reviewed. Words contained in an EAL that appear in uppercase and bold print (e.g., **VALID**) are defined at the end of the basis for the EAL. Words or numbers contained in an EAL that are in bold print but not uppercase are EAL threshold values (e.g., **≥ 15 minutes**).

6. If an EAL has been exceeded, equal level EALs or lower level EALs are not required to be seperately reported as long as the applicable information is communicated to the NRC using ECG Attachment 5, EP-HC-111-F5, NRC Data Sheet Completion Reference.

7. When the Shift Manager (SM) is the Emergency Coordinator, the Shift Technical Advisor (STA) is responsible to perform an independent verification of the EAL classification. The STA verification does not alleviate the requirement of the SM to make a timely classification. Should the SM fill the STA role, independent verification of the EAL classification will be delegated to another on-shift SRO, the Independent Assessor.

8. Identify and implement the referenced ECG form based on the Emergency Classification Level.

   - Unusual Event Implement EC-HC-111-F1
   - Alert Implement EC-HC-111-F2
   - Site Area Emergency Implement EC-HC-111-F3
   - General Emergency Implement EC-HC-111-F4
   - Unusual Event (Common Site) Implement EC-HC-111-F8

9. Continue assessment after classification and attachment initiation, by returning to the EAL wallcharts to review EALs that may result in escalation/de-escalation of the emergency level.

5. Emergency Short Duration Events

1. A Short Duration emergency event is a transitory event that meets or exceeds one or more EALs for less than 15 minutes (i.e., action is taken and the plant returned to a condition in which no EAL applies). For a Short Duration event the Control Room Staff is aware of the event and realizes that an EAL had been exceeded.

2. Short Duration events that occur will be assessed and emergency classification made, if appropriate, within 15 minutes of control room indications or the receipt of the information, indicating that an EAL has or had been exceeded. This classification is to be made even if no EALs are currently being exceeded (i.e., actions have been taken to stabilize the Plant such that no EALs currently apply).

3. For some events, the condition may be corrected before a declaration has been made. The key consideration in this situation is to determine whether or not further plant damage occurred while the corrective actions were being taken. In some situations, this can be readily determined, in other situations, further analyses (e.g., coolant radiochemistry sampling, may be necessary). Classify the event as indicated and terminate the emergency once assessment shows that there were no consequences from the event and other termination criteria are met.

4. Guidance for classifying transient events addresses the period of time of event recognition and classification (15 minutes). However, in cases when EAL declaration criteria may be met momentarily during the normal expected response of the plant, declaration requirements should not be considered to be met when the conditions are a part of the designed plant response, or result from appropriate Operator actions.

6. Conditions Discovered After-the-Fact

There may be cases in which a plant condition that exceeded an EAL was not recognized at the time of occurrence but is identified well after the condition has occurred (e.g., as a result of routine log or record review), and the condition no longer exists. In these cases, an emergency should not be declared. Reporting requirements of 10 CFR 50.72 are applicable and the guidance of NUREG-1022, Rev. 2, Section 3, should be applied.

1. An After-the-Fact event is defined as an event that exceeded an EAL threshold and was not recognized at the time of occurrence but is identified greater than 1 hour after the condition has occurred (e.g., as a result of a routine log review, record review, post trip review, engineering evaluation) and the condition no longer exists.

2. For an After-the-Fact event the Control Room Staff was either not aware of the event or did not realize that an EAL was exceeded at the time of the occurrence.

3. Plant emergency events that are in progress or have occurred with ongoing adverse consequences/effects should not be considered After-the-Fact events and should therefore be classified and declared as an ongoing emergency event.

4. EMERGENCY CONDITIONS - After-the-Fact events that occur will be assessed and evaluated to ensure that no EAL currently applies. An emergency declaration is NOT required and a non-emergency, One-Hour Report should be initiated in accordance with non-emergency RALs in the ECG.

7. NRC Communications During An Emergency Guidance

1. Complete and accurate communications with the NRC Operations Center during emergencies is required and expected. The purpose of notifying the NRC within one-hour of an emergency, is to provide event information when immediate NRC action may be required to protect the public health and safety OR when the NRC needs accurate and timely information to respond to heightened public concern. If the information we provide is not accurate or does not contain sufficient detail, then we hamper the NRC from doing their job.

2. The NRC Data Sheet, along with the Initial Contact Message Form, is the primary vehicle to ensure the NRC is kept informed. General Guidance on completing the event description portion of the NRC Data Sheet is provided in the NRC Data Sheet (ECG Attachment 5).

8. Event Retraction Guidance

IF an ENS notification to the NRC was made as directed by the applicable ECG Attachment AND it is later determined that the event or condition is not reportable,

THEN the notification may be retracted as follows:

1. OBTAIN both the Operations Shift Manager's and Shift Manager's approval of any proposed retractions. Ensure Reg Assurance is consulted prior to approval to retract an Event.

2. COMPLETE Page 1 of the ECG Attachment 5, EP-HC-111-F5, NRC Data Sheet Completion Reference, providing a retraction of the original notification. Event Description Section of NRC Data Sheet should explain the rationale for the retraction.

3. NOTIFY the NRC Operations Center and NRC Resident Inspector.

4. RECORD on the NRC Data Sheet the name of the NRC contact that received the retraction information.

5. FORWARD the retraction NRC Data Sheet with the rest of the original attachment of the ECG that was implemented when the original notification was made to the Operations Shift Manager.

9. Common Site Events Guidance

1. Selected EALs in Category H (Unusual Event level only) have been designated as "Common Site" events. These events will be annotated with the words "Common Site" just below the OPCON applicability line in the wallcharts and next to the classification level in the EAL Bases document.

2. The Common Site UE ECG Attachment 8, EP-HC-111-F8, Declaration of "Common Site" UE, will direct the SM to establish agreement on which SM will declare and report the event. Therefore, either Salem or Hope Creek will report Common Site Unusual Events, but not both.

3. Events classified at an Alert or higher level require plant specific information to be provided to the states of New Jersey and Delaware, the NRC, and to PSEG Emergency Response Facilities and therefore will not be classified as common site events.

10. EAL Classification Considerations

1. Planned evolutions involve preplanning to address the limitations imposed by the condition, the performance of required surveillance testing, and the implementation of specific controls prior to knowingly entering the condition in accordance with the specific requirements of the HCGS Technical Specifications. Activities which cause the site to operate beyond that allowed by the HCGS Technical Specifications, planned or unplanned, may result in an EAL threshold being met or exceeded. **Planned evolutions to test, manipulate, repair, perform maintenance or modifications to systems and equipment that result in an EAL value being met or exceeded are not subject to classification and activation requirements as long as the evolution proceeds as planned and is within the operational limitations imposed by the specific operating license.** However, these conditions may be subject to the reporting requirements of 10 CFR 50.72.

2. All classifications are to be based upon **VALID** indications, reports or conditions. Indications, reports or conditions are considered **VALID** when they are verified by (1) an instrument channel check, or (2) indications on related or redundant indications, or (3) by direct observation by plant personnel, such that doubt related to the indication's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

3. Although the majority of the EALs provide very specific thresholds, the Emergency Coordinator must remain alert to events or conditions that lead to the conclusion that exceeding the EAL is **IMMINENT**. If, in the judgment of the Emergency Coordinator, an **IMMINENT** situation is at hand, the classification should be made as if the threshold has been exceeded. While this is particularly prudent at the higher emergency classification levels (as the early classification may provide for more effective implementation of protective measures), it is nonetheless applicable to all emergency classification levels.

4. When multiple simultaneous events occur, the emergency classification level is based on the highest EAL reached. For example, two Alerts remain in the Alert category. Or, an Alert and a Site Area Emergency is a Site Area Emergency. Further guidance is provided in RIS 2007-02, Clarification of NRC Guidance for Emergency Notifications During Quickly Changing Events.

5. Another important aspect of usable EAL guidance is the consideration of what to do when the risk posed by an emergency is clearly decreasing. A combination approach involving recovery from General Emergencies and some Site Area Emergencies and termination from Unusual Events, Alerts, and certain Site Area Emergencies causing no long term plant damage appears to be the best choice. Downgrading to lower emergency classification levels adds notifications but may have merit under certain circumstances. Refer to procedure NC.EP-EP.ZZ-0405, Emergency Termination – Reduction – Recovery, for detailed directions.

6. The logic used for the Fission Product Barrier EALs reflects the following considerations:

    - The Fuel Clad Barrier and the RCS Barrier are weighted more heavily than the Primary Containment Barrier. Unusual Events associated with RCS and Fuel Clad Barriers are addressed under EALs in Category S, System Malfunctions.

    - The ability to escalate to higher emergency classification levels as an event deteriorates must be maintained. For example, RCS leakage steadily increasing would represent an increasing risk to public health and safety.

    - The Primary Containment Barrier should not be declared lost or potentially lost based on exceeding Technical Specification action statement criteria, unless there is an event in progress requiring mitigation by the Primary Containment barrier. When no event is in progress (Loss or Potential Loss of either Fuel Clad and/or RCS barrier) the Primary Containment Barrier status is addressed by Technical Specifications.

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EALs for:

Abnormal Radiological Levels

&

ISFSI

EAL Category: R – Abnormal Rad Levels / Rad Effluent

EAL Subcategory: 1 – Offsite Rad Conditions

Initiating Condition: Any release of gaseous or liquid radioactivity to the environment greater than 2 times the ODCM for 60 minutes or longer

OPCON Applicability: All

EAL# & Classification Level: **RU1.1 – UNUSUAL EVENT**

EAL:

VALID gaseous monitor reading **> Table R-1** column "UE"

AND

≥ 60 minutes have elapsed (Note 2)

Note 2: 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 release duration has exceeded, or will likely exceed, the applicable time. In the absence of data to the contrary, assume that the release duration has exceeded the applicable time if an ongoing release is detected and the release start time is unknown.

Table R-1 Effluent Monitor Classification Thresholds*						
	Release Point	**Monitor**	GE	SAE	ALERT	UE*
Gaseous	SPDS – (Total) Offsite Gas Rad Release **OR** **SUM** of: FRVS Vent NG + North Plant Vent NG + South Plant Vent NG + Hardened Torus Vent NG	SPDS Point B5097 **OR** **SUM** of: 9RX680 + 9RX590 + 9RX580 + 9RX518	5.25E+08 µCi/sec	5.25E+07 µCi/sec	3.0E+06 µCi/sec	3.0E+04 µCi/sec
Liquid	Liquid Radwaste Discharge	9RX508	----	----	The lesser of the following thresholds: • >200X the High Alarm Setpoint • >5.80E-02 uCi/cc • >1.50E-02 uCi/cc – CST discharge only	2X the High Alarm Setpoint
	Cooling Tower Blowdown	9RX506	----	----	The lesser of the following thresholds: • > 200X the High Alarm Setpoint • >1.64E-03 µCi/cc	2X the High Alarm Setpoint
	TB Circ Water Discharge	9RX505	----	----	The lesser of the following thresholds: • > 200X the High Alarm Setpoint • > 4.80E-04 µCi/cc – for continuous release • >5.80E-02 uCi/cc for batch release	2X the High Alarm Setpoint

* For high alarm conditions on offgas pretreatment monitor 9RX621 or 9RX622, refer to EAL SU7.1

Basis:

This EAL addresses a potential decrease in the level of safety of the plant as indicated by a radiological release that exceeds regulatory commitments for an extended period of time.

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

The multiple of two times the ODCM limits is specified in EAL RU1.1 only to distinguish between non-emergency conditions. While this multiple obviously corresponds to an off-site dose or dose rate, the emphasis in classifying this event is the degradation in the level of safety of the plant, not the magnitude of the associated dose or dose rate.

This EAL addresses radioactivity releases, that for whatever reason, cause effluent radiation monitor readings to exceed the threshold identified in the EAL.

This EAL is intended for sites that have established effluent monitoring on non-routine release pathways for which a discharge permit would not normally be prepared.

Explanation/Discussion/Definitions:

The column "UE" gaseous release value in Table R-1 represents two (2) times the calculated ODCM release rate limits.

Instrumentation that may be used to assess this EAL is listed below:

- SPDS Point B5097 – Offsite Gas Rad Release

  The SPDS point represents the total sum of Rad Gas Releases of the below 4 potential release pathways.

- 9RX680 (RE-4811A) FRVS Vent Noble Gas

  FRVS is normally maintained in a standby condition. Upon FRVS actuation and reactor building isolation, FRVS circulates the reactor building air through HEPA and charcoal filters. Releases are made to the atmosphere via the FRVS Vent Exhaust units.

- 9RX590 (RE-4873B) North Plant Vent (NPV) Noble Gas

  The NPV receives discharge from the gaseous radwaste treatment system (Offgas system), Chem Lab exhaust and solid radwaste area exhaust.

- 9RX580 (RE-4875B) South Plant (SPV) Vent Noble gas

  The SPV receives discharge from the service/radwaste building, reactor building, condensate demineralizer, pipe chase, turbine building mechanical vacuum pumps, gland seal exhaust, and other untreated ventilation sources.

- 9RX518 Hardened Torus Vent (HTV)

  The HTV Rad Gas Release value is a calculated release rate based on HRT Rad detectors 9RX516 (low range) or 9RX517 (high range) and the HTV flow rate. The HTV is not a normal release pathway and is only used when the primary containment is vented per EOP/SAMG guidelines.

Definitions:

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.

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, AU1 Example EAL #1
2. HCGS Offsite Dose Calculation Manual (ODCM) Section 3.3.7.11 – Radioactive Gaseous Effluent Monitoring Instrumentation
3. Hope Creek Radiological EAL Setpoint Calculation Document (Attachment 6)

EAL Category: R – Abnormal Rad Levels / Rad Effluent

EAL Subcategory: 1 – Offsite Rad Conditions

Initiating Condition: Any release of gaseous or liquid radioactivity to the environment greater than 2 times the ODCM for 60 minutes or longer

EAL# & Classification Level: **RU1.2 – UNUSUAL EVENT**

OPCON Applicability: All

EAL:

ANY VALID liquid monitor reading **> Table R-1** column "UE"

AND

≥ 60 minutes have elapsed (Note 2)

Note 2: 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 release duration has exceeded, or will likely exceed, the applicable time. In the absence of data to the contrary, assume that the release duration has exceeded the applicable time if an ongoing release is detected and the release start time is unknown.

Table R-1 Effluent Monitor Classification Thresholds*						
	Release Point	**Monitor**	GE	SAE	ALERT	UE*
Gaseous	SPDS – (Total) Offsite Gas Rad Release **OR** **SUM** of: FRVS Vent NG + North Plant Vent NG + South Plant Vent NG + Hardened Torus Vent NG	SPDS Point B5097 **OR** **SUM** of: 9RX680 + 9RX590 + 9RX580 + 9RX518	5.25E+08 µCi/sec	5.25E+07 µCi/sec	3.0E+06 µCi/sec	3.0E+04 µCi/sec
Liquid	Liquid Radwaste Discharge	9RX508	----	----	The lesser of the following thresholds: • >200X the High Alarm Setpoint • >5.80E-02 uCi/cc • >1.50E-02 uCi/cc – CST discharge only	2X the High Alarm Setpoint
	Cooling Tower Blowdown	9RX506	----	----	The lesser of the following thresholds: • > 200X the High Alarm Setpoint • >1.64E-03 µCi/cc	2X the High Alarm Setpoint
	TB Circ Water Discharge	9RX505	----	----	The lesser of the following thresholds: • > 200X the High Alarm Setpoint • > 4.80E-04 µCi/cc – for continuous release • >5.80E-02 uCi/cc for batch release	2X the High Alarm Setpoint

* For high alarm conditions on offgas pretreatment monitor 9RX621 or 9RX622, refer to EAL SU7.1

Basis:

This EAL addresses a potential decrease in the level of safety of the plant as indicated by a radiological release that exceeds regulatory commitments for an extended period of time.

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

The multiple of two times the ODCM limits is specified in EAL RU1.2 only to distinguish between non-emergency conditions. While this multiple obviously corresponds to an off-site dose or dose rate, the emphasis in classifying this event is the degradation in the level of safety of the plant, not the magnitude of the associated dose or dose rate.

This EAL addresses radioactivity releases, that for whatever reason, cause effluent radiation monitor readings to exceed the threshold identified in the EAL.

This EAL is intended for sites that have established effluent monitoring on non-routine liquid release pathways for which a discharge permit would not normally be prepared (Cooling Water Blowdown & TB Circ Water) as well as planned batch releases for which a radioactivity discharge permit is prepared (Radwaste Discharge).

Explanation/Discussion/Definitions:

The column "UE" liquid release values in Table R-1 represent two (2) times the current High Alarm Setpoint based on the current liquid release pathway discharge permit for the specified monitor. Instrumentation that may be used to assess this EAL is listed below:

- 9RX508 (RE-4861) Liquid Radwaste Discharge (Upper Range is 5.8E-02 uCi/cc)

  The Liquid Radwaste Discharge Line Monitor provides the alarm and automatic termination of liquid radioactive material releases from the liquid rad waste treatment and monitoring system.

- 9RX506 (RE-8817) Cooling Tower Blowdown (Upper Range is 1.0E-02 uCi/cc)

  The Cooling Tower Blowdown Effluent Radiation Monitor monitors radioactivity in the cooling tower blowdown before it is discharged into the Delaware River and warns personnel of an excessive amount of radioactivity (greater than ODCM Limits) being released to the environment. The Cooling-Tower Blowdown Effluent Monitor provides an Alarm function only for releases into the environment.

- 9RX505 (RE-4557) Turbine Building Circulating Water Dewatering Sump Discharge (Upper Range is 5.8E-02 uCi/cc)

  The Turbine Building Circulating Water Dewatering Sump Discharge Monitor provides alarm and automatic termination of liquid radioactive releases from the circulating water dewatering sump. The sump pumps discharge to the circulating water system to the cooling tower basin. The Turbine Building Circulating Water Dewatering Sump is a normal radwaste discharge pathway and is monitored as such because of possible contamination from the Turbine Building Ventilation drains.

Definitions:

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.

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, AU1 Example EAL #2
2. HCGS Offsite Dose Calculation Manual (ODCM), Section 3.3.7.10 – Radioactive Liquid Effluent Monitoring Instrumentation
3. HCGS Offsite Dose Calculation Manual (ODCM), Table 1-1 Parameters for Liquid Alarm Setpoint Determination
4. HCGS Offsite Dose Calculation Manual (ODCM), Appendix A, Evaluation of Default MPC Value for Liquid Effluent Monitors
5. HC UFSAR TABLE 11.5-1 - Hope Creek Radiation Monitoring Systems, Rev 10

EAL Category: R – Abnormal Rad Levels / Rad Effluent

EAL Subcategory: 1 – Offsite Rad Conditions

Initiating Condition: Any release of gaseous or liquid radioactivity to the environment greater than 2 times the ODCM for 60 minutes or longer

EAL# & Classification Level: **RU1.3 – UNUSUAL EVENT**

OPCON Applicability: All

EAL:

Confirmed sample analyses for gaseous or liquid releases indicate concentrations or release rates **> Table R-2** column **"UE"**

AND

≥ 60 minutes have elapsed (Note 2)

Note 2: 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 release duration has exceeded, or will likely exceed, the applicable time. In the absence of data to the contrary, assume that the release duration has exceeded the applicable time if an ongoing release is detected and the release start time is unknown.

Table R-2 Effluent Sample Classification Thresholds

	Release Point	Sample	ALERT	UE
Gaseous	FRVS Vent	NG	7.10E-01 μCi/cc	7.10E-03 μCi/cc
		I-131	8.20E-04 μCi/cc	8.20E-06 μCi/cc
	North Plant Vent	NG	1.52E-01 μCi/cc	1.52E-03 μCi/cc
		I-131	1.80E-04 μCi/cc	1.80E-06 μCi/cc
	South Plant Vent	NG	1.44E-02 μCi/cc	1.44E-04 μCi/cc
		I-131	1.68E-05 μCi/cc	1.68E-07 μCi/cc
	Unmonitored	Isotopic	200 x ODCM 3/4.11.2	2 x ODCM 3/4.11.2
Liquid	Liquid Radwaste Discharge	Isotopic	200 x ODCM 3/4.11.1	2 x ODCM 3/4.11.1
	Cooling Tower Blowdown	Isotopic	200 x ODCM 3/4.11.1	2 x ODCM 3/4.11.1
	TB Circ Water Discharge	Isotopic	200 x ODCM 3/4.11.1	2 x ODCM 3/4.11.1
	Unmonitored	Isotopic	200 x ODCM 3/4.11.1	2 x ODCM 3/4.11.1

Basis:

This EAL addresses a potential decrease in the level of safety of the plant as indicated by a radiological release that exceeds regulatory commitments for an extended period of time.

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

The multiple of two times the ODCM limits is specified in EAL RU1.3 only to distinguish between non-emergency conditions. While this multiple obviously corresponds to an off-site dose or dose rate, the emphasis in classifying this event is the degradation in the level of safety of the plant, not the magnitude of the associated dose or dose rate.

This EAL includes any release for which a radioactivity discharge permit was not prepared, or a release that exceeds the conditions (e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.) on the applicable permit for ≥ 60 minutes.

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

The underlying basis of this EAL involves the degradation in the level of safety of the plant implied by the uncontrolled release.

Explanation/Discussion/Definitions:

Releases in excess of two times the site Offsite Dose Calculation Manual (ODCM) Section 3/4.11.1 or 3/4.11.2 limits that continue for 60 minutes or longer represent an uncontrolled situation and hence, a potential degradation in the level of safety. The final integrated dose (which is very low in the UNUSUAL EVENT emergency class) is not the primary concern here; it is the degradation in plant control implied by the fact that the release was not isolated within 60 minutes.

Table R-2 provides calculated radiological release noble gas and iodine sample concentrations that equate to a release that is 2 times the ODCM limits (Section 3/4.11.2) of 500 mRem/year as well as specifying liquid release effluent sample streams 2 times the ODCM limits (Section 3/4.11.1.1, Liquid Effluent Concentrations).

Hope Creek has three gaseous release points for which sample concentration thresholds have been calculated.

- FRVS – Filtration Recirculation Vent System
- NPV – North Plant Vent
- SPV – South Plant Vent

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, AU1 Example EAL #3
2. Off-Site Dose Calculation Manual, Section 3/4.11.1.1 – Liquid Effluents Concentrations
3. Off-Site Dose Calculation Manual, Section 3/4.11.2.1 – Gaseous Effluents Dose Rates
4. Hope Creek Radiological EAL Setpoint Calculation Document (Attachment 6)

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EAL Category: R – Abnormal Rad Levels / Rad Effluent

EAL Subcategory: 1 – Offsite Rad Conditions

Initiating Condition: Any release of gaseous or liquid radioactivity to the environment greater than 200 times the ODCM for 15 minutes or longer

OPCON Applicability: All

EAL# & Classification Level: **RA1.1 – ALERT**

EAL:

VALID gaseous monitor reading **> Table R-1** column "ALERT"

<u>AND</u>

≥ 15 minutes have elapsed (Note 2)

Note 2: 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 release duration has exceeded, or will likely exceed, the applicable time. In the absence of data to the contrary, assume that the release duration has exceeded the applicable time if an ongoing release is detected and the release start time is unknown.

Table R-1 Effluent Monitor Classification Thresholds*						
	Release Point	**Monitor**	GE	SAE	ALERT	UE*
Gaseous	SPDS – (Total) Offsite Gas Rad Release **OR** **SUM** of: FRVS Vent NG + North Plant Vent NG + South Plant Vent NG + Hardened Torus Vent NG	SPDS Point B5097 **OR** **SUM** of: 9RX680 + 9RX590 + 9RX580 + 9RX518	5.25E+08 µCi/sec	5.25E+07 µCi/sec	3.0E+06 µCi/sec	3.0E+04 µCi/sec
Liquid	Liquid Radwaste Discharge	9RX508	----	----	The lesser of the following thresholds: • >200X the High Alarm Setpoint • >5.80E-02 uCi/cc • >1.50E-02 uCi/cc – CST discharge only	2X the High Alarm Setpoint
	Cooling Tower Blowdown	9RX506	----	----	The lesser of the following thresholds: • > 200X the High Alarm Setpoint • >1.64E-03 µCi/cc	2X the High Alarm Setpoint
	TB Circ Water Discharge	9RX505	----	----	The lesser of the following thresholds: • > 200X the High Alarm Setpoint • > 4.80E-04 µCi/cc – for continuous release • >5.80E-02 uCi/cc for batch release	2X the High Alarm Setpoint

* For high alarm conditions on offgas pretreatment monitor 9RX621 or 9RX622, refer to EAL SU7.1

Basis:

This EAL addresses an actual or substantial potential decrease in the level of safety of the plant as indicated by a radiological release that exceeds regulatory commitments for an extended period of time.

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

The multiple of two hundred times the ODCM limits is specified in EAL RA1.1 only to distinguish between non-emergency conditions. While this multiple obviously corresponds to an off-site dose or dose rate, the emphasis in classifying this event is the degradation in the level of safety of the plant, not the magnitude of the associated dose or dose rate.

This EAL is intended for sites that have established effluent monitoring on non-routine release pathways for which a discharge permit would not normally be prepared.

Explanation/Discussion/Definitions:

The column "ALERT" gaseous release value in Table R-1 represents two hundred (200) times the calculated ODCM gaseous release rate limits.

Instrumentation that may be used to assess this EAL is listed below:

- SPDS Point B5097 – Offsite Gas Rad Release

  The SPDS point represents the total sum of Rad Gas Releases of the below 4 potential release pathways.

- 9RX680 (RE-4811A) FRVS Vent Noble Gas

  FRVS is normally maintained in a standby condition. Upon FRVS actuation and reactor building isolation, FRVS circulates the reactor building air through HEPA and charcoal filters. Releases are made to the atmosphere via the FRVS Vent Exhaust units.

- 9RX590 (RE-4873B) North Plant Vent (NPV) Noble Gas

  The NPV receives discharge from the gaseous radwaste treatment system (Offgas system), Chem Lab exhaust and solid radwaste area exhaust.

- 9RX580 (RE-4875B) South Plant (SPV) Vent Noble gas

  The SPV receives discharge from the service/radwaste building, reactor building, condensate demineralizer, pipe chase, turbine building mechanical vacuum pumps, gland seal exhaust, and other untreated ventilation sources

- 9RX518 Hardened Torus Vent (HTV)

  The HTV Rad Gas Release value is a calculated release rate based on HRT Rad detectors 9RX516 (low range) or 9RX517 (high range) and the HTV flow rate. The HTV is not a normal release pathway and is only used when the primary containment is vented per EOP/SAMG guidelines.

Definitions:

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.

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, AA1 Example EAL #1
2. HCGS Offsite Dose Calculation Manual (ODCM) Section 3.3.7.11 – Radioactive Gaseous Effluent Monitoring Instrumentation
3. Hope Creek Radiological EAL Setpoint Calculation Document (Attachment 6)

EAL Category: R – Abnormal Rad Levels / Rad Effluent

EAL Subcategory: 1 – Offsite Rad Conditions

Initiating Condition: Any release of gaseous or liquid radioactivity to the environment greater than 200 times the ODCM for 15 minutes or longer

EAL# & Classification Level: **RA1.2 – ALERT**

OPCON Applicability: All

EAL:

ANY VALID liquid monitor reading **> Table R-1** column "ALERT"

AND

≥ 15 minutes have elapsed (Note 2)

Note 2: 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 release duration has exceeded, or will likely exceed, the applicable time. In the absence of data to the contrary, assume that the release duration has exceeded the applicable time if an ongoing release is detected and the release start time is unknown.

Table R-1 Effluent Monitor Classification Thresholds*						
	Release Point	**Monitor**	GE	SAE	ALERT	UE*
Gaseous	SPDS – (Total) Offsite Gas Rad Release **OR** **SUM** of: FRVS Vent NG + North Plant Vent NG + South Plant Vent NG + Hardened Torus Vent NG	SPDS Point B5097 **OR** **SUM** of: 9RX680 + 9RX590 + 9RX580 + 9RX518	5.25E+08 µCi/sec	5.25E+07 µCi/sec	3.0E+06 µCi/sec	3.0E+04 µCi/sec
Liquid	Liquid Radwaste Discharge	9RX508	----	----	The lesser of the following thresholds: • >200X the High Alarm Setpoint • >5.80E-02 uCi/cc • >1.50E-02 uCi/cc – CST discharge only	2X the High Alarm Setpoint
	Cooling Tower Blowdown	9RX506	----	----	The lesser of the following thresholds: • > 200X the High Alarm Setpoint • >1.64E-03 µCi/cc	2X the High Alarm Setpoint
	TB Circ Water Discharge	9RX505	----	----	The lesser of the following thresholds: • > 200X the High Alarm Setpoint • > 4.80E-04 µCi/cc – for continuous release • >5.80E-02 uCi/cc for batch release	2X the High Alarm Setpoint

* For high alarm conditions on offgas pretreatment monitor 9RX621 or 9RX622, refer to EAL SU7.1

Basis:

This EAL addresses an actual or substantial potential decrease in the level of safety of the plant as indicated by a radiological release that exceeds regulatory commitments for an extended period of time.

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

The multiple of two hundred times the ODCM limits is specified in EAL RA1.2 only to distinguish between non-emergency conditions. While this multiple obviously corresponds to an off-site dose or dose rate, the emphasis in classifying this event is the degradation in the level of safety of the plant, not the magnitude of the associated dose or dose rate.

This EAL includes any release for which a radioactivity discharge permit was not prepared, or a release that exceeds the conditions (e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.) on the applicable permit.

This EAL is intended for sites that have established effluent monitoring on non-routine release pathways for which a discharge permit would not normally be prepared (Cooling Water Blowdown & TB Circ Water) as well as planned batch releases for which a radioactivity discharge permit is prepared (Radwaste Discharge).

Explanation/Discussion/Definitions:

Since the "high alarm" setpoint of the liquid release radiation monitors may vary based on the latest release discharge permit, the ALERT column for liquid release values in Table R-1 was developed taking into consideration setpoint variability, monitor range and the default high alarm setpoints provided in the ODCM.

The EAL thresholds in Table R-1 for the ALERT call for the user to determine the lessor of either two hundred (200) times the current high alarm setpoint (if still within the monitor's indicating range) or two hundred (200) times the ODCM default high alarm setpoint. For monitors that would be over-range using the two hundred (200) times the ODCM default High Alarm Setpoint, the high end range value was chosen as the EAL threshold. Instrumentation that may be used to assess this EAL is listed below:

- 9RX508 (RE-4861) Liquid Radwaste Discharge (Upper Range is 5.8E-02 uCi/cc)

  The Liquid Radwaste Discharge Line Monitor provides the alarm and automatic termination of liquid radioactive material releases from the liquid rad waste treatment and monitoring system. Since 200 times the ODCM default High Alarm Setpoint would be well above the range of the monitor's indication, the monitor's upper range of 5.8E-02 uCi/cc was selected as an EAL threshold, for discharges not from the CST, to be used only if 200 times the discharge permit calculated High Alarm Setpoint is not within the monitors indicating range. For CST only discharges, the EAL threshold value represents two hundred (200) times the ODCM default High Alarm Setpoint.

- 9RX506 (RE-8817) Cooling Tower Blowdown (Upper Range is 1.0E-02 uCi/cc)

  The Cooling Tower Blowdown Effluent Radiation Monitor monitors radioactivity in the cooling tower blowdown before it is discharged into the Delaware River and warns personnel of an excessive amount of radioactivity (greater than ODCM Limits) being released to the environment. The Cooling-Tower Blowdown Effluent Monitor provides an Alarm function only for releases into the environment. The EAL threshold value represents two hundred (200) times the ODCM default High Alarm Setpoint.

- 9RX505 (RE-4557) Turbine Building Circulating Water Dewatering Sump Discharge (Upper Range is 5.8E-02 uCi/cc)

  The Turbine Building Circulating Water Dewatering Sump Discharge Monitor provides alarm and automatic termination of liquid radioactive releases from the circulating water dewatering sump. The sump pumps discharge to the circulating water system to the cooling tower basin. The Turbine Building Circulating Water Dewatering Sump is a normal radwaste continuous discharge pathway and is monitored as such because of possible contamination from the Turbine Building Ventilation drains. The EAL threshold value for continuous releases represents two hundred (200) times the ODCM default High Alarm Setpoint. For a batch release, 200 times the ODCM default High Alarm Setpoint would be well above the range of the monitor's indication and therefore the monitor's upper range of 5.8E-02 uCi/cc was selected as an EAL threshold for batch release only.

Definitions:

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.

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, AA1 Example EAL #2
2. HCGS Offsite Dose Calculation Manual (ODCM) Section 3.3.7.10 – Radioactive Liquid Effluent Monitoring Instrumentation
3. HCGS Offsite Dose Calculation Manual (ODCM) Table 1-1 Parameters for Liquid Alarm Setpoint Determination
4. HCGS Offsite Dose Calculation Manual (ODCM), Appendix A, Evaluation of Default MPC Value for Liquid Effluent Monitors
5. HC UFSAR TABLE 11.5-1 - Hope Creek Radiation Monitoring Systems, Rev 10

EAL Category: R – Abnormal Rad Levels / Rad Effluent

EAL Subcategory: 1 – Offsite Rad Conditions

Initiating Condition: Any release of gaseous or liquid radioactivity to the environment greater than 200 times the ODCM for 15 minutes or longer

EAL# & Classification Level: **RA1.3 – ALERT**

OPCON Applicability: All

EAL:

Confirmed sample analyses for gaseous or liquid releases indicate concentrations or release rates **> Table R-2** column "ALERT"

AND

≥ 15 minutes have elapsed (Note 2)

Note 2: 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 release duration has exceeded, or will likely exceed, the applicable time. In the absence of data to the contrary, assume that the release duration has exceeded the applicable time if an ongoing release is detected and the release start time is unknown.

Table R-2 Effluent Sample Classification Thresholds

	Release Point	Sample	ALERT	UE
Gaseous	FRVS Vent	NG	7.10E-01 µCi/cc	7.10E-03 µCi/cc
		I-131	8.20E-04 µCi/cc	8.20E-06 µCi/cc
	North Plant Vent	NG	1.52E-01 µCi/cc	1.52E-03 µCi/cc
		I-131	1.80E-04 µCi/cc	1.80E-06 µCi/cc
	South Plant Vent	NG	1.44E-02 µCi/cc	1.44E-04 µCi/cc
		I-131	1.68E-05 µCi/cc	1.68E-07 µCi/cc
	Unmonitored	Isotopic	200 x ODCM 3/4.11.2	2 x ODCM 3/4.11.2
Liquid	Liquid Radwaste Discharge	Isotopic	200 x ODCM 3/4.11.1	2 x ODCM 3/4.11.1
	Cooling Tower Blowdown	Isotopic	200 x ODCM 3/4.11.1	2 x ODCM 3/4.11.1
	TB Circ Water Discharge	Isotopic	200 x ODCM 3/4.11.1	2 x ODCM 3/4.11.1
	Unmonitored	Isotopic	200 x ODCM 3/4.11.1	2 x ODCM 3/4.11.1

Basis:

This EAL addresses an actual or substantial potential decrease in the level of safety of the plant as indicated by a radiological release that exceeds regulatory commitments for an extended period of time.

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

The multiple of two hundred times the ODCM limits is specified in EAL RA1.3 only to distinguish between non-emergency conditions. While this multiple obviously corresponds to an off-site dose or dose rate, the emphasis in classifying this event is the degradation in the level of safety of the plant, not the magnitude of the associated dose or dose rate.

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

Explanation/Discussion/Definitions:

Confirmed sample analyses in excess of two hundred times the site Offsite Dose Calculation Manual Section 3/4.11.1 or 3/4.11.2 limits that continue for 15 minutes or longer represent an uncontrolled situation and hence, a potential degradation in the level of safety. This event escalates from the UNUSUAL EVENT by raising the magnitude of the release by a factor of 100 over the UNUSUAL EVENT level (i.e., 200 times ODCM).

Table R-2 provides calculated radiological release noble gas and iodine sample concentrations that equate to a release that is 200 times the ODCM limit (Section 3/4.11.2) of 500 mRem/year as well as specifying liquid release effluent sample streams 200 times the ODCM limits (Section 3/4.11.1.1 Liquid Effluent Concentrations).

Hope Creek has three gaseous release points for which sample concentration thresholds have been calculated.

- FRVS – Filtration Recirculation Vent System
- NPV – North Plant Vent
- SPV – South Plant Vent

The required release duration was reduced to 15 minutes in recognition of the raised severity.

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, AA1 Example EAL #3
2. Off-Site Dose Calculation Manual, Section 3/4.11.1 – Liquid Effluents Concentrations
3. Off-Site Dose Calculation Manual, Section 3/4.11.2.1 – Gaseous Effluents Dose Rates
4. Hope Creek Radiological EAL Setpoint Calculation Document (Attachment 6)

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EAL Category: R – Abnormal Rad Levels / Rad Effluent

EAL Subcategory: 1 – Offsite Rad Conditions

Initiating Condition: Off-site dose resulting from an actual or **IMMINENT** release of gaseous radioactivity greater than 100 mRem TEDE or 500 mRem Thyroid CDE for the actual or projected duration of the release

OPCON Applicability: All

EAL# & Classification Level: **RS1.1 – SITE AREA EMERGENCY**

EAL:

VALID gaseous monitor reading **> Table R-1** column "SAE"

AND

Dose assessment results are NOT available

AND

≥ 15 minutes have elapsed (Note 1)

Note 1: If dose assessment results are available, declaration should be based on dose assessment (EAL RS1.2) instead of gaseous monitor values. Do NOT delay declaration awaiting dose assessment results.

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 will likely exceed the applicable time.

Table R-1 Effluent Monitor Classification Thresholds*						
	Release Point	Monitor	GE	SAE	ALERT	UE*
Gaseous	SPDS – (Total) Offsite Gas Rad Release **OR** **SUM** of: FRVS Vent NG + North Plant Vent NG + South Plant Vent NG + Hardened Torus Vent NG	SPDS Point B5097 **OR** **SUM** of: 9RX680 + 9RX590 + 9RX580 + 9RX518	5.25E+08 µCi/sec	5.25E+07 µCi/sec	3.0E+06 µCi/sec	3.0E+04 µCi/sec
Liquid	Liquid Radwaste Discharge	9RX508	----	----	The lesser of the following thresholds: • >200X the High Alarm Setpoint • >5.80E-02 uCi/cc • >1.50E-02 uCi/cc – CST discharge only	2X the High Alarm Setpoint
	Cooling Tower Blowdown	9RX506	----	----	The lesser of the following thresholds: • > 200X the High Alarm Setpoint • >1.64E-03 µCi/cc	2X the High Alarm Setpoint
	TB Circ Water Discharge	9RX505	----	----	The lesser of the following thresholds: • > 200X the High Alarm Setpoint • > 4.80E-04 µCi/cc – for continuous release • >5.80E-02 uCi/cc for batch release	2X the High Alarm Setpoint

* For high alarm conditions on offgas pretreatment monitor 9RX621 or 9RX622, refer to EAL SU7.1

Basis:

This EAL addresses radioactivity releases that result in doses at or beyond the site boundary that exceed 10% of the EPA Protective Action Guides (PAGs). Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public.

While these failures are addressed by other EALs, this EAL provides appropriate diversity and addresses events which may not be able to be classified on the basis of plant status alone. It is important to note that for the more severe accidents the release may be unmonitored or there may be large uncertainties associated with the source term and/or meteorology.

The TEDE dose which forms the bases for the specified effluent monitor threshold is set at 10% of the EPA PAG.

The Table R-1 monitor list includes effluent monitors on all potential release pathways.

Since dose assessment is based on actual meteorology, whereas the monitor reading EAL is not, the results from these assessments may indicate that the classification is not warranted, or may indicate that a higher classification is warranted. For this reason, emergency implementing procedures call for the timely performance of dose assessments using actual meteorology and release information. If the results of these dose assessments are available when the classification is made (e.g., initiated at a lower classification level), the dose assessment results override the monitor reading EAL.

Explanation/Discussion/Definitions:

This EAL address gaseous radioactivity releases, that for whatever reason, cause effluent radiation monitor readings corresponding to site boundary doses that exceed 100 mRem TEDE.

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

Instrumentation that may be used to assess this EAL is listed below:

- SPDS Point B5097 – Offsite Gas Rad Release

  The SPDS point represents the total sum of Rad Gas Releases of the below 4 potential release pathways.

- 9RX680 (RE-4811A) FRVS Vent Noble Gas

  FRVS is normally maintained in a standby condition. Upon FRVS actuation and reactor building isolation, FRVS circulates the reactor building air through HEPA and charcoal filters. Releases are made to the atmosphere via the FRVS Vent Exhaust units.

- 9RX590 (RE-4873B) North Plant Vent (NPV) Noble Gas

  The NPV receives discharge from the gaseous radwaste treatment system (Offgas system), Chem Lab exhaust and solid radwaste area exhaust.

- 9RX580 (RE-4875B) South Plant (SPV) Vent Noble gas

  The SPV receives discharge from the service/radwaste building, reactor building, condensate demineralizer, pipe chase, turbine building mechanical vacuum pumps, gland seal exhaust, and other untreated ventilation sources.

- 9RX518 Hardened Torus Vent (HTV)

  The HTV Rad Gas Release value is a calculated release rate based on HRT Rad detectors 9RX516 (low range) or 9RX517 (high range) and the HTV flow rate. The HTV is not a normal release pathway and is only used when the primary containment is vented per EOP/SAMG guidelines.

If dose assessment results are available, EAL RS1.2 would dictate the need for a Site Area Emergency classification due to abnormal radiation effluents.

Definitions:

> **IMMINENT**: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours (unless a different time is specified).
>
> **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.

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, AS1 Example EAL #1
2. HCGS Offsite Dose Calculation Manual (ODCM) Section 3.3.7.11 – Radioactive Gaseous Effluent Monitoring Instrumentation
3. Hope Creek Radiological EAL Setpoint Calculation Document (Attachment 6)

EAL Category: R – Abnormal Rad Levels / Rad Effluent

EAL Subcategory: 1 – Offsite Rad Conditions

Initiating Condition: Off-site dose resulting from an actual or **IMMINENT** release of gaseous radioactivity greater than 100 mRem TEDE or 500 mRem Thyroid CDE for the actual or projected duration of the release

EAL# & Classification Level: **RS1.2 – SITE AREA EMERGENCY**

OPCON Applicability: All

EAL:

Dose assessment using actual meteorology indicates TEDE 4-day dose **> 4.0E+02 mRem** or Thyroid CDE dose **> 2.0E+03 mRem** at or beyond the **MINIMUM EXCLUSION AREA (MEA)**

Basis:

This EAL addresses radioactivity releases that result in doses at or beyond the **MINIMUM EXCLUSION AREA (MEA)** that exceed 10% of the EPA Protective Action Guides (PAGs). Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public.

While these failures are addressed by other EALs, this EAL provides appropriate diversity and addresses events which may not be able to be classified on the basis of plant status alone. It is important to note that for the more severe accidents the release may be unmonitored or there may be large uncertainties associated with the source term and/or meteorology.

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

Since dose assessment is based on actual meteorology, whereas the monitor reading EAL is not, the results from these assessments may indicate that the classification is not warranted, or may indicate that a higher classification is warranted. For this reason, emergency implementing procedures call for the timely performance of dose assessments using actual meteorology and release information. If the results of these dose assessments are available when the classification is made (e.g., initiated at a lower classification level), the dose assessment results override the monitor reading EAL.

Explanation/Discussion/Definitions:

The dose assessment output on the Station Status Checklist (SSCL) is reported at varying distances from the plant as a TEDE 4-Day dose. This TEDE 4-day dose assumes a 4 hr release duration. To obtain the approximate dose for a projected release condition of 1 hour, the TEDE 4-day dose value would need to be divided by 4.

A TEDE 4-Day Dose > 4.0E+02 mRem correspond directly to a TEDE dose rate value of 100 mRem/hr and exceeds 10% of the EPA Protective Actions Guides (PAGs). The Thyroid-CDE Dose > 2.0E+03 mRem correspond directly to an CDE dose rate value of 500 mRem/hr and exceeds 10% of the EPA Protective Actions Guides (PAGs) which was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

For the purposes of this EAL, the Site Boundary for HCGS is the **MINIMUM EXCLUSION AREA** distance; see definition below.

Definitions:

IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours (unless a different time is specified).

MINIMUM EXCLUSION AREA (MEA): The closest location just beyond the **OWNER CONTROLLED AREA** where a member of the general public could gain access. For Hope Creek the **MEA** is 0.56 miles.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, AS1 Example EAL #2
2. Hope Creek Radiological EAL Setpoint Calculation Document (Attachment 6)

EAL Category: R – Abnormal Rad Levels / Rad Effluent

EAL Subcategory: 1 – Offsite Rad Conditions

Initiating Condition: Off-site dose resulting from an actual or **IMMINENT** release of gaseous radioactivity greater than 100 mRem TEDE or 500 mRem Thyroid CDE for the actual or projected duration of the release

EAL# & Classification Level: **RS1.3 – SITE AREA EMERGENCY**

OPCON Applicability: All

EAL:

Field survey results indicate closed window dose rates **> 100 mRem/hr** expected to continue for **≥ 1 hr** at or beyond the **PROTECTED AREA BOUNDARY**

OR

Analyses of field survey samples indicate I-131 concentration **> 3.85E-07 μCi/cc** at or beyond the **PROTECTED AREA BOUNDARY**

Basis:

This EAL addresses radioactivity releases that result in doses at or beyond the **PROTECTED AREA BOUNDARY** that exceed 10% of the EPA Protective Action Guides (PAGs). Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public.

While these failures are addressed by other EALs, this EAL provides appropriate diversity and addresses events which may not be able to be classified on the basis of plant status alone. It is important to note that for the more severe accidents the release may be unmonitored or there may be large uncertainties associated with the source term and/or meteorology.

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

Explanation/Discussion/Definitions:

This EAL addresses a radioactivity release field survey I-131 sample concentration or count rate that would result in a Thyroid CDE dose of greater than 500 mRem for one hour of inhalation at or beyond the **PROTECTED AREA BOUNDARY**. This value exceeds 10% of the EPA Protective Action Guides (PAGs). Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public.

The Iodine-131 field survey sample concentration and count rate threshold is based on I-131 dose conversion factors (DCFs) from EPA-400. The thresholds are based on a Thyroid-CDE Dose Rate of 500 mRem/hr for I-131.

For the purposes of this EAL, the **PROTECTED AREA BOUNDARY** is used as it is an easily determined location to obtain a field survey dose rate reading or to obtain a field sample.

Definitions:

IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours (unless a different time is specified).

PROTECTED AREA (PA): A security controlled area within the **OWNER-CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, AS1 Example EAL #4
2. HCGS Offsite Dose Calculation Manual Figure 5.1.1-1, Area Plot Plan of Site
3. Hope Creek Radiological EAL Setpoint Calculation Document (Attachment 6)

EAL Category: R – Abnormal Rad Levels / Rad Effluent

EAL Subcategory: 1 – Offsite Rad Conditions

Initiating Condition: Off-site dose resulting from an actual or **IMMINENT** release of gaseous radioactivity greater than 1000 mRem TEDE or 5000 mRem Thyroid CDE for the actual or projected duration of the release

OPCON Applicability: All

EAL# & Classification Level: **RG1.1 – GENERAL EMERGENCY**

EAL:

VALID gaseous monitor reading **> Table R-1** column "GE"

AND

Dose assessment results are NOT available

AND

≥ **15 minutes** have elapsed (Note 1)

Note 1: If dose assessment results are available, declaration should be based on dose assessment (EAL RG1.2) instead of gaseous monitor values. Do NOT delay declaration awaiting dose assessment results.

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 will likely exceed the applicable time.

Table R-1 Effluent Monitor Classification Thresholds*						
	Release Point	**Monitor**	GE	SAE	ALERT	UE*
Gaseous	SPDS – (Total) Offsite Gas Rad Release **OR** **SUM of:** FRVS Vent NG + North Plant Vent NG + South Plant Vent NG + Hardened Torus Vent NG	SPDS Point B5097 **OR** **SUM of:** 9RX680 + 9RX590 + 9RX580 + 9RX518	5.25E+08 µCi/sec	5.25E+07 µCi/sec	3.0E+06 µCi/sec	3.0E+04 µCi/sec
Liquid	Liquid Radwaste Discharge	9RX508	----	----	The lesser of the following thresholds: • >200X the High Alarm Setpoint • >5.80E-02 uCi/cc • >1.50E-02 uCi/cc – CST discharge only	2X the High Alarm Setpoint
	Cooling Tower Blowdown	9RX506	----	----	The lesser of the following thresholds: • > 200X the High Alarm Setpoint • >1.64E-03 µCi/cc	2X the High Alarm Setpoint
	TB Circ Water Discharge	9RX505	----	----	The lesser of the following thresholds: • > 200X the High Alarm Setpoint • > 4.80E-04 µCi/cc – for continuous release • >5.80E-02 uCi/cc for batch release	2X the High Alarm Setpoint

* For high alarm conditions on offgas pretreatment monitor 9RX621 or 9RX622, refer to EAL SU7.1

Basis:

This EAL addresses radioactivity releases that result in doses at or beyond the site boundary that exceed the EPA Protective Action Guides (PAGs). Public protective actions will be necessary. Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public and likely involve fuel damage.

While these failures are addressed by other EALs, this EAL provides appropriate diversity and addresses events which may not be able to be classified on the basis of plant status alone. It is important to note that for the more severe accidents the release may be unmonitored or there may be large uncertainties associated with the source term and/or meteorology.

The TEDE dose which forms the bases for the specified effluent monitor threshold is set at the EPA PAG.

The Table R-1 monitor list includes effluent monitors on all potential release pathways.

Since dose assessment is based on actual meteorology, whereas the monitor reading EAL is not, the results from these assessments may indicate that the classification is not warranted. For this reason, emergency implementing procedures call for the timely performance of dose assessments using actual meteorology and release information. If the results of these dose assessments are available when the classification is made (e.g., initiated at a lower classification level), the dose assessment results override the monitor reading EAL.

Explanation/Discussion/Definitions:

This EAL address gaseous radioactivity releases, that for whatever reason, cause effluent radiation monitor readings corresponding to site boundary doses that exceed 1000 mRem TEDE.

The column GE gaseous effluent release value in Table R-1 corresponds to calculated doses of 100% of the EPA Protective Action Guidelines (TEDE).

Instrumentation that may be used to assess this EAL is listed below:

- SPDS Point B5097 – Offsite Gas Rad Release

  The SPDS point represents the total sum of Rad Gas Releases of the below 4 potential release pathways.

- 9RX680 (RE-4811A) FRVS Vent Noble Gas

  FRVS is normally maintained in a standby condition. Upon FRVS actuation and reactor building isolation, FRVS circulates the reactor building air through HEPA and charcoal filters. Releases are made to the atmosphere via the FRVS Vent Exhaust units.

- 9RX590 (RE-4873B) North Plant Vent (NPV) Noble Gas

  The NPV receives discharge from the gaseous radwaste treatment system (Offgas system), Chem Lab exhaust and solid radwaste area exhaust.

- 9RX580 (RE-4875B) South Plant (SPV) Vent Noble gas

  The SPV receives discharge from the service/radwaste building, reactor building, condensate demineralizer, pipe chase, turbine building mechanical vacuum pumps, gland seal exhaust, and other untreated ventilation sources.

- 9RX518 Hardened Torus Vent (HTV)

  The HTV Rad Gas Release value is a calculated release rate based on HRT Rad detectors 9RX516 (low range) or 9RX517 (high range) and the HTV flow rate. The HTV is not a normal release pathway and is only used when the primary containment is vented per EOP/SAMG guidelines.

If dose assessment results are available, EAL RG1.2 would dictate the need for a General Emergency classification due to abnormal radiation effluents.

Definitions:

IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours (unless a different time is specified).

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.

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, AG1 Example EAL #1
2. HCGS Offsite Dose Calculation Manual (ODCM) Section 3.3.7.11 – Radioactive Gaseous Effluent Monitoring Instrumentation
3. Hope Creek Radiological EAL Setpoint Calculation Document (Attachment 6)

EAL Category: R – Abnormal Rad Levels / Rad Effluent

EAL Subcategory: 1 – Offsite Rad Conditions

Initiating Condition: Off-site dose resulting from an actual or **IMMINENT** release of gaseous radioactivity greater than 1000 mRem TEDE or 5000 mRem Thyroid CDE for the actual or projected duration of the release

EAL# & Classification Level: **RG1.2 – GENERAL EMERGENCY**

OPCON Applicability: All

EAL:

Dose assessment using actual meteorology indicates TEDE 4-day dose **> 4.0E+03 mRem** or Thyroid CDE dose **> 2.0E+04 mRem** at or beyond the **MINIMUM EXCLUSION AREA (MEA)**

Basis:

This EAL addresses radioactivity releases that result in doses at or beyond the **MINIMUM EXCLUSION AREA (MEA)** that exceed the EPA Protective Action Guides (PAGs). Public protective actions will be necessary. Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public and likely involve fuel damage.

While these failures are addressed by other EALs, this EAL provides appropriate diversity and addresses events which may not be able to be classified on the basis of plant status alone. It is important to note that for the more severe accidents the release may be unmonitored or there may be large uncertainties associated with the source term and/or meteorology.

The TEDE dose is set at the EPA PAG, while the 5000 mrem thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

Since dose assessment is based on actual meteorology, whereas the monitor reading EAL is not, the results from these assessments may indicate that the classification is not warranted. For this reason, emergency implementing procedures call for the timely performance of dose assessments using actual meteorology and release information. If the results of these dose assessments are available when the classification is made (e.g., initiated at a lower classification level), the dose assessment results override the monitor reading EAL.

Explanation/Discussion/Definitions:

The dose assessment output on the SSCL is reported at varying distances from the plant as a TEDE 4-Day dose. This TEDE 4-day dose assumes a 4 hr release duration. To obtain the approximate dose for a projected release condition of 1 hour, the TEDE 4-day dose value would need to be divided by 4.

A TEDE 4-Day Dose > 4.0E+03 mRem correspond directly to a TEDE dose rate value of 1000 mRem/hr and exceeds the EPA Protective Actions Guides (PAGs). The Thyroid-CDE Dose > 2.0E+04 mRem correspond directly to an CDE dose rate value of 5000 mRem/hr and exceeds the EPA Protective Actions Guides (PAGs) which was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

For the purposes of this EAL, the Site Boundary for HCGS is the **MINIMUM EXCLUSION AREA** distance; see definition below.

Definitions:

IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours (unless a different time is specified).

MINIMUM EXCLUSION AREA (MEA): The closest location just beyond the **OWNER CONTROLLED AREA** where a member of the general public could gain access. For Hope Creek the **MEA** is 0.56 miles.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, AG1 Example EAL #2
2. Hope Creek Radiological EAL Setpoint Calculation Document (Attachment 6)

EAL Category: R – Abnormal Rad Levels / Rad Effluent

EAL Subcategory: 1 – Offsite Rad Conditions

Initiating Condition: Off-site dose resulting from an actual or **IMMINENT** release of gaseous radioactivity greater than 1000 mRem TEDE or 5000 mRem Thyroid CDE for the actual or projected duration of the release

EAL# & Classification Level: **RG1.3 – GENERAL AREA EMERGENCY**

OPCON Applicability: All

EAL:

Field survey results indicate closed window dose rates **> 1000 mRem/hr** expected to continue for **≥ 1 hr** at or beyond the **PROTECTED AREA BOUNDARY**

OR

Analyses of field survey samples indicate I-131 concentration **> 3.85E-06 μCi/cc** at or beyond the **PROTECTED AREA BOUNDARY**

Basis:

This EAL addresses radioactivity releases that result in doses at or beyond the **PROTECTED AREA BOUNDARY** that exceed the EPA Protective Action Guides (PAGs). Public protective actions will be necessary. Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public and likely involve fuel damage.

While these failures are addressed by other EALs, this EAL provides appropriate diversity and addresses events which may not be able to be classified on the basis of plant status alone. It is important to note that for the more severe accidents the release may be unmonitored or there may be large uncertainties associated with the source term and/or meteorology.

The TEDE dose is set at the EPA PAG, while the 5000 mrem thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

Explanation/Discussion/Definitions:

This EAL addresses a radioactivity release field survey I-131 sample concentration or count rate that would result in a Thyroid CDE dose of greater than 5000 mRem for one hour of inhalation at or beyond the **PROTECTED AREA BOUNDARY**. This value exceeds the EPA Protective Action Guides (PAGs). Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public.

The Iodine-131 field survey sample concentration and count rate threshold is based on I-131 dose conversion factors (DCFs) from EPA-400. The thresholds are based on a Thyroid-CDE Dose Rate of 5000 mRem/hr for I-131.

For the purposes of this EAL, the **PROTECTED AREA BOUNDARY** is used as it is an easily determined location to obtain a field survey dose rate reading or to obtain a field sample.

Definitions:

IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours (unless a different time is specified).

PROTECTED AREA (PA): A security controlled area within the **OWNER-CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, AG1 Example EAL #4
2. HCGS Offsite Dose Calculation Manual Figure 5.1.1-1, Area Plot Plan of Site
3. Hope Creek Radiological EAL Setpoint Calculation Document (Attachment 6)

EAL Category: R – Abnormal Rad Levels / Rad Effluent

EAL Subcategory: 2 – Onsite Rad Conditions/Fuel Pool Events

Initiating Condition: **UNPLANNED** rise in plant radiation levels

OPCON Applicability: All

EAL# & Classification Level: **RU2.1 – UNUSUAL EVENT**

EAL:

UNPLANNED water level drop in the reactor cavity or spent fuel pool (SFP) as indicated by **ANY** of the following:

- Confirmed SFP low level alarm
  Annunciator D1-A5 (FUEL POOL LEVEL HI/LO)
- Reactor Water Level Shutdown Range Indicator LI-R605-B21
- Visual observation (local or remote)

AND

VALID area radiation monitor reading rise on **ANY** of the following:

- Spent Fuel Storage Pool Area (9RX707)
- New Fuel Criticality A Rad (9RX612)
- New Fuel Criticality B Rad (9RX613)
- Temporary Refueling Bridge ARM

Basis:

This EAL addresses increased radiation levels as a result of water level decreases above irradiated fuel or events that have resulted, or may result, in unplanned increases in radiation dose rates within plant buildings. These radiation increases represent a loss of control over radioactive material and represent a potential degradation in the level of safety of the plant.

The refueling pathway is the combination of cavities and pools in which spent fuel may be located. While a radiation monitor could detect an increase in dose rate due to a drop in the water level, it might not be a reliable indication of whether or not the fuel is covered.

For example, an ARM reading may increase due to planned evolutions such as head lift, or even a fuel assembly being raised in the fuel grapple. Also, a monitor could in fact be properly responding to a known event involving transfer or relocation of a source, stored in or near the fuel pool or responding to a planned evolution such as removal of the reactor head. Generally, increased radiation monitor indications will need to combined with another indicator (or personnel report) of water loss.

For refueling events where the water level drops below the RPV flange classification would be via EAL CU3.1. This event escalates to an ALERT per EAL RA2.1 if irradiated fuel outside the RPV is uncovered. For events involving irradiated fuel in the RPV, escalation would be via the Fission Product Barrier Table for events in OPCONS 1-3.

Explanation/Discussion/Definitions:

The fuel pool low level alarm is actuated by level switch LSHL-4657 when fuel pool water level drops below 39 ft 9 in. This alarm is actuated by local panel alarm 10C214 1-1 Fuel Pool Lo Level or 10C214 1-2 Reactor Cavity Low Level. The reactor cavity low level alarms at 75 in. from LISL-N027 (L-11683) reactor vessel level Shutdown Range transmitter 1BBLT-N027 (1CCLT-11683). The annunciator on local Panel 10C214 is always valid for low Spent Fuel Pool level, however it is only enabled for the low reactor cavity water level during refueling operations. The annunciator on local Panel 10C214 alarms on low Spent Fuel Pool level and/or low reactor cavity water level when the annunciator is enabled.

During refueling operations, the reactor cavity is flooded and reactor cavity level indication is monitored on the shutdown instrument range (LI-R605-B21).

When irradiated fuel is not seated in the RPV or SFP storage racks, there still remains the possibility of uncovering irradiated fuel during refueling operations. Therefore, this EAL is applicable for conditions in which irradiated fuel is being transferred to and from the RPV and spent fuel pool as well as for spent fuel pool drain down events.

Area radiation monitors that may respond to a loss of spent fuel shielding are those located on the 201' elevation (refuel floor):

- Spent Fuel Storage Pool Area (9RX707)
- New Fuel Criticality A Rad (9RX612)
- New Fuel Criticality B Rad (9RX613)
- Temporary Refueling Bridge ARM

Definitions:

UNPLANNED: A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions.

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.

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, AU2 Example EAL #1
2. HC.OP-AR.ZZ-0013(Q) Overhead Annunciator Window Box D1-A5
3. HC.OP-AR.EC-0002(Q) Reactor Level Indication Panel 10C214
4. HC.OP-AB.COOL-004(Q) Fuel Pool Cooling
5. HC.OP-AB.CONT-005(Q) Irradiated Fuel Damage
6. UFSAR Table 12.3-9 Area Radiation Monitor Detector Locations
7. UFSAR Section 9.1.3.5 Instrumentation Applications
8. HC.IC-GP.BB-0003(Q) Channel L-11683 / B21-N027 Rx Cavity Floodup Level/RX Shutdown Range Level Setup

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EAL Category: R – Abnormal Rad Levels / Rad Effluent

EAL Subcategory: 2 – Onsite Rad Conditions/Fuel Pool Events

Initiating Condition: **UNPLANNED** rise in plant radiation levels

OPCON Applicability: All

EAL# & Classification Level: **RU2.2 – UNUSUAL EVENT**

EAL:

UNPLANNED VALID area radiation monitor readings or survey results rise by a factor of **1,000** over normal levels (Note 7)

Note 7: Normal levels can be considered as the highest reading in the past 24 hours excluding the current peak value

Basis:

This EAL addresses **UNPLANNED** increases in radiation dose rates within plant buildings. These radiation increases represent a loss of control over radioactive material and represent a potential degradation in the level of safety of the plant.

This EAL excludes radiation level increases that result from planned activities such as use of radiographic sources and movement of radioactive waste materials. A specific list of ARMs is not required as it would restrict the applicability of the threshold. The intent is to identify loss of control of radioactive material in any monitored area.

Explanation/Discussion/Definitions:

Definitions:

UNPLANNED - A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions.

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.

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, AU2 Example EAL #2

EAL Category: R – Abnormal Rad Levels / Rad Effluent

EAL Subcategory: 2 – Onsite Rad Conditions/Fuel Pool Events

Initiating Condition: Damage to irradiated fuel or loss of water level that has resulted or will result in the uncovering of irradiated fuel outside the RPV

OPCON Applicability: All

EAL# & Classification Level: **RA2.1 – ALERT**

EAL:

Damage to irradiated fuel or loss of water level (uncovering irradiated fuel outside the RPV) that causes a **VALID** high alarm on **ANY** of the following radiation monitors:

- Spent Fuel Storage Pool Area (9RX707)
- New Fuel Criticality A Rad (9RX612)
- New Fuel Criticality B Rad (9RX613)
- Refuel Floor Exhaust Duct Rad Channel A (9RX627)
- Refuel Floor Exhaust Duct Rad Channel B (9RX628)
- Refuel Floor Exhaust Duct Rad Channel C (9RX629)

Basis:

This EAL addresses increases in radiation dose rates within plant buildings, and may be a precursor to a radioactivity release to the environment. These events represent a loss of control over radioactive material and represent an actual or substantial potential degradation in the level of safety of the plant.

These events escalate from EAL RU2.1 in that fuel activity has been released, or is anticipated due to fuel heatup. This EAL applies to spent fuel requiring water coverage and is not intended to address spent fuel which is licensed for dry storage.

This EAL addresses radiation monitor indications of fuel uncovery and/or fuel damage.

Increased ventilation monitor readings may be indication of a radioactivity release from the fuel, confirming that damage has occurred. Increased background at the ventilation monitor due to water level decrease may mask increased ventilation exhaust airborne activity and needs to be considered.

While a radiation monitor could detect an increase in dose rate due to a drop in the water level, it might not be a reliable indication of whether or not the fuel is covered.

For example, a refueling bridge ARM reading may increase due to planned evolutions such as head lift, or even a fuel assembly being raised in the fuel grapple. Also, a monitor could in fact be properly responding to a known event involving transfer or relocation of a source, stored in or near the fuel pool or responding to a planned evolution such as removal of the reactor head. Generally, increased radiation monitor indications will need to combined with another indicator (or personnel report) of water loss.

Escalation of this emergency classification level, if appropriate, would be based on EAL RS1.1 or EAL RG1.1.

Explanation/Discussion/Definitions:

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

For a loss of shielding, the source of the radiation is within the reactor cavity or spent fuel pool. Without the shielding provided by normal water inventory, radiation levels from irradiated fuel and activation products will rise substantially.

Area radiation monitors that may alarm in response to damaged spent fuel or loss of spent fuel shielding are those located on the 201' elevation (refuel floor):

- Spent Fuel Storage Pool Area (9RX707)
- New Fuel Criticality A Rad (9RX612)
- New Fuel Criticality B Rad (9RX613)

The Refuel Floor Exhaust Duct Rad Monitors 9RX627, 9RX628 and 9RX629 are process monitors and are designed to detect a release of Fission Products to the Reactor Building atmosphere. Hence, they are included as part of the EAL threshold, to confirm the magnitude of damage to an irradiated fuel bundle. These monitors can also react as Area Radiation Monitors, in the event of rising radiation levels due to lowered shielding, as would occur during a loss of spent fuel pool inventory event. It is important to distinguish between the cause for rising radiation levels when classifying an event under this EAL.

Definitions:

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.

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, AA2 Example EAL #2
2. UFSAR Table 12.3-9 Area Radiation Monitor Detector Locations
3. HC.OP-AR.ZZ-0013(Q) Overhead Annunciator Window Box D1-A5
4. HC.OP-AB.COOL-004(Q) Fuel Pool Cooling
5. HC.OP-AB.CONT-005(Q) Irradiated Fuel Damage
6. HC.RP-AR.SP-0001(Q) RMS Alarm Response
7. HC.OP-AR.ZZ-0019(Q) Overhead Annunciator Window Box E6-A3

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EAL Category: R – Abnormal Rad Levels / Rad Effluent

EAL Subcategory: 2 – Onsite Rad Conditions/Fuel Pool Events

Initiating Condition: Damage to irradiated fuel or loss of water level that has resulted or will result in the uncovering of irradiated fuel outside the RPV

OPCON Applicability: All

EAL# & Classification Level: **RA2.2 – ALERT**

EAL:

A water level drop in the reactor cavity or spent fuel pool that will result in irradiated fuel becoming uncovered

Basis:

This event represents a loss of control over radioactive material and represents an actual or substantial potential degradation in the level of safety of the plant.

This event escalates from EAL RU2.1 in that fuel activity release is anticipated due to fuel heatup. This EAL applies to spent fuel requiring water coverage and is not intended to address spent fuel which is licensed for dry storage.

Indications may include instrumentation such as water level and local area radiation monitors, and personnel (e.g., refueling crew) reports. If available, video cameras may allow remote observation. Depending on available level instrumentation, the declaration threshold may need to be based on indications of water makeup rate or decrease in water storage tank level.

Escalation of this emergency classification level, if appropriate, would be based on EAL RS1.1 or EAL RG1.1.

Explanation/Discussion/Definitions:

None

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, AA2 Example EAL #1

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EAL Category: R – Abnormal Rad Levels / Rad Effluent

EAL Subcategory: 3 – CR/CAS Rad

Initiating Condition: Rise in radiation levels within the facility that impedes operation of systems required to maintain plant safety functions

OPCON Applicability: All

EAL# & Classification Level: **RA3.1 – ALERT**

EAL:

Dose rates **> 15 mR/hr** in the Control Room (9RX710)

Basis:

This EAL addresses increased radiation levels that impact continued operation in areas requiring continuous occupancy to maintain safe operation or to perform a safe shutdown.

The cause and/or magnitude of the increase in radiation levels is not a concern of this EAL. The Emergency Coordinator must consider the source or cause of the increased radiation levels and determine if any other EAL may be involved.

The value of 15mR/hr is derived from the GDC 19 value of 5 rem in 30 days with adjustment for expected occupancy times. Although Section III.D.3 of NUREG-0737, "Clarification of TMI Action Plan Requirements", provides that the 15 mR/hr value can be averaged over the 30 days, the value is used here without averaging, as a 30 day duration implies an event potentially more significant than an Alert.

The area requiring continuous occupancy at Hope Creek is the Control Room.

Explanation/Discussion/Definitions:

The area that meets this threshold at Hope Creek is the Control Room. The Central Alarm Station (CAS) is not included in this EAL because it is located at Salem. Control Room ARM (9RX710) measures area radiation in a range of 1 - 10^4 mR/hr.

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, AA3 Example EAL #1
2. HCGS UFSAR Table 12.3-9 Area Radiation Monitor Detector Locations
3. HC.RP-AR.SP-0001(Q) RMS Alarm Response

EAL Category:	E – **ISFSI**
EAL Sub-category:	Spent Fuel Transit & Storage
Initiating Condition:	Damage to a loaded cask **CONFINEMENT BOUNDARY**
OPCON Applicability:	Mode NOT applicable
EAL# & Classification Level:	**EU1.1 – UNUSUAL EVENT**

EAL:

Damage to a Multi Purpose Canister (MPC) **CONFINEMENT BOUNDARY** as indicated by on-contact radiation readings **≥ 600 mR/hr** (gamma + neutron) on the surface of the spent fuel cask, excluding the air vents, OR **≥ 60 mR/hr** (gamma + neutron) on the top of the spent fuel cask.

Basis:

An UNUSUAL EVENT in this EAL is categorized on the basis of the occurrence of an event of sufficient magnitude that a loaded MPC **CONFINEMENT BOUNDARY** is damaged or violated. This includes classification based on a loaded fuel storage cask **CONFINEMENT BOUNDARY** loss leading to the degradation of the fuel during storage or posing an operational safety problem with respect to its removal from storage.

Explanation/Discussion/Definitions:

This EAL applies to emergency conditions affecting a spent fuel cask caused by an accident or natural phenomena. This EAL would be applicable at all times in all Operational Conditions for a loaded spent fuel storage cask from the time the lid is installed, as the cask leaves the Hope Creek Reactor Building and during transport to and storage at the **INDEPENDENT SPENT FUEL STORAGE INSTALLATION** (**ISFSI**). This EAL provides for an Unusual Event classification, which may be entered if conditions occur that have the potential for damaging or degrading the **CONFINEMENT BOUNDARY** of a spent fuel cask. Damage to the storage cask could result in an increase in direct radiation readings from the cask. A similar Salem EAL is only applicable for a Salem spent fuel cask that is in transit to the **ISFSI**. After the spent fuel cask is in place at the **ISFSI**, any further conditions that could adversely impact the **ISFSI** or an individual cask from either Salem or Hope Creek would be assessed and classified as needed by the Hope Creek Shift Manager (SM) per this EAL.

As provided in the Holtec HI-STORM 100 System Certificate of Compliance (CoC), Appendix A (Technical Specifications), Section 5.7.4 contains radiation values for the cask that should not be exceeded. Under Amendment #5, the highest allowable radiation level on contact with the HI-STORM 100 cask body is 300 mR/hr on the side of the cask and 30 mR/hr on the top of the cask. Keeping in line with NEI guidance that a UE is warranted for radiation conditions at a level of twice the Technical Specification value, **600 mR/hr** and **60 mR/hr** are being used as the EAL threshold radiation levels.

Continued use of this lower value is conservative for casks loaded under later CoC amendments where the radiation limit values may increase. The threshold values are sufficiently above nominal radiation levels of the **CONFINEMENT BOUNDARY** that radiation levels above this EAL threshold would indicate significant damage to the **CONFINEMENT BOUNDARY**.

No releases of radioactive material requiring offsite response or monitoring are expected because the seal-welded spent fuel canister (part of the **CONFINEMENT BOUNDARY**) is designed to remain intact under all normal, off-normal, and credible accident conditions of onsite transport and storage at the **ISFSI**, according to Holtec licensing documents. Prior to the installation of the spent fuel cask lid on the HI-STORM 100 cask, emergency classifications would be based on other Category R EALs.

Definitions:

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.

CONFINEMENT BOUNDARY: Is the barrier(s) between areas containing radioactive substances and the environment and includes the multi-purpose canister (MPC) and, for the purposes of this EAL, the associated cask shielding.

EAL Basis Reference(s):

1. NEI 99-01 Rev. 5, E-HU1 Example EAL #1
2. HOLTEC HI-STORM 100 UFSAR, Chapter 5 and Chapter 11
3. Certificate of Compliance, Docket # 72-1014
4. Holtec International Final Safety Analysis Report for the HI-STORM 100 Cask System Holtec Report No.: HI-2002444
5. Certificate of Compliance No. 72-1014 Appendix A Technical Specifications for the HI-STORM 100 Cask System Section 1.1 Definitions

EALs for:

HAZARDS

EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 1 – Natural & Destructive Phenomena

Initiating Condition: Natural or destructive phenomena affecting the **PROTECTED AREA**

OPCON Applicability: All

EAL# & Classification Level: **HU1.1 – UNUSUAL EVENT (Common Site)**

EAL:

Seismic event identified by **ANY** two of the following:

- Earthquake felt in plant by Control Room Operators
- SMA-3 Event Indicator (flag) white on Panel 10C673
- National Earthquake Information Center (NEIC) (Note 4)

Note 4: The NEIC can be contacted by calling (303) 273-8500. Select option #1 and inform the analyst you wish to confirm recent seismic activity in the vicinity of Salem/Hope Creek Generating Station. Provide the analyst with the following coordinates: 39° 27' 46" (39.465°) north latitude, 75° 32' 08" (75.537°) west longitude.

Basis:

This EAL is categorized on the basis of the occurrence of an event of sufficient magnitude to be of concern to plant operators.

Damage may be caused to some portions of the site, but should not affect ability of safety functions to operate.

As defined in the EPRI-sponsored Guidelines for Nuclear Plant Response to an Earthquake, dated October 1989, a "felt earthquake" is: An earthquake of sufficient intensity such that: (a) the vibratory ground motion is felt at the nuclear plant site and recognized as an earthquake based on a consensus of control room operators on duty at the time, and (b) for plants with operable seismic instrumentation, the seismic switches of the plant are activated.

The National Earthquake Information Center can confirm if an earthquake has occurred in the area of the plant.

Explanation/Discussion/Definitions:

The HCGS seismic instrumentation consists of a Kinemetrics SMA-3 Strong Motion Accelerograph (Auxiliary Building Upper Relay Room) and associated sensors that are equipped with seismic triggers set to alarm and initiate recording at an acceleration equal to or exceeding 0.01 g. When the seismic trigger activates the SMA-3 Event Indicator (flag) will change from black to white and the amber event alarm will illuminate. The amber event alarm will extinguish when ground acceleration reduces below the 0.01 g setpoint but the Event Indicator (flag) will remain white until manually reset. Three time-history triaxial acceleration sensors are provided. These sensors transmit electrical signals to the Upper Relay Room where they are recorded on magnetic tape.

The National Earthquake Information Center (NEIC) can confirm seismic activity in the vicinity of the SGS/HCGS site. Refer to Note 4 to contact the NEIC.

Alternatively go to the USGS NEIC website:

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

On the US map, click on 'New Jersey' and then click on earthquake indicator for information. The maps are updated within 5 min. of a measured earthquake.

Additional Earthquake information can be found on the internet at:

- http://www.earthquake.usgs.gov
- http://www.mgs.md.gov (click on "Live Earthquake Data online")
- http://earthquake.usgs.gov/regional/neic

This event escalates to an ALERT under EAL HA1.1 if the earthquake exceeds Operating Basis Earthquake (OBE) levels (0.1g).

An approximate relationship between acceleration units in gravity and magnitude reported per the Richter scale is as follows:

An Acceleration of:	is approx. equal to a Richter Scale Magnitude of:
0.01g	4.0
0.02g	4.5
0.1g	5.5
0.2g	6.5

Definitions:

PROTECTED AREA (PA): A security controlled area within the **OWNER CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HU1 Example EAL #1
2. HC.OP-SO.SG-001(Z) Seismic Instrumentation System Operation
3. HC.OP-AB.MISC-001(Q) Acts of Nature
4. HC.OP-AR.ZZ-0011(Q) Overhead Annunciator Window Box C6
5. UFSAR 2.1.1.1 Specification of Location
6. UFSAR 1.2.1.5 Seismology

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EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 1 – Natural & Destructive Phenomena

Initiating Condition: Natural or destructive phenomena affecting the **PROTECTED AREA**

OPCON Applicability: All

EAL# & Classification Level: **HU1.2 – UNUSUAL EVENT (Common Site)**

EAL:

Tornado TOUCHING DOWN within the **PROTECTED AREA**

OR

Average Wind Speeds **> 95 MPH** from **ANY** elevation of the Met Tower

Basis:

This EAL is categorized on the basis of the occurrence of an event of sufficient magnitude to be of concern to plant operators.

This EAL is based on a tornado touching down within the **PROTECTED AREA** or high winds onsite

Escalation of this emergency classification level, if appropriate, would be based on **VISIBLE DAMAGE**, or by other in-plant conditions, via EAL HA1.2.

Explanation/Discussion/Definitions:

Average, as used in the EAL threshold, is intended to be the 15 minute average as provided on SPDS and not the instantaneous wind speed.

The design wind velocities are 108 mph (including a gust factor of approximately 1.3) at 30 feet above ground. However, the Control Room wind speed only provides indication up to 100 mph so the classification threshold has been capped at 95 mph to allow for onscale indication of wind speed. The SPDS display provides wind speed readings on a 15-minute average. The manner in which the HCGS SPDS processes data from the meteorological instrumentation differs from the SGS SPDS; consequently, minor differences between HCGS and SGS readings may occur.

A tornado 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.

The National Weather Service can be contacted for further information about existing or projected Adverse Weather Conditions:

- Phila/Mount Holly (609) 261-6600
- NWS Web site http://www.erh.noaa.gov/er/phi
- Phila/Mount Holly (609) 261-6604
- Phila/Mount Holly (609) 261-6602

Definitions:

PROTECTED AREA (PA): A security controlled area within the **OWNER CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

VISIBLE DAMAGE: Damage to equipment or structure that is readily observable without measurements, testing, or analysis. Damage is sufficient to cause concern regarding the continued operability or reliability of the affected structure, system, or component. Example damage includes: deformation due to heat or impact, denting, penetration, rupture, cracking, and paint blistering. Surface blemishes (e.g., paint chipping, scratches) should not be included.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HU1 Example EAL #2
2. UFSAR 3.3.1.1 Design wind Velocity
3. OP-AA-108-111-1001 Severe Weather and Natural Disaster Guidelines
4. NC.CH-SC-MET-1206(Q) Meteorological Monitoring System Calibration and Maintenance
5. HC.OP-AB.MISC-0001 (Q) Acts of Nature

EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 1 – Natural & Destructive Phenomena

Initiating Condition: Natural or destructive phenomena affecting the **PROTECTED AREA**

OPCON Applicability: All

EAL# & Classification Level: **HU1.3 – UNUSUAL EVENT**

EAL:

Main Turbine rotating component failures resulting in **EITHER** of the following:

- Main Turbine casing penetration
- Main Turbine or Generator Seal Damage

Basis:

This EAL is categorized on the basis of the occurrence of an event of sufficient magnitude to be of concern to plant operators.

This EAL addresses main turbine rotating component failures of sufficient magnitude to cause observable damage to the turbine casing or to the seals of the turbine generator. Generator seal damage observed after generator purge does not meet the intent of this EAL because it did not impact normal operation of the plant.

Of major concern is the potential for leakage of combustible fluids (lubricating oils) and gases (hydrogen cooling) to the plant environs. Actual fires and flammable gas build up are appropriately classified via EAL HU2.1 and EAL HU3.1.

This EAL is consistent with the definition of an UNUSUAL EVENT while maintaining the anticipatory nature desired and recognizing the risk to non-safety related equipment.

Escalation of this emergency classification level, if appropriate, would be to EAL HA1.3 based on damage done by projectiles generated by the failure or by any radiological releases in category R.

Explanation/Discussion/Definitions:

Main Turbine rotating component failures of sufficient magnitude to cause damage to the turbine casing or turbine/generator seals increases the potential for leakage of combustible/explosive gases and of combustible liquids to the Turbine Building or damage to plant systems due to **PROJECTILES**. The presence of H_2 gas in sufficient quantities may present a combustion hazard. Actual fires and flammable gas build up is classified under fire and flammable gas EALs.

Generator seal damage observed after generator purge does not meet the intent of this EAL since it did not impact normal plant operations.

Turbine rotating component failures may also result in other direct damage to plant systems and components. Damage may rupture the turbine lubricating oil system, which would release flammable liquids to the Turbine Building. Potential rupture of the condenser and condenser tubes may cause flooding in the lower levels of the Turbine Building. This damage should be readily observable.

Escape of H_2 gas from the generator due to a loss of seal oil pumps or turbine lube oil without a turbine rotating component failure should not be classified under this event but should be reviewed IAW EALs in Subcategory H.3, Hazardous Gas.

Definitions:

PROTECTED AREA (PA): A security controlled area within the **OWNER CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA.**

PROJECTILE: An object that impacts Salem and/or Hope Creek that could cause concern for continued operability, reliability or personnel safety.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HU1 Example EAL #4
2. UFSAR 3.5.1.3 Turbine Missiles
3. HC.OP-AB.BOP-0002 (Q) Main Turbine

EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 1 – Natural & Destructive Phenomena

Initiating Condition: Natural or destructive phenomena affecting the **PROTECTED AREA**

OPCON Applicability: All

EAL# & Classification Level: **HU1.4 – UNUSUAL EVENT**

EAL:

Visual Observation of **Flooding** in **ANY** **Table H-1** structures that confirms **ANY** of the following:

- Reactor Building Floor Levels above the Maximum Normal Floor Level (> 1 in.) referenced in EOP 103 / 104, Reactor Building and Radioactive Release Control
- Receipt of SSWS Pump Room Flooded Alarm A1-B2 (PUMP ROOM FLOODED)
- Greater than 2 in. of water in **ANY** other area that contains a **Safety System(s)**

AND

The Safety Related Equipment is required by Technical Specifications for the present operational condition (OPCON)

Table H-1 Plant Structures Containing Safe Shutdown Systems or Components
• Reactor Building • Control/Auxiliary Building • Service Water Intake Structure • Service/Radwaste Building

Basis:

This EAL is categorized on the basis of the occurrence of an event of sufficient magnitude to be of concern to plant operators.

This EAL addresses the effect of internal flooding caused by events such as component failures, equipment misalignment, or outage activity mishaps.

Escalation of this emergency classification level, if appropriate, would be based **DEGRADED PERFORMANCE** via EAL HA1.4, or by other plant conditions.

Explanation/Discussion/Definitions:

Flooding as used in this EAL describes a condition where water is entering the room faster than installed equipment is capable of removal, resulting in a rise of water level within the room. Classification of this EAL should not be delayed while corrective actions are being taken to isolate the water source.

Flooding in the structures listed in Table H-1 represents the potential to directly impact continued safe operation of the plant. This EAL specifically addresses those areas of the plant where **flooding** presents a challenge to Safety System(s). Visual Observation of the **flooding** should occur prior to classification to validate any alarm conditions. **Flooding** is an event or condition in excess of the available sump pump handling capability (installed or temporary) that has the potential to affect a safety system(s) required for the present operational condition (OPCON) and is not the result of a controlled/preplanned evolution.

Events classified under this EAL, for example, include the effects of flooding from system malfunctions, component failures, or repair activity failures (such as a failed freeze seal). Those events that result in the **flooding** of an area as the direct result of a planned evolution, such as system draining in preparation for an equipment outage, do not warrant event classification, unless the draining cannot be successfully terminated. Safety System is any system or component included in the Technical Specification.

For the purpose of implementing this EAL, levels in the Reactor Building that would require classification under this EAL are defined as the Maximum Normal Floor Level in the EOPs. Exceeding this level in any of the Reactor Building areas would require running all available sump pumps. If level in these areas cannot be lowered to below the 1 in. level, systems discharging into this area are to be isolated, except for systems required to:

- Ensure adequate core cooling
- Shutdown the reactor
- Protect primary containment integrity
- Suppress a fire

SSWS Pump Room Flooded Alarm Overhead Annunciator A1-B2 (PUMP ROOM FLOODED) is fed from the following CRID points: D5518, D5519, D5533 and D5534. The setpoint for the SSWS Pump Room Flooded Alarm is 1" for either A/C SSW pump room or B/D SSW pump room. Possible causes for flooding in these areas are an Service Water System leak (strainer, pump, valve, pipe), Fire Protection System leak, or Sump Pump malfunction.

Definitions:

PROTECTED AREA (PA): A security controlled area within the **OWNER CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

DEGRADED PERFORMANCE: Assessment of degraded safe shutdown system performance includes examination of systems in standby status as well as those in operation. When a safe shutdown system is in operation, its performance can be directly observed and compared to its design capability (e.g., rated flow is required but cannot be achieved). When an operating safe shutdown system cannot fulfill its design function, its performance is degraded. When a safe shutdown system is in standby, its performance capability may not be readily determined. One or more of the following can provide indirect indication of its performance capability:

- Electrical faults on power supplies
- Normally closed breakers in tripped position
- System annunciators activated
- System warning lights lit
- Insufficient system pressure from keep-fill pumps
- Elevated area temperatures or radiation levels
- Increased sump pump operation in areas in which the system is located

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HU1 Example EAL #3
2. HC.OP-EO.ZZ-0103/4 (Q)-FC Reactor Building and Radioactive Release Control
3. HC.OP-AR.ZZ-0001(Q) Overhead Annunciator Window Box A1

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EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 1 – Natural & Destructive Phenomena

Initiating Condition: Natural or destructive phenomena affecting the **PROTECTED AREA**

OPCON Applicability: All

EAL# & Classification Level: **HU1.5 – UNUSUAL EVENT (Common Site)**

EAL:

River level **> 99.5'**
OR
River level **< 80.0'**

Basis:

See Explanation Section below:

Explanation/Discussion/Definitions:

The first condition of this EAL indicates river level conditions that can threaten the level of safety of the plant due to flooding. River level > **99.5'** (+10.5' Mean Steam Line, MSL) is indication of impending site flood conditions. Flood protection measures are required by Hope Creek Technical Specifications and procedure at 95.0' (+6.0' MSL). At this river level precautionary actions are taken, including filling outside tanks and ensuring that perimeter flood doors are closed. These actions ensure that the facility flood protection features are in place prior to a river level which would necessitate their use.

The high river level threshold is at the river level that would require a plant shutdown. Hope Creek Technical Specification actions required by a river level of > **99.5'** includes placing the plant in at least Hot Shutdown within the next 12 hours and in Cold Shutdown within the next 24 hours.

The grade level at the Salem station is lower than that for Hope Creek (Salem = **99.5'**, Hope Creek = 101.5').

The second condition of this EAL indicates river level conditions, River level **< 80.0'** (-9.0'MSL), approaching the loss of the Service Water Intake (Ultimate Heat Sink). This level is one foot lower than the historical low water level of 81.0' (-8.0'MSL) (December 31, 1962) and is higher than the Service Water pumps design level.

These events will be escalated based on damage to plant safety systems, loss of fission product barriers or abnormal radiological releases as discussed in other EAL categories.

River level indication is displayed on LR-2220-1(2) which has a range of 72' to 102'.

The National Weather Service can be contacted for further information about existing or projected Adverse Weather Conditions:

- Phila/Mount Holly (609) 261-6600
- NWS Web site http://www.erh.noaa.gov/er/phi
- Phila/Mount Holly (609) 261-6604
- Phila/Mount Holly (609) 261-6602

Definitions:

PROTECTED AREA (PA): A security controlled area within the **OWNER CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HU1 Example EAL #5
2. HC.OP-AB.MISC-0001 (Q) Acts of Nature
3. Technical Specification Section 3/4.7.3
4. Technical Specification Section 3/4.7.1.3
5. UFSAR 2.4 Hydraulic Engineering
6. UFSAR Figure 2.4-3 Datum and Water Level Relationships
7. OP.SH-108-111-1001 Severe Weather and National Disaster Guidelines

EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 1 – Natural & Destructive Phenomena

Initiating Condition: Natural or destructive phenomena affecting **VITAL AREAS**

OPCON Applicability: All

EAL# & Classification Level: **HA1.1 – ALERT**

EAL:

Actuation of the OBE Seismic Switch (**> 0.1 g**) as indicated by **EITHER**:

- Annunciator C6-C4 (SEISMIC MON PNL C673) activated
- Amber alarm light on the Seismic Switch Power Supply Drawer Panel 10C673

AND

Earthquake confirmed by **ANY** of the following:

- Earthquake felt in plant by Control Room Operators
- National Earthquake Information Center (NEIC) (Note 4)
- Control Room indication of **DEGRADED PERFORMANCE** of safe shutdown systems

Note 4: The NEIC can be contacted by calling (303) 273-8500. Select option #1 and inform the analyst you wish to confirm recent seismic activity in the vicinity of Salem/Hope Creek Generating Station. Provide the analyst with the following coordinates: 39° 27' 46" (39.465°) north latitude, 75° 32' 08" (75.537°) west longitude.

Basis:

This EAL escalates from HU1.1 in that the occurrence of the event may have resulted in damage to plant structures or areas containing equipment necessary for a safe shutdown, or may have caused damage to the safety systems in those structures evidenced by Control Room indications of degraded system response or performance. The occurrence of damage and/or degraded system response is intended to discriminate against lesser events. The initial report should not be interpreted as mandating a lengthy damage assessment prior to classification. No attempt is made in this EAL to assess the actual magnitude of the damage.

The significance here is not that a particular system or structure was damaged, but rather, that the event was of sufficient magnitude to cause this degradation.

Escalation of this emergency classification level, if appropriate, would be based on System Malfunction EALs.

Seismic events of this magnitude can result in a **VITAL AREA** being subjected to forces beyond design limits, and thus damage may be assumed to have occurred to plant safety systems.

The National Earthquake Information Center can confirm if an earthquake has occurred in the area of the plant.

Explanation/Discussion/Definitions:

Ground motion acceleration of 0.1g is the Operating Basis Earthquake (OBE) for HCGS.

HCGS seismic instrumentation consists of a Kinemetrics SMA-3 Strong Motion Accelerograph (Auxiliary Building Upper Relay Room) and associated sensors that are equipped with seismic triggers set to alarm and initiate recording at an acceleration equal to or exceeding 0.01 g. When the seismic trigger activates the SMA-3 Event Indicator (flag) will change from black to white and the amber event alarm will illuminate. The amber event alarm will extinguish when ground acceleration reduces below the 0.01 g setpoint but the Event Indicator (flag) will remain white until manually reset.

The amber Seismic Switch Event Alarm on the Seismic Switch Power Supply (SP-1) will illuminate at an acceleration equal to or exceeding 0.1 g (OBE). This also annunciates the seismic activity alarm C6-C4 (SEISMIC MON PNL C673). Three time-history triaxial acceleration sensors are provided. These sensors transmit electrical signals to the Upper Relay room where they are recorded on magnetic tape. These tapes are analyzed to determine the exact magnitude of the seismic event and to confirm whether the OBE has been exceeded.

As defined in the EPRI-sponsored Guidelines for Nuclear Plant Response to an Earthquake, dated October 1989, a "felt earthquake" is: An earthquake of sufficient intensity such that: (a) the vibratory ground motion is felt at the nuclear plant site and recognized as an earthquake based on a consensus of Control Room operators on duty at the time, and (b) for plants with operable seismic instrumentation, the seismic switches of the plant are activated.

The National Earthquake Information Center (NEIC) can confirm seismic activity in the vicinity of the SGS/HCGS site. Refer to Note 4 to contact the NEIC.

Alternatively go to the USGS NEIC website:

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

On the US map, click on 'New Jersey' and then click on earthquake indicator for information. The maps are updated within 5 min. of a measured earthquake.

Additional Earthquake information can be found on the internet at:

- http://www.earthquake.usgs.gov
- http://www.mgs.md.gov (click on "Live Earthquake Data online")
- http://earthquake.usgs.gov/regional/neic

An approximate relationship between acceleration units in gravity and magnitude reported per the Richter scale is as follows:

An Acceleration of:	is approx. equal to a Richter Scale Magnitude of:
0.01g	4.0
0.02g	4.5
0.1g	5.5
0.2g	6.5

Definitions:

VITAL AREA: Typically any site specific areas, normally within the **PROTECTED AREA**, that contains equipment, systems, components, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

DEGRADED PERFORMANCE: Assessment of degraded safe shutdown system performance includes examination of systems in standby status as well as those in operation. When a safe shutdown system is in operation, its performance can be directly observed and compared to its design capability (e.g., rated flow is required but cannot be achieved). When an operating safe shutdown system cannot fulfill its design function, its performance is degraded. When a safe shutdown system is in standby, its performance capability may not be readily determined. One or more of the following can provide indirect indication of its performance capability:

- Electrical faults on power supplies
- Normally closed breakers in tripped position
- System annunciators activated
- System warning lights lit

- Insufficient system pressure from keep-fill pumps
- Elevated area temperatures or radiation levels
- Increased sump pump operation in areas in which the system is located

PROTECTED AREA (PA): A security controlled area within the **OWNER CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HA1 Example EAL #1
2. HC.OP-SO.SG-001(Z) Seismic Instrumentation System Operation
3. HC.OP-AB.MISC-001(Q) Acts of Nature
4. HC.OP-AR.ZZ-0011(Q) Overhead Annunciator Window Box C6
5. UFSAR 2.1.1.1 Specification of Location
6. UFSAR 1.2.1.5 Seismology

EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 1 – Natural & Destructive Phenomena

Initiating Condition: Natural or destructive phenomena affecting **VITAL AREAS**

OPCON Applicability: All

EAL# & Classification Level: **HA1.2 – ALERT**

EAL:

Tornado TOUCHING DOWN within the **PROTECTED AREA**

OR

Average Wind Speeds **> 95 MPH** from **ANY** elevation of the Met Tower

AND

Resulting in **EITHER** of the following:

- Control Room indication of **DEGRADED PERFORMANCE** of a Safety System
- **VISIBLE DAMAGE** to **ANY** of the **plant** structures in **Table H-1**

Table H-1 Plant Structures Containing Safe Shutdown Systems or Components
• Reactor Building • Control/Auxiliary Building • Service Water Intake Structure • Service/Radwaste Building

Basis:

This EAL escalates from EAL HU1.2 in that the occurrence of the event has resulted in **VISIBLE DAMAGE** to plant structures or areas containing equipment necessary for a safe shutdown, or has caused damage to the safety systems in those structures evidenced by Control Room indications of degraded system response or performance. The occurrence of **VISIBLE DAMAGE** and/or degraded system response is intended to discriminate against lesser events. The initial report should not be interpreted as mandating a lengthy damage assessment prior to classification. No attempt is made in this EAL to assess the actual magnitude of the damage. The significance here is not that a particular system or structure was damaged, but rather, that the event was of sufficient magnitude to cause this degradation.

Escalation of this emergency classification level, if appropriate, would be based on System Malfunction EALs.

This EAL is based on a tornado touching down or high winds that have caused **VISIBLE DAMAGE** to structures containing functions or systems required for safe shutdown of the plant.

Explanation/Discussion/Definitions:

Average, as used in the EAL threshold, is intended to be the 15 minute average as provided on SPDS and not the instantaneous wind speed.

The design wind velocities are 108 mph (including a gust factor of approximately 1.3) at 30 feet above ground for Seismic Category I structures. However, the Control Room wind speed only provides a display up to 100 mph so the classification threshold has been capped at 95 mph to allow for onscale indication of wind speed. The SPDS display provides wind speed readings on a 15-minute average. The manner in which the HCGS SPDS processes data from the meteorological instrumentation differs from the SGS SPDS; consequently, minor differences between HCGS and SGS readings may occur.

The ALERT classification is appropriate if relevant plant parameters indicate that the performance of safety systems has been degraded. No attempt should be made to fully inventory the actual magnitude of the damage or quantify the degradation of safety system performance prior to declaration of an ALERT under this threshold. The declaration of an ALERT and the activation of the TSC provide the Emergency Coordinator with the resources needed to perform detailed damage assessments.

The National Weather Service can be contacted for further information about existing or projected Adverse Weather Conditions:

- Phila/Mount Holly (609) 261-6600
- NWS Web site http://www.erh.noaa.gov/er/phi
- Phila/Mount Holly (609) 261-6604
- Phila/Mount Holly (609) 261-6602

Definitions:

VITAL AREA: Typically any site specific areas, normally within the **PROTECTED AREA**, that contains equipment, systems, components, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

DEGRADED PERFORMANCE: Assessment of degraded safe shutdown system performance includes examination of systems in standby status as well as those in operation. When a safe shutdown system is in operation, its performance can be directly observed and compared to its design capability (e.g., rated flow is required but cannot be achieved). When an operating safe shutdown system cannot fulfill its design function, its performance is degraded. When a safe shutdown system is in standby, its performance capability may not be readily determined. One or more of the following can provide indirect indication of its performance capability:

- Electrical faults on power supplies
- Normally closed breakers in tripped position
- System annunciators activated
- System warning lights lit
- Insufficient system pressure from keep-fill pumps
- Elevated area temperatures or radiation levels
- Increased sump pump operation in areas in which the system is located

PROTECTED AREA (PA): A security controlled area within the **OWNER CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

VISIBLE DAMAGE: Damage to equipment or structure that is readily observable without measurements, testing, or analysis. Damage is sufficient to cause concern regarding the continued operability or reliability of the affected structure, system, or component. Example damage includes: deformation due to heat or impact, denting, penetration, rupture, cracking, and paint blistering. Surface blemishes (e.g., paint chipping, scratches) should not be included.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HA1 Example EAL #2
2. UFSAR 3.3.1.1 Design Wind Velocity
3. UFSAR Table 3.2-1 HCGS Classification of Structures, Systems and Components
4. OP-AA-108-111-1001 Severe Weather and Natural Disaster Guidelines
5. NC.CH-SC-MET-1206(Q) Meteorological Monitoring System Calibration and Maintenance
6. HC.OP-AB.MISC-0001 (Q) Acts of Nature

EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 1 – Natural & Destructive Phenomena

Initiating Condition: Natural or destructive phenomena affecting **VITAL AREAS**

OPCON Applicability: All

EAL# & Classification Level: **HA1.3 – ALERT**

EAL:

Turbine failure-generated **PROJECTILES** resulting in EITHER of the following:

- **VISIBLE DAMAGE** to ANY **Table H-1** plant structures
- Control Room indication of **DEGRADED PERFORMANCE** of safe shutdown systems

Table H-1 Plant Structures Containing Safe Shutdown Systems or Components
• Reactor Building
• Control/Auxiliary Building
• Service Water Intake Structure
• Service/Radwaste Building

Basis:

This EAL escalates from EAL HU1.3 in that the occurrence of the event has resulted in **VISIBLE DAMAGE** to plant structures or areas containing equipment necessary for a safe shutdown, or has caused damage to the safety systems in those structures evidenced by Control Room indications of degraded system response or performance. The occurrence of **VISIBLE DAMAGE** and/or degraded system response is intended to discriminate against lesser events. The initial report should not be interpreted as mandating a lengthy damage assessment prior to classification. No attempt is made in this EAL to assess the actual magnitude of the damage. The significance here is not that a particular system or structure was damaged, but rather, that the event was of sufficient magnitude to cause this degradation.

Escalation of this emergency classification level, if appropriate, would be based on System Malfunction EALs.

This EAL addresses the threat to safety related equipment imposed by **PROJECTILES** generated by main turbine rotating component failures. Therefore, this EAL is consistent with the definition of an ALERT in that the potential exists for actual or substantial potential degradation of the level of safety of the plant.

Explanation/Discussion/Definitions:

Definitions:

VITAL AREA: Typically any site specific areas, normally within the **PROTECTED AREA**, that contains equipment, systems, components, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

DEGRADED PERFORMANCE: Assessment of degraded safe shutdown system performance includes examination of systems in standby status as well as those in operation. When a safe shutdown system is in operation, its performance can be directly observed and compared to its design capability (e.g., rated flow is required but cannot be achieved). When an operating safe shutdown system cannot fulfill its design function, its performance is degraded. When a safe shutdown system is in standby, its performance capability may not be readily determined. One or more of the following can provide indirect indication of its performance capability:

- Electrical faults on power supplies
- Normally closed breakers in tripped position
- System annunciators activated
- System warning lights lit
- Insufficient system pressure from keep-fill pumps
- Elevated area temperatures or radiation levels
- Increased sump pump operation in areas in which the system is located

PROTECTED AREA (PA): A security controlled area within the **OWNER CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

VISIBLE DAMAGE: Damage to equipment or structure that is readily observable without measurements, testing, or analysis. Damage is sufficient to cause concern regarding the continued operability or reliability of the affected structure, system, or component. Example damage includes: deformation due to heat or impact, denting, penetration, rupture, cracking, and paint blistering. Surface blemishes (e.g., paint chipping, scratches) should not be included.

PROJECTILE: An object that impacts Salem and/or Hope Creek that could cause concern for continued operability, reliability or personnel safety.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HA1 Example EAL #4
2. UFSAR 3.5.1.3 Turbine Missiles
3. UFSAR Table 3.2-1 HCGS Classification of Structures, Systems and Components
4. HC.OP-AB.BOP-0002 (Q) Main Turbine

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EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 1 – Natural & Destructive Phenomena

Initiating Condition: Natural or destructive phenomena affecting **VITAL AREAS**

OPCON Applicability: All

EAL# & Classification Level: **HA1.4 – ALERT**

EAL:

Visual Observation of **Flooding** in **ANY** **Table H-1** structures that confirms **ANY** of the following:

- Reactor Building Floor Levels above the Maximum Normal Floor Level (> 1 in.) referenced in EOP 103 / 104, Reactor Building and Radioactive Release Control
- Receipt of SSWS Pump Room Flooded Alarm A1-B2 (PUMP ROOM FLOODED)
- Greater than 2 in. of water in **ANY** other area that contains a **Safety System(s)**

AND

The **Flooding** is of a magnitude that results in **EITHER** of the following:

- Indication of **DEGRADED PERFORMANCE** of a **Safety System** within a **Table H-1** Structure.
- An Industrial Safety Hazard (Electrical Shock, High Temp, etc.) resulting in access restrictions to operate or monitor **Safety System** equipment.

Table H-1 Plant Structures Containing Safe Shutdown Systems or Components
• Reactor Building
• Control/Auxiliary Building
• Service Water Intake Structure
• Service/Radwaste Building

Basis:

This EAL escalates from EAL HU1.4 in that the occurrence of the event has resulted in an electrical shock hazard precluding access to plant structures containing safe shutdown systems or components or damage to the safety systems or components in those structures as evidenced by Control Room indications of degraded system response or performance. The lack of access or occurrence of degraded system response is intended to discriminate against lesser events. The initial report should not be interpreted as mandating a lengthy assessment prior to classification. No attempt is made in this EAL to assess the actual magnitude of any damage. The significance here is not that a particular system or structure was damaged, but rather, that the event was of sufficient magnitude to cause this lack of access or performance degradation.

Escalation of this emergency classification level, if appropriate, would be based on System Malfunction EALs.

This EAL addresses the effect of internal **flooding** caused by events such as component failures, equipment misalignment, or outage activity mishaps. It is based on the **DEGRADED PERFORMANCE** of systems, or has created industrial safety hazards (e.g., electrical shock) that preclude necessary access to operate or monitor safety equipment. The inability to access, operate or monitor safety equipment represents an actual or substantial potential degradation of the level of safety of the plant.

Flooding as used in this EAL describes a condition where water is entering the room faster than installed equipment is capable of removal, resulting in a rise of water level within the room. Classification of this EAL should not be delayed while corrective actions are being taken to isolate the water source.

Explanation/Discussion/Definitions:

Flooding is an event or condition in excess of the available sump pump handling capability (installed or temporary) that results in a condition where water is entering a room faster than it is being removed resulting in a rise in water level within the room. Classification should not be delayed while taking corrective actions to isolate the source of the **flooding**. This EAL addresses the effects of **Flooding** caused by events such as component failures, equipment misalignment, or outage activity mishaps where **Flooding** is occurring in areas that affect safety related equipment. This EAL is based on the degraded performance of systems, or has created industrial safety hazards (electrical shock) that preclude necessary access to operate or monitor safety equipment. The inability to access, operate or monitor safety equipment represents an actual or substantial potential degradation of the level of safety of the plant meeting the definition of an ALERT.

In those cases where it is believed that **DEGRADED PERFORMANCE** due to **flooding** may have caused damage to a Safety System, an ALERT declaration is warranted since the full extent of the damage need not be known. A Safety System is defined as any system required to maintain safe operation or to establish or maintain Cold Shutdown.

SSWS Pump Room Flooded Alarm Overhead Annunciator A1-B2 (PUMP ROOM FLOODED) is fed from the following CRID points: D5518, D5519, D5533 and D5534. The setpoint for the SSWS Pump Room Flooded Alarm is 1" for either A/C SSW pump room or B/D SSW pump room. Possible causes for flooding in these areas are an Service Water System leak (strainer, pump, valve, pipe), Fire Protection System leak, or Sump Pump malfunction.

Definitions:

VITAL AREA: Typically any site specific areas, normally within the **PROTECTED AREA**, that contains equipment, systems, components, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

DEGRADED PERFORMANCE: Assessment of degraded safe shutdown system performance includes examination of systems in standby status as well as those in operation. When a safe shutdown system is in operation, its performance can be directly observed and compared to its design capability (e.g., rated flow is required but cannot be achieved). When an operating safe shutdown system cannot fulfill its design function, its performance is degraded. When a safe shutdown system is in standby, its performance capability may not be readily determined. One or more of the following can provide indirect indication of its performance capability:

- Electrical faults on power supplies
- Normally closed breakers in tripped position
- System annunciators activated
- System warning lights lit
- Insufficient system pressure from keep-fill pumps
- Elevated area temperatures or radiation levels
- Increased sump pump operation in areas in which the system is located

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OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HA1 Example EAL #3
2. HC.OP-EO.ZZ-0103/4 (Q)-FC Reactor Building and Radioactive Release Control
3. HC.OP-AR.ZZ-0001(Q) Overhead Annunciator Window Box A1

EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 1 – Natural & Destructive Phenomena

Initiating Condition: Natural or destructive phenomena affecting **VITAL AREAS**

OPCON Applicability: All

EAL# & Classification Level: **HA1.6 – ALERT**

EAL:

Vehicle Crash or **PROJECTILE** Impact with or within **ANY** **Table H-1** Structure

AND

The Vehicle Crash or **PROJECTILE** Impact results in **EITHER** of the following:

- Control Room indication of **DEGRADED PERFORMANCE** of a **Safety System** within **Table H-1** Structure
- **VISIBLE DAMAGE** to **ANY** of the **plant** structures in **Table H-1**

Table H-1 Plant Structures Containing Safe Shutdown Systems or Components
• Reactor Building
• Control/Auxiliary Building
• Service Water Intake Structure
• Service/Radwaste Building

Basis:

The occurrence of **VISIBLE DAMAGE** and/or degraded system response is intended to discriminate against lesser events. The initial report should not be interpreted as mandating a lengthy damage assessment prior to classification. No attempt is made in this EAL to assess the actual magnitude of the damage. The significance here is not that a particular system or structure incurred damage, but rather that the event was of sufficient magnitude to cause either **VISIBLE DAMAGE** to the safety systems in Table H-1 structures or Control Room indications of degraded system performance.

Escalation of this emergency classification level, if appropriate, would be based on EALs in Category S, System Malfunctions.

This EAL addresses vehicle crashes or **PROJECTILE** impacts within the **PROTECTED AREA** that results in **VISIBLE DAMAGE** to **VITAL AREAS** or indication of damage to safety structures, systems, or components containing functions and systems required for safe shutdown of the plant.

Explanation/Discussion/Definitions:

The primary concern in this EAL is the magnitude of the vehicle crashes/ **PROJECTILE** impacts. A detailed assessment of system damage is not required prior to classification. Vehicle Crash includes **AIRCRAFT**, Helicopters, Ships, Barges, Trucks, Autos, or any other vehicle types of sufficient momentum to potentially damage the structure. Minor contacts (not crashes) by onsite vehicles such as trucks, autos, forklifts, etc., are excluded from classification under this EAL. **PROJECTILE** impact includes flying objects from either offsite or onsite, rotating equipment or turbine failure causing turbine-casing penetration.

A Safety System is any system required to maintain safe operation or to establish or maintain cold shutdown. In those cases where it is believed that the vehicle crash/ **PROJECTILE** impact may have caused **VISIBLE DAMAGE** to a Safety System, an ALERT declaration is warranted since the full extent of the damage may not be known. The turbine building is not a safety structure and would not be considered for this EAL.

No lengthy or time-consuming assessment of damage is required prior to classification. In this EAL, no attempt is made to quantify the magnitude of the damage to any safety system but instead an attempt is made to identify any damage in order to quantify the magnitude and extent of the vehicle crashes/**PROJECTILE** impact.

In short, if the vehicle crash/ **PROJECTILE** impact is big enough that it has damaged a Safety System/Safety Structure or cause Safety System DEGRADED PERFORMANCE, then the vehicle crash/ **PROJECTILE** impact is big enough to justify an ALERT declaration.

Any security aspects or suspected **HOSTILE ACTIONS** that involve vehicles or **PROJECTILE** impact should be considered under EALs in Subcategory H.4.

This event will be escalated based on further damage to plant safety systems, fission product barriers, or abnormal radiation releases. The Emergency Coordinator may use discretion and escalate the classification to a SITE AREA EMERGENCY based on the nature of the damage.

Definitions:

VITAL AREA: Typically any site specific areas, normally within the **PROTECTED AREA**, that contains equipment, systems, components, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

PROJECTILE: An object that impacts Salem and/or Hope Creek that could cause concern for continued operability, reliability, or personnel safety.

DEGRADED PERFORMANCE: Assessment of degraded safe shutdown system performance includes examination of systems in standby status as well as those in operation. When a safe shutdown system is in operation, its performance can be directly observed and compared to its design capability (e.g., rated flow is required but cannot be achieved). When an operating safe shutdown system cannot fulfill its design function, its performance is degraded. When a safe shutdown system is in standby, its performance capability may not be readily determined. One or more of the following can provide indirect indication of its performance capability:

- Electrical faults on power supplies
- Normally closed breakers in tripped position
- System annunciators activated
- System warning lights lit
- Insufficient system pressure from keep-fill pumps
- Elevated area temperatures or radiation levels
- Increased sump pump operation in areas in which the system is located

PROTECTED AREA (PA): A security controlled area within the **OWNER CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

VISIBLE DAMAGE: Damage to equipment or structure that is readily observable without measurements, testing, or analysis. Damage is sufficient to cause concern regarding the continued operability or reliability of the affected structure, system, or component. Example damage includes: deformation due to heat or impact, denting, penetration, rupture, cracking, and paint blistering. Surface blemishes (e.g., paint chipping, scratches) should not be included.

AIRCRAFT: Includes both small and large **AIRCRAFT**. Examples of **AIRCRAFT** include general aviation Cessna, Piper and Lear type private planes, large passenger or freight planes as well as police, medical and media helicopters.

HOSTILE ACTION: An act toward Salem or Hope Creek or its personnel that includes the use of violent force to destroy equipment, take **HOSTAGES**, and/or intimidate PSEG to achieve an end. This includes attack by air, land, or water using guns, explosives, **PROJECTILE**s, 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 Salem or Hope Creek. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the **OCA**).

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

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HA1 Example EAL #5
2. UFSAR Table 3.2-1 HCGS Classification of Structures, Systems and Components
3. HC.OP-AB.BOP-0002 (Q) Main Turbine

EAL Category:	H – Hazards & Other Conditions Affecting Plant Safety
EAL Subcategory:	2 – Fire or Explosion
Initiating Condition:	**FIRE** within the **PROTECTED AREA** not extinguished within **15 minutes** of detection or **EXPLOSION** within the **PROTECTED AREA**
OPCON Applicability:	All
EAL# & Classification Level:	**HU2.1 – UNUSUAL EVENT**

EAL:

FIRE NOT extinguished within **15 minutes** of **EITHER** of the following:

- Control Room notification/report of a **FIRE**
- Verified **FIRE** detection system alarm/actuation

AND

FIRE is located in the Turbine Building or **ANY** **Table H-1** plant structure (Note 3)

Note 3: 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 will likely exceed the applicable time.

Table H-1 Plant Structures Containing Safe Shutdown Systems or Components
• Reactor Building • Control/Auxiliary Building • Service Water Intake Structure • Service/Radwaste Building

Basis:

This EAL addresses the magnitude and extent of **FIRES** that may be potentially significant precursors of damage to safety systems. It addresses the **FIRE**, and not the degradation in performance of affected systems that may result.

The **15 minute** time period begins with a credible notification/report that a **FIRE** is occurring, or upon verification that a **FIRE** detection system alarm/actuation is due to a **FIRE**.

a. A credible notification/report to the Control room would be a communications from a member of the plant staff (in-house or contractor) that identifies the observation of a **FIRE** in a specific location.

   NOTE: In this case, the **15 minute** clock to assess the EAL and to extinguish the **FIRE** runs concurrently and starts upon Control Room receipt of the **FIRE** notification/report.

b. Verification that a **FIRE** detection system alarm/actuation is due to a **FIRE** (not a spurious/false alarm) includes either one of the following:

   1. Control Room (or other nearby site-specific location) receipt of related independent alarm(s) (**FIRE**, temperature, deluge, **FIRE** pump start, etc.)

      NOTE: In this case, the **15 minute** clock to assess the EAL and to extinguish the **FIRE** runs concurrently and starts upon receipt of the independent alarm(s) related to the **FIRE**.

   2. On/Near-scene visual confirmation if only a single **FIRE**/smoke detector has alarmed.

      NOTE: In this case, the **15 minute** clock to assess the EAL and to extinguish the **FIRE** runs concurrently and starts upon an on/near-scene confirmation of a **FIRE** related to the single **FIRE**/smoke detector that had alarmed.

The intent of this **15 minute** duration is to size the **FIRE** and to discriminate against small **FIRES** that are readily extinguished (e.g., smoldering waste paper basket).

The Turbine Building and Table H-1 list is limited and applies to buildings and areas in actual contact with or immediately adjacent to **VITAL AREAS** or other significant buildings or areas. The intent of this EAL is not to include buildings (i.e., warehouses) or areas that are not in actual contact with or immediately adjacent to **VITAL AREAS**. This excludes **FIRES** within administration buildings, waste-basket **FIRES**, and other small **FIRES** of no safety consequence. Immediately adjacent implies that the area immediately adjacent contains or may contain equipment or cabling that could impact equipment located in **VITAL AREAS** or the **FIRE** could damage equipment inside **VITAL AREAS** or that precludes access to **VITAL AREAS**.

Escalation of this emergency classification level, if appropriate, would be based on EAL HA2.1.

Explanation/Discussion/Definitions:

The Table H-1 Plant Structures Containing Safe Shutdown Systems or Components include those plant structures identified as Seismic Category I.

Definitions:

PROTECTED AREA (PA): A security controlled area within the **OWNER CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

VITAL AREA: Typically any site specific areas, normally within the **PROTECTED AREA**, that contains equipment, systems, components, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

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.

EXPLOSION: A rapid, violent, unconfined combustion, or catastrophic failure of pressurized/energized equipment that imparts energy of sufficient force to potentially damage permanent structures, systems, or components.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HU2 Example EAL #1
2. UFSAR Table 3.2-1 HCGS Classification of Structures, Systems and Components

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EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 2 – Fire or Explosion

Initiating Condition: **FIRE** within the **PROTECTED AREA** not extinguished within 15 minutes of detection or **EXPLOSION** within the **PROTECTED AREA**

OPCON Applicability: All

EAL# & Classification Level: **HU2.2 – UNUSUAL EVENT**

EAL:

EXPLOSION within the **PROTECTED AREA**

Basis:

This EAL addresses the magnitude and extent of **EXPLOSIONS** that may be potentially significant precursors of damage to safety systems. It addresses the **EXPLOSION**, and not the degradation in performance of affected systems that may result.

This EAL addresses only those **EXPLOSIONS** of sufficient force to damage permanent structures or equipment within the **PROTECTED AREA**.

No attempt is made to assess the actual magnitude of the damage. The occurrence of the **EXPLOSION** is sufficient for declaration.

The Emergency Coordinator also needs to consider any security aspects of the **EXPLOSION**, if applicable.

Escalation of this emergency classification level, if appropriate, would be based on EAL HA2.2.

Explanation/Discussion/Definitions:

If the **EXPLOSION** is determined to be hostile in nature, the event is classified under EAL HS4.1.

Definitions:

PROTECTED AREA (PA): A security controlled area within the **OWNER CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

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.

EXPLOSION: A rapid, violent, unconfined combustion, or catastrophic failure of pressurized/energized equipment that imparts energy of sufficient force to potentially damage permanent structures, systems, or components.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HU2 Example EAL #2

EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 2 – Fire or Explosion

Initiating Condition: **FIRE** or **EXPLOSION** in a **VITAL AREA** affecting the operability of plant safety systems required to establish or maintain safe shutdown

OPCON Applicability: All

EAL# & Classification Level: **HA2.1 – ALERT**

EAL:

FIRE in **ANY** **Table H-1** plant structure affecting the operability of plant safety systems required to establish or maintain safe shutdown

AND

≥ 15 minutes have elapsed (Note 3)

Note 3: 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 will likely exceed the applicable time.

Table H-1 Plant Structures Containing Safe Shutdown Systems or Components
• Reactor Building • Control/Auxiliary Building • Service Water Intake Structure • Service/Radwaste Building

Basis:

The significance here is that the **FIRE** was large enough to cause damage to these systems.

The declaration of an ALERT and the activation of the Technical Support Center will provide the Emergency Coordinator with the resources needed to perform detailed damage assessments.

Escalation of this emergency classification level, if appropriate, will be based on EALs in Category S, System Malfunctions, Category F, Fission Product Barrier Degradation, or Category R, Abnormal Rad Levels / Rad Effluent.

Explanation/Discussion/Definitions:

The Table H-1 Plant Structures Containing Safe Shutdown Systems or Components include those plant structures identified as Seismic Category I.

Definitions:

> **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.
>
> **EXPLOSION**: A rapid, violent, unconfined combustion, or catastrophic failure of pressurized/energized equipment that imparts energy of sufficient force to potentially damage permanent structures, systems, or components.
>
> **VITAL AREAS**: Typically any site specific areas, normally within the **PROTECTED AREA**, that contains equipment, systems, components, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.
>
> **PROTECTED AREA (PA)**: A security controlled area within the **OWNER CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HA2 Example EAL #1
2. UFSAR Table 3.2-1 HCGS Classification of Structures, Systems and Components

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EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 2 – Fire or Explosion

Initiating Condition: **FIRE** or **EXPLOSION** in a **VITAL AREA** affecting the operability of plant safety systems required to establish or maintain safe shutdown

OPCON Applicability: All

EAL# & Classification Level: **HA2.2 – ALERT**

EAL:

EXPLOSION in ANY **Table H-1** plant structure affecting the operability of plant safety systems required to establish or maintain safe shutdown

Table H-1 Plant Structures Containing Safe Shutdown Systems or Components
• Reactor Building
• Control/Auxiliary Building
• Service Water Intake Structure
• Service/Radwaste Building

Basis:

The significance here is that the **EXPLOSION** was large enough to cause damage to these systems.

The declaration of an ALERT and the activation of the Technical Support Center will provide the Emergency Coordinator with the resources needed to perform detailed damage assessments.

The Emergency Coordinator also needs to consider any security aspects of the **EXPLOSION**.

Escalation of this emergency classification level, if appropriate, will be based on EALs in Category S, System Malfunctions, Category F, Fission Product Barrier Degradation, or Category R, Abnormal Rad Levels / Rad Effluent.

Explanation/Discussion/Definitions:

If the **EXPLOSION** is determined to be hostile in nature, the event is classified under EAL HS4.1.

The Table H-1 Plant Structures Containing Safe Shutdown Systems or Components include those plant structures identified as Seismic Category I.

Definitions:

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.

EXPLOSION: A rapid, violent, unconfined combustion, or catastrophic failure of pressurized/energized equipment that imparts energy of sufficient force to potentially damage permanent structures, systems, or components.

VITAL AREAS: Typically any site specific areas, normally within the **PROTECTED AREA**, that contains equipment, systems, components, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

PROTECTED AREA (PA): A security controlled area within the **OWNER CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HA2 Example EAL #1
2. UFSAR Table 3.2-1 HCGS Classification of Structures, Systems and Components

EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 3 – Hazardous Gas

Initiating Condition: Release of toxic, corrosive, asphyxiant or flammable gases deemed detrimental to **NORMAL PLANT OPERATIONS**

OPCON Applicability: All

EAL# & Classification Level: **HU3.1 – UNUSUAL EVENT**

EAL:

Release of toxic, corrosive, asphyxiant or flammable gas in amounts (excluding small or incidental releases) that have or could adversely affect **NORMAL PLANT OPERATIONS**

Basis:

This EAL is based on the release of toxic, corrosive, asphyxiant or flammable gases of sufficient quantity to affect normal plant operations.

The fact that SCBA or other respiratory protection may be worn does not eliminate the need to declare the event.

This EAL is not intended to require significant assessment or quantification. It assumes an uncontrolled process that has the potential to affect **NORMAL PLANT OPERATIONS**. This would preclude small or incidental releases, or releases that do not impact structures needed for plant operation.

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.

Escalation of this emergency classification level, if appropriate, would be based on EAL HA3.1.

Explanation/Discussion/Definitions:

The release may have originated within the Site Boundary, or it may have originated offsite and subsequently drifted onto the Site Boundary. Offsite events (e.g., tanker truck accident releasing toxic gases, etc.) resulting in the plant being within the evacuation area should also be considered in this EAL because of the adverse affect on **NORMAL PLANT OPERATIONS**.

Should the release affect plant **VITAL AREAS**, escalation to an ALERT would be based on EAL HA3.1. Should an **EXPLOSION** or **FIRE** occur due to flammable gas within an affected plant area, an ALERT may be appropriate based on EAL HA2.1 or EAL HA2.2.

A Toxic Gas is considered to be any substance that is dangerous to life or limb by reason of inhalation or skin contact.

A Flammable Gas is considered to be any substance that can result in an ignition, sustained burn or detonation.

Carbon dioxide (CO_2) is an asphyxiant gas. A 20 lb CO_2 extinguisher discharge will not create a hazardous atmosphere unless the room volume is less than 2500 cubic feet.

A Corrosive Gas is a highly reactive substance that causes obvious damage to living tissue. Corrosives act either directly, by chemically destroying the part or indirectly by causing inflammation. Acids and bases are common corrosive materials. Corrosives such as these are also sometimes referred to as caustics.

This EAL should not be construed to include confined spaces that must be ventilated prior to entry or situations involving the fire department personnel who are using respiratory equipment during the performance of their duties unless it also affects personnel not involved with the fire department activates. In addition, those situations that require personnel to wear respiratory protection equipment as the result of airborne contamination as required by Radiation Protection personnel do not meet the intent of this EAL.

Definitions:

NORMAL PLANT OPERATIONS: Activities at the plant site associated with routine testing, maintenance, or equipment operations, in accordance with normal operating or administrative procedures. Entry into abnormal or emergency operating procedures, or deviation from normal security or radiological controls posture, is a departure from **NORMAL PLANT OPERATIONS**.

VITAL AREA: Typically any site specific areas, normally within the **PROTECTED AREA**, that contains equipment, systems, components, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

PROTECTED AREA (PA): A security controlled area within the **OWNER CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

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.

EXPLOSION: A rapid, violent, unconfined combustion, or catastrophic failure of pressurized/energized equipment that imparts energy of sufficient force to potentially damage permanent structures, systems, or components.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HU3 Example EAL #1
2. HC.OP-AB.HVAC-0002 Control Room Environment
3. OE25324 Alert Declared Due to CO2 Fire Extinguisher Discharge

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EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 3 – Hazardous Gas

Initiating Condition: Release of toxic, corrosive, asphyxiant or flammable gases deemed detrimental to **NORMAL PLANT OPERATIONS**

OPCON Applicability: All

EAL# & Classification Level: **HU3.2 – UNUSUAL EVENT (Common Site)**

EAL:

Notification by Local, County, or State Officials for evacuation or sheltering of site personnel based on an **off-site gas release event** that includes toxic, corrosive, asphyxiant, or flammable gas

Basis:

The fact that SCBA or other respiratory protection may be worn does not eliminate the need to declare 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.

Escalation of this emergency classification level, if appropriate, would be based on EAL HA3.1.

Explanation/Discussion/Definitions:

This EAL is based on the existence of an uncontrolled release originating offsite and local, county or state officials have reported the need for evacuation or sheltering of site personnel.

State and local officials may determine the evacuation area for an offsite spill or release by using "The Emergency Response Guidebook (ERG2008)" developed by the US Department of Transportation.

Should the release affect plant **VITAL AREAS**, escalation to an ALERT would be based on EAL HA3.1. Should an **EXPLOSION** or **FIRE** occur due to flammable gas within an affected plant area, an ALERT may be appropriate based on EAL HA2.1.

A Toxic Gas is considered to be any substance that is dangerous to life or limb by reason of inhalation or skin contact.

A Flammable Gas is considered to be any substance that can result in an ignition, sustained burn or detonation.

Carbon dioxide (CO_2) is an asphyxiant gas. A 20 lb CO_2 extinguisher discharge will not create a hazardous atmosphere unless the room volume is less than 2500 cubic feet.

A Corrosive Gas is a highly reactive substance that causes obvious damage to living tissue. Corrosives act either directly, by chemically destroying the part or indirectly by causing inflammation. Acids and bases are common corrosive materials. Corrosives such as these are also sometimes referred to as caustics.

Definitions:

NORMAL PLANT OPERATIONS: Activities at the plant site associated with routine testing, maintenance, or equipment operations, in accordance with normal operating or administrative procedures. Entry into abnormal or emergency operating procedures, or deviation from normal security or radiological controls posture, is a departure from **NORMAL PLANT OPERATIONS**.

VITAL AREA: Typically any site specific areas, normally within the **PROTECTED AREA**, that contains equipment, systems, components, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

PROTECTED AREA (PA): A security controlled area within the **OWNER CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

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.

EXPLOSION: A rapid, violent, unconfined combustion, or catastrophic failure of pressurized/energized equipment that imparts energy of sufficient force to potentially damage permanent structures, systems, or components.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HU3 Example EAL #2
2. The Emergency Response Guidebook (ERG2008)
3. OE25324 Alert Declared Due to CO2 Fire Extinguisher Discharge

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EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 3 – Hazardous Gas

Initiating Condition: Access to a **VITAL AREA** is prohibited due to toxic, corrosive, asphyxiant or flammable gases which jeopardize operation of operable equipment required to maintain safe operations or safely shut down the reactor

OPCON Applicability: All

EAL# & Classification Level: **HA3.1 – ALERT**

EAL:

Access to **ANY Table H-1** plant structure is prohibited due to toxic, corrosive, asphyxiant, or flammable gases which jeopardize operation of systems required to maintain safe operations or safely shut down the reactor (Note 5)

Note 5: If the equipment in the stated area was already inoperable, or out of service, before the event occurred, then this EAL should NOT be declared as it will have NO adverse impact on the ability of the plant to safely operate or safely shut down beyond that already allowed by Technical Specifications at the time of the event.

Table H-1 Plant Structures Containing Safe Shutdown Systems or Components
• Reactor Building
• Control/Auxiliary Building
• Service Water Intake Structure
• Service/Radwaste Building

Basis:

Gases in a **VITAL AREA** can affect the ability to safely operate or safely shut down the reactor.

The fact that SCBA may be worn does not eliminate the need to declare the event.

Declaration should not be delayed for confirmation from atmospheric testing if the atmosphere poses an immediate threat to life and health or an immediate threat of severe exposure to gases. This could be based upon documented analysis, indication of personal ill effects from exposure, or operating experience with the hazards.

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.

An uncontrolled release of flammable gasses within a facility structure has the potential to affect safe operation of the plant by limiting either operator or equipment operations due to the potential for ignition and resulting equipment damage/personnel injury. Flammable gasses, such as hydrogen and acetylene, are routinely used to maintain plant systems (hydrogen) or to repair equipment/components (acetylene - used in welding). This EAL assumes concentrations of flammable gasses which can ignite/support combustion.

Escalation of this emergency classification level, if appropriate, will be based on EALs in Category S, System Malfunctions, Category F, Fission Product Barrier Degradation, or Category R, Abnormal Rad Levels / Rad Effluent .

Explanation/Discussion/Definitions:

This EAL is based on gases that have entered a plant structure in concentrations that could be unsafe for plant personnel and, therefore, preclude access to equipment necessary for the safe operation or safe shutdown of the plant. The Table H-1 Plant Structures Containing Safe Shutdown Systems or Components include those plant structures identified as Seismic Category I.

This EAL does not apply to routine inerting of the Primary Containment.

A Toxic Gas is considered to be any substance that is dangerous to life or limb by reason of inhalation or skin contact.

A Flammable Gas is considered to be any substance that can result in an ignition, sustained burn or detonation.

Carbon dioxide (CO_2) is an asphyxiant gas. A 20 lb CO_2 extinguisher discharge will not create a hazardous atmosphere unless the room volume is less than 2500 cubic feet.

A Corrosive Gas is a highly reactive substance that causes obvious damage to living tissue. Corrosives act either directly, by chemical destruction or indirectly by causing inflammation. Acids and bases are common corrosive materials. Corrosives such as these are also sometimes referred to as caustics.

This EAL should not be construed to include confined spaces that must be ventilated prior to entry or situations involving the fire department personnel who are using respiratory equipment during the performance of their duties unless it also affects personnel not involved with the fire department activates. In addition, those situations that require personnel to wear respiratory protection equipment as the result of airborne contamination as required by Radiation Protection personnel do not meet the intent of this EAL.

Definitions:

VITAL AREA: Typically any site specific areas, normally within the **PROTECTED AREA**, that contains equipment, systems, components, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

PROTECTED AREA (PA): A security controlled area within the **OWNER CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HA3 Example EAL #1
2. UFSAR Table 3.2-1 HCGS Classification of Systems, Structures and Components
3. HC.OP-AB.HVAC-0002 Control Room Environment
4. OE25324 Alert Declared Due to CO2 Fire Extinguisher Discharge

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EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 4 – Security

Initiating Condition: Confirmed **SECURITY CONDITION** or threat which indicates a potential degradation in the level of safety of the plant

OPCON Applicability: All

EAL# & Classification Level: **HU4.1 – UNUSUAL EVENT (Common Site)**

EAL:

A **SECURITY CONDITION** that does NOT involve a **HOSTILE ACTION** as reported by the Security Operations Supervisor or designee (Note 9)

OR

Receipt of a **CREDIBLE/ACTUAL THREAT** to Salem or Hope Creek station – (determined by security in accordance with SY-AA-101-132, "Threat Assessment") (Note 9)

OR

A **VALIDATED** notification from NRC providing information of a Salem/Hope Creek **AIRCRAFT** threat

NOTE 9: Shift Manager (SM) should implement the Prompt Actions of NC.EP-EP.ZZ-0102, EC Response, Attachment 10, prior to classification of a security emergency.

Key Information to obtain from Security Supervision upon SM notification of a security event:

- Determination if the security event is a **HOSTILE ACTION** or **SECURITY CONDITION**
- If a **HOSTILE ACTION**, is location the **OCA** or **PA**?

Basis:

Security events which do not represent a potential degradation in the level of safety of the plant are reported under 10 CFR 73.71 or in some cases under 10 CFR 50.72. Security events assessed as **HOSTILE ACTIONS** are classifiable under EAL HA4.1, EAL HS4.1 and EAL HG4.1.

A higher initial classification could be made based upon the nature and timing of the security threat and potential consequences. The Emergency Coordinator shall consider upgrading the emergency response status and emergency classification level in accordance with the Salem – Hope Creek Security Contingency Plan.

1st Condition (**SECURITY CONDITION**)

Reference is made to the specific security shift supervision (Security Operations Supervisor or designee) because these individuals are the designated personnel on-site 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 Salem – Hope Creek Security Contingency Plan.

This threshold is based on the Salem – Hope Creek Security Contingency Plan. The Salem – Hope Creek Security Contingency Plan is based on guidance provided by NEI 03-12, Template for the Security Plan, Training and Qualification Plan, Security Contingency Plan and ISFSI Program.

2nd Condition (**CREDIBLE / ACTUAL THREAT**)

This threshold is included to ensure that appropriate notifications for the security threat are made in a timely manner. This includes information of a credible threat. Only the site to which the specific threat is made needs declare the Notification of an UNUSUAL EVENT.

The determination of **CREDIBLE** is made through use of information found in Threat Assessment, SY-AA-101-132.

3rd Condition (**AIRCRAFT** threat)

The intent of this part of the EAL is to ensure that notifications for the **AIRCRAFT** threat are made in a timely manner and that offsite response organization (OROs) and plant personnel are at a state of heightened awareness regarding the credible threat. It is not the intent of this EAL to replace existing non-hostile related EALs involving **AIRCRAFT**.

This EAL is met when a plant (site) receives information regarding an **AIRCRAFT** threat from NRC. Validation is performed by calling the NRC or by other approved methods of authentication. Only the site to which the specific threat is made need declare the UNUSUAL EVENT.

The NRC Headquarters Operations Officer (HOO) will communicate to the licensee if the threat involves an **AIRLINER** (**AIRLINER** is meant to be a large **AIRCRAFT** with the potential for causing significant damage to the plant). The status and size of the plane may be provided by NORAD through the NRC.

Escalation to ALERT emergency classification level would be via EAL HA4.1 and would be appropriate if the threat involves an **AIRLINER** within 30 minutes of the plant or a **HOSTILE ACTION** in the **OCA** or **PA**.

Explanation/Discussion/Definitions:

If the security events do not meet the threshold for an UNUSUAL EVENT classification, they may result in the need to make a non-emergency report per RAL Section 11.7.1.a, One Hour Non-Emergency Safeguards Event (10 CFR 73.71) as determined by Security per SY-AA-1002, "Safeguards Event Report."

Security will be focused on actions to mitigate the security event and will provide the SM with key information as the event progresses. Communications between the SMs and the Security Team Leader should be accurate, concise, and focused on EAL criteria and protection of key target sets. As Security and Operations terminology sometimes differ, clarifying questions should be asked to ensure accurate information exchange.

1st Condition (**SECURITY CONDITION**)

Page 6 of this EAL Basis is a "Security Contingency Event Summary Table" that indicates which Security Contingency Events could result in Security Supervision determining that a **SECURITY CONDITION** exists and therefore an UNUSUAL EVENT classification should be made **OR**, could result in Security Supervision determining that a **HOSTILE ACTION** is or has occurred and therefore classification at the ALERT or higher level should be made based on the location (**OCA** or **PA**) of the **HOSTILE ACTION**.

2nd Condition (**CREDIBLE / ACTUAL THREAT**)

This threshold is included to ensure that threat information from any source which is assessed by security supervision as being a "**CREDIBLE/ACTUAL THREAT**" is classified as an UNUSUAL EVENT. Only the site to which the specific threat is made needs to declare the UNUSUAL EVENT. For Security Events, Salem and Hope Creek is considered a single site, therefore a "**CREDIBLE/ACTUAL THREAT**" to either Salem or Hope Creek would affect the entire site and a "Common Site" UE declaration would be made.

Timely classification will ensure that Offsite Response Organizations and plant personnel are notified in a timely manner resulting in a state of heightened awareness. Threats are evaluated by security per Threat Assessment, SY-AA-101-132. Security threats that do not meet the definition of a "**CREDIBLE/ACTUAL THREAT**" should be dispositioned IAW Threat Assessment, SY-AA-101-132.

3rd Condition (**AIRCRAFT** threat)

AIRCRAFT threat calls from the NRC should be **VALIDATED** by use of NRC authentication code or a return call to the NRC Headquarter Operations Center.

For security events, Salem and Hope Creek is considered a single site, therefore, a "**VALIDATED AIRCRAFT THREAT**" to either Salem or Hope Creek would affect the entire site and a "Common Site" UE declaration would be made.

Definitions:

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**.

VALIDATED: **AIRCRAFT** threat call from the NRC that is confirmed to be authentic. Calls from the NRC are **VALIDATED** by use of the NRC provided authentication code or by making a return call to the NRC Headquarter Operations Center and confirming threat information with the NRC Operation Officer. **AIRCRAFT** threat calls from other agencies, NORAD, FAA, or FBI should be **VALIDATED** by calling the NRC Operations Officer.

AIRCRAFT: Includes both small and large **AIRCRAFT.** Examples of **AIRCRAFT** include general aviation Cessna, Piper and Lear type private planes, large passenger or freight planes as well as police, medical and media helicopters. A large **AIRCRAFT** is referred to as an **AIRLINER.**

AIRLINER/LARGE AIRCRAFT: Any size or type of **AIRCRAFT** with the potential for causing significant damage to the plant (refer to the Security Contingency Plan for a more detailed definition).

CREDIBLE / ACTUAL THREAT: Is a threat which poses a likely and serious danger to the safe operation of the facility or to site personnel and public safety.

HOSTILE ACTION: An act toward Salem or Hope Creek 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, **PROJECTILE**s, 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 Salem or Hope Creek. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the **OCA**).

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, the area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA.**

PROTECTED AREA (PA): A security controlled area within the **OWNER-CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security center.

PROJECTILE: An object that impacts Salem/Hope Creek that could cause concern for continued operability, reliability, or personnel safety.

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

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HU4 Example EAL #1, #2, #3
2. Salem – Hope Creek Security Contingency Plan
3. SY-AA-101-132 Threat Assessment
4. HC.OP-AB.SEC-0001 Security Event
5. HC.OP-AB.SEC-0002 Airborne Threat

Security Contingency Event Summary Table

Contingency Event Number	Contingency Event Title	Event Could Result in Determination of a **SECURITY CONDITION** (UE ONLY) Yes / No	Event Could Result in Determination of a **HOSTILE ACTION** (ALERT or Higher) Yes / No
# 1	Malevolent Threat / Use of a Vehicle	Yes	Yes
# 2	Detection of Impending Attack / Threat Directed Armed Attack	Yes	Yes
# 3	Civil Disturbance	Yes	No
# 4	PA/VA Intrusion or Detection of a Breached Barrier	No	Yes
# 5	Fire / Explosion or other Catastrophic Event	Yes	Yes
# 6	Detection of Aberrant Behavior	No	No
# 7	Security Force Strike / Unavailability of Security Force	No	No
# 8	Loss of Contact with Security Officer	Yes	Yes
# 9	Confirmed Sabotage / Tampering / Vandalism / Malicious Mischief	Yes	Yes
# 10	Bomb Threat / Explosive Device Discovered	Yes	Yes
# 11	Loss of Onsite / Offsite Security Communications	Yes	No
# 12	Loss of Security System Power	Yes	No
# 13	Loss of Alarm Assessment Capability	Yes	No
# 14	Loss of Security Lighting	Yes	No
# 15	Loss of Security Computer	Yes	No
# 16	Extortion / Coercion / Hostage Threat	Yes	Yes
# 17	Waterborne Threat	Yes	Yes
# 18	Coordinated Land Vehicle Bomb Attack	No	Yes
# 19	Standoff Attack by a Sniper	Yes	Yes
# 20	Insider Threat	Yes	No

EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 4 – Security

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

OPCON Applicability: All

EAL# & Classification Level: **HA4.1 – ALERT**

EAL:

A **HOSTILE ACTION** is occurring or has occurred within the **OCA** as reported by the Security Operations Supervisor or designee (Note 9)

OR

A **VALIDATED** notification from NRC of a **AIRLINER** attack threat **< 30 minutes** away from Salem/Hope Creek (Note 9)

NOTE 9: Shift Manager (SM) should implement the Prompt Actions of NC.EP-EP.ZZ-0102, EC Response, Attachment 10, prior to classification of a security emergency.

Key Information to obtain from Security Supervision upon SM notification of a security event:

- Determination if the security event is a **HOSTILE ACTION** or **SECURITY CONDITION**
- If a **HOSTILE ACTION**, is location the **OCA** or **PA**?

Basis:

This EAL addresses the contingency for a very rapid progression of events, such as that experienced on September 11, 2001. They are not premised solely on the potential for a radiological release. Rather the issue includes the need for rapid assistance due to the possibility for significant and indeterminate damage from additional air, land or water attack elements.

The fact that the site is under serious attack or is an identified attack target with minimal time available for further preparation or additional assistance to arrive requires a heightened state of readiness and implementation of protective measures that can be effective (such as on-site evacuation, dispersal or sheltering).

<u>1st Condition (**OCA HOSTILE ACTION**)</u>

This EAL addresses the potential for a very rapid progression of events due to a **HOSTILE ACTION** within or directed towards the **OWNER CONTROLLED AREA (OCA)**. It is not intended to address incidents that are accidental events or acts of civil disobedience, such as small **AIRCRAFT** impact, hunters, or physical disputes between employees within the **OCA.** Those events are adequately addressed by other EALs or RALs

Note that this EAL is applicable for any **HOSTILE ACTION** occurring, or that has occurred, in the **OWNER CONTROLLED AREA**.

If not previously notified by the NRC that the airborne **HOSTILE ACTION** was intentional, then it would be expected, although not certain, that notification by an appropriate Federal agency would follow. In this case, appropriate federal agency is intended to be NORAD, FBI, FAA or NRC. However, the declaration should not be unduly delayed awaiting Federal notification.

<u>2nd Condition (**AIRLINER** threat)</u>

This EAL addresses the immediacy of an expected threat (**AIRLINER**) arrival or impact on the site within a relatively short time (< 30 minutes).

The intent of this EAL is to ensure that notifications for the **AIRLINER** attack threat are made in a timely manner and that OROs and plant personnel are at a state of heightened awareness regarding the credible threat. **AIRLINER** is meant to be a large **AIRCRAFT** with the potential for causing significant damage to the site.

This EAL is met when a plant receives information regarding an **AIRLINER** attack threat from NRC and the **AIRLINER** is within 30 minutes of the plant. Only the site to which the specific threat is made need declare the ALERT.

The NRC Headquarters Operations Officer (HOO) will communicate to the licensee if the threat involves an **AIRLINER** (**AIRLINER** is meant to be a large **AIRCRAFT** with the potential for causing significant damage to the plant). The status and size of the plane may be provided by NORAD through the NRC.

Explanation/Discussion/Definitions:

This event will be escalated to a SITE AREA EMERGENCY based upon **HOSTILE ACTION** affecting the **PROTECTED AREA (PA)**. Also, if Salem declares an SAE due to their **PA** being affected by the security event, Hope Creek will escalate to SAE to match them.

1st Condition (**OCA HOSTILE ACTION**)

Reference is made to the specific security shift supervision (Security Operations Supervisor or designee) because these individuals are the designated personnel on-site qualified and trained to confirm that a **HOSTILE ACTION** is occurring or has occurred.

This EAL condition is not premised solely on adverse health effects caused by a radiological release. Rather the issue is the immediate need for assistance due to the nature of the event and the potential for significant and indeterminate damage. Although nuclear plant security officers are well trained and prepared to protect against **HOSTILE ACTION**, it is appropriate for Offsite Response Organizations (OROs) to be notified and encouraged to begin activation to be better prepared should it be necessary to consider further actions.

Page 6 of this EAL Basis is a "Security Contingency Event Summary Table" that indicates which Security Contingency Events could result in Security Supervision determining that a **HOSTILE ACTION** is or has occurred and therefore classification at the ALERT or higher level should be made based on the location (**OCA** or **PA**) of the **HOSTILE ACTION**. Security events that do not involve a **HOSTILE ACTION** may result in Security Supervision determining that a **SECURITY CONDITION** exists and therefore an UNUSUAL EVENT classification should be made per EAL HU4.1.

2nd Condition (**AIRLINER** threat)

The fact that the site is an identified attack candidate with minimal time available for further preparation requires a heightened state of readiness and implementation of protective measures that can be effective (onsite evacuation, dispersal, or sheltering) before arrival or impact.

This EAL is met when a plant receives **VALIDATED** information regarding an **AIRLINER** attack threat from NRC and the **AIRLINER** is less than 30 minutes away from the site. Only the site (Salem and Hope Creek is considered a single site for Security event classifications) to which the specific threat is made needs declare the ALERT.

AIRLINER threat calls from the NRC should be **VALIDATED** by use of NRC authentication code or a return call to the NRC Headquarter Operations Center.

Definitions:

HOSTILE ACTION: An act toward Salem or Hope Creek 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 Salem or Hope Creek. 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 (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

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

PROTECTED AREA (PA): A security controlled area within the **OWNER-CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

AIRCRAFT: Includes both small and large **AIRCRAFT.** Examples of **AIRCRAFT** include general aviation Cessna, Piper and Lear type private planes, large passenger or freight planes as well as police, medical and media helicopters. A large **AIRCRAFT** is referred to as an **AIRLINER.**

AIRLINER/LARGE AIRCRAFT: Any size or type of **AIRCRAFT** with the potential for causing significant damage to the plant (refer to the Security Contingency Plan for a more detailed definition).

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**.

PROJECTILE: An object directed toward Salem/Hope Creek that could cause concern for its continued operability, reliability, or personnel safety.

VALIDATED: **AIRCRAFT** threat call from the NRC that is confirmed to be authentic. Calls from the NRC are **VALIDATED** by use of the NRC provided authentication code or by making a return call to the NRC Headquarter Operations Center and confirming threat information with the NRC Operation Officer. **AIRCRAFT** threat calls from other agencies, NORAD, FAA, or FBI should be **VALIDATED** by calling the NRC Operations Officer.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HA4 Example EAL #1, #2
2. Salem – Hope Creek Security Contingency Plan
3. HC.OP-AB.SEC-0001 Security Event
4. HC.OP-AB.SEC-0002 Airborne Threat

Security Contingency Event Summary Table

Contingency Event Number	Contingency Event Title	Event Could Result in Determination of a **SECURITY CONDITION** (UE ONLY) Yes / No	Event Could Result in Determination of a **HOSTILE ACTION** (ALERT or Higher) Yes / No
# 1	Malevolent Threat / Use of a Vehicle	Yes	Yes
# 2	Detection of Impending Attack / Threat Directed Armed Attack	Yes	Yes
# 3	Civil Disturbance	Yes	No
# 4	PA/VA Intrusion or Detection of a Breached Barrier	No	Yes
# 5	Fire / Explosion or other Catastrophic Event	Yes	Yes
# 6	Detection of Aberrant Behavior	No	No
# 7	Security Force Strike / Unavailability of Security Force	No	No
# 8	Loss of Contact with Security Officer	Yes	Yes
# 9	Confirmed Sabotage / Tampering / Vandalism / Malicious Mischief	Yes	Yes
# 10	Bomb Threat / Explosive Device Discovered	Yes	Yes
# 11	Loss of Onsite / Offsite Security Communications	Yes	No
# 12	Loss of Security System Power	Yes	No
# 13	Loss of Alarm Assessment Capability	Yes	No
# 14	Loss of Security Lighting	Yes	No
# 15	Loss of Security Computer	Yes	No
# 16	Extortion / Coercion / Hostage Threat	Yes	Yes
# 17	Waterborne Threat	Yes	Yes
# 18	Coordinated Land Vehicle Bomb Attack	No	Yes
# 19	Standoff Attack by a Sniper	Yes	Yes
# 20	Insider Threat	Yes	No

EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 4 – Security

Initiating Condition: **HOSTILE ACTION** within the **PROTECTED AREA**

OPCON Applicability: All

EAL# & Classification Level: **HS4.1 – SITE AREA EMERGENCY**

EAL:

A **HOSTILE ACTION** is occurring or has occurred within the **PROTECTED AREA** as reported by the Security Operations Supervisor or designee (Note 9)

NOTE 9: Shift Manager (SM) should implement the Prompt Actions of NC.EP-EP.ZZ-0102, EC Response, Attachment 10, prior to classification of a security emergency.

Key Information to obtain from Security Supervision upon SM notification of a security event:

- Determination if the security event is a **HOSTILE ACTION** or **SECURITY CONDITION**
- If a **HOSTILE ACTION**, is location the **OCA** or **PA**?

Basis:

This condition represents an escalated threat to plant safety above that contained in the ALERT in that a **HOSTILE FORCE** has progressed from the **OWNER CONTROLLED AREA** to the **PROTECTED AREA**.

This EAL addresses the contingency for a very rapid progression of events due to a **HOSTILE ACTION** within or directed towards the **PROTECTED AREA (PA)**. Plant **VITAL AREAS** are within the **PROTECTED AREA** and are generally controlled by card key readers. A **HOSTILE ACTION** in the **PROTECTED AREA** (which includes **VITAL AREAS**) could represent a situation that threatens the safety of plant personnel and the general public.

These EALs address the contingency for a very rapid progression of events, such as that experienced on September 11, 2001. It is not premised solely on the potential for a radiological release. Rather the issue includes the need for rapid assistance due to the possibility for significant and indeterminate damage from additional air, land or water attack elements.

The fact that the site is under serious attack with minimal time available for further preparation or additional assistance to arrive requires Offsite Response Organization (ORO) readiness and preparation for the implementation of protective measures.

This EAL is not intended to address incidents that are accidental events or acts of civil disobedience, such as small **AIRCRAFT** impact, hunters, or physical disputes between employees within the **PROTECTED AREA**. Those events are adequately addressed by other EALs or RALs.

Although nuclear plant security officers are well trained and prepared to protect against **HOSTILE ACTION**, it is appropriate for OROs to be notified and encouraged to begin preparations for public protective actions to be better prepared should it be necessary to consider further actions.

If not previously notified by NRC that the airborne **HOSTILE ACTION** was intentional, then it would be expected, although not certain, that notification by an appropriate Federal agency would follow. In this case, appropriate federal agency is intended to be NORAD, FBI, FAA or NRC. However, the declaration should not be unduly delayed awaiting Federal notification.

Escalation of this emergency classification level to a GENERAL EMERGENCY, if appropriate, would be based upon the actual loss of physical control of the facility. If necessary, Salem will declare this event.

Explanation/Discussion/Definitions:

The Security Shift Supervision is defined as the Security Operations Supervisor or designee.

These individuals are the designated on-site personnel qualified and trained to confirm that a security event is occurring or has occurred. Training on security event classification confirmation is closely controlled due to the strict secrecy controls placed on the Salem – Hope Creek Security Contingency Plan (Safeguards) information.

PROJECTILES that are directed into or that have impacted the **PA** from the **OCA** or beyond are considered under this EAL as **HOSTILE ACTIONS** within the **PA.**

Page 5 of this EAL Basis is a "Security Contingency Event Summary Table" that indicates which Security Contingency Events could result in Security Supervision determining that a **HOSTILE ACTION** is or has occurred and therefore classification at the ALERT or higher level should be made based on the location (**OCA** or **PA**) of the **HOSTILE ACTION**. Security events that do not involve a **HOSTILE ACTION** may result in Security Supervision determining that a **SECURITY CONDITION** exists and therefore an UNUSUAL EVENT classification should be made per EAL HU4.1.

Definitions:

HOSTILE ACTION: An act toward Salem or Hope Creek 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 Salem or Hope Creek. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the **OCA**).

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the OCA.

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.

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

PROTECTED AREA (PA): A security controlled area within the **OWNER-CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

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**.

AIRCRAFT: Includes both small and large **AIRCRAFT.** Examples of **AIRCRAFT** include general aviation Cessna, Piper and Lear type private planes, large passenger or freight planes as well as police, medical and media helicopters. A large **AIRCRAFT** is referred to as an **AIRLINER.**

AIRLINER/LARGE AIRCRAFT: Any size or type of **AIRCRAFT** with the potential for causing significant damage to the plant (refer to the Security Contingency Plan for a more detailed definition).

PROJECTILE: An object that impacts Salem and/or Hope Creek that could cause concern for continued operability, reliability, or personnel safety.

VITAL AREAS: Typically any site specific areas, normally within the **PROTECTED AREA**, that contains equipment, systems, components, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HA4 Example EAL #1, #2
2. Salem – Hope Creek Security Contingency Plan
3. HC.OP-AB.SEC-0001 Security Event
4. HC.OP-AB.SEC-0002 Airborne Threat

Security Contingency Event Summary Table

Contingency Event Number	Contingency Event Title	Event Could Result in Determination of a **SECURITY CONDITION** (UE ONLY) Yes / No	Event Could Result in Determination of a **HOSTILE ACTION** (ALERT or Higher) Yes / No
# 1	Malevolent Threat / Use of a Vehicle	Yes	Yes
# 2	Detection of Impending Attack / Threat Directed Armed Attack	Yes	Yes
# 3	Civil Disturbance	Yes	No
# 4	PA/VA Intrusion or Detection of a Breached Barrier	No	Yes
# 5	Fire / Explosion or other Catastrophic Event	Yes	Yes
# 6	Detection of Aberrant Behavior	No	No
# 7	Security Force Strike / Unavailability of Security Force	No	No
# 8	Loss of Contact with Security Officer	Yes	Yes
# 9	Confirmed Sabotage / Tampering / Vandalism / Malicious Mischief	Yes	Yes
# 10	Bomb Threat / Explosive Device Discovered	Yes	Yes
# 11	Loss of Onsite / Offsite Security Communications	Yes	No
# 12	Loss of Security System Power	Yes	No
# 13	Loss of Alarm Assessment Capability	Yes	No
# 14	Loss of Security Lighting	Yes	No
# 15	Loss of Security Computer	Yes	No
# 16	Extortion / Coercion / Hostage Threat	Yes	Yes
# 17	Waterborne Threat	Yes	Yes
# 18	Coordinated Land Vehicle Bomb Attack	No	Yes
# 19	Standoff Attack by a Sniper	Yes	Yes
# 20	Insider Threat	Yes	No

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EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 4 – Security

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

OPCON Applicability: All

EAL# & Classification Level: **HG4.1 – GENERAL EMERGENCY**

EAL:

A **HOSTILE ACTION** has occurred such that plant personnel are unable to operate equipment required to maintain safety functions (i.e., reactivity control, RPV water level, or decay heat removal) at Salem or Hope Creek (Note 9)

<u>**OR**</u>

A **HOSTILE ACTION** has caused failure of Spent Fuel Cooling Systems and **IMMINENT** fuel damage is likely at Salem or Hope Creek (Note 9)

NOTE 9: Shift Manager (SM) should implement the Prompt Actions of NC.EP-EP.ZZ-0102, EC Response, Attachment 10, prior to classification of a security emergency.

Key Information to obtain from Security Supervision upon SM notification of a security event:

- Determination if the security event is a **HOSTILE ACTION** or **SECURITY CONDITION**
- If a **HOSTILE ACTION**, is location the **OCA** or **PA**?

Basis:

<u>1st Condition</u>

This EAL encompasses conditions under which a **HOSTILE ACTION** has resulted in a loss of physical control of **VITAL AREAS** (containing vital equipment or controls of vital equipment) required to maintain safety functions and control of that equipment cannot be transferred to and operated from another location.

Typically, these safety functions are reactivity control (ability to shut down the reactor and keep it shutdown), reactor water level (ability to cool the core), and decay heat removal (ability to maintain a heat sink).

If control of the plant equipment necessary to maintain safety functions can be transferred to another location, then the threshold is not met.

2nd Condition

This EAL addresses failure of spent fuel cooling systems as a result of **HOSTILE ACTION** if **IMMINENT** fuel damage is likely.

Explanation/Discussion/Definitions:

Definitions:

HOSTILE ACTION: An act toward Salem or Hope Creek 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 Salem or Hope Creek. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the **OCA**).

PROJECTILE: An object that impacts Salem and/or Hope Creek that could cause concern for continued operability, reliability, or personnel safety.

VITAL AREAS: Typically any site specific areas, normally within the **PROTECTED AREA**, that contains equipment, systems, components, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

PROTECTED AREA (PA): A security controlled area within the **OWNER-CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

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

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HG1 Example EAL #1, #2
2. HC.OP-AB.SEC-0001 Security Event
3. HC.OP-AB.SEC-0002 Airborne Threat

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EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 5 – Control Room Evacuation

Initiating Condition: Control Room evacuation has been initiated

OPCON Applicability: All

EAL# & Classification Level: **HA5.1 – ALERT**

EAL:

Control Room evacuation has been initiated

Basis:

With the Control Room evacuated, additional support, monitoring and direction through the Technical Support Center and/or other emergency response facilities may be necessary.

Inability to establish plant control from outside the Control Room will escalate this event to a SITE AREA EMERGENCY per EAL HS5.1.

Explanation/Discussion/Definitions:

Control Room evacuation represents a serious plant situation since the degree of plant control at the Remote Shutdown Panel (RSP) is not as complete as from the Control Room. The intent of this EAL is to declare an ALERT when the determination to evacuate the Control Room has been made based on environmental/personnel safety concerns, and the physical process of evacuating the Control Room per HC.OP-AB.HVAC-0002(Q), Control Room Environment, has commenced.

The Shift Manager (SM) determines if the Control Room 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.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HA5 Example EAL #1
2. HC.OP-AB.HVAC-0002(Q) Control Room Environment
3. HC.OP-IO.ZZ-008(Q) Shutdown from Outside the Control Room

EAL Category: H – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 5 – Control Room Evacuation

Initiating Condition: Control Room evacuation has been initiated and plant control CANNOT be established

OPCON Applicability: All

EAL# & Classification Level: **HS5.1 – SITE AREA EMERGENCY**

EAL:

Control Room evacuation has been initiated

AND

Control of the plant CANNOT be established within **15 minutes** (Note 3)

Note 3: 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 will likely exceed the applicable time.

Basis:

The intent of this EAL is to capture those events where control of the plant cannot be reestablished in a timely manner. In this case, expeditious transfer of control of safety systems has not occurred (although fission product barrier damage may not yet be indicated).

The intent of the EAL is to establish control of important plant equipment and knowledge of important plant parameters in a timely manner. Primary emphasis should be placed on those components and instruments that supply protection for and information about safety functions. These safety functions are reactivity control (ability to shutdown the reactor and maintain it shutdown), reactor water level (ability to cool the core), and decay heat removal (ability to maintain a heat sink).

The Emergency Coordinator is expected to make a reasonable, informed judgment within the allocated **15 minutes** that the licensee has control of the plant from the remote shutdown panel.

Escalation of this emergency classification level, if appropriate, would be by EALs in Category F, Fission Product Barrier Degradation, or Category R, Abnormal Rad Levels/Rad Effluent.

Explanation/Discussion/Definitions:

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.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HS5 Example EAL #1
2. HC.OP-AB.HVAC-0002(Q) Control Room Environment
3. HC.OP-IO.ZZ-008(Q) Shutdown from Outside the Control Room

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EAL Category: C – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 6 – EC Judgment

Initiating Condition: Other conditions exist which in the judgment of the Emergency Coordinator warrant declaration of an UNUSUAL EVENT

OPCON Applicability: All

EAL# & Classification Level: **HU6.1 – UNUSUAL EVENT**

EAL:

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 off-site response or monitoring are expected unless further degradation of safety systems occurs

Basis:

This EAL 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 UNUSUAL EVENT emergency classification level.

Explanation/Discussion/Definitions:

None

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HU5 Example EAL #1

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EAL Category: C – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 6 – EC Judgment

Initiating Condition: Other conditions exist which in the judgment of the Emergency Coordinator warrant declaration of an ALERT

OPCON Applicability: All

EAL# & Classification Level: **HA6.1 – ALERT**

EAL:

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**. <u>**ANY**</u> releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels

Basis:

This EAL 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 ALERT emergency classification level.

Explanation/Discussion/Definitions:

Definitions:

HOSTILE ACTION: An act toward Salem or Hope Creek 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 Salem or Hope Creek plants.

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

PROJECTILE: An object that impacts Salem and/or Hope Creek that could cause concern for its continued operability, reliability, or personnel safety.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HA6 Example EAL #1

EAL Category: C – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 6 – EC Judgment

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

OPCON Applicability: All

EAL# & Classification Level: **HS6.1 – SITE AREA EMERGENCY**

EAL:

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

Basis:

This EAL 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 SITE AREA EMERGENCY.

Explanation/Discussion/Definitions:

Definitions:

HOSTILE ACTION: An act toward Salem or Hope Creek 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 Salem or Hope Creek plants.

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

PROJECTILE: An object that impacts Salem and/or Hope Creek that could cause concern for its continued operability, reliability, or personnel safety.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HS3 Example EAL #1

EAL Category: C – Hazards & Other Conditions Affecting Plant Safety

EAL Subcategory: 6 – EC Judgment

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

OPCON Applicability: All

EAL# & Classification Level: **HG6.1 – GENERAL EMERGENCY**

EAL:

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 off-site for more than the immediate site area

Basis:

This EAL 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 GENERAL EMERGENCY.

Explanation/Discussion/Definitions:

Definitions:

HOSTILE ACTION: An act toward Salem or Hope Creek 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 Salem or Hope Creek plants.

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

PROJECTILE: An object that impacts Salem and/or Hope Creek that could cause concern for its continued operability, reliability, or personnel safety.

IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours (unless a different time is specified).

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, HG2 Example EAL #1

EALs for:

Systems Malfunctions

EAL Category: S – System Malfunction

EAL Subcategory: 1 – Loss of AC Power

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

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Classification Level: **SU1.1 – UNUSUAL EVENT**

EAL:

Loss of **all** Offsite AC power to **all** 4.16 KV Vital Buses

AND

≥ **15 minutes** have elapsed (Note 3)

Note 3: 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 will likely exceed the applicable time.

Basis:

Prolonged loss of off-site AC power reduces required redundancy and potentially degrades the level of safety of the plant by rendering the plant more vulnerable to a complete loss of AC power to vital buses.

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

Explanation/Discussion/Definitions:

The AC power distribution is summarized in Attachment 2, page 2.

Emergency Classification escalates to an ALERT under EAL SA1.1 based on AC power to 4.16 KV vital buses being reduced to a single source.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05 – SU1 Example EAL #1
2. 205415-A-8765 Sheet 1 500 kv Transmission Plan & Profiles
3. E-0001-0 sheet 1 Hope Creek Generating Station Single Line Diagram Station
4. UFSAR 8.1.2 Onsite Power Systems
5. HCGS Technical Specifications 3.8.1 AC Sources

EAL Category: S – System Malfunction

EAL Subcategory: 1 – Loss of AC Power

Initiating Condition: AC power capability to vital buses reduced to a single power source for 15 minutes or longer such that any additional single failure would result in complete loss of AC power to vital buses

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Classification Level: **SA1.1 – ALERT**

EAL:

Loss of 4.16 KV Vital Bus Power Sources (Offsite and Onsite) which results in the availability of only **one** 4.16 KV Vital Bus Power Source (Offsite or Onsite)

AND

≥ 15 minutes have elapsed (Note 3)

Note 3: 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 will likely exceed the applicable time.

Basis:

The condition indicated by this EAL is the degradation of the offsite and onsite AC power systems such that any additional single failure would result in a complete loss of AC power to vital buses. This condition could occur due to a loss of off-site power with a concurrent failure of all but one emergency diesel generator to supply power to its vital bus. The subsequent loss of this single power source would escalate the event to a SITE AREA EMERGENCY in accordance with EAL SS1.1.

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

Explanation/Discussion/Definitions:

"Availability" means the power source can be aligned to provide power to a vital bus within 15 minutes or is currently supplying power to at least one vital bus.

The availability of EDGs that have not been challenged to start during degradation of AC power sources to the 4.16 KV vital buses should be based on meeting Technical Specification action requirements for loss of offsite AC power sources.

The AC power distribution is summarized in Attachment 2, page 2.

This hot condition Alert EAL is equivalent to the cold condition Unusual Event EAL CU1.1.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05 – SA5 Example EAL #1
2. HC.OP-AB.ZZ-0135 (Q) Station Blackout / Loss of Offsite Power / Diesel Generator Malfunction
3. 205415-A-8765 Sheet 1 500 kv Transmission Plan & Profiles
4. E-0001-0 sheet 1 Hope Creek Generating Station Single Line Diagram Station
5. UFSAR 8.1.2 Onsite Power Systems
6. HCGS Technical Specifications 3.8.1 A.C. Sources

EAL Category: S – System Malfunction

EAL Subcategory: 1 – Loss of AC Power

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

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Classification Level: **SS1.1 – SITE AREA EMERGENCY**

EAL:

Loss of **all** Power (Onsite and Offsite) to **all** 4.16 KV Vital Buses

AND

≥ **15 minutes** have elapsed (Note 3)

Note 3: 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 will likely exceed the applicable time.

Basis:

Loss of all AC power to vital buses compromises all plant safety systems requiring electric power including RHR, ECCS, and Station Service Water. Prolonged loss of all AC power to vital buses will lead to loss of Fuel Clad, RCS, and Containment, thus this event can escalate to a GENERAL EMERGENCY.

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

Escalation to GENERAL EMERGENCY is via EALs in Category F, Fission Product Barrier Degradation, or EAL SG1.1, "Prolonged Loss of All Offsite Power and Prolonged Loss of All Onsite AC Power."

Explanation/Discussion/Definitions:

The intent of this EAL is to classify degraded AC power events that result in a loss of all offsite power sources 13.8 KV to the 4.16 KV vital buses along with a loss of all onsite power sources (EDGs).

The AC power distribution is summarized in Attachment 2, page 2.

This hot condition Site Area Emergency EAL is equivalent to the cold condition Alert EAL CA1.1.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05 – SS1 Example EAL #1
2. HC.OP-AB.ZZ-0135 (Q) Station Blackout / Loss of Offsite Power / Diesel Generator Malfunction
3. 205415-A-8765 Sheet 1 500 kv Transmission Plan & Profiles
4. E-0001-0 sheet 1 Hope Creek Generating Station Single Line Diagram Station
5. UFSAR 8.1.2 Onsite Power Systems
6. HCGS Technical Specifications 3.8.1 AC Sources

EAL Category: S – System Malfunction

EAL Subcategory: 1 – Loss of AC Power

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

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Classification Level: **SG1.1 – GENERAL EMERGENCY**

EAL:

Loss of **all** Power (Onsite and Offsite) to **all** 4.16 KV Vital Buses

AND

ANY of the following:

- Restoration of at least **one** Vital Bus in **< 4 hrs** is NOT likely
- RPV level CANNOT be restored and maintained above **-161 in.**
- RPV level CANNOT be determined

Basis:

Loss of all AC power to vital buses compromises all plant safety systems requiring electric power including RHR, ECCS, and Station Service Water. Prolonged loss of all AC power to vital buses will lead to loss of Fuel Clad, RCS, and Containment, thus this event can escalate to a GENERAL EMERGENCY.

This EAL is specified to assure that in the unlikely event of a prolonged station blackout, timely recognition of the seriousness of the event occurs and that declaration of a GENERAL EMERGENCY occurs as early as is appropriate, based on a reasonable assessment of the event trajectory.

The likelihood of restoring at least one vital bus should be based on a realistic appraisal of the situation since a delay in an upgrade decision based on only a chance of mitigating the event could result in a loss of valuable time in preparing and implementing public protective actions.

In addition, under these conditions, fission product barrier monitoring capability may be degraded.

Explanation/Discussion/Definitions:

The AC power distribution is summarized in Attachment 2, page 2.

Four hours is the station blackout coping time. Beyond the four hour window, RPV injection capability may no longer be available and degradation in core cooling will commence.

Core Submergence is the preferred method of maintaining adequate core cooling. When RPV level decreases to below TAF (-161 in.), the ability to effectively remove decay heat is being challenged, and as such the Fuel Clad fission product barrier can no longer be considered intact. While the Emergency Operating Procedures provide contingencies to establish adequate core cooling when RPV level drops below TAF (Core Spray or Steam Cooling with or without injection), these actions are designed to be an alternative method of providing adequate core cooling while actions are taken to reestablish core submergence. Sustained partial or total core uncovery can result in fuel damage and a significant release of fission products to the Reactor coolant. Sustained core uncovery can also result in a breach of the RPV due to core melt material interaction with the RPV.

A Loss of Core Submergence will occur when the rate of inventory loss is greater than the rate of inventory makeup from high pressure injection sources. This condition can occur as the result of the following events/sequences:

- A LOCA will cause RPV level to reach the Top of Active Fuel when the LOCA is the result of a large break (momentary core uncovery is expected to occur under this condition) or when the LOCA is due to a small or intermediate break in combination with an inability of high pressure injection sources to keep up with the leakrate.
- A loss of high pressure injection sources without the presence of a LOCA will also result in RPV level decreasing to TAF due to continued RPV Steam Flow without makeup.

Either of these events/sequences results in a challenge to the Fuel Clad Barrier when RPV level CANNOT be restored **AND** maintained above the TAF due to core uncovery, hence classification at this threshold is appropriate. However, for both these sequences, Low Pressure ECCS are designed to inject to the RPV as RPV Pressure decreases below the shutoff head of the pumps. RPV Depressurization will occur either due to the LOCA or Manual initiation of Emergency Depressurization when RPV level reaches -185 in., provided injection systems are available. This will allow for restoration of RPV level and re-establishment of Core Submergence. Failure of these systems to restore and maintain RPV level above -185 in. will result in a Loss of the Fuel Clad barrier per EAL FB1-L.

Until the wide range RPV level (WR) indicator is downscale or becomes questionable, it should be used to assure RPV level is above TAF. Once WR is downscale, use compensated fuel zone indication (SPDS or graph) to assess RPV level above TAF and when compensated fuel zone level indication goes below TAF or becomes questionable, declare the EAL.

If all RPV level instrumentation is lost, it is assumed RPV level may be below the top of active fuel and a General Emergency classification is warranted under this EAL.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05 – SG1 Example EAL #1
2. HC.OP-AB.ZZ-0135 (Q) Station Blackout / Loss of Offsite Power / Diesel Generator Malfunction
3. 205415-A-8765 Sheet 1 500 kv Transmission Plan & Profiles
4. E-0001-0 sheet 1 Hope Creek Generating Station Single Line Diagram Station
5. UFSAR 8.1.2 Onsite Power Systems
6. HCGS Technical Specifications 3.8.1 AC Sources
7. HC.OP-EO.ZZ-0101(Q)-FC RPV Control
8. HC.OP-EO.ZZ-0101A(Q)-FC ATWS - RPV Control

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EAL Category: S – System Malfunction

EAL Subcategory: 2 – Loss of DC Power

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

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Classification Level: **SS2.1 – SITE AREA EMERGENCY**

EAL:

< 108 V DC bus voltage indication on **all** Vital 125 V DC Buses

AND

≥ 15 minutes have elapsed (Note 3)

Note 3: 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 will likely exceed the applicable time.

Basis:

Loss of all DC power compromises ability to monitor and control plant safety functions. Prolonged loss of all DC power will cause core uncovering and loss of primary containment integrity when there is significant decay heat and sensible heat in the reactor system.

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

Escalation to a General Emergency would occur by EALs in Category R, Abnormal Rad Levels/Rad Effluent, or Category F, Fission Product Barrier Degradation.

Explanation/Discussion/Definitions:

Per Technical Specifications, **108 VDC** is the minimum voltage required for operability of the Class 1E 125 VDC buses following a battery discharge test. Although continued equipment operation may occur with degraded voltage, this value signifies the minimum operable voltage allowed.

125 VDC Power Channels A-D provide control power to Engineered Safety Features actuation, diesel generator auxiliaries, plant alarm and indication circuits, as well as the control power for the associated loads. If 125 VDC power is lost for an extended period of time

(greater than 15 minutes) critical plant functions such as 4.16 KV breaker controls, CS and RHR pump controls required to maintain safe plant conditions may not operate, and core uncovery with subsequent Reactor Coolant System (RCS) and Primary Containment failure might occur.

Loss of ADS may create a loss of low pressure ECCS availability due to the potential inability to depressurize the reactor. In addition, loss of these buses will eventually lead to MSIV closure and reactor scram due to the loss of the Primary Containment Instrument Gas (PCIG). Subsequent to MSIV closure, much of the equipment noted above will be required for plant stabilization and shutdown.

A sustained loss of 125 V DC power will threaten the ability to remove heat from the reactor core and from the primary containment. SRVs will remain operable in the relief mode and the heat addition to the primary containment could result in a loss of the Primary Containment as a fission product release barrier.

Loss of all Vital 1E 125 V DC power will also render HPCI and RCIC inoperable for automatic initiation, and from the Control Room due to loss of control power.

Class 1E 125 VDC battery bank capacities are as follows:

Channel	Switchgear	Battery	Capacity (design 4 hours)
A	10D410	1AD411	1885 AH at 8 hours
B	10D420	1BD411	1885 AH at 8 hours
C	10D430	1CD411	1885 AH at 8 hours
D	10D440	1DD411	1885 AH at 8 hours
C	10D436	1CD447	577 AH at 8 hours
D	10D446	1DD447	577 AH at 8 hours

In OPCONs 1, 2, or 3, the loss of any single channel 125V DC power source would require the channel to be restored within 2 hours or the unit placed in at least Hot Shutdown within the next 12 hours and in Cold Shutdown within the following 24 hours.

This Site Area Emergency EAL is the hot condition equivalent of the cold condition loss of DC power Unusual Event EAL CU2.1.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, SS3 Example EAL #1
2. HC.OP-AB.ZZ-0150 (Q), 125VDC System Malfunction
3. HC.OP-AB.ZZ-0135 (Q), Station Blackout / Loss of Offsite Power / Diesel Generator Malfunction
4. HC.OP-EO.ZZ-0101(Q)-FC RPV Control
5. HC.OP-EO.ZZ-0102(Q)-FC Primary Containment Control
6. HC.OP-EO.ZZ-0202(Q)-FC Emergency Depressurization
7. HCGS Technical Specifications Section 3/4.8.2.1, 3/4.8.3.1.b; DC Sources – Operating
8. UFSAR 8.3.2 DC Power Systems

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EAL Category: S – System Malfunction

EAL Subcategory: 3 – ATWS / Criticality

Initiating Condition: Inadvertent Criticality

OPCON Applicability: 3 - Hot Shutdown

EAL# & Classification Level: **SU3.1 – UNUSUAL EVENT**

EAL:

UNPLANNED sustained positive period observed on nuclear instrumentation

Basis:

This EAL addresses inadvertent criticality events. This EAL indicates a potential degradation of the level of safety of the plant, warranting a UE classification. This EAL excludes inadvertent criticalities that occur during planned reactivity changes associated with reactor startups (e.g., criticality earlier than estimated).

Escalation would be by the Fission Product Barrier Table, as appropriate to the operating mode at the time of the event.

Explanation/Discussion/Definitions:

The term "sustained" is used in order to allow exclusion of expected short term positive periods from planned control rod movements. These short term positive periods are the result of the increase in neutron population due to subcritical multiplication.

Positive reactor period may be identified by:

- SRM period indicators and recorders R602A and B (green pens) on panel 10C650C
- Overhead Annunciator C3-D1, SRM PERIOD
- Computer points B3001, B3002, B3003 and B3004

This EAL is the hot condition equivalent of the cold condition EAL CU6.1.

Definitions:

UNPLANNED: A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, SU8 Example EAL #1
2. Technical Specifications 3.3.7.6 Source Range Monitors
3. HC.OP-ST.SE-0005(Q) SRM Channel Count Rate Surveillance
4. HC.OP-AR.ZZ-0009 Overhead Annunciator Window Box C3

EAL Category: S – System Malfunction

EAL Subcategory: 3 – ATWS / Criticality

Initiating Condition: Automatic scram fails to shut down the reactor and the manual actions taken from the reactor control console are successful in shutting down the reactor

OPCON Applicability: 1 - Power Operations, 2 - Startup

EAL# & Classification Level: **SA3.1 – ALERT**

EAL:

An automatic scram failed to shut down the reactor

AND

Manual scram actions taken at the reactor control console (mode switch, manual scram pushbuttons, manual ARI actuation) successfully shut down the reactor as indicated by reactor power ≤ **4%**

Basis:

The reactor should be considered shutdown when it is producing less heat than the maximum decay heat load for which the safety systems are designed (4% power). This power level is the APRM downscale trip setpoint.

Manual scram actions taken at the reactor control console are any set of actions by the reactor operator(s) which causes or should cause control rods to be rapidly inserted into the core and shuts down the reactor.

Insertion of a scram signal via Mode Switch to Shutdown or activation of the RPS Manual Scram Pushbuttons on the Control Room console is considered automatic scram inputs into RPS. A failure to scram from either operator inserted scram actions would meet the criteria for this EAL even if no other scram inputs were present. However, an inability to physically place the mode switch in the "Shutdown" position (i.e., broken key) does not constitute a RPS failure, since the RPS logic has not failed.

This condition indicates failure of the automatic protection system to scram the reactor. This condition is more than a potential degradation of a safety system in that a front line automatic protection system did not function in response to a plant transient. Thus the plant safety has been compromised because design limits of the fuel may have been exceeded. An ALERT is indicated because conditions may exist that lead to potential loss of fuel clad or RCS and because of the failure of the Reactor Protection System to automatically shutdown the plant.

If manual actions taken at the reactor control console fail to shut down the reactor, the event would escalate to a SITE AREA EMERGENCY.

Explanation/Discussion/Definitions:

The Reactor Protection System (RPS) is designed to function to shut down the reactor (either manually or automatically). The system is "fail safe", that is it de-energizes to function. An Anticipated Transient Without Scram (ATWS) event can be caused either by a failure of RPS (electrical/pneumatic failure) or a failure of the Control Rod Drive System to permit the control rods to insert (hydraulic failure).

The Alternate Rod Insertion (ARI) function of the Redundant Reactivity Control System (RRCS) provides an automatic backup function for an electrical/pneumatic failure of RPS. A successful scram due to ARI following a failure of RPS would still be classified under this EAL because of the potentially serious consequences of an RPS failure.

The ALERT threshold is set so that unsuccessful manual RPS scrams from the Control Room, as well as unsuccessful automatic RPS scrams would be classified at the ALERT level. This will cover those situations, in which a manual RPS scram is attempted in anticipation of a continually degrading plant condition (i.e., degrading Main Condenser Vacuum). In addition, this threshold will also address those situations where a manual scram is required by procedure (i.e., stuck open SRV, Main Steam Line Hi-Hi Radiation, Dual Reactor Recirc Pump trip, Power Oscillations) and the manual scram is not successful. In either case, ALERT declaration is appropriate when the RPS fails to perform its intended design function.

The APRM downscale trip setpoint is 4%. 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. At or below the APRM downscale trip setpoint, plant response will be similar to that observed during a normal shutdown.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, SA2 Example EAL #1
2. Technical Specifications 1.0 Definitions
3. Technical Specifications SL/LSSS 2.1/2.2 Safety Limits/ Limited Safety System Settings
4. Technical Specifications LCO 3/4.1 Reactor Control Systems
5. Technical Specifications LCO 3/4.3 Instrumentation
6. HC.OP-AB.IC-0003(Q) Reactor Protection System
7. HC.OP-EO.ZZ-0101A(Q)-FC ATWS – RPV Control

EAL Category: S – System Malfunction

EAL Subcategory: 3 – ATWS / Criticality

Initiating Condition: Automatic scram fails to shut down the reactor and manual actions taken from the reactor control console are not successful in shutting down the reactor.

OPCON Applicability: 1 - Power Operations, 2 - Startup

EAL# & Classification Level: **SS3.1 – SITE AREA EMERGENCY**

EAL:

An automatic scram failed to shut down the reactor

AND

Manual scram actions taken at the reactor control console (mode switch, manual scram pushbuttons, manual ARI actuation) do NOT shut down the reactor as indicated by reactor power **> 4%**

Basis:

The reactor should be considered shutdown when it is producing less heat than the maximum decay heat load for which the safety systems are designed (4% power). This power level is the APRM downscale trip setpoint.

Under these conditions, the reactor is producing more heat than the maximum decay heat load for which the safety systems are designed and efforts to bring the reactor subcritical are unsuccessful. A SITE AREA EMERGENCY is warranted because conditions exist that lead to **IMMINENT** loss or potential loss of both fuel clad and RCS.

Manual scram actions taken at the reactor control console are any set of actions by the reactor operator(s) at which causes or should cause control rods to be rapidly inserted into the core and shuts down the reactor.

Insertion of a scram signal via Mode Switch to Shutdown or activation of the RPS Manual Scram Pushbuttons on the Control Room console are considered automatic scram inputs into RPS. A failure to scram from either operator inserted scram actions would meet the criteria for this EAL even if no other scram inputs were present. However, an inability to physically place the mode switch in the "Shutdown" position (i.e., broken key) does not constitute a RPS failure, since the RPS logic has not failed.

Escalation of this event to a GENERAL EMERGENCY would be due to a prolonged condition leading to an extreme challenge to either core cooling or heat removal.

Explanation/Discussion/Definitions:

This EAL addresses 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.

For the purposes of emergency classification at the SITE AREA EMERGENCY level, successful manual scram actions are those which can be quickly performed from the reactor control console (i.e., mode switch, manual scram pushbuttons and manual ARI actuation). Manual actions to shut down the Reactor achieved by use of the alternate control rod insertion methods of EOP-101A Step RC/Q-21 would still be classified under this EAL and do not constitute a successful manual scram.

A manual scram signal via Mode Switch to Shutdown and/or activation of the RPS Manual Scram Pushbuttons on the Control Room console are considered an automatic input into RPS and a Failure to Scram making this EAL applicable. However, an inability to physically place the mode switch in the "Shutdown" position (i.e., broken key) does not constitute a RPS failure, since the RPS logic has not failed.

The APRM downscale trip setpoint is 4%. 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. At or below the APRM downscale trip setpoint, plant response will be similar to that observed during a normal shutdown.

Escalation of this event to a GENERAL EMERGENCY would be under EAL SG3.1 or Emergency Coordinator judgment.

Definitions:

> **IMMINENT**: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours (unless a different time is specified).

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, SS2 Example EAL #1
2. HC.OP-EO.ZZ-0101A(Q)-FC ATWS – RPV Control

EAL Category: S – System Malfunction

EAL Subcategory: 3 – ATWS / Criticality

Initiating Condition: Automatic scram and all manual actions fail to shut down the reactor and indication of an extreme challenge to the ability to cool the core exists

OPCON Applicability: 1 - Power Operations, 2 - Startup

EAL# & Classification Level: **SG3.1 – GENERAL EMERGENCY**

EAL:

An automatic scram failed to shut down the reactor

AND

All manual actions do NOT shut down the reactor as indicated by reactor power **> 4%**

AND

EITHER of the following:

- RPV level CANNOT be restored and maintained above **-185 in.**
- HCTL (EOP Curve SPT-P) is exceeded

Basis:

The reactor should be considered shutdown when it is producing less heat than the maximum decay heat load for which the safety systems are designed (4% power). This power level is the APRM downscale trip setpoint.

Under these conditions, the reactor is producing more heat than the maximum decay heat load for which the safety systems are designed and efforts to bring the reactor subcritical are unsuccessful.

In the event either of these challenges exists at a time that the reactor has not been brought below the power associated with the safety system design a core melt sequence exists. In this situation, core degradation can occur rapidly. For this reason, the GENERAL EMERGENCY declaration is intended to be anticipatory of the fission product barrier table declaration to permit maximum offsite intervention time.

Explanation/Discussion/Definitions:

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 SS3.1), and

- Indications that either core cooling is extremely challenged or heat removal is extremely challenged.

The Alternate Rod Insertion (ARI) function of the Redundant Reactivity Control System (RRCS) provides an automatic backup function for an electrical/pneumatic failure of RPS. A failure of ARI and alternate control rod insertion methods of EOP-101A to reduce Reactor Power to **≤ 4%** following a failure of the RPS is classified under this EAL because of the potentially serious consequences of a failure of RPS and ARI to reduce Reactor Power.

Reactor shutdown achieved by use of the alternate control rod insertion methods of EOP-101A Step RC/Q-21 is also credited as a successful manual action 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.

The Reactor Protection System (RPS) is designed to function to shut down the reactor (either manually or automatically). The system is "fail safe", that is it de-energizes to function. An Anticipated Transient Without Scram (ATWS) event can be caused either by a failure of RPS (electrical/pneumatic failure) or a failure of the Control Rod Drive System to permit the control rods to insert (hydraulic failure).

An extreme challenge to the ability to cool the core occurs when RPV water level cannot be maintained above -185". Although this is below the Top of Active Fuel (Loss of Core Submergence), maintaining Reactor water level above -185" will ensure sufficient steam flow from the covered portion of the core to preclude fuel clad temperatures in the uncovered portion of the core from exceeding 1500°F. This is referred to as the Minimum Steam Cooling RPV Water Level (MSCRWL). Inability to maintain this level for an extended period of time could be precursors of a core melt sequence.

An extreme challenge to the primary containment occurs when heat cannot be removed from the primary containment resulting in elevated suppression pool water temperature. The Heat Capacity Temperature Limit (HCTL) is the highest suppression pool water temperature from which a Blowdown will not raise suppression chamber pressure above the Primary Containment Pressure Limit (PCPL) of 65 psig before the rate of energy transfer from the RPV to the primary containment is within the capacity of the primary containment vent. When the PCPL is challenged, primary containment venting will be required even if offsite radioactivity release rate limits will be exceeded.

The HCTL is a function of RPV pressure and suppression pool water temperature and is a measure of the maximum heat load, which the primary containment can withstand. Plant parameters in excess of the HCTL could be precursor of primary containment failure. The Heat Capacity Temperature Limit is given in Curve SPT-P of HC.OP-EO.ZZ-0102(Q), Primary Containment Control.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, SG2 Example EAL #1
2. HC.OP-EO.ZZ-0101A(Q)-FC ATWS – RPV Control
3. HC.OP-EO.ZZ-0206A(Q)-FC ATWS - RPV Flooding
4. HC.OP-EO.ZZ-0102(Q)-FC Primary Containment Control

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EAL Category: S – System Malfunction

EAL Subcategory: 4 – Inability to Reach or Maintain Shutdown Conditions

Initiating Condition: Inability to reach required shutdown within Technical Specification limits

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Classification Level: **SU4.1 – UNUSUAL EVENT**

EAL:

Plant is NOT brought to required Operational Condition (OPCON) within Technical Specifications LCO action statement time

Basis:

Limiting Conditions of Operation (LCOs) require the plant to be brought to a required Operational Condition when the Technical Specification required configuration cannot be restored. Depending on the circumstances, this may or may not be an emergency or precursor to a more severe condition. In any case, the initiation of plant shutdown required by the site Technical Specifications requires a four hour report under 10 CFR 50.72 (b) Non-emergency events. The plant is within its safety envelope when being shut down within the allowable action statement time in the Technical Specifications. An immediate UE is required when the plant is not brought to the required Operational Condition within the allowable action statement time in the Technical Specifications. Declaration of a UE is based on the time at which the LCO-specified action statement time period elapses under the site Technical Specifications and is not related to how long a condition may have existed.

Explanation/Discussion/Definitions:

Depending on the circumstances, this may or may not be a precursor to a more severe condition. A shutdown required by the Technical Specifications requires a report under 10 CFR 50.72 (b) Non-emergency events. The plant is within its safety envelope when actions are completed within the allowable Action Statement time in the T/S. If the times specified within the Action Statements are not met, the plant may be in an unsafe condition.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, SU2 Example EAL #1
2. HCGS Technical Specifications

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EAL Category: S – System Malfunction

EAL Subcategory: 5 – Instrumentation

Initiating Condition: **UNPLANNED** loss of safety system annunciation or indication in the Control Room for 15 minutes or longer

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Classification Level: **SU5.1 – UNUSUAL EVENT**

EAL:

UNPLANNED loss of **> approximately 75%** of Control Room Overhead Annunciators for **≥ 15 minutes** (Note 3)

<u>OR</u>

UNPLANNED loss of **> approximately 75%** of Control Room Indications associated with the following safety functions for **≥ 15 minutes** (Note 3):

- Reactivity Control
- RCS Inventory
- Decay Heat Removal
- Fission Product Barriers

Note 3: 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 will likely exceed the applicable time.

Basis:

This EAL is intended to recognize the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment.

Recognition of the availability of computer based indication equipment is considered.

"Planned" loss of annunciators or indicators includes scheduled maintenance and testing activities.

Quantification is arbitrary, however, it is estimated that if **approximately 75%** of the annunciators or indicators are lost, there is an increased risk that a degraded plant condition could go undetected. It is not intended that plant personnel perform a detailed count of the instrumentation lost but use the value as a judgment threshold for determining the severity of the plant conditions.

It is further recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This will be addressed by the specific Technical Specification. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification action, the UE is based on SU4.1 "Inability to Reach Required Shutdown Within Technical Specification Limits."

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

This UE will be escalated to an ALERT based on a concurrent loss of compensatory indications or a **SIGNIFICANT TRANSIENT** is occurring during a loss of annunciators/indications.

Explanation/Discussion/Definitions:

This EAL recognizes the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment. An **UNPLANNED** loss of most or all Control Room Overhead Annunciators or other key control room indication systems without a plant transient in Operational Conditions 1, 2, or 3 for **≥ 15 minutes** warrants a heightened awareness by Control Room Operators. Quantification of **> 75%** is left to the discretion of the Shift Manager (SM) and is considered **approximately 75%**. It is not intended that a detailed count be performed but that a rough approximation be used to determine the severity of the loss.

This EAL is not required in Operational Conditions 4 or 5 due to the limited number of safety systems required for operation.

In judging the severity of the annunciator and loss other key Control Room indication systems, consideration should be given to those annunciators needed by the operating staff for operation in abnormal and emergency operating procedures. This includes the ability to shutdown the reactor and keeping it shutdown, ability to cool the core, ability to maintain core inventory, ability to maintain a heat sink, and ability to monitor primary containment parameters.

For short-term loss of OHAs and other key Control Room indication systems (< 15 minutes) reportable level (RAL) #11.7.1.c should be considered.

Definitions:

UNPLANNED: a parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions. An **UNPLANNED** loss of annunciators and loss other key control room indication systems excludes scheduled maintenance and testing activities.

SIGNIFICANT TRANSIENT: An **UNPLANNED** event based on EC judgment, but includes as a minimum any one of the following: (1) Reactor SCRAM, (2) Electrical Load Rejection > 22%, (3) Thermal Power Reduction > 25%, (4) ECCS Injection, or (5) Thermal Power Oscillation > 10%.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, SU3 Example EAL #1
2. HC.OP.AB.MISC-0002 (Q) CRIDS / Overhead Annunciators / PPC Computer
3. HC.OP-AR.ZZ-0011 Window C6-C5, SPDS System Trouble
4. HCGS Technical Specifications 3/4.3, Instrumentation

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EAL Category: S – System Malfunction

EAL Subcategory: 5 – Instrumentation

Initiating Condition: **UNPLANNED** loss of safety system annunciation or indication in the Control Room with either (1) a **SIGNIFICANT TRANSIENT** in progress, or (2) compensatory indicators unavailable

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Classification Level: **SA5.1 – ALERT**

EAL:

UNPLANNED loss of **> approximately 75%** of Control Room Overhead Annunciators for **≥ 15 minutes** (Note 3)

OR

UNPLANNED loss of **> approximately 75%** of Control Room Indications associated with the following safety functions for **≥ 15 minutes** (Note 3):

- Reactivity Control
- RCS Inventory
- Decay Heat Removal
- Fission Product Barriers

AND

EITHER of the following:

- A **SIGNIFICANT TRANSIENT** is in progress, **Table S-1**
- Compensatory indications are NOT available (PPC, CRIDS and SPDS)

Note 3: 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 will likely exceed the applicable time.

Table S-1 SIGNIFICANT TRANSIENTS
• Reactor scram • Thermal Power Reduction **> 25%** • Electrical Load rejection **> 22%** • ECCS injection • Thermal power oscillations **> 10%**

Basis:

This EAL is intended to recognize the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment during a **SIGNIFICANT TRANSIENT**.

"Planned" loss of annunciators or indicators includes scheduled maintenance and testing activities.

Quantification is arbitrary, however, it is estimated that if **approximately 75%** of the annunciators or indicators are lost, there is an increased risk that a degraded plant condition could go undetected. It is not intended that plant personnel perform a detailed count of the instrumentation lost but use the value as a judgment threshold for determining the severity of the plant conditions. It is also not intended that the Shift Manager be tasked with making a judgment decision as to whether additional personnel are required to provide increased monitoring of system operation.

It is further recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This will be addressed by the specific Technical Specification. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification action, the UE is based on SU4.1 "Inability to Reach Required Shutdown Within Technical Specification Limits."

"Compensatory indications" in this context includes computer based information such as the Plant Process Computer System (PPC), Control Room Integrated Display System (CRIDS) and Safety Parameter Display System (SPDS). If both a major portion of the annunciation system and all computer monitoring are unavailable, the ALERT is required.

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

This ALERT will be escalated to a SITE AREA EMERGENCY if the operating crew cannot monitor the transient in progress due to a concurrent loss of compensatory indications with a **SIGNIFICANT TRANSIENT** in progress during the loss of annunciation or indication.

Explanation/Discussion/Definitions:

This EAL recognizes the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment. An **UNPLANNED** loss of most or all Control Room Overhead Annunciators or other key control room indication systems without a plant transient in Operational Conditions 1, 2, or 3 for **≥ 15 minutes** warrants a heightened awareness by Control Room Operators. Quantification of **> 75%** is left to the discretion of the Shift Manager (SM) and is considered **approximately 75%**. It is not intended that a detailed count be performed, but that a rough approximation be used to determine the severity of the loss. An **UNPLANNED** loss of most or all Control Room Overhead Annunciators or other key Control Room indication systems with **SIGNIFICANT TRANSIENT** in Operational Conditions 1, 2, or 3 also warrants a heightened awareness by Control Room Operators. In this case, the **15 minute** criterion is not required to meet the EAL as expeditious notification is warranted. **UNPLANNED** loss of annunciators or indicators excludes scheduled maintenance and testing activities.

The **15 minutes** clock starts when the annunciators or other key Control Room indication systems have been lost, or are determined to have been lost. If upon time of discovery it is determined that the annunciators have been lost for at least **15 minutes** prior to discovery, classification should be made under this EAL regardless of time required for restoration.

SIGNIFICANT TRANSIENTS are listed in Table S-1.

The Plant Process Computer System (PPC), Control Room Integrated Display System (CRIDS) and Safety Parameter Display System (SPDS) serve as redundant indicators which may be utilized as compensatory measures in lieu of the Control Room Overhead Annunciators and Control Room indicators associated with safety functions.

The judgment of the Shift Manager should be used as the threshold for determining the severity of the plant conditions.

In judging the severity of the annunciator and loss of other key Control Room indication systems, consideration should be given to those annunciators needed by the operating staff for operation in abnormal and emergency operating procedures. This includes the ability to shut down the reactor and keeping it shutdown, ability to cool the core, ability to maintain core inventory, ability to maintain a heat sink, and ability to monitor primary containment parameters.

If the operating crew cannot monitor the transient in progress, the ALERT escalates to a SITE AREA EMERGENCY under EAL SS5.1.

Definitions:

UNPLANNED: a parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions. An **UNPLANNED** loss of annunciators and loss other key control room indication systems excludes scheduled maintenance and testing activities.

SIGNIFICANT TRANSIENT: An **UNPLANNED** event based on EC judgment, but includes as a minimum any one of the following: (1) Reactor SCRAM, (2) Electrical Load Rejection > 22%, (3) Thermal Power Reduction > 25%, (4) ECCS Injection, or (5) Thermal Power Oscillation > 10%.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, SA5 Example EAL #1
2. UFSAR Section 1.2.4.3.6 Turbine Bypass System and Pressure Control System
3. HC.OP.AB.MISC-0002 (Q) CRIDS / Overhead Annunciators / PPC Computer
4. HC.OP-AR.ZZ-0011 Window C6-C5, SPDS System Trouble
5. HC.OP-AR.ZZ-0011 Window C6-B5, BOP Computer Trouble
6. HCGS Technical Specifications 3/4.3, Instrumentation

EAL Category: S – System Malfunction

EAL Subcategory: 5 – Instrumentation

Initiating Condition: Inability to monitor a **SIGNIFICANT TRANSIENT** in progress

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Classification Level: **SS5.1 – SITE AREA EMERGENCY**

EAL:

UNPLANNED loss of **> approximately 75%** of Control Room Overhead Annunciators for **≥ 15 minutes** (Note 3)

OR

UNPLANNED loss of **> approximately 75%** of Control Room Indications associated with the following safety functions for **≥ 15 minutes** (Note 3):

- Reactivity Control
- RCS Inventory
- Decay Heat Removal
- Fission Product Barriers

AND

A **SIGNIFICANT TRANSIENT** is in progress, **Table S-1**

AND

Compensatory indications are NOT available (PPC, CRIDS and SPDS)

Note 3: 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 will likely exceed the applicable time.

Table S-1 SIGNIFICANT TRANSIENTS
• Reactor scram • Thermal Power Reduction **> 25%** • Electrical Load rejection **> 22%** • ECCS injection • Thermal power oscillations **> 10%**

Basis:

This EAL is intended to recognize the threat to plant safety associated with the complete loss of capability of the control room staff to monitor plant response to a **SIGNIFICANT TRANSIENT**.

"Planned" and "**UNPLANNED**" actions are not differentiated since the loss of instrumentation of this magnitude is of such significance during a transient that the cause of the loss is not a factor.

Quantification is arbitrary, however, it is estimated that if **approximately 75%** of the annunciators or indicators are lost, there is an increased risk that a degraded plant condition could go undetected. It is not intended that plant personnel perform a detailed count of the instrumentation lost but use the value as a judgment threshold for determining the severity of the plant conditions. It is also not intended that the Shift Manager be tasked with making a judgment decision as to whether additional personnel are required to provide increased monitoring of system operation.

It is further recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This will be addressed by the specific Technical Specification. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification action, the UE is based on SU4.1 "Inability to Reach Required Shutdown Within Technical Specification Limits."

A SITE AREA EMERGENCY is considered to exist if the Control Room staff cannot monitor safety functions needed for protection of the public while a significant transient is in progress.

Site specific indications needed to monitor safety functions necessary for protection of the public must include control room indications, computer generated indications and dedicated annunciation capability.

"Compensatory indications" in this context includes computer based information such as Plant Process Computer System (PPC), Control Room Integrated Display System (CRIDS) and Safety Parameter Display System (SPDS).

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

Explanation/Discussion/Definitions:

This EAL recognizes the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment. An **UNPLANNED** loss of most or all Control Room Overhead Annunciators or other key control room indication systems without a plant transient in Operational Conditions 1, 2, or 3 for **≥ 15 minutes** warrants a heightened awareness by Control Room Operators. Quantification of **> 75%** is left to the discretion of the Shift Manager (SM) and is considered **approximately 75%**. It is not intended that a detailed count be performed, but that a rough approximation be used to determine the severity of the loss. An **UNPLANNED** loss of most or all Control Room Overhead Annunciators or other key Control Room indication systems with **SIGNIFICANT TRANSIENT** in Operational Conditions 1, 2, or 3 also warrants a heightened awareness by Control Room Operators. In this case, the **15 minute** criterion is not required to meet the EAL as expeditious notification is warranted. **UNPLANNED** loss of annunciators or indicators excludes scheduled maintenance and testing activities.

The **15 minutes** clock starts when the annunciators or other key Control Room indication systems have been lost, or are determined to have been lost. If upon time of discovery it is determined that the annunciators have been lost for at least **15 minutes** prior to discovery, classification should be made under this EAL regardless of time required for restoration.

SIGNIFICANT TRANSIENTS are listed in Table S-1.

The PPC, CRIDS and SPDS serve as redundant indicators which may be utilized as compensatory measures in lieu of the Control Room Overhead Annunciators and Control Room indicators associated with safety functions.

The judgment of the Shift Manager should be used as the threshold for determining the severity of the plant conditions.

Definitions:

> **UNPLANNED:** a parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions. An **UNPLANNED** loss of annunciators and loss other key control room indication systems excludes scheduled maintenance and testing activities.

SIGNIFICANT TRANSIENT: An **UNPLANNED** event based on EC judgment, but includes as a minimum any one of the following: (1) Reactor SCRAM, (2) Electrical Load Rejection > 22%, (3) Thermal Power Reduction > 25%, (4) ECCS Injection, or (5) Thermal Power Oscillation > 10%.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, SS6 Example EAL #1
2. UFSAR Section 1.2.4.3.6 Turbine Bypass Systems and Pressure Control System
3. HC.OP.AB.MISC-0002 (Q) CRIDS / Overhead Annunciators / PPC Computer
4. HC.OP-AR.ZZ-0011 Window C6-C5, SPDS System Trouble
5. HC.OP-AR.ZZ-0011 Window C6-B5, BOP Computer Trouble
6. HCGS Technical Specifications 3/4.3, Instrumentation

EAL Category: S – System Malfunction

EAL Subcategory: 6 – Communications

Initiating Condition: Loss of all onsite or offsite communications capabilities

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Classification Level: **SU6.1 – UNUSUAL EVENT**

EAL:

Loss of **all Table S-2** Onsite communication methods affecting the ability to perform routine operations

OR

Loss of **all Table S-2** Offsite communication methods affecting the ability to perform offsite notifications

Table S-2 Communications Systems		
System	**Onsite**	**Offsite**
Direct Inward Dial System (DID)	X	X
Station Page System (Gaitronics)	X	
Station Radio System	X	
Nuclear Emergency Telephone System (NETS)		X
Centrex Phone System (ESSX)		X
NRC (ENS)		X

Basis:

The purpose of this EAL is to recognize a loss of communications capability that either defeats the plant operations staff ability to perform routine tasks necessary for plant operations or the ability to communicate issues with off-site authorities.

The availability of one method of ordinary off-site communications is sufficient to inform federal, state, and local authorities of plant problems. This EAL is intended to be used only when extraordinary means (e.g., relaying of information from non-routine radio transmissions, individuals being sent to off-site locations, etc.) are being used to make communications possible.

Explanation/Discussion/Definitions:

Onsite and offsite communications include one or more of the systems listed in Table S-2.

Direct Inward Dial System (DID)

Direct Inward Dial (DID) system is named for the dominant feature of the commercial telephone service provided by the local telephone company for the site. DID allows station telephones to be extensions or tied lines of the same systems. These exchanges can take advantage of backup power supplies provided to the stations, and may use either PSEG microwave, commercial telephone system microwave, or buried cable transmission systems to maintain external communications. This commercial telephone service is available as an additional backup for the NETS and Centrex/ESSX 1 system.

Station Page System (Gaitronics)

Gaitronics is a completely transistorized voice communication system with five voice channels: one page and five party. The system is designed for use in extreme environmental conditions such as dust, moisture, heat and noise. The system consists of handsets, speakers and their associated amplifiers. The power for this system is 120 volts AC from an inverted DC source to provide reliable communications during an emergency.

Station Radio System

The Operations and Fire Protection Department UHF radio system is a multi-frequency system used routinely by both station Operations Departments and the Fire Protection Department. When an emergency event is declared, these radio frequencies serve both station Operations Support Centers (OSC).

Nuclear Emergency Telephone System (NETS)

The Nuclear Emergency Telecommunications System (NETS) is a privately controlled, self-contained telephone exchange that operates as a closed system, not accessible from other phone exchanges. This feature allows the system to be dedicated to emergency response use. The system may use PSEG microwave, commercial telephone system microwave, fiber optics, or buried cable transmission as needed. The exchange switching equipment is maintained at the Environmental & Energy Resource Center (EERC). As an independent system with an uninterruptible power supply, it may operate with or without local phone service or external power.

Centrex Phone System (ESSX)

The Centrex/Electronic Switch System Exchange 1 (Centrex/ESSX 1) is also a privately controlled exchange, which PSEG operates with its own microwave signal system. This system is also independent of local phone service, since each circuit is independently wired. The microwave signal is generated from corporate facilities in Newark, NJ, separated from any local effects of weather or telephone use. The exchange is accessible from other exchanges, but circuits are located only in PSEG facilities. It is considered the primary backup for the NETS system.

NRC (ENS)

The Emergency Notification System (ENS) is a dedicated communications system with the NRC, which is part of the Federal Telecommunications System (FTS) and consists of direct lines to the NRC. FTS lines are used to provide general accident information. These telephones are installed in the Control Room, TSC, and the EOF.

This EAL is the hot condition equivalent of the cold condition EAL CU5.1.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, SU6 Example EAL #1, #2
2. PSEG Nuclear Emergency Plan, Section 7 Communications
3. UFSAR 9.5.2 Communications Systems

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EAL Category: S – System Malfunction

EAL Subcategory: 7 – Fuel Clad Degradation

Initiating Condition: Fuel clad degradation

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Classification Level: **SU7.1 – UNUSUAL EVENT**

EAL:

VALID Offgas Pretreatment Radiation Monitor (9RX621/9RX622) **high alarm**

Basis:

This EAL is included because it is a precursor of more serious conditions and, as result, is considered to be a potential degradation of the level of safety of the plant.

Escalation of this EAL to the ALERT level is via the Fission Product Barriers.

This threshold addresses Offgas radiation monitor readings that provide indication of a degradation of fuel clad integrity.

Explanation/Discussion/Definitions:

A **VALID** Offgas Pretreatment Radiation Monitor High alarm is indicative of a degradation of the fuel clad, and is a precursor of a more serious problem. The alarm is set at **2.2E+04 mR/hr**, which ensures that the alarm will actuate prior to exceeding the Technical Specification Offgas System Noble Gas Effluent Limit of 3.3E5 µCi/sec.

Classification should be based on an Offgas Pretreatment Radiation Monitor High Alarm actuating specifically due to fuel clad degradation, thus precluding unwarranted UNUSUAL EVENT declaration as the result of a resin / chemical intrusion transient, HWCI System malfunction, etc. UNUSUAL EVENT declaration is warranted only when actual fuel damage has occurred. Obtaining timely (within 90 minutes) confirmatory samples may be required to make this determination if the High Alarm condition is suspected to not be related to fuel clad degradation (per Abnormal Operating Procedures).

The Offgas Pretreatment Radiation Monitors (9RX621 / 9RX622) monitor gamma radiation levels attributable to the non-condensable fission product gases produced in the reactor and transported with steam through the turbine to the condenser. These instruments take a sample from the sample tap between the fourth and fifth holdup pipe of the Offgas system.

Restricting the gross radioactivity from the Main Condenser provides reasonable assurance that the whole body dose to an individual at the exclusion area boundary will not exceed a small fraction of the limits of 10 CFR 100 in the event this effluent is inadvertently discharged directly to the environment without treatment.

Definitions:

VALID: An indication, report, or condition, is considered to be **VALID** when it is verified by (1) an instrument channel check, (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.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, SU4 Example EAL #1
2. HC.OP-AR.ZZ-0011(Q) Overhead Annunciator Window Box C6
3. HCGS Technical Specification Table 3.3.7.1-1 Radiation Monitoring Instrumentation
4. HCGS Technical Specification 3.11.2.7 Radioactive Effluents - Main Condenser
5. HC.OP-AB.RPV-0008(Q) Reactor Coolant Activity
6. HC.RP-AR.SP-0001(Q) Radiation Monitoring System Alarm Response
7. OE-6144 Resin Intrusion, Hope Creek

EAL Category: S – System Malfunction

EAL Subcategory: 7 – Fuel Clad Degradation

Initiating Condition: Fuel clad degradation

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Classification Level: **SU7.2 – UNUSUAL EVENT**

EAL:

Coolant activity **> 4 µCi/gm** Dose Equivalent I-131

Basis:

This EAL is included because it is a precursor of more serious conditions and, as result, is considered to be a potential degradation of the level of safety of the plant.

Escalation of this EAL to the ALERT level is via the Fission Product Barriers.

This threshold addresses coolant samples exceeding coolant technical specifications for transient iodine spiking limits.

Explanation/Discussion/Definitions:

A Reactor Coolant sample analysis with specific activity in excess of the Technical Specification limit of **4 µCi/gm** Dose Equivalent Iodine-131 (DEI-131) is indicative of a degradation of the fuel clad, and is a precursor of more serious problems. This activity level is chosen instead of the 0.2 µCi/gm DEI-131 Technical Specification limit (under which operation is allowed to continue for up to 48 hours) to accommodate short duration Iodine spikes following changes in thermal power.

The Technical Specification limit on Reactor Coolant activity ensures that the 2 hour thyroid and whole body doses resulting from a Main Steam Line failure outside the primary containment during steady state operation will not exceed a small fraction of the 10 CFR 100 limits.

This limit accommodates Iodine spiking, which frequently occurs following shutdowns, startups, rapid power changes and coolant depressurization. Iodine spikes are characterized by a rapid increase in Reactor Coolant Iodine concentration by as much as three orders of magnitude followed by a return to pre-spike concentrations. This spiking is a temporary excursion and is not caused by a sudden fuel failure and should not be classified under this EAL.

Reactor Coolant Sample Activity of **> 4 µCi/gm** DEI- 131 can only occur as the result of fuel clad degradation and not as a result of Iodine spiking, resin / chemical intrusion transient, HWCI System malfunction, etc. UNUSUAL EVENT declaration is warranted only when actual fuel clad degradation has occurred.

The Technical Specification limit of > 100/E µCi/gm is excluded from this EAL because this limit does not include Iodine Activity.

Escalation to an ALERT or higher emergency classification occurs if a sample analysis of reactor coolant activity exceeds 300 µCi/gm DEI-131 via EAL FB3-L.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, SU4, Example EAL #2
2. HGCS Technical Specifications 3.4.5 Specific Activity
3. HC.OP-AB.RPV-0008(Q) Reactor Coolant Activity

EAL Category: S – System Malfunction

EAL Subcategory: 8 – RCS Leakage

Initiating Condition: RCS Leakage

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Classification Level: **SU8.1 – UNUSUAL EVENT**

EAL:

UNIDENTIFIED LEAKAGE or **PRESSURE BOUNDARY LEAKAGE > 10 gpm** (Using 10 minute average) (Note 6)

OR

IDENTIFIED LEAKAGE > 25 gpm (Averaged over any 24 hour period) (Note 6)

Note 6: See the Fission Product Barrier Table for possible escalation above the UNUSUAL EVENT due to RCS Leakage

Basis:

This EAL is included as a UE because it may be a precursor of more serious conditions and, as result, is considered to be a potential degradation of the level of safety of the plant. The **10 gpm** value for the **UNIDENTIFIED** or **PRESSURE BOUNDARY LEAKAGE** was selected as it is observable with normal Control Room indications. Lesser values must generally be determined through time-consuming surveillance tests (e.g., mass balances).

Relief valve normal operation should be excluded from this EAL. However, a relief valve that operates and fails to close per design should be considered applicable to this EAL if the relief valve cannot be isolated.

The EAL for identified leakage is set at a higher value due to the lesser significance of **IDENTIFIED LEAKAGE** in comparison to **UNIDENTIFIED** or **PRESSURE BOUNDARY LEAKAGE**. In either case, escalation of this EAL to the ALERT level is via Fission Product Barrier Degradation EALs.

Explanation/Discussion/Definitions:

Allowable leakage rates from the RCS are based on predicted and experimentally observed behavior of cracks in pipes. Utilizing the leak before break methodology, it is anticipated that there will be indication(s) of minor RCS boundary leakage prior to a fault escalating to a major leak or a system rupture. Detection of low levels of leakage while pressurized allows for implementation of mitigative actions and permits monitoring for catastrophic failure or rupture precursors.

The limit for RCS **UNIDENTIFIED LEAKAGE** and **PRESSURE BOUNDARY LEAKAGE** is set to a lower value than **IDENTIFIED LEAKAGE** due to concern over break propagation resulting from a small break that could potentially lead to a significantly larger loss of inventory.

RCS leakage is detected by monitoring:

- Drywell atmospheric gaseous radioactivity
- Drywell floor and equipment drain sump flow rate
- Drywell air cooler condensate flow rate
- Drywell pressure
- RPV head flange leak detection system
- Drywell temperature

Drywell Leak Detection (DLD) instrumentation is available via the Radiation Monitoring System (RM-11) to help determine **IDENTIFIED LEAKAGE**. Redundant instrumentation for DLD is available on Panel 10C604 located in the back of the Control Room.

The value of **10 gpm** for RCS **UNIDENTIFIED LEAKAGE** and **PRESSURE BOUNDARY LEAKAGE** was set higher than the T/S limits of 0 and 5 gpm respectively, to allow time to implement corrective actions (including plant shutdown) prior to exceeding the threshold. However, if the value of **10 gpm** is exceeded (using 10 minute average) and then clears, classification is still warranted.

IDENTIFIED LEAKAGE should ONLY be classified as an UNUSUAL EVENT, when the leak rate exceeds **25 gpm** when averaged over any 24-hour period, regardless of whether or not the leak has been isolated. The 24 hour average is included as part of the EAL threshold to provide consistency with the Technical Specification (T/S) limit for **IDENTIFIED LEAKAGE**.

Relief valve normal operation is excluded from this EAL. However, a relief valve that operates and fails to close per design should be considered applicable to this EAL if the relief valve cannot be isolated. An emergency declaration is NOT appropriate for the opening or cycling of an SRV when no other emergency condition exists.

Escalation to the ALERT emergency classification level is via EALs in Category F. Note 6 has been added to remind the EAL-user to review the Fission Product Barrier EALs for possible escalation to higher emergency classifications.

Definitions:

UNIDENTIFIED LEAKAGE: As defined in T/S, shall be all leakage into the drywell that is not **IDENTIFIED LEAKAGE**.

PRESSURE BOUNDARY LEAKAGE: As defined in T/S, shall be leakage through a nonisolable fault in a RCS component body, pipe wall, or vessel wall.

IDENTIFIED LEAKAGE: As defined in T/S, shall be leakage into collection systems, such as pump seal or valve packing leaks, that is captured and conducted to a sump or collecting tank, or, leakage into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of the leakage detection systems or not to be pressure boundary leakage.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, SU4 Example EAL #2
2. HCGS Technical Specifications, Definitions
3. HCGS Technical Specifications 3.4.3.2 Operational Leakage
4. HC.OP-AB.CONT-0001 (Q) Drywell Pressure
5. HC.OP-AB.CONT-0002 (Q) Primary Containment
6. HC.OP-EO.ZZ-0101(Q)-FC Reactor/Pressure Vessel (RPV) Control
7. HC.OP-EO.ZZ-0102(Q)-FC Primary Containment Control
8. HC.OP-GP.ZZ-0005(Q) Drywell Leakage Source Detection
9. HC.OP-SO.SM-0001(Q) Isolation Systems Operation
10. UFSAR 5.2.5 Detection of Leakage Through the Reactor Coolant Pressure Boundary and from the ECCS
11. UFSAR 7.6.1.3 Leak Detection System - Instrumentation and Control

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EALs for:

Fission Product Barriers

EAL Category: F – Fission Product Barrier Degradation

Subcategory: RPV Level

Initiating Condition: Potential Loss of Fuel Clad

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **FB1-P (4 points)**

EAL:

RPV level CANNOT be restored and maintained above **-161 in.**

OR

RPV level CANNOT be determined

Basis:

This threshold is the same as the RCS barrier Loss threshold RB1-L and corresponds to the RPV level at the top of the active fuel. Thus, this threshold indicates a Potential Loss of the Fuel Clad barrier and a Loss of RCS barrier that appropriately escalates the emergency classification level to a SITE AREA EMERGENCY.

Explanation/Discussion/Definitions:

Core Submergence is the preferred method of maintaining adequate core cooling. When RPV level decreases to below TAF, the ability to effectively remove decay heat is being challenged, and as such the Fuel Clad fission product barrier can no longer be considered intact. While the Emergency Operating Procedures provide contingencies to establish adequate core cooling when RPV level drops below TAF (Core Spray or Steam Cooling with or without injection), these actions are designed to be an alternative method of providing adequate core cooling while actions are taken to reestablish core submergence. Sustained partial or total core uncovery can result in fuel damage and a significant release of fission products to the Reactor coolant. Sustained core uncovery can also result in a breach of the RPV due to core melt material interaction with the RPV.

A Loss of Core Submergence will occur when the rate of inventory loss is greater than the rate of inventory makeup from high pressure injection sources. This condition can occur as the result of the following events/sequences:

- A LOCA will cause RPV level to reach the Top of Active Fuel when the LOCA is the result of a large break (momentary core uncovery is expected to occur under this condition) or when the LOCA is due to a small or intermediate break in combination with an inability of high pressure injection sources to keep up with the leakrate.

- A loss of high pressure injection sources without the presence of a LOCA will also result in RPV level decreasing to TAF, due to continued Reactor Steam Flow without makeup.

Either of these events/sequences results in a challenge to the Fuel Clad Barrier when RPV level CANNOT be restored **AND** maintained above the TAF due to core uncovery, hence classification at this threshold is appropriate. However, for both these sequences, Low Pressure ECCS are designed to inject to the RPV as RPV Pressure decreases below the shutoff head of the pumps. RPV Depressurization will occur either due to the LOCA or Manual initiation of Emergency RPV Depressurization when RPV level cannot be restored and maintained above -185 in., provided injection systems are available. This will allow for restoration of RPV level and re-establishment of Core Submergence. Failure of these systems to restore and maintain RPV level above -185 in. will result in a Loss of the Fuel Clad barrier per EAL FB1-L.

Until the wide range RPV level (WR) indicator is downscale or becomes questionable, it should be used to assure RPV level is above TAF. Once WR is downscale, use compensated fuel zone indication (SPDS or graph) to assess RPV level above TAF and when compensated fuel zone level indication goes below TAF or becomes questionable, declare the EAL.

If RPV level cannot be determined, the indicated level value and trend have become unreliable to the extent that decisions concerning adequate core cooling cannot be made. RPV Flooding in accordance with EOP 206 or EOP 206A is required to assure continued core cooling. These EOPs specify actions to rapidly depressurize the RPV and establish sufficient RPV injection to cool the core by either steam cooling (with injection) or flooding the RPV to the main steam line penetrations. Entry to the RPV Flooding EOPs warrants classification of a SITE AREA EMERGENCY based on EAL RB1-L and this EAL.

Note that EOP Flowchart 101A may require intentionally controlling RPV level below -161 in. Under these conditions, a high-power ATWS event exists and requires at least a SITE AREA EMERGENCY classification in accordance with the ATWS/Criticality EALs.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Fuel Clad Potential Loss 2.A
2. Technical Specifications Table 3.3.3-2 ECCS Actuation Instrumentation Setpoints
3. Technical Specifications Figure B3/4-3-1 Reactor Vessel Water Level
4. HC.OP-EO.ZZ-0101(Q)-FC RPV Control
5. HC.OP-EO.ZZ-0206(Q)-FC RPV Flooding
6. HC.OP-EO.ZZ-0206A(Q)-FC ATWS - RPV Flooding
7. HC.OP-EO.ZZ-0101A(Q)-FC ATWS - RPV Control

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EAL Category: F – Fission Product Barrier Degradation

Subcategory: EC Judgment

Initiating Condition: Potential Loss of Fuel Clad

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **FB2-P (4 points)**

EAL:

<u>ANY</u> condition in the opinion of the Emergency Coordinator that indicates potential loss of the Fuel Clad barrier

Basis:

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. In addition, the inability to monitor the barrier should also be incorporated in this threshold as a factor in Emergency Coordinator judgment that the barrier may be considered potentially lost.

Explanation/Discussion/Definitions:

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.

- <u>Barrier degradation</u> exists if the degradation will likely occur within two hours based on a projection of current safety system performance.
- <u>Barrier monitoring</u> 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.
- <u>Dominant accident sequences</u> 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.

Definitions:

IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours (unless a different time is specified).

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Fuel Clad Potential Loss 6.A

EAL Category: F – Fission Product Barrier Degradation

Subcategory: RPV Level

Initiating Condition: Loss of Fuel Clad

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **FB1-L (5 points)**

EAL:

Primary Containment Flooding is required as indicated by **EITHER** of the following:

- RPV level CANNOT be restored and maintained above **-185 in.**
- RPV level CANNOT be determined **AND** it is determined that core damage is occurring

Basis:

This RPV level value corresponds to the level used in EOPs to indicate challenge of core cooling. This is the minimum value to assure core cooling without further degradation of the clad.

Explanation/Discussion/Definitions:

Core submergence is the mechanism of core cooling whereby each fuel element is completely covered with water. Indicated RPV level at or above the top of the active fuel (TAF) constitutes the principal means of confirming the adequacy of core cooling via this mechanism. Assurance of continued adequate core cooling through core submergence is achieved when RPV level can be maintained at or above TAF.

Spray cooling is the mechanism of core cooling whereby the uncovered portion of the core is cooled by spray flow. Adequate spray cooling exists by design when at least one Core Spray loop is operating at design flow (6150 gpm) and RPV level is at or above the elevation of the jet pump suctions (-215 in.). The covered portion of the core is then cooled by submergence while the uncovered portion is cooled by spray flow.

Steam cooling is the mechanism of core cooling whereby steam updraft up through the uncovered portion of each fuel bundle is sufficient to prevent the temperature of the hottest fuel rod from exceeding the appropriate limiting value, which is specific to the mode of steam cooling being employed (i.e., with and without injection of makeup water to the RPV).

With injection of makeup water into the RPV established, adequate core cooling exists when steam flow through the core is sufficient to preclude the peak clad temperature of the hottest fuel rod from exceeding 1500°F, the threshold temperature for fuel rod perforation. Assurance of continued adequate core cooling is achieved when RPV level can be maintained at or above the Minimum steam Cooling RPV Water Level **-185 in.**).

With no injection into the RPV established, adequate core cooling exists only so long as the covered portion of the reactor core generates sufficient steam to preclude the peak clad temperature of the hottest fuel rod from exceeding 1800°F, the threshold temperature for significant metal-water reaction.

Prolonged lack of cooling may result in severe overheating of the fuel clad, additional release of energy from accelerated clad oxidation, and eventual fuel melting. For events starting from full power operation, the failure to promptly reflood could result in some fuel melting. Even under these conditions vessel failure and primary containment failure with resultant release to the public would not be expected for some time. Reactor Water Level remaining below TAF for an extended amount of time represents an early indicator that significant core damage is in progress while providing sufficient time to initiate public protective actions.

Ample time should be allowed for Low Pressure ECCS and alternate injection systems to restore RPV level prior to entry into this classification. The time basis for deciding whether or not RPV level can be maintained **> -185 in.** should be based on the rate of reactor depressurization, the availability of low-pressure injection sources, (ECCS and alternate injection systems), and the rate of Reactor coolant inventory loss. Indications such as RPV level trend, injection flow rates, primary containment parameter trends, and low pressure injection system capability should also be considered.

In the event, RPV level cannot be restored **> -185 in.**, primary containment flooding will be required by the EOPs. This will attempt to flood the containment as a means of flooding the RPV, and use a flooded containment as a heat sink for the nuclear fuel.

Until the wide range RPV level (WR) indicator is downscale or becomes questionable, it should be used to assure RPV level is above TAF. Once WR is downscale, use compensated fuel zone indication (SPDS or graph) to assess RPV level above TAF and when compensated fuel zone level indication goes below **–185 in.** or becomes questionable, declare the EAL.

If RPV level cannot be determined, the indicated level value and trend have become unreliable to the extent that decisions concerning adequate core cooling cannot be made. RPV Flooding in accordance with EOP 206 or EOP 206A is required to assure continued core cooling. These EOPs specify actions to rapidly depressurize the RPV and establish sufficient RPV injection to cool the core by either steam cooling (with injection) or flooding the RPV to the main steam line penetrations. Entry to the RPV Flooding EOPs warrants classification of a SITE AREA EMERGENCY based on EAL FB1-P and EAL RB1-L. If RPV Flooding is unsuccessful, indications that core damage is occurring will be observed (DAPA > 600 R/hr with drywell sprays, DAPA > 1200 R/hr without drywell sprays, or H_2 > 2% in either the Drywell or Suppression Chamber) and primary containment flooding is required (SAG entry).

This threshold is also a Potential Loss of the Containment barrier (CB1-L). Since SAG entry occurs after core uncovery has occurred, a Loss of the RCS barrier exists (RB1-L). SAG entry, therefore, represents a Loss of two barriers and a Potential Loss of a third, which requires a GENERAL EMERGENCY classification.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Fuel Clad Loss 2.A
2. HC.OP-EO.ZZ-0101A(Q)-FC ATWS – RPV Control
3. HC.OP-EO.ZZ-0101(Q)-FC RPV Control
4. HC.OP-EO.ZZ-0206(Q)-FC RPV Flooding
5. HC.OP-EO.ZZ-0206A(Q)-FC ATWS - RPV Flooding
6. HC.OP-AM.ZZ-0001(Z) Severe Accident Guidelines (SAG)

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EAL Category: F – Fission Product Barrier Degradation

Subcategory: RPV Level

Initiating Condition: Loss of Fuel Clad

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **FB2-L (5 points)**

EAL:

<u>**ANY**</u> DAPA Radiation Monitor reading <u>**EITHER**</u> of the following:

- With drywell sprays, ≥ **2000 R/hr**
- Without drywell sprays, ≥ **4000 R/hr**

Basis:

The DAPA radiation monitor readings are values which indicate the release of reactor coolant, with elevated activity indicative of fuel damage, into the drywell.

Reactor coolant concentrations of this magnitude are several times larger than the maximum concentrations (including iodine spiking) allowed within Technical Specifications and are therefore indicative of fuel damage.

There is no Potential Loss threshold associated with this item.

Explanation/Discussion/Definitions:

Drywell Atmosphere Post Accident (DAPA) Radiation monitors indicating **2000 R/hr** or greater corresponds to a release of Reactor Coolant to the drywell with a concentration of 300 μCi/gm Dose Equivalent Iodine-131 (DEI-131) into the Primary Containment when Drywell Spray is in service. This value of Reactor Coolant Activity is well above the threshold that could occur as the result of Iodine Spiking, resin/chemical intrusion transients or a HWCI System malfunction. This activity level corresponds to fuel damage of approximately 4%.

EAL FB3-L provides a core damage analysis showing that a Reactor Coolant activity of 300 μCi/gm Dose Equivalent Iodine-131(DEI) is indicative of 4% fuel damage. Using Attachment 2 of HC.EP-EP.ZZ-0205, 4% fuel damage is indicated by a DAPA reading of approximately **2000 R/hr** at 1 hour after shutdown (the most conservative) with drywell spray in service and approximately **4000 R/hr** at 1 hour after shutdown with drywell spray not in service.

From Attachment 2 of HC.EP-EP.ZZ-0205, Step 6 the following formula was used to derive the EAL set-points:

$$\% \text{ Cladding Damage} = \frac{\text{Indicated Radiation Level}}{100\% \text{Cladding Damage Radiation Level}} \times 100$$

4 (% Cladding Damage) = $\dfrac{\text{DAPA Rad Monitor Reading X100}}{\text{50,000R/HR}}$ (from Att 2. Fig. 1, of HC.EP-EP.ZZ-0205 with Sprays)

DAPA Reading = $\dfrac{(4)\,(50{,}000\text{R/HR})}{100}$

DAPA Reading = **2000R/hr** (with Drywell Spray in service)

OR

4 (% Cladding Damage) = $\dfrac{\text{DAPA Rad Monitor Reading X100}}{\text{100,000R/HR}}$ (from Att 2. Fig. 1, of HC.EP-EP.ZZ-0205 without Sprays)

DAPA Reading = $\dfrac{(4)\,(100{,}000\text{R/HR})}{100}$

DAPA Reading = **4000R/hr** (without Drywell Spray in Service)

DAPA radiation monitors RE-4825A and RE-4825B are high range area radiation monitors and are located in the drywell at 145' elevation. Each detector has a range of 1 to 10^8 R/hr and a built in check source that keeps the associated channel on-scale at approximately 1.2 R/hr. In the Control Room, DAPA radiation levels are displayed on RI-4825A (RM-11 9RX635) and B (RM-11 9RX636) (Panel 10C604) and RR-4825A and B (10C650). Drywell radiation levels ≥ 2.0E+2 R/hr activates Overhead Annunciator C6-C1, RADIATION MONITORING ALARM/TRBL.

A structural I-beam in the drywell shields DAPA radiation monitor RE-4825B from shine due to radioactivity in the RCS piping. RE-4825A is not shielded. When the RCS is intact, elevated RCS coolant activity produces higher readings on RE-4825A than on RE-4825B. During events in which radioactivity is dispersed into the drywell atmosphere, structural shielding diminishes as the monitors become immersed in the radiation field. If the difference in RE-4825A and RE-4825B readings should decrease, it may be inferred that a LOCA event is occurring.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Fuel Clad Loss 4.A
2. HC.EP-EP.ZZ-0205(Q) TSC – Post Accident Core Damage Assessment
3. UFSAR Table 11.5-1 Hope Creek Radiation Monitoring System
4. HC.OP-AR.ZZ-0011(Q) Overhead Annunciator Box C6

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EAL Category: F – Fission Product Barrier Degradation

Subcategory: Radiation

Initiating Condition: Loss of Fuel Clad

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **FB3-L (5 points)**

EAL:

Primary coolant activity **> 300 µCi/gm** dose equivalent I-131

Basis:

Assessment by the EAL Task Force indicates that **300 µCi/gm** I-131 equivalent coolant activity is well above that expected for iodine spikes and corresponds to less than 4% fuel damage. This amount of radioactivity indicates significant fuel damage and thus the Fuel Clad Barrier is considered lost.

There is no Potential Loss threshold associated with this item.

Explanation/Discussion/Definitions:

The percentage of Fuel Damage that corresponds to an RCS Activity of **300 µCi/gm** DEI-131 is calculated as follows (for purposes of this calculation, cc and gm are considered equivalent):

Dose Factors (RG-1.109)

I-131 = 4.39E-3
I-132 = 5.23E-5
I-133 = 1.04E-3
I-134 = 1.37E-5
I-135 = 2.14E-4

Total core inventory (HCGS-UFSAR, table 12.2-135). This table gives 50% inventory, so table values are multiplied by 2.0.

I-131 = 8.64E7 Ci
I-132 = 1.29E8 Ci
I-133 = 1.99E8 Ci
I-134 = 2.32E8 Ci
I-135 = 1.81E8 Ci

Reactor Water Volume = 13000 cubic feet (HCGS Calculation BJ-0024)

Clad Release Fraction for iodines = 0.02 (Table 4.1, NUREG-1228)

The activity of each isotope in the clad would then be:

I-131 = 8.64E7(0.02) = 1.73E6 Ci
I-132 = 1.29E8(0.02) = 2.58E6 Ci
I-133 = 1.99E8(0.02) = 3.98E6 Ci
I-134 = 2.32E8(0.02) = 4.64E6 Ci
I-135 = 1.81E8(0.02) = 3.62E6 Ci

These activities are equivalent to 2.89E6 Ci DEI-131

$$DEI-131=\frac{(4.39\mathrm{E}-3)(1.73\mathrm{E}6)+(5.23\mathrm{E}-5)(2.58\mathrm{E}6)+(1.04\mathrm{E}-3)(3.98\mathrm{E}6)+(1.37\mathrm{E}-5)(4.64\mathrm{E}6)+(2.14\mathrm{E}-4)(3.62\mathrm{E}6)}{(4.39E-3)}$$

Calculating the equivalent concentration:

$$\text{Conc} = \frac{2.89\mathrm{E}6\ \mathrm{Ci}(1\mathrm{E}6\mu\mathrm{Ci}/\mathrm{Ci})}{13000\ \mathrm{cf}(2.8\mathrm{E}4\ \mathrm{cc}/\mathrm{cf})} = 7.94\mathrm{E}3\ \mu\mathrm{Ci/cc}$$

which represents the 100% fuel damage concentration.

300 µCi/cc DEI-131 is then equivalent to:

$$\frac{300\ \mu\mathrm{Ci}/\mathrm{cc}}{7.94\mathrm{E}3\ \mu\mathrm{Ci}/\mathrm{cc}} = 3.78\%$$

This is rounded to 3.8%.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Fuel Clad Loss 1.A
2. NEI 99-01, Rev. 05, FC1
3. HC.OP-AB.RPV-0008 (Q) Reactor Coolant Activity
4. HCGS Technical Specification LCO 3.4.5 Specific Activity
5. NUREG 1228 - Source Term Estimation During Incident Response to Severe Nuclear Power Plant Accidents, Table 4.1
6. Reg. Guide 1.109, Table E-9
7. UFSAR Table 12.2-135 Post Accident Source Terms for Depressurized Liquid Containing Systems

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EAL Category: F – Fission Product Barrier Degradation

Subcategory: EC Judgment

Initiating Condition: Loss of Fuel Clad

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **FB4-L (5 points)**

EAL:

<u>**ANY**</u> condition in the opinion of the Emergency Coordinator that indicates loss of the Fuel Clad barrier

Basis:

This threshold addresses any other factors that are to be used by the Emergency Coordinator in determining whether the Fuel Clad barrier is lost. In addition, the inability to monitor the barrier should also be incorporated in this threshold as a factor in Emergency Coordinator judgment that the barrier may be considered lost.

Explanation/Discussion/Definitions:

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.

- <u>Barrier degradation</u> exists if the degradation will likely occur within two hours based on a projection of current safety system performance.
- <u>Barrier monitoring</u> 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.
- <u>Dominant accident sequences</u> 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.

  IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours (unless a different time is specified).

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Fuel Clad Loss 6.A

EAL Category: F – Fission Product Barrier Degradation

Subcategory: RCS Leakage, Leak Isolation, PC Venting

Initiating Condition: Potential Loss of RCS

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **RB1-P (4 points)**

EAL:

RCS leakage **> 50 gpm** inside the drywell

Basis:

This threshold is based on leakage is set at a level indicative of a small breach of the RCS but which is well within the makeup capability of normal and emergency high pressure systems. Core uncovery is not a significant concern for a **50 gpm** leak, however, break propagation leading to significantly larger loss of inventory is possible.

If primary system leak rate information is unavailable, other indicators of RCS leakage should be used.

Explanation/Discussion/Definitions:

RCS leakage into the drywell exceeding **50 gpm** is substantially greater than the RCS leakage thresholds established in EAL SU8.1 and represents further degradation of the RCS barrier. Inability to isolate the RCS leakage would eventually result in a high drywell pressure actuation (>1.68 psig) of RPS, ECCS and PCIS. The actuation would lead to an isolation of the drywell floor and equipment drain sumps, complicating efforts to further identify and quantify any changes in the leak rate.

Other indications of RCS leakage include:

- Drywell atmospheric gaseous radioactivity
- Drywell air cooler condensate flow rate
- Drywell pressure
- RPV head flange leak detection system
- Drywell temperature
- Recirc Pump Dual Seal Failure

Inventory loss events, such as a stuck open SRV, should not be considered when referring to "RCS leakage" because they are not indications of break propagation.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 RCS Barrier Potential Loss 3.A
2. HC.OP-GP-ZZ-0005 (Q) Drywell Leakage Source Detection
3. HC.OP-AB.CONT-0001 (Q) Drywell Pressure
4. HC.OP-AB.CONT-0002 (Q) Primary Containment
5. HC.OP-AB.RPV-0003 (Q) Recirc System / Power Oscillations
6. HC.RP-AR.SP-0001 (Q) Radiation Monitoring System Alarm Response – RM-11
7. HC.OP-EO.ZZ-0101(Q)-FC Reactor/Pressure Vessel (RPV) Control
8. HC.OP-EO.ZZ-0102(Q)-FC Primary Containment Control
9. HC.OP-EO.ZZ-0103/4(Q)-FC Reactor Building and Radioactive Release Control
10. HC.OP-SO.SM-0001(Q) Isolation Systems Operation

EAL Category: F – Fission Product Barrier Degradation

Subcategory: RCS Leakage, Leak Isolation, PC Venting

Initiating Condition: Potential Loss of RCS

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **RB2-P (4 points)**

EAL:

UNISOLABLE primary system leakage outside primary containment (after isolation from the Control Room has or should have been attempted) as indicated by exceeding **EITHER** of the following:

- **ANY** EOP 103 Reactor Bldg room temperature Table 1, Column 1
- **ANY** EOP 103 Reactor Bldg local rad monitoring alarm

Basis:

Potential loss of RCS based on primary system leakage outside the primary containment is determined from EOP flowchart 103 temperature or area radiation Maximum Normal Operating values in the areas of the RCIC, HPCI, etc., which indicate a direct path from the RCS to areas outside primary containment.

The indicators reaching the threshold barriers and confirmed to be caused by RCS leakage warrant an ALERT classification. An **UNISOLABLE** leak defined by this EAL escalates to a SITE AREA EMERGENCY when combined with Containment Barrier Loss threshold CB5-L (after a containment isolation) and a GENERAL EMERGENCY when any Fuel Clad Barrier Loss criterion is also exceeded.

Explanation/Discussion/Definitions:

The presence of elevated general area temperatures or radiation levels in the Reactor Building may be indicative of **UNISOLABLE** primary system leakage outside the primary containment. The Reactor Bldg room temperatures listed in EOP 103 Table 1, Column 1, and the Reactor Bldg local rad monitoring alarm levels define the Maximum Normal Operating values because they signify the onset of abnormal system operation. When parameters reach these levels, equipment failure or misoperation 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 103.

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.

This EAL allows for valve closure from the Control Room to isolate any systems not completely isolated, prior to event classification. Isolation is defined as the closure of ANY valve from the Control Room in the system(s) not completely isolated. For example, if the isolation logic fails to cause valve closure, but operator actions implemented in the Control Room successfully isolates the containment breach/leak path, then classification under this EAL is not warranted. This includes Motor Operated Valves not controlled by the isolation logic, but that are controlled from the Control Room.

Although this EAL allows for valve closure from the Control Room, the time to attempt closure and make a decision if leak isolation was successful runs concurrently with the EAL 15-minute assessment clock:

- If, during the EAL 15-minute assessment period attempts from the Control Room to isolate the leak are successful then, this EAL is NOT exceeded and classification per this EAL should NOT be made.
- If, during the EAL 15-minute assessment period attempts from the Control Room to isolate the leak are NOT successful then, this EAL is exceeded and classification should be made at that time. There is no need to wait the full 15 minutes.
- If near the end of the 15 minute assessment period and the control room staff has not been able to attempt leak isolation or the EC is not convinced that an isolation attempt has been successful, then this EAL is exceeded and classification should be made at or before the 15-minute assessment time expires.

Definitions:

UNISOLABLE: A breach or leak that cannot be promptly isolated from the Control Room.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 RCS Barrier Potential Loss 3.B
2. HC.OP-EO.ZZ-0103/4(Q)-FC Reactor Building and Rad Release Control

EAL Category:	F – Fission Product Barrier Degradation
Subcategory:	EC Judgment
Initiating Condition:	Potential Loss of RCS
OPCON Applicability:	1 - Power Operations, 2 - Startup, 3 - Hot Shutdown
EAL# & Point Value:	**RB3-P (4 points)**

EAL:

ANY condition in the opinion of the Emergency Coordinator that indicates potential loss of the RCS barrier

Basis:

This threshold addresses any other factors that are to be used by the Emergency Coordinator in determining whether the RCS barrier is potentially lost. In addition, the inability to monitor the barrier should also be incorporated in this threshold as a factor in Emergency Coordinator judgment that the barrier may be considered potentially lost.

Explanation/Discussion/Definitions:

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.

- Barrier degradation exists if the degradation will likely occur within two hours based on a projection of current safety system performance.
- 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.

Definitions:

IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours (unless a different time is specified).

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 RCS Potential Loss 6.A

EAL Category: F – Fission Product Barrier Degradation

Subcategory: RPV Level

Initiating Condition: Loss of RCS

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **RB1-L (5 points)**

EAL:

RPV level CANNOT be restored and maintained above **-161 in.**

<u>**OR**</u>

RPV level CANNOT be determined

Basis:

The Loss threshold RPV water level of **-161 in.** corresponds to the level that is used in EOPs to indicate challenge of core cooling.

This threshold is the same as Fuel Clad Barrier Potential Loss threshold FB1-P and corresponds to a challenge to core cooling. Thus, this threshold indicates a Loss of RCS barrier and Potential Loss of Fuel Clad barrier that appropriately escalates the emergency classification level to a SITE AREA EMERGENCY.

There is no Potential Loss threshold associated with this item.

Explanation/Discussion/Definitions:

The top of the active fuel 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 (PC) barriers, and initiation of all ECCS. If RPV level cannot be maintained above the top of active fuel, ECCS and other sources of RPV injection have been ineffective or incapable of reversing the decreasing level trend.

Core Submergence is the preferred method of maintaining adequate core cooling. When RPV Level decreases to below TAF, the ability to effectively remove decay heat is being challenged, and as such the Fuel Clad fission product barrier can no longer be considered intact. While the Emergency Operating Procedures provide contingencies to establish adequate core cooling when RPV Level drops below TAF (Core Spray or Steam Cooling with or without injection), these actions are designed to be an alternative method of providing adequate core cooling while actions are taken to reestablish core submergence. Sustained partial or total core uncovery can result in fuel damage and a significant release of fission products to the Reactor coolant. Sustained core uncovery can also result in a breach of the RPV due to core melt material interaction with the RPV.

A Loss of Core Submergence will occur when the rate of inventory loss is greater than the rate of inventory makeup from high pressure injection sources. This condition can occur as the result of the following events/sequences:

- A LOCA will cause RPV Level to reach the Top of Active Fuel when the LOCA is the result of a large break (momentary core uncovery is expected to occur under this condition) or when the LOCA is due to a small or intermediate break in combination with an inability of high pressure injection sources to keep up with the leakrate.

- A loss of high pressure injection sources without the presence of a LOCA will also result in RPV Level decreasing to TAF, due to continued Reactor Steam Flow without makeup.

Either of these events/sequences results in a challenge to the Fuel Clad Barrier when RPV Level CANNOT be restored **AND** maintained above the TAF due to core uncovery, hence classification at this threshold is appropriate. However, for both these sequences, Low Pressure ECCS are designed to inject to the RPV as RPV Pressure decreases below the shutoff head of the pumps. RPV Depressurization will occur either due to the LOCA or Manual initiation of Emergency RPV Depressurization when RPV Level cannot be restored and maintained above -185 in., provided injection systems are available. This will allow for restoration of RPV Level and re-establishment of Core Submergence. Failure of these systems to restore and maintain RPV Level above -185 in. will result in a Loss of the Fuel Clad barrier per EAL FB1-L.

Until the wide range (WR) indicator is downscale or becomes questionable, it should be used to assure RPV water level is above TAF. Once WR is downscale, use compensated fuel zone indication (SPDS or graph) to assess RPV level above TAF and when compensated fuel zone level indication goes below TAF or becomes questionable, declare the EAL.

If RPV level cannot be determined, the indicated level value and trend have become unreliable to the extent that decisions concerning adequate core cooling cannot be made. RPV Flooding in accordance with EOP 206 or EOP 206A is required to assure continued core cooling. These EOPs specify actions to rapidly depressurize the RPV and establish sufficient RPV injection to cool the core by either steam cooling (with injection) or flooding the RPV to the main steam line penetrations. Entry to the RPV Flooding EOPs warrants classification of a SITE AREA EMERGENCY based on EAL FB1-P and this EAL.

Note that EOP Flowchart 101A may require intentionally controlling RPV level below **-161 in.** Under these conditions, a high-power ATWS event exists and requires at least a SITE AREA EMERGENCY classification in accordance with the ATWS/Criticality EALs.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 RCS Barrier Loss 2.A
2. Technical Specifications Table 3.3.3-2 ECCS Actuation Instrumentation Setpoints
3. Technical Specifications Figure B3/4-3-1 Reactor Vessel water Level
4. HC.OP-EO.ZZ-0101(Q)-FC RPV Control
5. HC.OP-EO.ZZ-0206(Q)-FC RPV Flooding
6. HC.OP-EO.ZZ-0206A(Q)-FC ATWS - RPV Flooding
7. HC.OP-EO.ZZ-0101A(Q)-FC ATWS - RPV Control

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EAL Category: F – Fission Product Barrier Degradation

Subcategory: RPV / Drywell Pressure / Temperature / H_2 & O_2 Levels

Initiating Condition: Loss of RCS

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **RB2-L (5 points)**

EAL:

Drywell pressure **> 1.68 psig** due to RCS leakage

Basis:

The Drywell pressure is based on the drywell high pressure of 1.68 psig which indicates a LOCA by automatically initiating ECCS.

There is no Potential Loss threshold associated with this item.

Explanation/Discussion/Definitions:

The drywell high pressure scram setpoint (**1.68 psig**) is an entry condition to the EOP flowcharts 101 and 102. EOP Flowchart 102 will prescribe operation of drywell or suppression chamber sprays.

There are multiple Control Room indicators and alarms that can be used to determine the presence of this threshold. Overhead annunciators alarm at 1.0 psig, 1.5 psig and **1.68 psig**. Plant automatic response to a high drywell pressure condition includes: a reactor scram, ECCS initiation, trip of the drywell cooling fans and isolation of the cooling water to the drywell. These actuations may mask the trend in Drywell pressure. For example, the scram will result in less heat being added to the containment and the cooling water isolation will result in no heat being removed.

In the HCGS design basis, primary 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.

The threshold phrase "...due to RCS leakage" focuses the barrier failure on the RCS instead of the non-LOCA malfunctions that may adversely affect Drywell pressure. Drywell pressure greater than **1.68 psig** with corollary indications (e.g., elevated 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.

Indication of an RCS leakage should be positively determined by observing Drywell parameters, including drywell pressure and temperature trends, drywell equipment and floor drain sump levels, DAPA radiation levels, atmospheric pressure, torus pressure, and the status of drywell cooling systems.

An isolable Reactor Recirculation pump dual seal failure should not result in drywell pressure reaching this threshold, hence classification under this RCS Loss should not occur.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 RCS Barrier Loss 1.A
2. Technical Specifications Table 3.3.3-2 ECCS Actuation Instrumentation Setpoints
3. HC.OP-EO.ZZ-0101(Q)-FC Reactor/Pressure Vessel (RPV) Control
4. HC.OP-EO.ZZ-0102(Q)-FC Primary Containment Control
5. HC.OP-AB.CONT-0002(Q) Primary Containment
6. HC.OP-AB.CONT-0001(Q) Drywell Pressure
7. HC.OP-GP.ZZ-0005(Q) Drywell Leak Source Detection
8. HC.OP-SO.SM-0001(Q) Isolation Systems Operation

EAL Category: F – Fission Product Barrier Degradation

Subcategory: RCS Leakage, Leak Isolation, PC Venting

Initiating Condition: Loss of RCS

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **RB3-L (5 points)**

EAL:

VALID isolation signal exists with an **UNISOLABLE** break outside primary containment (after isolation from the Control Room has or should have been attempted) in **ANY** of the following systems:

- Main steam line
- HPCI steam line
- RCIC steam line
- RWCU
- Feedwater

Basis:

An **UNISOLABLE** MSL break is a breach of the RCS barrier. Thus, this threshold is included for consistency with the ALERT emergency classification level.

Other large high-energy line breaks such as HPCI, Feedwater, RWCU, or RCIC that are **UNISOLABLE** also represent a significant loss of the RCS barrier and should be considered as MSL breaks for purposes of classification.

Explanation/Discussion/Definitions:

This **UNISOLABLE** Break is a breach of the RCS Barrier. This EAL represents large high-energy line breaks that are **UNISOLABLE** and meet the criteria for ALERT emergency classification. Failure to completely isolate the effected break as determined by valve position and indication of continuing leakage, if outside the containment, could result in an additional Loss of the Containment Barrier.

A high energy line break that results in a **VALID** Isolation Signal for any of the systems listed in the EAL requires closure of the associated Primary Containment Isolation valves to maintain RCS and Primary Containment integrity under abnormal conditions. A failure of these isolation valves to isolate allows Reactor Coolant to be released directly outside the Primary Containment (Containment Bypass), resulting in a Loss of RCS and Loss of Containment. A RCS Line is ANY line that communicates directly with the Reactor.

This EAL allows for valve closure from the Control Room to isolate any high energy line not completely isolated, prior to event classification. Isolation is defined as the closure of <u>ANY</u> valve from the Control Room in the system(s) not completely isolated. For example, if the isolation logic fails to cause valve closure, but operator actions implemented in the Control Room successfully isolates the effected line(s), then event classification under this EAL is not warranted. This includes motor operated valves not controlled by the isolation logic, but that are controlled from the Control Room.

Although this EAL allows for valve closure from the Control Room, the time to attempt closure and make a decision if leak isolation was successful runs concurrently with the EAL 15-minute assessment clock:

- If, during the EAL 15-minute assessment period attempts from the Control Room to isolate the leak are successful then, this EAL is NOT exceeded and classification per this EAL should NOT be made.

- If, during the EAL 15-minute assessment period attempts from the Control Room to isolate the leak are NOT successful then, this EAL is exceeded and classification should be made at that time. There is no need to wait the full 15 minutes.

- If near the end of the 15 minute assessment period and the control room staff has not been able to attempt leak isolation or the EC is not convinced that an isolation attempt has been successful, then this EAL is exceeded and classification should be made at or before the 15-minute assessment time expires.

Nuclear Steam Supply Shutoff System (NSSSS) isolations, as well as HPCI and RCIC steam line isolations, are associated with systems that are part of the RCS boundary and penetrate the Primary Containment. Isolation requirements for these lines are covered in 10CFR50, Appendix A, General Design Criteria 55. These systems form a closed loop <u>outside</u> the Primary Containment, and are not open or potentially open to the environment. They are included in this EAL since they represent an extension of the RCS boundary beyond the Primary Containment, and a potential release path from the RCS to the environment. Without complete isolation, continuing flow/leakage represents a situation where Reactor Coolant is discharging outside the Primary Containment, including areas in the Reactor Building addressed in the EOPs.

Indication of an **UNISOLABLE** break includes: flow indication through isolated lines, increasing Reactor Building area temperatures, area radiation levels, also increases in sump levels, or room levels in spaces associated with affected lines, as well as increases in Plant Vent Effluent levels.

The isolation valve status of all isolation groups is monitored for quick reference on SPDS to be backed up by operator observation of valve status.

A high-energy line break may be detected by the following:

- Main steam line:

  NSSSS ISLN SIG - STM TNL TEMP HI (C8-C4)

  NSSSS ISLN SIG - MN STM FLOW HI (C8-B4)

  MSIV CLOSURE (C5-B3)

  Rapid changes in Main Steam Line Flow and Steam Tunnel Temperatures

- HPCI steam line:

  HPCI/RHR A AREA LEAK TEMP HI (D3-A1)

  HPCI STM LK ISLO TIMER INITIATED (D3-B1)

  HPCI STEAM LINE DIFF PRESSURE HI (B1-A5)

- RCIC steam line:

  RCIC/RHR B AREA LEAK TEMP HI (D3-A2)

  RCIC STM LK ISLO TIMER INITIATED (D3-B2)

  RCIC STEAM LINE DIFF PRESSURE HI (B1-A2)

- RWCU:

  MN STM/RWCU AREA LEAK TEMP HI (D3-A3)

  RWCU STM LK ISLO TIMER INITIATED (D3-B3)

  RWCU DIFF FLOW HI (C1-A2)

- Feedwater line break in steam tunnel:

  NSSSS ISLN SIG - STM TNL TEMP HI (C8-C4)

  NSSSS ISLN SIG - MN STM FLOW HI (C8-B4)

MSIV CLOSURE (C5-B3)

Rapid changes in Feedwater Flow and Steam Tunnel Temperatures

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.

Definitions:

UNISOLABLE: A breach or leak that cannot be promptly isolated from the Control Room.

VALID: An indication, report, or condition, is considered to be **VALID** when it is verified by (1) an instrument channel check, (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.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 RCS Barrier Loss 3.A
2. UFSAR 5.4.5 Main Steam Line Isolation System
3. UFSAR 6.3.1.1 Emergency Core Cooling System
4. UFSAR 5.4.6 RCIC
5. UFSAR 5.4.8 RWCU
6. UFSAR 5.4.9 Main Steam Line and Feedwater Line
7. HC.OP-AR.ZZ-0006, 8, 10, 12, 14 (Q) Annunciator Response Procedure, Windows B1/C1/C5/C8/D3

EAL Category: F – Fission Product Barrier Degradation

Subcategory: RCS Leakage, Leak Isolation, PC Venting

Initiating Condition: Loss of RCS

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **RB4-L (5 points)**

EAL:

Emergency RPV Depressurization is required

Basis:

Plant symptoms requiring Emergency RPV Depressurization per the EOP flowcharts are indicative of a loss of the RCS barrier. If Emergency RPV depressurization is required, the plant operators are directed to open safety relief valves (SRVs) and keep them open. Even though the RCS is being vented into the suppression pool, a loss of the RCS should be considered to exist due to the diminished effectiveness of the RCS pressure barrier to a release of fission products beyond its boundary.

Explanation/Discussion/Definitions:

The following EOPs require Emergency Depressurization under specific conditions:

HC.OP-EO.ZZ-0101A-FC, ATWS - RPV Control

- When RPV level cannot be restored and maintained above -185 in.

HC.OP-EO.ZZ-0101-FC, Reactor/Pressure Vessel (RPV) Control

- Before RPV level reaches -185 in. with available injection, or
- When RPV level drops to -200 in. when in Steam Cooling

HC.OP-EO.ZZ-0102-FC, Primary Containment Control

- Cannot maintain Supp Chamber Pressure below Pressure Suppression Pressure Curve, or
- Drywell Temperature cannot be restored and maintained below 340°F, or
- Combined Supp Pool Temp and RPV Press cannot be maintained below the Heat Capacity Temperature Limit Curve, or
- Supp Pool Level cannot be maintained above 38.5 in., or
- Supp Pool Level and RPV Press cannot be restored and maintained below the SRV Tail Pipe level Limit Curve

HC.OP-EO.ZZ-0103/4-FC, Reactor Building & Rad Release Control

- When selected Area Room Temperatures/Levels cannot be maintained below the Max Safe Operating Temperature/Floor Level and there is a Primary System discharging outside Primary Containment, or
- When Gaseous Radioactive Release cannot be maintained below GE levels and there is a Primary System discharging outside Primary Containment and Reactor Building

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 RCS Barrier Loss 3.B
2. HC.OP-EO.ZZ-0101(Q)-FC Reactor/Pressure Vessel (RPV) Control
3. HC.OP-EO.ZZ-0101A(Q)-FC ATWS - RPV Control
4. HC.OP-EO.ZZ-0102(Q)-FC Primary Containment Control
5. HC.OP-EO.ZZ-0103/4(Q)-FC Reactor Building & Rad Release Control

EAL Category: F – Fission Product Barrier Degradation

Subcategory: EC Judgment

Initiating Condition: Loss of RCS

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **RB5-L (5 points)**

EAL:

<u>**ANY**</u> condition in the opinion of the Emergency Coordinator that indicates loss of the RCS barrier

Basis:

This threshold addresses any other factors that are to be used by the Emergency Coordinator in determining whether the RCS barrier is lost. In addition, the inability to monitor the barrier should also be incorporated in this threshold as a factor in Emergency Coordinator judgment that the barrier may be considered lost.

Explanation/Discussion/Definitions:

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.

- <u>Barrier degradation</u> exists if the degradation will likely occur within two hours based on a projection of current safety system performance.
- <u>Barrier monitoring</u> 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.
- <u>Dominant accident sequences</u> 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.

Definitions:

IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours (unless a different time is specified).

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 RCS Loss 6.A

EAL Category: F – Fission Product Barrier Degradation

Subcategory: RPV Level

Initiating Condition: Potential Loss of Containment

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **CB1-P (2 points)**

EAL:

Primary Containment Flooding is required as indicated by **EITHER** of the following:

- RPV level CANNOT be restored and maintained above **-185 in.**
- RPV level CANNOT be determined **AND** it is determined that core damage is occurring

Basis:

There is no Loss threshold associated with this item.

The potential loss requirement for Primary Containment Flooding indicates adequate core cooling cannot be established and maintained and that core melt is possible. Entry into Primary Containment Flooding procedures (SAGs) is a logical escalation in response to the inability to maintain adequate core cooling.

The condition in this potential loss threshold represents a potential core melt sequence which, if not corrected, could lead to vessel failure and increased potential for containment failure. In conjunction with RPV level Loss threshold EALs FB1-L and RB1-L, this threshold will result in the declaration of a GENERAL EMERGENCY -- loss of two barriers and the potential loss of a third.

Explanation/Discussion/Definitions:

Core submergence is the mechanism of core cooling whereby each fuel element is completely covered with water. Indicated RPV water level at or above the top of the active fuel (TAF) constitutes the principal means of confirming the adequacy of core cooling via this mechanism. Assurance of continued adequate core cooling through core submergence is achieved when RPV water level can be maintained at or above TAF.

Spray cooling is the mechanism of core cooling whereby the uncovered portion of the core is cooled by spray flow. Adequate spray cooling exists by design when at least one Core Spray loop is operating at design flow (6150 gpm) and RPV water level is at or above the elevation of the jet pump suctions (-215 inches). The covered portion of the core is then cooled by submergence while the uncovered portion is cooled by spray flow.

Steam cooling is the mechanism of core cooling whereby steam updraft up through the uncovered portion of each fuel bundle is sufficient to prevent the temperature of the hottest fuel rod from exceeding the appropriate limiting value, which is specific to the mode of steam cooling being employed (i.e., with and without injection of makeup water to the RPV).

With injection of makeup water into the RPV established, adequate core cooling exists when steam flow through the core is sufficient to preclude the peak clad temperature of the hottest fuel rod from exceeding 1500°F, the threshold temperature for fuel rod perforation. Assurance of continued adequate core cooling is achieved when RPV water level can be maintained at or above the Minimum Steam Cooling RPV Water Level **-185 in.**).

With no injection into the RPV established, adequate core cooling exists only so long as the covered portion of the reactor core generates sufficient steam to preclude the peak clad temperature of the hottest fuel rod from exceeding 1800°F, the threshold temperature for significant metal-water reaction.

Prolonged lack of cooling may result in severe overheating of the fuel clad, additional release of energy from accelerated clad oxidation, and eventual fuel melting. For events starting from full power operation, the failure to promptly reflood could result in some fuel melting. Even under these conditions vessel failure and containment failure with resultant release to the public would not be expected for some time. Reactor Water Level remaining below TAF for an extended amount of time represents an early indicator that significant core damage is in progress while providing sufficient time to initiate public protective actions.

Ample time should be allowed for Low Pressure ECCS and alternate injection systems to restore RPV level prior to entry into this classification. The time basis for deciding whether or not RPV level can be maintained **> -185 in.** should be based on the rate of reactor depressurization, the availability of low-pressure injection sources, (ECCS and alternate injection systems), and the rate of Reactor coolant inventory loss. Indications such as RPV level trend, injection flow rates, containment parameter trends, and low pressure injection system operability should also be considered.

In the event, RPV level cannot be restored > **-185 in.,** primary containment flooding will be required by the EOPs. This will attempt to flood the containment as a means of flooding the RPV, and use a flooded containment as a heat sink for the nuclear fuel.

Until the wide range RPV level (WR) indicator is downscale or becomes questionable, it should be used to assure RPV water level is above TAF. Once WR is downscale, use compensated fuel zone indication (SPDS or graph) to assess RPV level above TAF and when compensated fuel zone level indication goes below **-185 in.** or becomes questionable, declare the EAL.

If RPV level cannot be determined, the indicated level value and trend have become unreliable to the extent that decisions concerning adequate core cooling cannot be made. RPV Flooding in accordance with EOP 206 or EOP 206A is required to assure continued core cooling. These EOPs specify actions to rapidly depressurize the RPV and establish sufficient RPV injection to cool the core by either steam cooling (with injection) or flooding the RPV to the main steam line penetrations. Entry to the RPV Flooding EOPs warrants classification of a SITE AREA EMERGENCY based on EAL FB1-P and EAL RB1-L. If RPV Flooding is unsuccessful, indications that core damage is occurring will be observed (DAPA > 2000 R/hr [w/ drywell sprays], DAPA > 4000 R/hr [w/o drywell sprays] or H_2 > 2% in either the Drywell or Suppression Chamber) and primary containment flooding is required (SAG entry).

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Containment Potential Loss 2.A
2. HC.OP-EO.ZZ-0101A(Q)-FC ATWS – RPV Control
3. HC.OP-EO.ZZ-0101(Q)-FC RPV Control
4. HC.OP-EO.ZZ-0206(Q)-FC RPV Flooding
5. HC.OP-EO.ZZ-0206A(Q)-FC ATWS - RPV Flooding
6. HC.OP-AM.ZZ-0001(Z) Severe Accident Guidelines (SAG)

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EAL Category: F – Fission Product Barrier Degradation

Subcategory: RPV / Drywell Pressure / Temperature / H_2 & O_2 Levels

Initiating Condition: Potential Loss of Containment

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **CB2-P (2 points)**

EAL:

Drywell Pressure **> 62 psig** and rising

Basis:

The Drywell pressure of **62 psig** is based on the primary containment design pressure.

Explanation/Discussion/Definitions:

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.

EOP 102 requires intentional venting of the primary containment before drywell pressure reaches 65 psig (Primary Containment Pressure Limit). If the venting action is performed before this EAL threshold is exceeded, a Loss of the Containment Barrier exists under EAL CB4-L.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Containment Potential Loss 1.A
2. UFSAR Table 6.2-1 Containment Design Parameters
3. UFSAR Section 6.2 Containment Systems
4. HC.OP-EO.ZZ-0102(Q)-FC Primary Containment Control

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EAL Category: F – Fission Product Barrier Degradation

Subcategory: RPV / Drywell Pressure / Temperature / H_2 & O_2 Levels

Initiating Condition: Potential Loss of Containment

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **CB3-P (2 points)**

EAL:

Indications of ≥ **6% H_2** and ≥ **5% O_2** in Drywell or Torus

Basis:

BWRs specifically define the limits associated with explosive mixtures in terms of deflagration concentrations of hydrogen and oxygen.

Explanation/Discussion/Definitions:

Venting is required when Hydrogen concentration in the Drywell or Torus reaches the Explosive Mixture (deflagration concentrations) of ≥ **6%** with Oxygen concentration ≥ **5%**. Exceeding these parameters creates the potential for an **UNISOLABLE** breach of the primary containment, which could result in an uncontrolled, unmonitored, and untreated release of radioactivity to the environment. This EAL represents a Potential Loss of Containment, since containment venting is required due to Containment parameters potentially exceeding their design limits. Once the containment is vented per the EOPs, a loss of the Containment barrier has occurred and classification per EAL CB4-L should be made. The magnitude of any radiological release is dependent upon events leading to the requirement for emergency venting, including a loss of the RCS and a loss of the Fuel Clad Barriers.

The elevated hydrogen in the Drywell or Torus may result from excessive zircaloy-water reaction occurring following a LOCA. Additionally, hydrogen and oxygen gas may be introduced into the containment environment from long term disassociation of water in the Suppression Chamber.

SAG guidance in these cases is provided to vent the Primary Containment regardless of off-site dose consequences. Although radiological releases resulting from venting containment may exceed Environmental Protection Agency (EPA) Protective Action Guideline (PAG) limits, a controlled, monitored, and isolable release is preferred to a potential uncontrolled, unmonitored radiological release that would result from a failure of containment.

Elevated primary containment hydrogen concentration is alarmed at ≥ 2% by overhead annunciator E3-F5 (H2/O2 ANALYZER TROUBLE) and digital alarm points D4203 and D4212.

Definitions:

UNISOLABLE: A breach or leak that cannot be promptly isolated from the Control Room.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Containment Potential Loss 1.B
2. HC.OP-AM.ZZ-0001(Z) (SAG-2) Containment and Radioactivity Release Control
3. HC.OP-AR.ZZ-0024(Q) CRIDS Computer Points Book 5 D3624 thru D4288
4. HC.OP-AR.ZZ-0016(Q) Overhead Annunciator Window Box E3

EAL Category: F – Fission Product Barrier Degradation

Subcategory: RPV / Drywell Pressure / Temperature / H_2 & O_2 Levels

Initiating Condition: Potential Loss of Containment

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **CB4-P (2 points)**

EAL:

RPV pressure and suppression pool temperature CANNOT be maintained below the HCTL (EOP Curve SPT-P)

Basis:

The Heat Capacity Temperature Limit (HCTL) is the highest suppression pool temperature from which Emergency RPV Depressurization will not result in exceeding either:

- Suppression chamber design temperature of > 310 degrees

  OR

- Primary Containment Pressure Limit of 65 psig, while the rate of energy transfer from the RPV to the containment is greater than the capacity of the containment vent.

The HCTL 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 and therefore, the inability to maintain plant parameters below the limit constitutes a potential loss of containment.

Explanation/Discussion/Definitions:

The HCTL is given in EOP Flowchart 102 Curve SPT-P (ref. 2).

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Containment Potential Loss 1.C
2. HC.OP-EO.ZZ-0102(Q)-FC Primary Containment Control

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EAL Category: F – Fission Product Barrier Degradation

Subcategory: Radiation

Initiating Condition: Potential Loss of Containment

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **CB5-P (2 points)**

EAL:

<u>**ANY**</u> DAPA Radiation Monitor reading <u>**EITHER**</u> of the following:

- With drywell sprays, ≥ **10,000 R/hr**
- Without drywell sprays, ≥ **20,000 R/hr**

Basis:

The DAPA readings are values that indicate significant fuel damage well in excess of that required for loss of Fuel Clad.

Regardless of whether Containment is challenged, this amount of activity in containment, if released, could have such severe consequences that it is prudent to treat this as a potential loss of Containment, such that a GENERAL EMERGENCY declaration is warranted.

There is no Loss threshold associated with this item.

Explanation/Discussion/Definitions:

Core damage analysis indicates 20% fuel damage dispersed into the drywell atmosphere is expected to produce a Drywell Atmosphere Post Accident (DAPA) radiation monitor reading of approximately **10,000 R/hr** at 1 hr after shutdown (the most conservative) with drywell spray in service, and approximately **20,000 R/hr** at 1 hr after shutdown with drywell spray not in service.

From Attachment 2 of HC.EP-EP.ZZ-0205, Step 6 the following formula was used to derive the EAL Set-points:

$$\%\text{ Cladding Damage} = \frac{\text{Indicated Radiation Level}}{100\%\text{Cladding Damage Radiation Level}} \times 100$$

20 (% Cladding Damage) = $\dfrac{\text{DAPA Rad Monitor Reading X100}}{\text{50,000R/HR}}$ (from Att 2. Fig. 1, of HC.EP-EP.ZZ-0205 with Sprays)

DAPA Reading = $\dfrac{(20)\ (50{,}000\text{R/HR})}{100}$

DAPA Reading = **10,000 R/hr** (with Drywell Spray in service)

OR

20 (% Cladding Damage) = $\dfrac{\text{DAPA Rad Monitor Reading X100}}{\text{100,000R/HR}}$ (from Att 2. Fig. 1, of HC.EP-EP.ZZ-0205 without Sprays)

DAPA Reading = $\dfrac{(20)\ (100{,}000\text{R/HR})}{100}$

DAPA Reading = **20,000 R/hr** (without Drywell Spray in Service)

DAPA radiation monitors RE-4825A and RE-4825B are high range area radiation monitors and are located in the drywell at 145' elevation. Each detector has a range of 1 to 10^8 R/hr and a built in check source that keeps the associated channel on-scale at approximately 1.2 R/hr. In the Control Room, DAPA radiation levels are displayed on RI-4825A (RM-11 9RX635) and B (RM-11 9RX636) ((Panel 10C604) and RR-4825A and B (10C650). Drywell radiation levels ≥ 2.0E+2 R/hr activates Overhead Annunciator C6-C1, RADIATION MONITORING ALARM/TRBL.

A structural I-beam in the drywell shields DAPA radiation monitor RE-4825B from shine due to radioactivity in the RCS piping. RE-4825A is not shielded. When the RCS is intact, elevated RCS coolant activity produces higher readings on RE-4825A than on RE-4825B. During events in which radioactivity is dispersed into the drywell atmosphere, structural shielding diminishes as the monitors become immersed in the radiation field. If the difference in RE-4825A and RE-4825B readings should decrease, it may be inferred that a LOCA event is occurring.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Containment Potential Loss 4.A
2. HC.EP-EP.ZZ-0205(Q) TSC – Post Accident Core Damage Assessment
3. UFSAR Table 11.5-1 Hope Creek Radiation Monitoring Systems
4. HC.OP-AR.ZZ-0011(Q) Overhead Annunciator Box C6

EAL Category: F – Fission Product Barrier Degradation

Subcategory: EC Judgment

Initiating Condition: Potential Loss of Containment

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **CB6-P (2 points)**

EAL:

ANY condition in the opinion of the Emergency Coordinator that indicates potential loss of the Containment barrier

Basis:

This threshold addresses any other factors that are to be used by the Emergency Coordinator in determining whether the Containment barrier is potentially lost. In addition, the inability to monitor the barrier should also be incorporated in this threshold as a factor in Emergency Coordinator judgment that the barrier may be considered potentially lost.

The Containment barrier should not be declared potentially lost based on exceeding Technical Specification action statement criteria, unless there is an event in progress requiring mitigation by the Containment barrier. When no event is in progress (Loss or Potential Loss of either Fuel Clad and/or RCS) the Containment barrier status is addressed by Technical Specifications.

Explanation/Discussion/Definitions:

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.

- Barrier degradation exists if the degradation will likely occur within two hours based on a projection of current safety system performance.
- 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.

Definitions:

IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours (unless a different time is specified).

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Containment Potential Loss 6.A

EAL Category: F – Fission Product Barrier Degradation

Subcategory: RPV / Drywell Pressure / Temperature / H_2 & O_2 Levels

Initiating Condition: Loss of Containment

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **CB1-L (3 points)**

EAL:

Drywell Pressure rise followed by a rapid unexplained drop in Drywell pressure

Basis:

Primary containment pressure should increase as a result of mass and energy release into containment from a LOCA. Rapid unexplained loss of pressure (i.e., not attributable to drywell spray or condensation effects) following an initial pressure increase from a high energy line break indicates a loss of Primary Containment integrity.

This indicator relies on operator recognition of an unexpected response for the condition and therefore does not have a specific value associated with it. The unexpected response is important because it is the indicator for a containment bypass condition.

Explanation/Discussion/Definitions:

Conditions that result in a drop in primary containment (PC) pressure following a pressure rise that are not the direct result of a containment failure do not warrant classification under this threshold. These events include the initiation of drywell sprays, the re-establishment of drywell cooling, and anticipated Drywell pressure drop due to ambient losses.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Containment Barrier Loss 1.A
2. HC.OP-EO.ZZ-0101(Q)-FC Reactor/Pressure Vessel (RPV) Control
3. HC.OP-EO.ZZ-0102(Q)-FC Primary Containment Control
4. HC.OP-AB.CONT-0002(Q) Primary Containment
5. HC.OP-AB.CONT-0001(Q) Drywell Pressure

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EAL Category: F – Fission Product Barrier Degradation

Subcategory: RPV / Drywell Pressure / Temperature / H_2 & O_2 Levels

Initiating Condition: Loss of Containment

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **CB2-L (3 points)**

EAL:

Drywell pressure response NOT consistent with LOCA conditions

Basis:

Primary containment pressure should increase as a result of mass and energy release into containment from a LOCA. Thus, primary containment pressure not increasing under these conditions indicates a loss of containment integrity.

This indicator relies on operator recognition of an unexpected response for the condition and therefore does not have a specific value associated with it. The unexpected response is important because it is the indicator for a containment bypass condition.

Explanation/Discussion/Definitions:

This threshold relies on operator recognition of an unexpected response for the condition and, therefore, does not have a specific criterion. The unexpected response is important because it is the indicator for a containment bypass condition.

A downcomer failure, by itself, does not represent a loss of the Containment barrier. This failure, however, renders the primary containment inoperable per Technical Specifications because primary containment integrity has been compromised. A downcomer failure (bypass of the pressure suppression function) combined with a large break LOCA would likely result in a Potential Loss of the Containment barrier under Containment Potential Loss EAL CB2-P if Drywell pressure cannot be maintained below 62 psig.

UFSAR Section 6.2 provides a summary of primary containment pressure response for several postulated accident conditions resulting in the release of RCS inventory to the containment. These accidents include:

- Rupture of a recirculation line
- Rupture of a main steam line

- Intermediate size liquid line rupture
- Small size RCS rupture

The primary containment pressure response to these breaks were bounded by the recirculation line break.

UFSAR Figures 6.2-3 and 6.2-7 (Attachment 2, pages 6 and 7) illustrates the primary containment pressure response due to a recirculation line break. The maximum calculated drywell pressure is 50.6 psig and is well below the design allowable pressure of 62 psig.

Due to conservatisms in LOCA analyses, actual primary containment 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, initial primary containment pressure may be less than 1.5 psig, etc.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Containment Barrier Loss 1.B
2. UFSAR Section 6.2.1.1.3.1 Introduction (Pressure Suppression Containment Design Evaluation)
3. UFSAR Figure 6.2-3 Short Term Containment Pressure Response Following Recirculation Line Break
4. UFSAR Figure 6.2-7 Long Term Containment Pressure Response Following Recirculation Line Break
5. UFSAR Table 6.2-1 Containment Design Parameters
6. UFSAR Table 6.2-3 Initial Conditions for Containment Response Analyses

EAL Category: F – Fission Product Barrier Degradation

Subcategory: RCS Leakage, Leak Isolation, PC Venting

Initiating Condition: Loss of Containment

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **CB3-L (3 points)**

EAL:

UNISOLABLE leakage outside primary containment (after isolation from the Control Room has or should have been attempted)

AND

Direct downstream pathway to the environment exists

Basis:

These thresholds address incomplete primary containment isolation that allows direct release to the environment.

The use of the modifier "direct" in defining the release path discriminates against release paths through interfacing liquid systems. The existence of an in–line charcoal filter does not make a release path indirect since the filter is not effective at removing fission product 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.

Explanation/Discussion/Definitions:

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 primary containment integrity.

As stated above, 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/HPCI 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 **UNISOLABLE** direct release path to the environment. These minor releases are assessed using EALs in Category R, Abnormal Rad Release / Rad Effluent.

Indications (symptoms) of primary containment failure may be evident without the exact pathway being understood at the time of the failure. If the primary containment or part of the RCS is required to be isolated and there are valid indications that the primary containment is not isolated, the Containment barrier should be considered lost.

This EAL ALLOWS for valve closure from the Control Room to isolate any system not completely isolated, prior to event classification. This includes Motor Operated Valves not controlled by isolation logic, but that are controlled from the Control Room. For example, if the isolation logic fails to cause valve closure, but operator actions implemented in the Control Room successfully isolates the containment breach path, then classification under this EAL is NOT WARRANTED.

Although this EAL ALLOWS for valve closure from the Control Room, the time to attempt closure and make a decision if containment leak isolation was successful RUNS CONCURRENTLY with the EAL 15-minute assessment clock.

- If, during the EAL 15-minute assessment period attempts from the Control Room to isolate the containment ARE SUCCESSFUL then, this EAL is NOT exceeded and classification per this EAL should NOT be made.

- If, during the EAL 15-minute assessment period attempts from the Control Room to isolate the containment ARE NOT SUCCESSFUL then, this EAL is exceeded and classification should be made at that time. There is no need to wait the full 15 minutes.

- If near the end of the 15-minute assessment period and the control room staff has not been able to attempt containment isolation or the EC is not convinced that an isolation attempt has been successful, then this EAL is exceeded and classification should be made at or before the 15-minute assessment time expires.

Definitions:

UNISOLABLE: A breach or leak that cannot be promptly isolated from the Control Room.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Containment Barrier Loss 3.A
2. HC.OP-EO.ZZ-0102(Q)-FC Primary Containment Control

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EAL Category: F – Fission Product Barrier Degradation

Subcategory: RCS Leakage, Leak Isolation, PC Venting

Initiating Condition: Loss of Containment

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **CB4-L (3 points)**

EAL:

Intentional primary containment venting per EOPs

Basis:

These thresholds address incomplete primary containment isolation that allows direct release to the environment.

Site specific EOPs may direct containment isolation valve logic(s) to be intentionally bypassed, regardless of radioactivity release rates. Under these conditions with a valid containment isolation signal, the containment should also be considered lost if containment venting is actually performed.

Intentional venting of primary containment for primary containment pressure control per EOPs to the secondary containment and/or the environment is considered a loss of Containment. Containment venting for pressure when not in an accident situation should not be considered.

Explanation/Discussion/Definitions:

Step DW/P-17 or DW/P-20 of EOP 102, 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. The threshold is met when the operator begins venting the primary containment in accordance with EOP 318, not when actions are taken to bypass interlocks prior to opening the vent valves. Purge and vent actions specified in Step DW/P-1 of EOP 102 to control primary containment pressure below the drywell high pressure scram setpoint does not meet this threshold because such action is only permitted if offsite radioactivity release rates will remain below the ODCM limits.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Containment Barrier Loss 3.B
2. HC.OP-EO.ZZ-0102(Q)-FC Primary Containment Control
3. HC.OP-EO.ZZ-318 (Q)-Containment Venting

EAL Category: F – Fission Product Barrier Degradation

Subcategory: RCS Leakage, Leak Isolation, PC Venting

Initiating Condition: Loss of Containment

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **CB5-L (3 points)**

EAL:

UNISOLABLE primary system leakage outside primary containment (after isolation from the Control Room has or should have been attempted) as indicated by exceeding **EITHER** of the following:

- **ANY** EOP 103 Reactor Bldg room temperature Table 1, Column 2
- **ANY** Reactor Bldg rad level > 1000 times normal

Basis:

This threshold addresses incomplete primary containment isolation that allows direct release to the environment.

In addition, The presence of area radiation or temperature Max Safe Operating setpoints indicating **UNISOLABLE** primary system leakage outside the primary containment are addressed after a containment isolation. The indicators should be confirmed to be caused by RCS leakage.

There is no Potential Loss threshold associated with this item.

Explanation/Discussion/Definitions:

The presence of elevated general area temperatures or radiation levels in the Reactor Building may be indicative of **UNISOLABLE** primary system leakage outside the primary containment. The maximum safe operating values 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 primary 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 103 Reactor Building Control.

RB maximum safe operating temperatures are conservatively defined by the qualification temperature of safety related equipment in the area. The equipment qualification program has proven that safety related equipment will perform satisfactorily to at least this temperature. In an area with multiple components and different qualification temperatures, the maximum safe operating temperature assigned to that area is generally the lowest of the individual temperatures.

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.

This EAL allows for valve closure from the Control Room to isolate any systems not completely isolated, prior to event classification. Isolation is defined as the closure of ANY valve from the Control Room in the system(s) not completely isolated. For example, if the isolation logic fails to cause valve closure, but operator actions implemented in the Control Room successfully isolates the containment breach/leak path, then classification under this EAL is not warranted. This includes Motor Operated Valves not controlled by the isolation logic, but that are controlled from the Control Room.

Although this EAL ALLOWS for valve closure from the Control Room, the time to attempt closure and make a decision if containment leak isolation was successful RUNS CONCURRENTLY with the EAL 15-minute assessment clock.

- If, during the EAL 15-minute assessment period attempts from the Control Room to isolate the containment ARE SUCCESSFUL then, this EAL is NOT exceeded and classification per this EAL should NOT be made.

- If, during the EAL 15-minute assessment period attempts from the Control Room to isolate the containment ARE NOT SUCCESSFUL then, this EAL is exceeded and classification should be made at that time. There is no need to wait the full 15 minutes.

- If near the end of the 15 minute assessment period and the control room staff has not been able to attempt containment isolation or the EC is not convinced that an isolation attempt has been successful, then this EAL is exceeded and classification should be made at or before the 15-minute assessment time expires.

Definitions:

UNISOLABLE: A breach or leak that cannot be promptly isolated from the Control Room.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Containment Barrier Loss 3.C
2. HC.OP-EO.ZZ-0103/4(Q)-FC Reactor Building and Rad Release Control

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EAL Category: F – Fission Product Barrier Degradation

Subcategory: EC Judgment

Initiating Condition: Loss of Containment

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

EAL# & Point Value: **CB6-L (3 points)**

EAL:

<u>**ANY**</u> condition in the opinion of the Emergency Coordinator that indicates loss of the Containment barrier

Basis:

This threshold addresses any other factors that are to be used by the Emergency Coordinator in determining whether the Containment barrier is lost. In addition, the inability to monitor the barrier should also be incorporated in this threshold as a factor in Emergency Coordinator judgment that the barrier may be considered lost.

The Containment barrier should not be declared lost based on exceeding Technical Specification action statement criteria, unless there is an event in progress requiring mitigation by the Containment barrier. When no event is in progress (Loss or Potential Loss of either Fuel Clad and/or RCS) the Containment barrier status is addressed by Technical Specifications.

Explanation/Discussion/Definitions:

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.

- <u>Barrier degradation</u> exists if the degradation will likely occur within two hours based on a projection of current safety system performance.
- <u>Barrier monitoring</u> 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.

Definitions:

IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours (unless a different time is specified).

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, Table 5-F-2 Containment Loss 6.A

EALs for:

Cold Shutdown Conditions

EAL Category: C – Cold Shutdown / Refuel System Malfunction

EAL Subcategory: 1 – Loss of AC Power

Initiating Condition: AC power capability to vital buses reduced to a single power source for 15 minutes or longer such that any additional single failure would result in complete loss of AC power to vital buses

OPCON Applicability: 4 - Cold Shutdown, 5 - Refueling

EAL# & Classification Level: **CU1.1 – UNUSUAL EVENT**

EAL:

Loss of 4.16 KV Vital Bus Power Sources (Offsite and Onsite) which results in the availability of only **one** 4.16 KV Vital Bus Power Source (Offsite or Onsite)

AND

≥ **15 minutes** have elapsed (Note 3)

Note 3: 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 will likely exceed the applicable time.

Basis:

The condition indicated by this EAL is the degradation of the offsite and onsite AC power systems such that any additional single failure would result in a complete loss of AC power to vital buses. This condition could occur due to a loss of off-site power with a concurrent failure of all but one emergency diesel generator to supply power to its vital bus. The subsequent loss of this single power source would escalate the event to an ALERT in accordance with EAL CA1.1.

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

Explanation/Discussion/Definitions:

"Availability" means the power source can be aligned to provide power to a vital bus within 15 minutes or is currently supplying power to at least one vital bus.

The availability of EDGs that have not been challenged to start during degradation of AC power sources to the 4.16 KV vital buses should be based on meeting Technical Specification action requirements for loss of offsite AC power sources.

The AC power distribution is summarized in Attachment 2, page 2.

Emergency Classification escalates to an ALERT under EAL CA1.1 based on a loss of all offsite and all onsite AC power to all 4.16 KV vital buses.

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

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05 – CU3 Example EAL #1
2. 205415-A-8765 Sheet 1 500 kv Transmission Plan & Profiles
3. E-0001-0 sheet 1 Hope Creek Generating Station Single Line Diagram
4. UFSAR 8.1.2 Onsite Power Systems
5. HCGS Technical Specifications 3.8.1.2, A.C. Sources-Shutdown

EAL Category: C – Cold Shutdown / Refuel System Malfunction

EAL Subcategory: 1 – Loss of AC Power

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

OPCON Applicability: 4 - Cold Shutdown, 5 - Refueling, D - Defueled

EAL# & Classification Level: **CA1.1 – ALERT**

EAL:

Loss of **all** Power (Onsite and Offsite) to **all** 4.16 KV Vital Buses

AND

≥ **15 minutes** have elapsed (Note 3)

Note 3: 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 will likely exceed the applicable time.

Basis:

Loss of all AC power compromises all plant safety systems requiring electric power including RHR, ECCS, Spent Fuel Pool Cooling and Service Water.

The event can be classified as an ALERT when in cold shutdown, refueling, or defueled mode because of the significantly reduced decay heat and lower temperature and pressure, increasing the time to restore one of the vital busses, relative to that specified for the SITE AREA EMERGENCY EAL.

Escalating to SITE AREA EMERGENCY, if appropriate, is by EALs in Category R, Abnormal Rad Levels / RadEffluent.

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

Explanation/Discussion/Definitions:

The intent of this EAL is to classify degraded AC power events that result in a loss of all offsite power sources 13.8 KV to the 4.16 KV vital buses along with a loss of all onsite power sources (EDGs).

The AC power distribution is summarized in Attachment 2, page 2.

This cold condition Alert EAL is equivalent to the hot condition Site Area Emergency EAL SS1.1.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05 – CA3 Example EAL #1
2. HC.OP-AB.ZZ-0135 (Q) Station Blackout / Loss of Offsite Power / Diesel Generator Malfunction
3. 205415-A-8765 Sheet 1 500 kv Transmission Plan & Profiles
4. E-0001-0 sheet 1 Hope Creek Generating Station Single Line Diagram
5. UFSAR 8.1.2 Onsite Power Systems
6. HCGS Technical Specifications 3.8.1.2, A.C. Sources-Shutdown

EAL Category: C – Cold Shutdown / Refuel System Malfunction

EAL Subcategory: 2 – Loss of DC Power

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

OPCON Applicability: 4 - Cold Shutdown, 5 - Refueling

EAL# & Classification Level: **CU2.1 – UNUSUAL EVENT**

EAL:

Loss of **ANY** of the following Vital 125 V DC Power Channel combinations as indicated by Voltage **< 108 V DC**:

- Channel A and Channel B
- Channel A, Channel C (either bus) and Channel D (either bus)
- Channel B, Channel C (either bus) and Channel D (either bus)

AND

≥ 15 minutes have elapsed (Note 3)

Note 3: 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 will likely exceed the applicable time.

Basis:

The purpose of this EAL and its associated EALs is to recognize a loss of DC power compromising the ability to monitor and control the removal of decay heat during Cold Shutdown or Refueling operations.

It is intended that the loss of the operating (operable) train is to be considered. If this loss results in the inability to maintain cold shutdown, the escalation to an ALERT will be per EAL CA4.1.

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

Explanation/Discussion/Definitions:

Per Technical Specifications, **108 VDC** is the minimum voltage required for operability of the Class 1E 125 VDC buses following a battery discharge test. Although continued equipment operation may occur with degraded voltage, this value signifies the minimum operable voltage allowed.

125 VDC Power Channels A-D provide control power to Engineered Safety Features actuation, diesel generator auxiliaries, plant alarm and indication circuits, as well as the control power for the associated loads. If 125 VDC power is lost for an extended period of time (greater than 15 minutes) critical plant functions such as 4.16 KV breaker controls, CS and RHR pump controls required to maintain safe plant conditions may not operate, and core uncovery with subsequent Reactor Coolant System (RCS) and Primary Containment failure might occur. Both the RCS and Primary Containment may already be open if in the Refueling mode.

In Operational Condition 4 or 5, a minimum of two of the four 125 VDC Power Channels are required by Technical Specifications, including either Channel A (10D410) or Channel B (10D420). With the loss of three of the Channels (two if both Channels A and B are lost) core alterations are to be suspended and handling of recently irradiated fuel in the Secondary Containment and operations with a potential for draining the reactor vessel are to be stopped.

Class 1E 125 VDC battery bank capacities are as follows:

Channel	Switchgear	Battery	Capacity (design 4 hours)
A	10D410	1AD411	1885 AH at 8 hours
B	10D420	1BD411	1885 AH at 8 hours
C	10D430	1CD411	1885 AH at 8 hours
D	10D440	1DD411	1885 AH at 8 hours
C	10D436	1CD447	577 AH at 8 hours
D	10D446	1DD447	577 AH at 8 hours

This Unusual Event EAL is the cold condition equivalent of the hot condition loss of DC power Site Area Emergency EAL SS2.1.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, CU7 Example EAL #1
2. Calculation E-4.1(Q) HC Class 1E 125 VDC Station Battery and Charger Sizing
3. UFSAR 8.3.2 DC Power Systems
4. HCGS Technical Specifications 3.8.2.2, DC Sources - Shutdown
5. HC.OP-AB.ZZ-0135 (Q) Station Blackout /Loss of Offsite Power/Diesel Generator Malfunction, Table 5.3 Battery Bank Capacities

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EAL Category: C – Cold Shutdown / Refuel System Malfunction

EAL Subcategory: 3 – RPV Level

Initiating Condition: **UNPLANNED** loss of RPV inventory

OPCON Applicability: 4 - Cold Shutdown

EAL# & Classification Level: **CU3.1 – UNUSUAL EVENT**

EAL:

RCS leakage results in the inability to maintain or restore RPV level **> +12.5 in.**

<u>**AND**</u>

≥ 15 minutes have elapsed (Note 3)

Note 3: 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 will likely exceed the applicable time.

Basis:

This EAL is considered to be a potential degradation of the level of safety of the plant. The inability to maintain or restore level is indicative of loss of RCS inventory.

Relief valve normal operation should be excluded from this EAL. However, a relief valve that operates and fails to close per design should be considered applicable to this EAL if the relief valve cannot be isolated.

Prolonged loss of RCS Inventory may result in escalation to the ALERT emergency classification level via either EAL CA3.1 or EAL CA4.1.

Explanation/Discussion/Definitions:

+12.5 in. is the RPV low water level scram setpoint.

RPV water level is normally monitored using the instrument ranges in Attachment 2, page 5.

In preparation for RPV floodup and refueling operations, the shutdown range instrument transmitter LT-N027 is valved out and replaced with LT-11683. The shutdown range indication is thus expanded to 0" - 550".

Definitions:

UNPLANNED: A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions.

EAL Basis Reference(s):

1. NEI 99-01, Rev. 05, CU1 Example EAL #1
2. Technical Specifications Table 2.2.1-1 Reactor Protection System Instrumentation Setpoints
3. Technical Specifications Figure B3/4-3-1, Reactor Vessel Water Level
4. HC.OP-IO.ZZ-0005(Q) Cold Shutdown to Refueling
5. HC.IC-GP.BB-0003(Q) Nuclear Boiler - Nondivisional Channel LT-11683 / B21-N027 Rx Cavity Flood Up Level / Rx Shutdown Range Level Setup

EAL Category: C – Cold Shutdown / Refuel System Malfunction

EAL Subcategory: 3 – RPV Level

Initiating Condition: **UNPLANNED** loss of RPV inventory

OPCON Applicability: 5 - Refueling

EAL# & Classification Level: **CU3.2 – UNUSUAL EVENT**

EAL:

RPV level CANNOT be monitored with a loss of RPV inventory as indicated by **ANY** unexplained RPV leakage indication, **Table C-1** (Note 8)

Note 8: Loss of inventory in the refueling pathway may raise radiation levels. Consider classification under EAL RU2.1.

Table C-1 RPV Leakage Indications
• Drywell equipment drain sump level rise
• Drywell floor drain sump level rise
• Reactor Building equipment drain sump level rise
• Reactor Building floor drain sump level rise
• Suppression pool level rise
• Observation of RCS leakage that is **UNISOLABLE**

Basis:

This EAL is a precursor of more serious conditions and considered to be a potential degradation of the level of safety of the plant.

This EAL addresses conditions in the Refueling OPCON when normal means of RPV level indication may not be available. Redundant means of RPV level indication will normally be installed (including the ability to monitor level visually) to assure that the ability to monitor level will not be interrupted. However, if all level indication were to be lost during a loss of RPV inventory event, the operators would need to determine that RPV inventory loss was occurring by Table C-1 indications. Table C-1 RPV leakage indications must be evaluated against other potential sources of leakage such as cooling water sources inside the Primary and Secondary Containments to ensure they are indicative of RPV leakage.

Escalation to the ALERT emergency classification level would be via EAL CA3.2 or EAL CA4.1.

Explanation/Discussion/Definitions:

In preparation for RPV floodup and refueling operations, the shutdown range instrument transmitter LT-N027 is valved out and replaced with LT-11683. The shutdown range indication is thus expanded to 0" - 550". During refueling operations, visual observation by personnel on the refuel floor in communication with the Control Room may also provide indication of reactor cavity water level and RPV water level.

In this EAL, all RPV 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. Drywell equipment and floor drain sump level rise is the normal method of monitoring and calculating leakage from the RPV. A Reactor Building equipment or floor drain sump level rise may also be indicative of RPV inventory losses external to the Primary Containment from systems connected to the RPV. With RHR System operating in the Shutdown Cooling mode, an unexplained rise in suppression pool level could be indicative of RHR valve misalignment or leakage. Visual observation of leakage from systems connected to the RCS in areas outside the Primary Containment that cannot be isolated could be indicative of a loss of RPV inventory.

Definitions:

> **UNPLANNED**: A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions.
>
> **UNISOLABLE**: A breach or leak that cannot be promptly isolated from the Control Room.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, CU2 Example EAL #2
2. HC.IC-GP.BB-0003(Q) Nuclear Boiler - Nondivisional Channel LT-11683 / B21-N027 Rx Cavity Flood Up Level / Rx Shutdown Range Level Setup
3. UFSAR 5.2.5 Detection of Leakage Through the Reactor Coolant Pressure Boundary and from the Emergency Core Cooling System
4. UFSAR 7.6.1.3 Leak Detection System – Instrumentation and Controls
5. HC.OP-EO.ZZ-0102(Q)-FC Primary Containment Control
6. HC.OP-GP.ZZ-0005(Q) Drywell Leak Source Detection

EAL Category: C – Cold Shutdown / Refuel System Malfunction

EAL Subcategory: 3 – RPV Level

Initiating Condition: **UNPLANNED** loss of RPV inventory

OPCON Applicability: 5 - Refueling

EAL# & Classification Level: **CU3.3 – UNUSUAL EVENT**

EAL:

UNPLANNED RPV level drop as indicated by **EITHER** of the following:

- RPV level drop below the RPV flange level of +**217.5 in.** for **≥ 15 minutes** (Notes 3 and 8)
- RPV level drop below the planned RPV level band (when RPV level is being controlled below the RPV flange) for a given (planned) evolution for **≥ 15 minutes** (Notes 3 and 8)

Note 3: 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 will likely exceed the applicable time.

Note 8 Loss of inventory in the refueling pathway may raise radiation levels. Consider classification under EAL RU2.1.

Basis:

This EAL is a precursor of more serious conditions and considered to be a potential degradation of the level of safety of the plant.

Refueling evolutions that decrease RPV water level below the RPV flange are carefully planned and procedurally controlled. An **UNPLANNED** event that results in water level decreasing below the RPV flange, or below the planned RPV water level for the given evolution (if the planned RPV water level is already below the RPV flange), warrants declaration of a UE due to the reduced RPV inventory that is available to keep the core covered.

The allowance of **15 minutes** was chosen because it is reasonable to assume that level can be restored within this time frame using one or more of the redundant means of refill that should be available. If level cannot be restored in this time frame then it may indicate a more serious condition exists.

Continued loss of RCS Inventory will result in escalation to the ALERT emergency classification level via either EAL CA3.1 or EAL CA4.1.

This EAL involves a decrease in RPV level below the top of the RPV flange that continues for **15 minutes** due to an **UNPLANNED** event. This EAL is not applicable to decreases in flooded reactor cavity level, which is addressed by EAL RU2.1, until such time as the level decreases to the level of the RPV flange.

Explanation/Discussion/Definitions:

+217.5 in. is the RPV flange level.

RPV water level is normally monitored using the instrument ranges in Attachment 2, page 5.

In preparation for RPV floodup and refueling operations, the shutdown range instrument transmitter LT-N027 is valved out and replaced with LT-11683. The shutdown range indication is thus expanded to 0" - 550". During refueling operations, visual observation by personnel on the refuel floor in communication with the Control Room may also provide indication of reactor cavity water level and RPV water level.

In cold conditions, RPV level may be intentionally lowered below the RPV flange (e.g., detensioning the RPV head, etc.). For such evolutions, this EAL is applicable if RPV level cannot be restored and maintained within the prescribed target band.

Definitions:

> **UNPLANNED**: A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions.

EAL Basis Reference(s):

1. NEI 99-01, Rev. 05, CU2 Example EAL #1
2. HC.OP-IO.ZZ-0005(Q) Cold Shutdown to Refueling
3. Technical Specifications Figure B3/4-3-1, Reactor Vessel Water Level
4. HC.IC-GP.BB-0003(Q) Nuclear Boiler - Nondivisional Channel LT-11683 / B21-N027 Rx Cavity Flood Up Level / Rx Shutdown Range Level Setup

EAL Category: C – Cold Shutdown / Refuel System Malfunction

EAL Subcategory: 3 – RPV Level

Initiating Condition: Loss of RPV inventory

OPCON Applicability: 4 - Cold Shutdown, 5 - Refueling

EAL# & Classification Level: **CA3.1 – ALERT**

EAL:

RPV compensated level **< -38 in.**

Basis:

This EAL serves as a precursor to a loss of ability to adequately cool the fuel. The magnitude of this loss of water indicates that makeup systems have not been effective and may not be capable of preventing further RPV level decrease and potential core uncovery. This condition will result in a minimum emergency classification level of an ALERT.

The Low-Low ECCS Actuation Setpoint/Level 2 was chosen because it is a standard setpoint at which some available injection systems automatically start. The inability to restore and maintain level after reaching this setpoint would be indicative of a failure of the RCS barrier.

If RPV level continues to lower then escalation to SITE AREA EMERGENCY will be via EAL CS3.1.

Explanation/Discussion/Definitions:

The threshold RPV level of **-38 in.** is the low-low ECCS actuation setpoint. RPV level is normally monitored using compensated level as read directly from SPDS or the compensation curves in the IOs. In Cold Shutdown mode, the RCS will normally be intact and standard RPV level monitoring means are available. In the Refueling mode, the RCS is not intact and RPV level may be monitored by different means, including the ability to monitor level visually.

In cold shutdown, the decay heat available to raise RCS temperature during a loss of inventory or heat removal event may be significantly greater than in the Refueling OPCON. Entry into cold shutdown conditions may be attained within hours of operating at power or hours after refueling is completed. Entry into the Refueling OPCON procedurally may not occur for typically a few days or longer after the reactor has been shutdown. Thus the heatup threat and therefore the threat to damaging the fuel clad may be lower for events that occur in the Refueling OPCON with irradiated fuel in the RPV (note that the heatup threat could be lower for cold shutdown conditions if the entry into cold shutdown was following a refueling).

EAL Basis Reference(s):

1. NEI 99-01, Rev. 05, CA1 Example EAL #1
2. HCGS Technical Specifications Table 3.3.3-2, ECCS Actuation Instrumentation Setpoints
3. HCGS Technical Specifications Figure B3/4-3-1 Reactor Vessel Water Level
4. HC.OP-IO.ZZ-0005(Q) Cold Shutdown to Refueling
5. HC.OP-IO.ZZ-0009 (Q) Refueling Operations
6. HC.OP-AB.RPV-0009(Q) Shutdown Cooling

EAL Category: C – Cold Shutdown / Refuel System Malfunction

EAL Subcategory: 3 – RPV Level

Initiating Condition: Loss of RPV inventory

OPCON Applicability: 4 - Cold Shutdown, 5 - Refueling

EAL# & Classification Level: **CA3.2 – ALERT**

EAL:

RPV level CANNOT be monitored for ≥ **15 minutes** with a loss of RPV inventory as indicated by **ANY** unexplained RPV leakage indication, **Table C-1** (Note 3)

Note 3: 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 will likely exceed the applicable time.

Table C-1 RPV Leakage Indications
• Drywell equipment drain sump level rise
• Drywell floor drain sump level rise
• Reactor Building equipment drain sump level rise
• Reactor Building floor drain sump level rise
• Suppression pool level rise
• Observation of RCS leakage that is **UNISOLABLE**

Basis:

This EAL serves as a precursor to a loss of ability to adequately cool the fuel. The magnitude of this loss of water indicates that makeup systems have not been effective and may not be capable of preventing further RPV level decrease and potential core uncovery. This condition will result in a minimum emergency classification level of an ALERT.

In the Cold Shutdown OPCON, normal RPV level instrumentation systems will usually be available. In the Refueling OPCON, normal means of RPV level indication may not be available. Redundant means of RPV level indication will usually be installed (including the ability to monitor level visually) to assure that the ability to monitor level will not be interrupted.

However, if all level indication were to be lost during a loss of RPV inventory event, the operators would need to determine that RPV inventory loss was occurring by observing Table C-1 indications. Table C-1 RPV leakage indications must be evaluated against other potential sources of leakage such as cooling water sources inside the Primary and Secondary Containments to ensure they are indicative of RPV leakage.

The **15-minute** duration for the loss of level indication was chosen because it is half of the EAL CS3.2 SITE AREA EMERGENCY duration. Significant fuel damage is not expected to occur until the core has been uncovered for greater than 1 hour per the analysis referenced in the EAL CG3.1 and EAL CG3.2 bases. Therefore this EAL meets the definition for an ALERT.

If RPV leakage indications continue and RPV level cannot be monitored for 30 minutes or longer, EAL CS3.2 will require escalation to SITE AREA EMERGENCY.

Explanation/Discussion/Definitions:

In this EAL, all RPV 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. Drywell equipment and floor drain sump level rise is the normal method of monitoring and calculating leakage from the RPV. A Reactor Building equipment or floor drain sump level rise may also be indicative of RPV inventory losses external to the Primary Containment from systems connected to the RPV. With RHR System operating in the Shutdown Cooling mode, an unexplained rise in suppression pool level could be indicative of RHR valve misalignment or leakage. Visual observation of leakage from systems connected to the RCS in areas outside the Primary Containment that cannot be isolated could be indicative of a loss of RPV inventory.

In cold shutdown, the decay heat available to raise RCS temperature during a loss of inventory or heat removal event may be significantly greater than in the Refueling OPCON. Entry into cold shutdown conditions may be attained within hours of operating at power or hours after refueling is completed. Entry into the Refueling OPCON procedurally may not occur for typically a few days or longer after the reactor has been shutdown. Thus the heatup threat and therefore the threat to damaging the fuel clad may be lower for events that occur in the Refueling OPCON with irradiated fuel in the RPV (note that the heatup threat could be lower for cold shutdown conditions if the entry into cold shutdown was following a refueling).

Definitions:

UNISOLABLE: A breach or leak that cannot be promptly isolated from the Control Room.

EAL Basis Reference(s):

1. NEI 99-01, Rev. 05, CA1 Example EAL #2
2. HC.IC-GP.BB-0003(Q) Nuclear Boiler - Nondivisional Channel LT-11683 / B21-N027 Rx Cavity Flood Up Level / Rx Shutdown Range Level Setup
3. UFSAR 5.2.5 Detection of Leakage Through the Reactor Coolant Pressure Boundary and from the Emergency Core Cooling System
4. UFSAR 7.6.1.3 Leak Detection System – Instrumentation and Controls
5. HC.OP-EO.ZZ-0102(Q)-FC Primary Containment Control
6. HC.OP-GP.ZZ-0005(Q) Drywell Leak Source Detection

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EAL Category: C – Cold Shutdown / Refuel System Malfunction

EAL Subcategory: 3 – RPV Level

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

OPCON Applicability: 4 - Cold Shutdown, 5 - Refueling

EAL# & Classification Level: **CS3.1 – SITE AREA EMERGENCY**

EAL:

CONTAINMENT CLOSURE NOT established **AND** RPV compensated level **< -44 in.**

OR

CONTAINMENT CLOSURE established **AND** RPV compensated level **< -161 in.**

Basis:

Under the conditions specified by this EAL, continued decrease in RPV level is indicative of a loss of inventory control. Inventory loss may be due to an RCS breach, pressure boundary leakage, or continued boiling in the RPV. Thus, declaration of a SITE AREA EMERGENCY is warranted.

Escalation to a GENERAL EMERGENCY is via EAL CG3.1 or EAL RG1.1.

Explanation/Discussion/Definitions:

When RPV level decreases to **-44 in.**, water level is six inches below the low-low ECCS actuation setpoint of -38 in. When RPV level drops to the top of active fuel (an indicated RPV level of **-161 in.**), core uncovery starts to occur. RPV level is normally monitored using compensated level as read directly from SPDS or the compensation curves in the IOs.

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.

Sustained core uncovery can result in core damage and a significant release of fission products to the RCS and could ultimately challenge the Containment barrier. When all irradiated fuel has been transferred to the Spent Fuel Pool, however, core uncovery in the RPV is not possible and thus this EAL does not apply.

CONTAINMENT CLOSURE can be established by meeting the requirements of any of the following:

- OP-HC-108-115-1001, Operability Assessment and Equipment Control Program, Attachment 5
- Technical Specifications 3.6.5.1, Secondary Containment Integrity
- Technical Specifications 3.6.1.1, Primary Containment Integrity

Definitions:

CONTAINMENT CLOSURE: Is the procedurally defined actions taken to secure the Containment (Primary or Secondary) and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

EAL Basis Reference(s):

1. NEI 99-01, Rev. 05, CS1 Example EAL #1 & #2
2. OU-AA-103 Shutdown Safety Management Program
3. HCGS Technical Specifications Table 3.3.3-2, ECCS Actuation Instrumentation Setpoints
4. HCGS Technical Specifications Figure B3/4-3-1, Reactor Vessel Water Level
5. HC.OP-AM-ZZ-0001(Z) Severe Accident Guidelines
6. OP-HC-108-115-1001 Operability Assessment and Equipment Control Program
7. Technical Specifications 3.6.5.1 Secondary Containment Integrity
8. Technical Specifications 3.6.1.1 Primary Containment Integrity

EAL Category: C – Cold Shutdown / Refuel System Malfunction

EAL Subcategory: 3 – RPV Level

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

OPCON Applicability: 4 - Cold Shutdown, 5 - Refueling

EAL# & Classification Level: **CS3.2 – SITE AREA EMERGENCY**

EAL:

RPV level CANNOT be monitored for **≥ 30 minutes** with a loss of RPV inventory as indicated by **EITHER** of the following (Note 3):

- Erratic Source Range Monitor indication
- **ANY** unexplained RPV leakage indication, **Table C-1**

Note 3: 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 will likely exceed the applicable time.

Table C-1 RPV Leakage Indications
• Drywell equipment drain sump level rise • Drywell floor drain sump level rise • Reactor Building equipment drain sump level rise • Reactor Building floor drain sump level rise • Suppression pool level rise • Observation of RCS leakage that is **UNISOLABLE**

Basis:

Under the conditions specified by this EAL, continued decrease in RPV level is indicative of a loss of inventory control. Inventory loss may be due to an RCS breach, pressure boundary leakage, or continued boiling in the RPV. Thus, declaration of a SITE AREA EMERGENCY is warranted.

Escalation to a GENERAL EMERGENCY is via EAL CG3.2 or EAL RG1.1.

In the Cold Shutdown OPCON, normal RPV level indication will usually be available. In the Refueling OPCON, normal means of RPV level indication may not be available. Redundant means of RPV level indication will usually be installed (including the ability to monitor level visually) to assure that the ability to monitor level will not be interrupted. However, if all level indication were to be lost during a loss of RPV inventory event, the operators would need to determine that RPV inventory loss was occurring by observing Table C-1 indications. Table C-1 RPV leakage indications must be evaluated against other potential sources of leakage such as cooling water sources inside the Primary and Secondary Containments to ensure they are indicative of RPV leakage.

The **30-minute** duration allows sufficient time for actions to be performed to recover inventory control equipment.

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

Explanation/Discussion/Definitions:

This EAL applies to conditions in which the loss of decay heat removal capability has caused a significant drop in RPV water level and core uncovery may be challenged. If RPV level monitoring capability is unavailable, the RPV inventory loss must be detected by erratic source range monitor indications or the leakage indications listed in Table C-1:

- Erratic source range monitor indication may be identified by:
    - SRM count rate recorders R602A and B (blue pens) on panel 10C650C
    - SRM upscale status lights on source range neutron monitoring section of the Control Room panel
    - Overhead Annunciators C3-C1 (SRM UPSCALE OR INOPERATIVE) and C3-D1 (SRM PERIOD)
    - Computer points C015, B3027, B3028, B3029, B3030

- The leakage indications are listed in Table C-1and 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. Drywell equipment and floor drain sump level rise is the normal method of monitoring and calculating leakage from the RPV. A Reactor Building equipment or floor drain sump level rise may also be indicative of RPV inventory losses external to the Primary Containment from systems connected to the RPV. With RHR System operating in the Shutdown Cooling mode, an unexplained rise in suppression pool level could be indicative of RHR valve misalignment or leakage. Visual observation of leakage from systems connected to the RCS in areas outside the Primary Containment that cannot be isolated could be indicative of a loss of RPV inventory.

Definitions:

UNISOLABLE: A breach or leak that cannot be promptly isolated from the Control Room.

EAL Basis Reference(s):

1. NEI 99-01, Rev. 05, CS1 Example EAL #3
2. Technical Specifications 3.3.7.6, Source Range Monitors
3. Technical Specifications 3.9.2, Instrumentation – Refueling Operations
4. HC.OP-AR.ZZ-0009(Q), Overhead Annunciator Window Box C3
5. UFSAR 5.2.5 Detection of Leakage Through Reactor Coolant Pressure Boundary and From the Emergency Core Cooling System
6. UFSAR 7.6.1.3 Leak Detection System - Instrumentation and Controls
7. HC.OP-EO.ZZ-0102(Q)-FC Primary Containment Control
8. HC.OP-GP.ZZ-0005(Q) Drywell Leak Source Detection

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EAL Category: C – Cold Shutdown / Refuel System Malfunction

EAL Subcategory: 3 – RPV Level

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

OPCON Applicability: 4 - Cold Shutdown, 5 - Refueling

EAL# & Classification Level: **CG3.1 – GENERAL EMERGENCY**

EAL:

RPV compensated level **< -161 in.** for **≥ 30 minutes** (Note 3)

AND

ANY Containment Challenge indication, **Table C-2**

Note 3: 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 will likely exceed the applicable time.

Table C-2 Containment Challenge Indications
• **CONTAINMENT CLOSURE** NOT established • Indications of **≥ 6%** H_2 and **≥ 5%** O_2 in Drywell or Torus • **UNPLANNED** rise in Drywell pressure • ANY Reactor Bldg rad level **> 1000 times normal**

Basis:

This EAL represents the inability to restore and maintain RPV level to above the top of active fuel with containment challenged. Fuel damage is probable if RPV level cannot be restored, as available decay heat will cause boiling, further reducing the RPV level. With the containment breached or challenged then the potential for unmonitored fission product release to the environment is high. This represents a direct path for radioactive inventory to be released to the environment. This is consistent with the definition of a GENERAL EMERGENCY. The

GENERAL EMERGENCY is declared on the occurrence of the loss or imminent loss of function of all three barriers.

A number of variables can have a significant impact on heat removal capability challenging the fuel clad barrier. Examples include: initial RPV level, RHR system shutdown cooling heat removal capability, etc.

Analysis indicates that core damage may occur as soon as one hour following continued core uncovery, therefore, **30 minutes** was conservatively chosen.

If **CONTAINMENT CLOSURE** is re-established prior to exceeding the **30 minute** core uncovery time limit then escalation to GE would not occur.

Explanation/Discussion/Definitions:

When RPV compensated level drops to the top of active fuel (an indicated RPV level of **-161 in.**), core uncovery starts to occur.

Four conditions are associated with a challenge to Containment:

- The status of **CONTAINMENT CLOSURE** indicates the ability to rely on the Primary or Secondary Containment as a barrier to fission product release. **CONTAINMENT CLOSURE** can be established by meeting the requirements of any of the following:
    - OP-HC-108-115-1001, Operability Assessment and Equipment Control Program, Attachment 5
    - Technical Specifications 3.6.5.1, Secondary Containment Integrity
    - Technical Specifications 3.6.1.1, Primary Containment Integrity
- Explosive (deflagration) mixtures in the Drywell or Torus are assumed to be elevated concentrations of hydrogen and oxygen. BWR industry evaluation of hydrogen generation for development of EOPs/SAGs indicates that any hydrogen concentration above minimum detectable is not to be expected within the short term. Post-LOCA hydrogen generation primarily caused by radiolysis is a slowly evolving, long-term condition. Hydrogen concentrations that rapidly develop are most likely caused by metal-water reaction. A metal-water reaction is indicative of an accident more severe than accidents considered in the plant design basis and would be indicative, therefore, of a potential threat to primary containment integrity. Hydrogen concentration of **≥ 6%** and oxygen concentration of **≥ 5%** are considered the global deflagration concentration limits (ref. 4). Elevated Containment hydrogen concentration is alarmed at ≥ 2% by overhead annunciator E3-F5, H2/O2 ANALYZER TROUBLE, and digital alarm points D4203 and D4212.

- An **UNPLANNED** rise in Drywell pressure in the Cold Shutdown or Refueling OPCON may signify an energy addition to the Primary Containment such that the Primary Containment cannot be relied upon as a barrier to fission product release.

- Reactor Building area radiation monitors should provide indication of increased release that may be indicative of a challenge to **CONTAINMENT CLOSURE**. The Maximum Safe Operating radiation level is **1000 times normal** and is indicative of problems in the Secondary Containment that may be spreading.

The Table C-2 Containment Challenge Indications applicable in the Refueling OPCON may likely consist only of the status of Secondary Containment and Reactor Building radiation levels. The Primary Containment is opened to the Secondary Containment in this OPCON and it is unlikely, if not impossible, to detect hydrogen concentrations in the deflagration range or rising Drywell pressure indications.

Definitions:

CONTAINMENT CLOSURE: Is the procedurally defined actions taken to secure the Containment (Primary or Secondary) and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

UNPLANNED: A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions.

EAL Basis Reference(s):

1. NEI 99-01, Rev. 05, CG1 Example EAL #1
2. OU-AA-103 Shutdown Safety Management Program
3. HCGS Technical Specifications Table 3.3.3-2 ECCS Actuation Instrumentation Setpoints
4. HC.OP-AM-ZZ-0001(Z) Severe Accident Guidelines
5. HC.OP-AM.ZZ-0001 (SAG-2) Containment and Radioactivity Release Control
6. HC.OP-AR.ZZ-0024(Q) CRIDS Computer Points Book 5 D3624 thru D4288
7. HC.OP-AR.ZZ-0016(Q) Overhead Annunciator Window Box E3
8. HC.OP-EO.ZZ-0103/4(Q)-FC Reactor Building and Rad Release Control
9. Technical Specifications 3.6.5.1 Secondary Containment Integrity
10. Technical Specifications 3.6.1.1 Primary Containment Integrity

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EAL Category: C – Cold Shutdown / Refuel System Malfunction

EAL Subcategory: 3 – RPV Level

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

OPCON Applicability: 4 - Cold Shutdown, 5 - Refueling

EAL# & Classification Level: **CG3.2 – GENERAL EMERGENCY**

EAL:

RPV level CANNOT be monitored for ≥ **30 minutes** with core uncovery indicated by **EITHER** of the following (Note 3):

- Erratic Source Range Monitor indication
- **ANY** unexplained RPV leakage indication, **Table C-1**

AND

ANY Containment Challenge indication, **Table C-2**

Note 3: 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 will likely exceed the applicable time.

Table C-1 RPV Leakage Indications
• Drywell equipment drain sump level rise
• Drywell floor drain sump level rise
• Reactor Building equipment drain sump level rise
• Reactor Building floor drain sump level rise
• Suppression pool level rise
• Observation of RCS leakage that is **UNISOLABLE**

Table C-2 Containment Challenge Indications
• **CONTAINMENT CLOSURE** NOT established • Indications of ≥ **6% H_2** and ≥ **5% O_2** in Drywell or Torus • **UNPLANNED** rise in Drywell pressure • <u>ANY</u> Reactor Bldg rad level **> 1000 times normal**

Basis:

This EAL represents the inability to restore and maintain RPV level to above the top of active fuel with containment challenged. Fuel damage is probable if RPV level cannot be restored, as available decay heat will cause boiling, further reducing the RPV level. With the containment breached or challenged then the potential for unmonitored fission product release to the environment is high. This represents a direct path for radioactive inventory to be released to the environment. This is consistent with the definition of a GENERAL EMERGENCY. The GENERAL EMERGENCY is declared on the occurrence of the loss or **IMMINENT** loss of function of <u>all three</u> barriers.

A number of variables can have a significant impact on heat removal capability challenging the fuel clad barrier. Examples include: initial RPV level, RHR system shutdown cooling heat removal capability, etc.

Analysis indicates that core damage may occur as soon as one hour following continued core uncovery, therefore, **30 minutes** was conservatively chosen.

If **CONTAINMENT CLOSURE** is re-established prior to exceeding the **30 minute** core uncovery time limit then escalation to GE would not occur.

Table C-1 RPV leakage indications must be evaluated against other potential sources of leakage such as cooling water sources inside the Primary and Secondary Containments to ensure they are indicative of RPV leakage.

In the Cold Shutdown OPCON, normal RPV level instrumentation systems will usually be available. In the Refueling OPCON, normal means of RPV level indication may not be available. Redundant means of RPV level indication will usually be installed (including the ability to monitor level visually) to assure that the ability to monitor level will not be interrupted. However, if all level indication were to be lost during a loss of RPV inventory event, the operators would need to determine that RPV inventory loss was occurring by observing Table

C-1 indications. Table C-1 RPV leakage indications must be evaluated against other potential sources of leakage such as cooling water sources inside the Primary and Secondary Containments to ensure they are indicative of RPV leakage.

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

Explanation/Discussion/Definitions:

If RPV level monitoring capability is unavailable, the RPV inventory loss must be detected by erratic source range monitor indications or the leakage indications listed in Table C-1:

- Erratic source range monitor indication may be identified by:
  - SRM count rate recorders R602A and B (blue pens) on panel 10C650C
  - SRM upscale status lights on source range neutron monitoring section of the Control Room panel
  - Overhead Annunciators C3-C1 (SRM UPSCALE OR INOPERATIVE) and C3-D1 (SRM PERIOD)
  - Computer points C015, B3027, B3028, B3029, B3030
- The leakage indications are listed in Table C-1 and 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. Drywell equipment and floor drain sump level rise is the normal method of monitoring and calculating leakage from the RPV. A Reactor Building equipment or floor drain sump level rise may also be indicative of RPV inventory losses external to the Primary Containment from systems connected to the RPV. With RHR System operating in the Shutdown Cooling mode, an unexplained rise in suppression pool level could be indicative of RHR valve misalignment or leakage. Visual observation of leakage from systems connected to the RCS in areas outside the Primary Containment that cannot be isolated could be indicative of a loss of RPV inventory.

Four conditions are associated with a challenge to Containment:

- The status of **CONTAINMENT CLOSURE** indicates the ability to rely on the Primary or Secondary Containment as a barrier to fission product release. **CONTAINMENT CLOSURE** can be established by meeting the requirements of any of the following:
  - OP-HC-108-115-1001, Operability Assessment and Equipment Control Program, Attachment 5

- Technical Specifications 3.6.5.1, Secondary Containment Integrity
- Technical Specifications 3.6.1.1, Primary Containment Integrity

- Explosive (deflagration) mixtures in the Drywell or Torus are assumed to be elevated concentrations of hydrogen and oxygen. BWR industry evaluation of hydrogen generation for development of EOPs/SAGs indicates that any hydrogen concentration above minimum detectable is not to be expected within the short term. Post-LOCA hydrogen generation primarily caused by radiolysis is a slowly evolving, long-term condition. Hydrogen concentrations that rapidly develop are most likely caused by metal-water reaction. A metal-water reaction is indicative of an accident more severe than accidents considered in the plant design basis and would be indicative, therefore, of a potential threat to primary containment integrity. Hydrogen concentration of **≥ 6%** and oxygen concentration of **≥ 5%** are considered the global deflagration concentration limits. Elevated Containment hydrogen concentration is alarmed at ≥ 2% by overhead annunciator E3-F5 (H2/O2 ANALYZER TROUBLE) and digital alarm points D4203 and D4212.

- An **UNPLANNED** rise in Drywell pressure in the Cold Shutdown or Refueling OPCON may signify an energy addition to the Primary Containment such that the Primary Containment cannot be relied upon as a barrier to fission product release.

- Reactor Building area radiation monitors should provide indication of increased release that may be indicative of a challenge to **CONTAINMENT CLOSURE**. The Maximum Safe Operating radiation level is **1000 times normal** and is indicative of problems in the Secondary Containment that may be spreading.

The Table C-2 Containment Challenge Indications applicable in the Refueling OPCON may likely consist only of the status of Secondary Containment and Reactor Building radiation levels. The Primary Containment is opened to the Secondary Containment in this OPCON and it is unlikely, if not impossible, to detect hydrogen concentrations in the deflagration range or rising Drywell pressure indications.

Definitions:

UNISOLABLE: A breach or leak that cannot be promptly isolated from the Control Room.

CONTAINMENT CLOSURE: Is the procedurally defined actions taken to secure the Containment (Primary or Secondary) and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

UNPLANNED: A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions.

IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours (unless a different time is specified).

EAL Basis Reference(s):

1. NEI 99-01, Rev. 05, CG1 Example EAL #2
2. OU-AA-103 Shutdown Safety Management Program
3. Technical Specifications 3.3.7.6 Source Range Monitors
4. Technical Specifications 3.9.2 Instrumentation – Refueling Operations
5. HC.OP-AR.ZZ-0009(Q), Overhead Annunciator Window Box C3
6. UFSAR 5.2.5 Detection of Leakage Through Reactor Coolant Pressure Boundary and From the Emergency Core Cooling System
7. UFSAR 7.6.1.3 Leak Detection System - Instrumentation and Controls
8. HC.OP-EO.ZZ-0102(Q)-FC Primary Containment Control
9. HC.OP-GP.ZZ-0005(Q) Drywell Leak Source Detection
10. HC.OP-AM.ZZ-0001 (SAG-2) Containment and Radioactivity Release Control
11. HC.OP-AR.ZZ-0024(Q) CRIDS Computer Points Book 5 D3624 thru D4288
12. HC.OP-AR.ZZ-0016(Q) Overhead Annunciator Window Box E3
13. HC.OP-EO.ZZ-0103/4(Q)-FC Reactor Building and Rad Release Control
14. Technical Specifications 3.6.5.1 Secondary Containment Integrity
15. Technical Specifications 3.6.1.1 Primary Containment Integrity

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EAL Category: C – Cold Shutdown / Refuel System Malfunction

EAL Subcategory: 4 – RCS Temperature

Initiating Condition: **UNPLANNED** loss of decay heat removal capability with irradiated fuel in the RPV

OPCON Applicability: 4 - Cold Shutdown, 5 - Refueling

EAL# & Classification Level: **CU4.1 – UNUSUAL EVENT**

EAL:

An **UNPLANNED** Loss of Decay Heat Removal functions

AND

RCS Temperature has risen to **> 200°F**

Basis:

This EAL is a precursor of more serious conditions and, as a result, is considered to be a potential degradation of the level of safety of the plant. In cold shutdown, the ability to remove decay heat relies primarily on forced cooling flow. Operation of the systems that provide this forced cooling may be jeopardized due to the unlikely loss of electrical power or RCS inventory. Since the RCS usually remains intact in the Cold Shutdown OPCON a large inventory of water is available to keep the core covered.

During refueling, the level in the RPV will normally be maintained above the RPV flange. Refueling evolutions that decrease water level below the RPV flange are carefully planned and procedurally controlled. Loss of forced decay heat removal at reduced inventory may result in more rapid increases in RPV temperatures depending on the time since shutdown.

Escalation to ALERT would be via EAL CA3.1 based on an inventory loss or EAL CA4.1 based on exceeding its temperature criteria.

Explanation/Discussion/Definitions:

The Technical Specification cold shutdown temperature limit is **200°F**.

RCS coolant temperature may be indicated by the following instrumentation:

- Recirc pump suction loop A and B temperature on TR-R650-B31 (10C650C)
- Recirc loop temperature from the following computer points:
  - Recirc loop A inlet temp 1 A221
  - Recirc loop A inlet temp 2 A222
  - Recirc loop B inlet temp 1 A223
  - Recirc loop B Inlet temp 2 A224
  - Recirc loop A avg inlet temp B2042
  - Recirc loop B avg inlet temp B2043
- RHR A & B Hx inlet temperatures from computer points A2380 & A2382
- RWCU bottom head drain temperature from computer point A2942

Definitions:

UNPLANNED: A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, CU4 Example EAL #1
2. Technical Specifications Table 1.2, Operational Conditions
3. HC.OP-IO.ZZ-0004(Q) Shutdown from Rated Power to Cold Shutdown
4. HC.OP-SO.BC-0002 (Q) Decay Heat Removal Operation
5. HC.OP-IO.ZZ-0005(Q) Cold Shutdown to Refueling

EAL Category: C – Cold Shutdown / Refuel System Malfunction

EAL Subcategory: 4 – RCS Temperature

Initiating Condition: **UNPLANNED** loss of decay heat removal capability with irradiated fuel in the RPV

OPCON Applicability: 4 - Cold Shutdown, 5 - Refueling

EAL# & Classification Level: **CU4.2 – UNUSUAL EVENT**

EAL:

An **UNPLANNED** Loss of Decay Heat Removal functions

AND

Loss of **BOTH** of the following:

- **All** RCS Temperature indication
- **All** RPV level indication

AND

≥ 15 minutes have elapsed (Note 3)

Note 3: 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 will likely exceed the applicable time.

Basis:

This EAL is be a precursor of more serious conditions and, as a result, is considered to be a potential degradation of the level of safety of the plant. In cold shutdown, the ability to remove decay heat relies primarily on forced cooling flow. Operation of the systems that provide this forced cooling may be jeopardized due to the unlikely loss of electrical power or RCS inventory. Since the RCS usually remains intact in the Cold Shutdown OPCON a large inventory of water is available to keep the core covered.

During refueling, the level in the RPV will normally be maintained above the RPV flange. Refueling evolutions that decrease water level below the RPV flange are carefully planned and procedurally controlled. Loss of forced decay heat removal at reduced inventory may result in more rapid increases in RPV temperatures depending on the time since shutdown.

Normal means of RCS temperature indication and RPV level indication may not be available in the refueling mode. Redundant means of RPV level indication are therefore procedurally installed to assure that the ability to monitor level will not be interrupted. However, if all level and temperature indication were to be lost in either the Cold Shutdown OPCON or Refueling OPCON, this EAL would result in declaration of a UE if both temperature and level indication cannot be restored within 15 minutes from the loss of both means of indication. Escalation to ALERT would be via EAL CA3.1 based on an inventory loss or EAL CA4.1 based on exceeding its temperature criteria.

Explanation/Discussion/Definitions:

RPV water level is normally monitored using the instrument ranges in Attachment 2, page 5.

In preparation for RPV floodup and refueling operations, the shutdown range instrument transmitter LT-N027 is valved out and replaced with LT-11683. The shutdown range indication is thus expanded to 0" - 550". During refueling operations, visual observation by personnel on the refuel floor in communication with the Control Room may also provide indication of reactor cavity water level and RPV water level.

RCS coolant temperature may be indicated by the following instrumentation:

- Recirc pump suction loop A and B temperature on TR-R650-B31 (10C650C)
- Recirc loop temperature from the following computer points:
  - Recirc loop A inlet temp 1 A221
  - Recirc loop A inlet temp 2 A222
  - Recirc loop B inlet temp 1 A223
  - Recirc loop B Inlet temp 2 A224
  - Recirc loop A avg inlet temp B2042
  - Recirc loop B avg inlet temp B2043
- RHR A & B Hx inlet temperatures from computer points A2380 & A2382
- RWCU bottom head drain temperature from computer point A2942

Definitions:

UNPLANNED: A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, CU4 Example EAL #2
2. Technical Specifications Figure B3/4-3-1, Reactor Vessel Water Level
3. HC.OP-IO.ZZ-0005(Q) Cold Shutdown to Refueling
4. HC.IC-GP.BB-0003(Q) Nuclear Boiler - Nondivisional Channel LT-11683 / B21-N027 Rx Cavity Flood Up Level / Rx Shutdown Range Level Setup
5. HC.OP-IO.ZZ-0004(Q) Shutdown from Rated Power to Cold Shutdown
6. HC.OP-SO.BC-0002 (Q) Decay Heat Removal Operation

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EAL Category: C – Cold Shutdown / Refuel System Malfunction

EAL Subcategory: 4 – RCS Temperature

Initiating Condition: Inability to maintain plant in cold shutdown

OPCON Applicability: 4 - Cold Shutdown, 5 - Refueling

EAL# & Classification Level: **CA4.1 – ALERT**

EAL:

An **UNPLANNED** event results in RCS temperature **> 200°F** for **> Table C-3** duration

<u>**OR**</u>

An **UNPLANNED** event results in RPV pressure increase **> 10 psig** due to a loss of RCS cooling

Table C-3 RCS Heatup Duration Thresholds

RCS Integrity	CONTAINMENT CLOSURE	Duration threshold
Intact	NOT Applicable	60 minutes **
NOT Intact	Established	20 minutes **
NOT Intact	NOT Established	0 minutes

** IF a Decay Heat Removal System is placed in operation within the duration threshold and RCS Temperature is lowering, THEN this EAL is NOT Applicable

Basis:

1st Condition

The RCS Heatup Duration Threshold table addresses complete loss of functions required for core cooling for greater than 60 minutes during Refueling and Cold Shutdown OPCONs when RCS integrity is established. RCS integrity should be considered to be in place 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). The status of **CONTAINMENT CLOSURE** in this condition is immaterial given that the RCS is providing a high pressure barrier to fission product release to the environment. The 60 minute time frame should allow sufficient time to restore cooling without a substantial degradation in plant safety.

The RCS Heatup Duration Threshold table also addresses the complete loss of functions required for core cooling for greater than 20 minutes during Refueling and Cold Shutdown OPCONs when **CONTAINMENT CLOSURE** is established but RCS integrity is not established. The allowed 20 minute time frame was included to allow operator action to restore the heat removal function, if possible.

Finally, complete loss of functions required for core cooling during Refueling and Cold Shutdown OPCONs when neither **CONTAINMENT CLOSURE** nor RCS integrity are established. RCS integrity is in place 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). No delay time is allowed because the evaporated reactor coolant that may be released into the Containment during this heatup condition could also be directly released to the environment.

The note (**) in Table C-3 indicates that this EAL is not applicable if actions are successful in restoring a decay heat removal system to operation and RCS temperature is being reduced within the specified time frame.

2nd Condition

The **10 psig** pressure increase addresses situations where, due to high decay heat loads, the time provided to restore temperature control, should be less than 60 minutes. The RPV pressure setpoint chosen should be **10 psig** or the lowest pressure that the site can read on installed Control Board instrumentation that is equal to or greater than **10 psig**.

Escalation to SITE AREA EMERGENCY would be via EAL CS3.1 or EAL CS3.2 should boiling result in significant RPV level loss leading to core uncovery.

A loss of Technical Specification components alone is not intended to constitute an ALERT. The same is true of a momentary unplanned excursion above the Technical Specification cold shutdown temperature limit when the heat removal function is available.

The Emergency Coordinator must remain alert to events or conditions that lead to the conclusion that exceeding the EAL is **IMMINENT**. If, in the judgment of the Emergency Coordinator, an **IMMINENT** situation is at hand, the classification should be made as if the threshold has been exceeded.

Explanation/Discussion/Definitions:

200°F is the Technical Specification cold shutdown temperature limit.

A **10 psig** RCS pressure increase is readable in the Control Room on PI-5824A (0 - 50 psig) and PI-5824B (0 - 50 psig).

RCS coolant temperature may be indicated by the following instrumentation:

- Recirc pump suction loop A and B temperature on TR-R650-B31 (10C650C)
- Recirc loop temperature from the following computer points:
    - Recirc loop A inlet temp 1 A221
    - Recirc loop A inlet temp 2 A222
    - Recirc loop B inlet temp 1 A223
    - Recirc loop B Inlet temp 2 A224
    - Recirc loop A avg inlet temp B2042
    - Recirc loop B avg inlet temp B2043
- RHR A & B Hx inlet temperatures from computer points A2380 & A2382
- RWCU bottom head drain temperature from computer point A2942

CONTAINMENT CLOSURE can be established by meeting the requirements of any of the following:

- OP-HC-108-115-1001, Operability Assessment and Equipment Control Program, Attachment 5
- Technical Specifications 3.6.5.1, Secondary Containment Integrity
- Technical Specifications 3.6.1.1, Primary Containment Integrity

Definitions:

UNPLANNED: A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions.

CONTAINMENT CLOSURE: Is the procedurally defined actions taken to secure the Containment (Primary or Secondary) and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours (unless a different time is specified).

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, CA4 Example EAL #1 & #2
2. OU-AA-103 Shutdown Safety Management Program
3. HCGS Technical Specifications Table 1.2, Operational Conditions
4. HC.OP-AB.RPV-0009(Q) Shutdown Cooling
5. HC.OP-IO.ZZ-0004(Q) Shutdown from Rated Power to Cold Shutdown
6. HC.OP-SO.BC-0002 (Q), Decay Heat Removal Operation
7. Technical Specifications 3.6.5.1 Secondary Containment Integrity
8. Technical Specifications 3.6.1.1 Primary Containment Integrity

EAL Category: C – Cold Shutdown / Refuel System Malfunction

EAL Subcategory: 5 – Communications

Initiating Condition: Loss of all onsite or offsite communications capabilities

OPCON Applicability: 4 - Cold Shutdown, 5 - Refueling, D - Defueled

EAL# & Classification Level: **CU5.1 – UNUSUAL EVENT**

EAL:

Loss of **all Table C-4** Onsite communication methods affecting the ability to perform routine operations

OR

Loss of **all Table C-4** Offsite communication methods affecting the ability to perform offsite notifications

Table C-4 Communications Systems		
System	**Onsite**	**Offsite**
Direct Inward Dial System (DID)	X	X
Station Page System (Gaitronics)	X	
Station Radio System	X	
Nuclear Emergency Telephone System (NETS)		X
Centrex Phone System (ESSX)		X
NRC (ENS)		X

Basis:

The purpose of this EAL is to recognize a loss of communications capability that either defeats the plant operations staff ability to perform routine tasks necessary for plant operations or the ability to communicate issues with off-site authorities. The loss of off-site communications ability is expected to be significantly more comprehensive than the condition addressed by 10 CFR 50.72.

The availability of one method of ordinary off-site communications is sufficient to inform federal, state, and local authorities of plant issues. This EAL is intended to be used only when extraordinary means (e.g., relaying of information from radio transmissions, individuals being sent to off-site locations, etc.) are being utilized to make communications possible.

Explanation/Discussion/Definitions:

Onsite and Offsite global communications include one or more of the systems listed in Table C-4.

Direct Inward Dial System (DID)

Direct Inward Dial (DID) system is named for the dominant feature of the commercial telephone service provided by the local telephone company for the site. DID allows station telephones to be extensions or tied lines of the same systems. These exchanges can take advantage of backup power supplies provided to the stations, and may use either PSEG microwave, commercial telephone system microwave, or buried cable transmission systems to maintain external communications. This commercial telephone service is available as an additional backup for the NETS and Centrex/ESSX 1 system.

Station Page System (Gaitronics)

Gaitronics is a completely transistorized voice communication system with five voice channels: one page and five party. The system is designed for use in extreme environmental conditions such as dust, moisture, heat and noise. The system consists of handsets, speakers and their associated amplifiers. The power for this system is 120 volts AC from an inverted DC source to provide reliable communications during an emergency.

Station Radio System

The Operations and Fire Protection Department UHF radio system is a multi-frequency system used routinely by both station Operations Departments and the Fire Protection Department. When an emergency event is declared, these radio frequencies serve both station Operations Support Centers (OSC).

Nuclear Emergency Telephone System (NETS)

The Nuclear Emergency Telecommunications System (NETS) is a privately controlled, self-contained telephone exchange that operates as a closed system, not accessible from other phone exchanges. This feature allows the system to be dedicated to emergency response use. The system may use PSEG microwave, commercial telephone system microwave, fiber optics, or buried cable transmission as needed. The exchange switching equipment is maintained at the Environmental & Energy Resource Center (EERC). As an independent system with an uninterruptible power supply, it may operate with or without local phone service or external power.

Centrex Phone System (ESSX)

The Centrex/Electronic Switch System Exchange 1 (Centrex/ESSX 1) is also a privately controlled exchange, which PSEG operates with its own microwave signal system. This system is also independent of local phone service, since each circuit is independently wired. The microwave signal is generated from corporate facilities in Newark, NJ, separated from any local effects of weather or telephone use. The exchange is accessible from other exchanges, but circuits are located only in PSEG facilities. It is considered the primary backup for the NETS system.

NRC (ENS)

The Emergency Notification System (ENS) is a dedicated communications system with the NRC, the Federal Telecommunications System (FTS) and consists of direct lines to the NRC. FTS lines are used to provide general accident information. These telephones are installed in the Control Room, TSC, and the EOF.

This EAL is the cold condition equivalent of the hot condition EAL SU6.1.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, CU6 Example EAL #1, #2
2. PSEG Nuclear Emergency Plan, Section 7 Communications
3. UFSAR 9.5.2 Communications Systems

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EAL Category: C – Cold Shutdown / Refuel System Malfunction

EAL Subcategory: 6 – Inadvertent Criticality

Initiating Condition: Inadvertent Criticality

OPCON Applicability: 4 - Cold Shutdown, 5 - Refueling

EAL# & Classification Level: **CU6.1 – UNUSUAL EVENT**

EAL:

UNPLANNED sustained positive period observed on nuclear instrumentation

Basis:

This EAL addresses criticality events that occur in the Cold Shutdown OPCON or Refueling OPCON such as fuel mis-loading events. This EAL indicates a potential degradation of the level of safety of the plant, warranting a UE classification.

Escalation would be by Emergency Coordinator Judgment.

Explanation/Discussion/Definitions:

The term "sustained" is used in order to allow exclusion of expected short term positive periods from planned control rod movements. These short term positive periods are the result of the increase in neutron population due to subcritical multiplication.

Positive reactor period may be identified by:

- SRM period indicators and recorders R602A and B (green pens) on panel 10C650C
- Overhead Annunciator C3-D1, SRM PERIOD
- Computer points B3001, B3002, B3003 and B3004

This EAL is the cold condition equivalent of the hot condition EAL SU3.1.

Definitions:

UNPLANNED: A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions.

EAL Bases Reference(s):

1. NEI 99-01, Rev. 05, CU8 Example EAL #1
2. Technical Specifications 3.3.7.6, Source Range Monitors
3. HC.OP-ST.SE-0005(Q) SRM Channel Count Rate Surveillance
4. HC.OP-AR.ZZ-0009(Q) Overhead Annunciator Window Box C3
5. Technical Specifications 3.9.2, Instrumentation

EAL

Attachments

(Support Materials)

Attachment 1 – Use of Fission Product Barrier Table

OPCON Applicability: 1 - Power Operations, 2 - Startup, 3 - Hot Shutdown

A point system is used to determine the Emergency Classification Level based on the Fission Product Barrier Table. Each Fission Product Barrier Loss and Potential Loss threshold is assigned a point value as noted below.

Perform the following:

1. Review all columns of the Fission Product Barrier Table and identify which need further review.
2. For each of the three barriers, determine the EAL with the highest point value. No more than one EAL should be selected for each barrier.
3. Add the point values for the three barriers.
4. Classify based on the point value sum as follows:

If the sum is:	Classify as:	EAL	ECG Att#
2, 3	UNUSUAL EVENT	**ANY** loss or **ANY** potential loss of Containment	**1**
4, 5	ALERT	**ANY** loss or **ANY** potential loss of either Fuel Clad or RCS	**2**
6 - 11	SITE AREA EMERGENCY	Loss or potential loss of **ANY** two barriers **OR** Potential loss of 2 barriers with the loss of the 3rd barrier	**3**
12, 13	GENERAL EMERGENCY	Loss of **ANY** two barriers **AND** Loss or potential loss of third barrier	**4**

5. Implement the appropriate ECG Attachment.
6. Continue to review the Fission Product Barrier Table for changes that could result in emergency escalation or de-escalation.

Attachment 2: EAL Bases Figures / Drawings

Figures/drawings referenced in the bases discussions of the EALs are listed in this Attachment.

AC Power Distribution

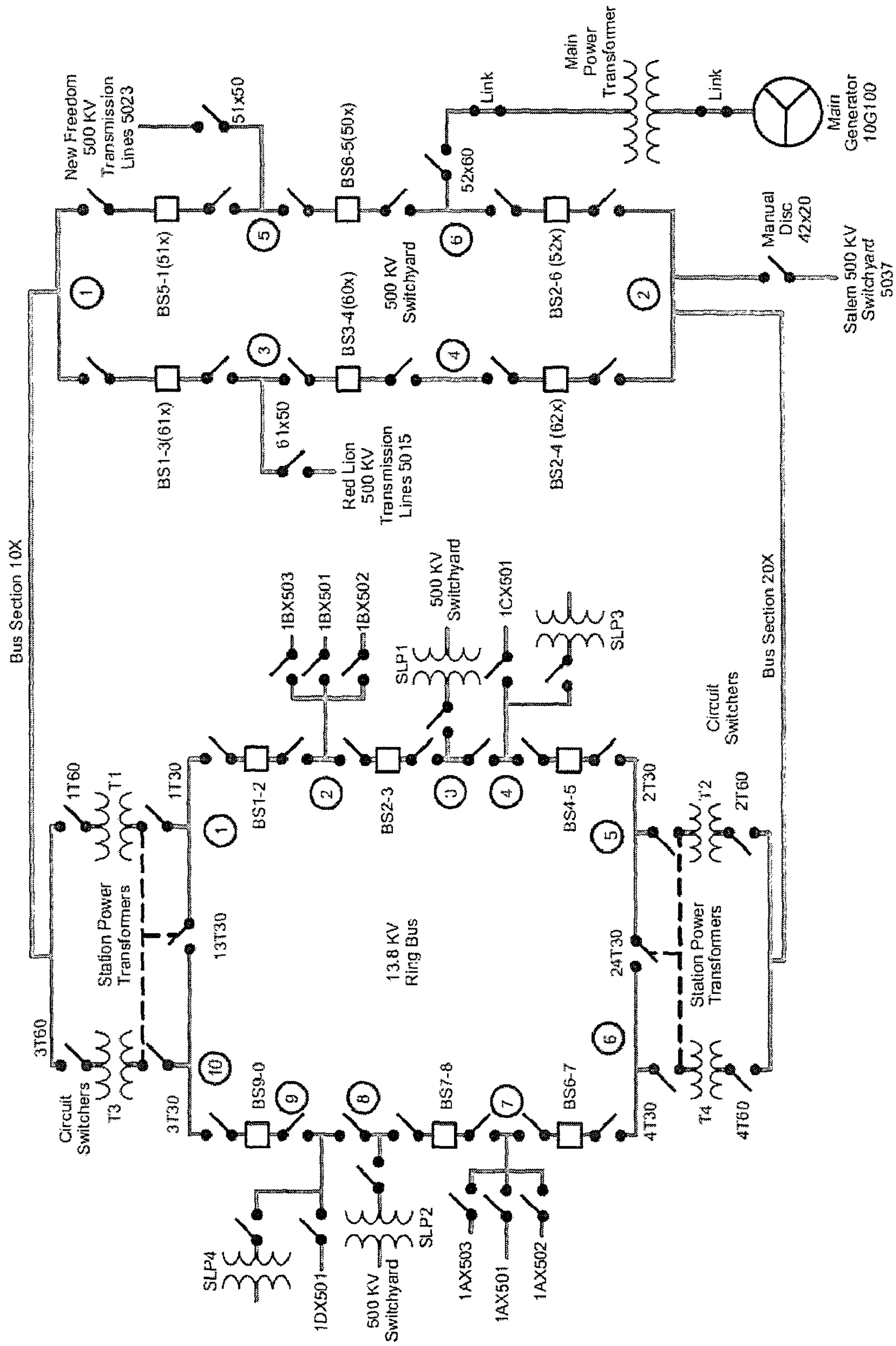
Hope Creek normally has three physically separate, independent 500 KV transmission lines connecting the Hope Creek 500 KV Switchyard with the Offsite Power Distribution Network (PJM). The three sources are:

- 500 KV Hope Creek - Salem Crosstie line.
- The Red Lion Line (referred to as the 5015 line) is a 30.1 mile tie to the Red Lion Switching Station located at Delaware City next to the river and feeds the 500 KV Switchyard Bus Section 3.
- The New Freedom Line (referred to as the 5023 line) is a 42.9 mile tie to the New Freedom Switching Station located northeast of Hope Creek in Camden County and feeds the 500 KV Switchyard Bus Section 5.

Power is distributed from the 500 KV switchyard to a 13.8 KV ring bus. Station electrical loads are supplied from the 13.8 KV ring bus through two physically independent auxiliary power systems via Station Service Transformers which supply vital and non-vital station loads. Station Service Transformers 1AX501 and 1BX501 normally supply the 4.16 KV vital buses. The four 4.16 KV vital buses can be supplied by either 1AX501 or 1BX501. Two of the four vital buses are normally provided power from 1AX501 with alternate power from 1BX501; the other two are normally supplied power from 1BX501 with alternate power from 1AX501. Loss of the normal power supply to a 4.16 KV vital bus initiates a fast transfer (alternate feeder breaker closes) to the alternate source, provided power is available.

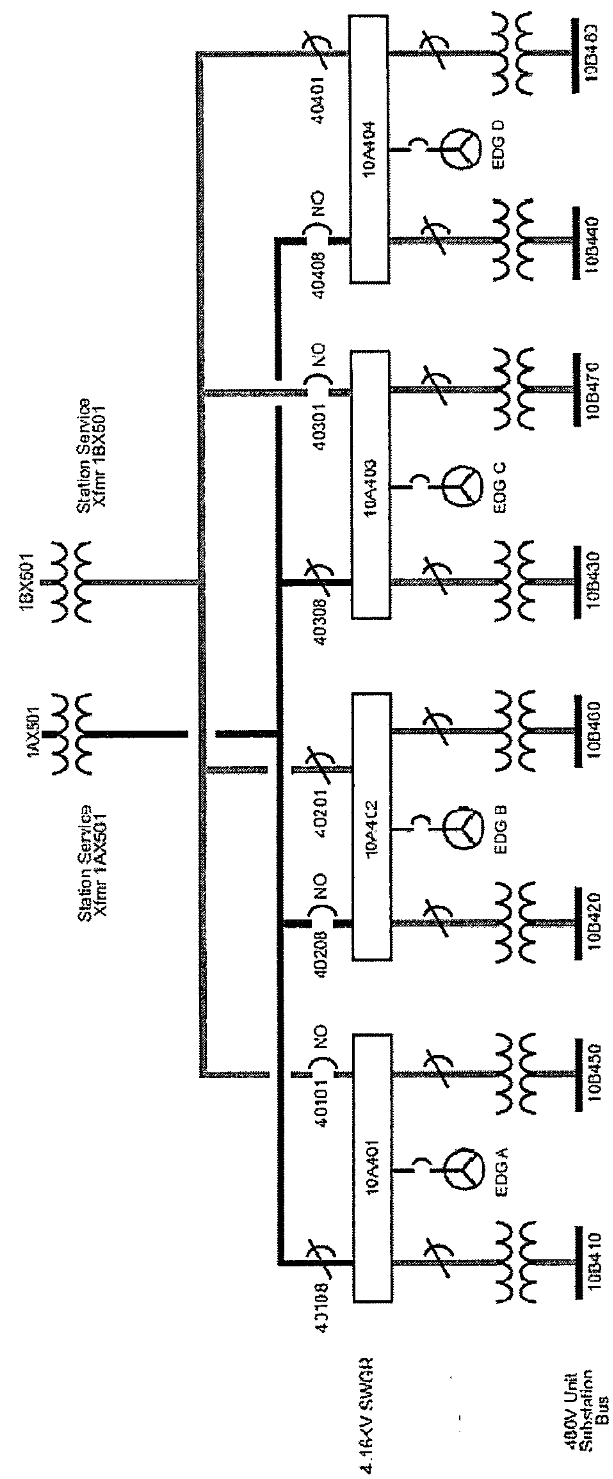
Additionally, each 4.16 KV vital bus has an Emergency Diesel Generator (EDG) which will automatically start and provide power to the bus in the event of a sustained loss of power to its associated vital bus. Additional automatic EDG starts are initiated on degraded power conditions on both 1AX501 and 1BX501, or under LOCA conditions. EDGs will not automatically provide power to the bus unless the bus has a sustained loss of power.

AC Power Distribution (cont'd)



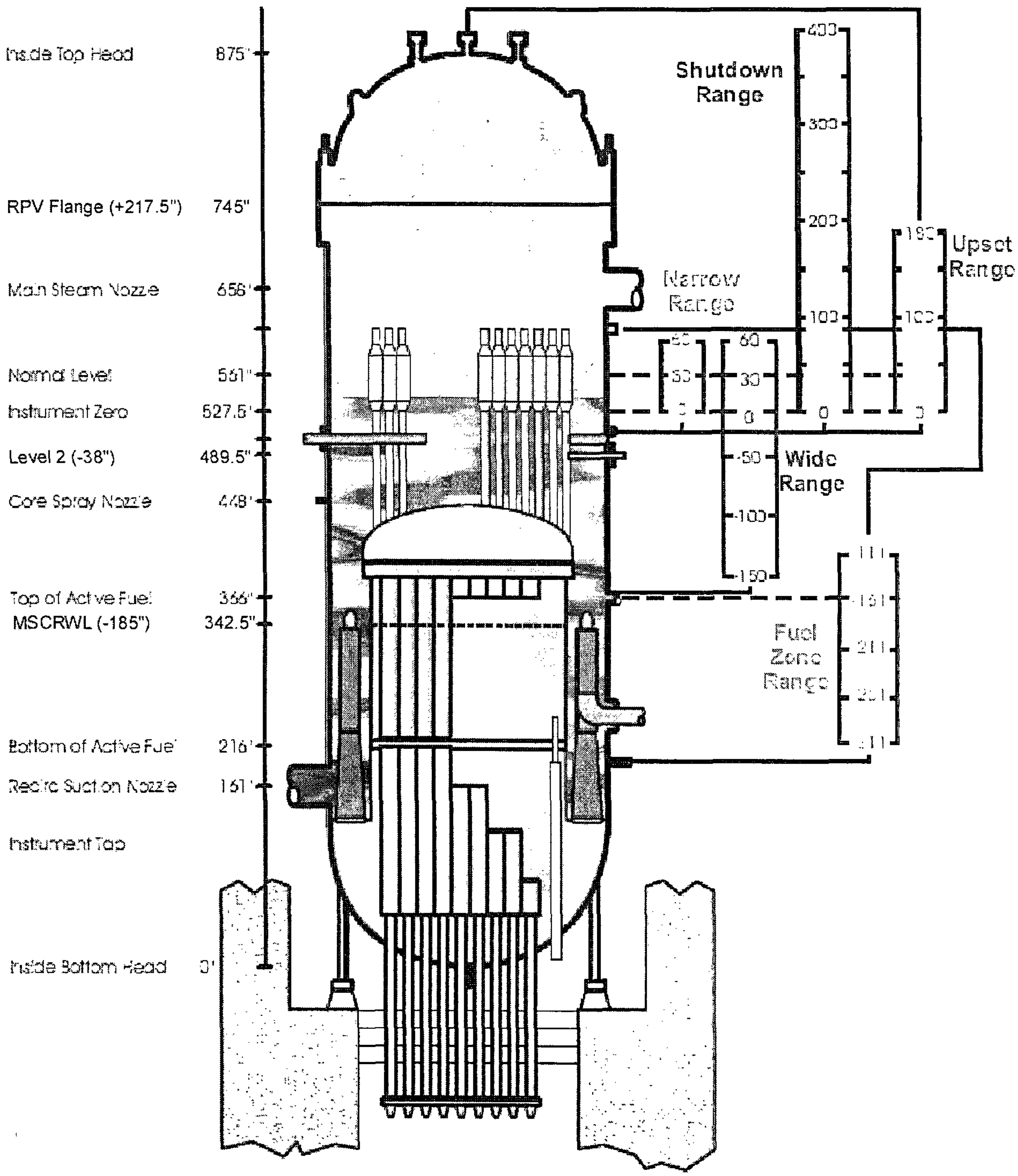
Attachment 2 - Figures / Drawings

AC Power Distribution (cont'd)



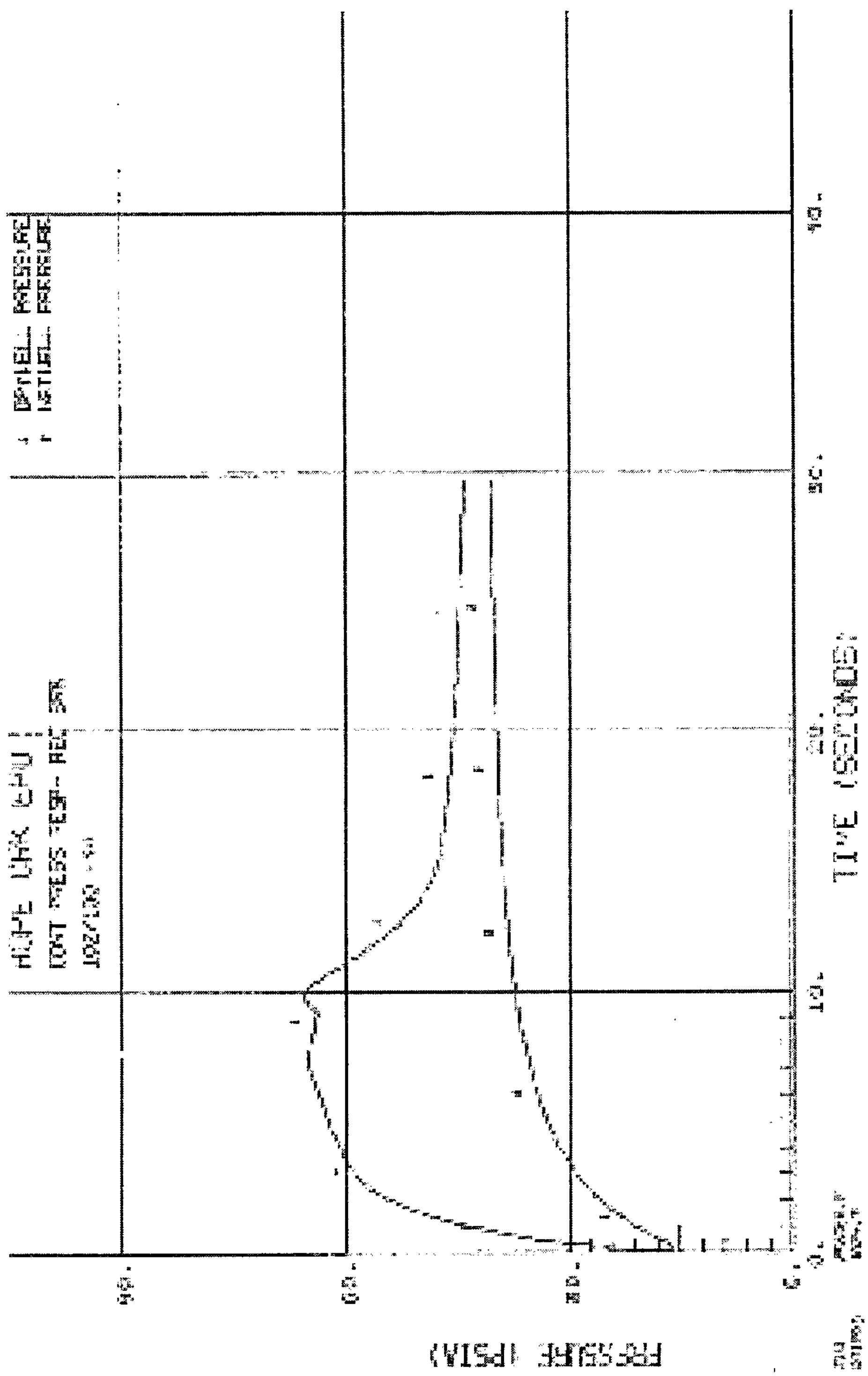
Attachment 2 - Figures / Drawings

RPV Level Instrument Ranges

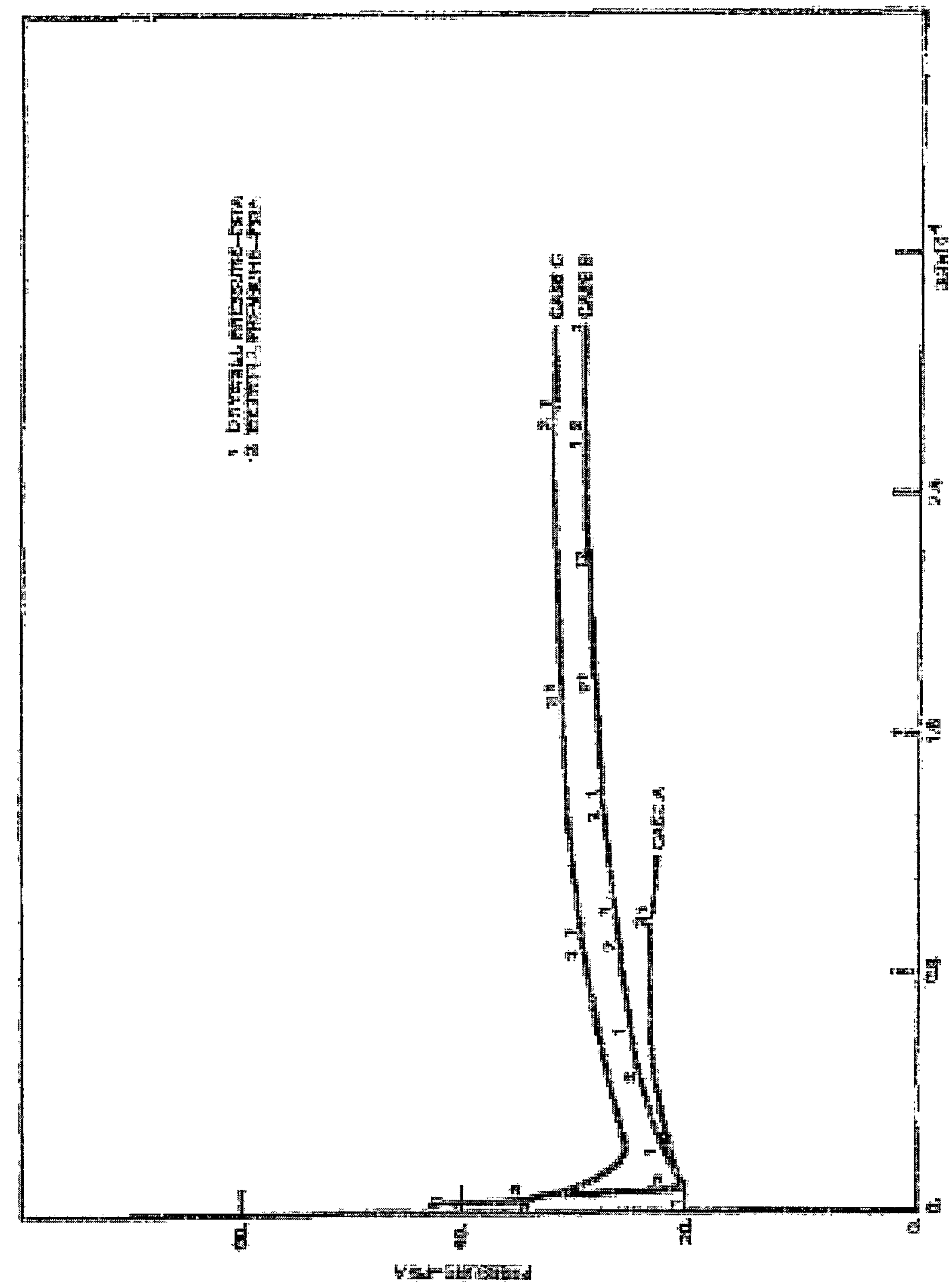


Attachment 2 - Figures / Drawings

Short-Term Containment Pressure Response Following Recirculation Line Break (4031 MWt)



Long-Term Containment Pressure Response Following Recirculation Line Break (3359 MWt)



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Attachment 3 – Definitions

Selected words in the ECG Initialting Conditions (ICs) and Emergency Action Levels (EALs) have been set in all capital letters and bolded.These words are defined terms having specific meanings as they relate to this document and the definitions of these terms are provided below and in the basis for the EAL that the word is used in.

AIRCRAFT: Includes both small and large **AIRCRAFT.** Examples of **AIRCRAFT** include general aviation Cessna, Piper and Lear type private planes, large passenger or freight planes as well as police, medical and media helicopters. A large **AIRCRAFT** is referred to as an **AIRLINER.**

AIRLINER/LARGE AIRCRAFT: Any size or type of **AIRCRAFT** with the potential for causing significant damage to the plant (refer to the Security Contingency Plan for a more detailed definition).

BOMB: Refers to an explosive device suspected of having sufficient force to damage plant systems or structures.

CIVIL DISTURBANCE: A group of persons violently protesting station operations or activities at the site.

CONFINEMENT BOUNDARY: Is the barrier(s) between areas containing radioactive substances and the environment and includes the multi-purpose canister (MPC) and, for the purposes of this EAL, the associated cask shielding.

CONTAINMENT CLOSURE: Is the procedurally defined action taken to secure the Containment (Primary or Secondary) and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

CREDIBLE / ACTUAL THREAT: Is a threat which poses a likely and serious danger to the safe operation of the facility or to site personnel and public safety.

DEGRADED PERFORMANCE: Assessment of degraded safe shutdown system performance includes examination of systems in standby status as well as those in operation. When a safe shutdown system is in operation, its performance can be directly observed and compared to its design capability (e.g., rated flow is required but cannot be achieved). When an operating safe shutdown system cannot fulfill its design function, its performance is degraded. When a safe shutdown system is in standby, its performance capability may not be readily determined. One or more of the following can provide indirect indication of its performance capability:

- Electrical faults on power supplies
- Normally closed breakers in tripped position
- System annunciators activated
- System warning lights lit
- Insufficient system pressure from keep-fill pumps
- Elevated area temperatures or radiation levels
- Increased sump pump operation in areas in which the system is located

EXPLOSION: A rapid, violent, unconfined combustion, or catastrophic failure of pressurized/energized equipment that imparts energy of sufficient force to potentially damage permanent structures, systems, or components.

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.

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

HOSTILE ACTION: An act toward Salem or Hope Creek or its personnel that includes the use of violent force to destroy equipment, take **HOSTAGES**, and/or intimidate PSEG to achieve an end. This includes attack by air, land, or water using guns, explosives, **PROJECTILE**s, 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 Salem or Hope Creek. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the **OCA**).

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.

IDENTIFIED LEAKAGE: As defined in T/S, shall be leakage into collection systems, such as pump seals or valve packing leaks, that is captured and conducted to a sump or collecting tank, or, shall be leakage into the containment atmosphere from sources that are both specifically located and known either not to interface with the operation of the leakage detection system or not to be **PRESSURE BOUNDRY LEAKAGE.**

IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur within approximately 2 hours (unless a different time is specified).

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.

MALICIOUS ACT: Purposeful malevolent actions directed at compromising reactor safety and thus could directly or indirectly endanger the public health and safety.

MINIMUM EXCLUSION AREA (MEA): The closest location just beyond the **OWNER CONTROLLED AREA** where a member of the general public could gain access. For Hope Creek the **MEA** is 0.56 miles.

NORMAL PLANT OPERATIONS: Activities at the plant site associated with routine testing, maintenance, or equipment operations, in accordance with normal operating or administrative procedures. Entry into abnormal or emergency operating procedures, or deviation from normal security or radiological controls posture, is a departure from **NORMAL PLANT OPERATIONS**.

OWNER CONTROLLED AREA (OCA): Property owned, maintained and controlled by PSEG Nuclear as part of the Salem & Hope Creek Generating Station complex. For the purpose of emergency classification, area from the PSEG Nuclear access road checkpoint and inward towards the stations is considered the **OCA**.

PRESSURE BOUNDARY LEAKAGE: As defined in T/S, shall be leakage through a non-isolable fault in a Reactor Coolant System component body, pipe wall or vessel wall.

PROJECTILE: An object that impacts Salem and/or Hope Creek that could cause concern for continued operability, reliability, or personnel safety.

PROTECTED AREA (PA): A security controlled area within the **OWNER-CONTROLLED AREA (OCA)** that is enclosed by the security perimeter fence and monitored by intrusion detection systems. Access to the **PA** requires proper security clearance and is controlled at the Security Center.

SABOTAGE: Deliberate damage, mis-alignment, or mis-operation of plant equipment with the intent to render the equipment inoperable. Equipment found tampered with or damaged due to malicious mischief may not meet the definition of **SABOTAGE** until this determination is made by security supervision.

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**.

SIGNIFICANT TRANSIENT: An **UNPLANNED** event based on EC judgment, but includes as a minimum any one of the following: (1) Reactor Scram, (2) Electrical Load Rejection > 22%, (3) Thermal Reactor Power Reduction > 25%, (4) ECCS Injection, or (5) Thermal Power Oscillations greater than 10%.

TAMPERING: Means deliberately damaging, disabling, or altering equipment necessary for safe shutdown or security equipment necessary for the protection of the facility. Confirmed tampering implies that a criminal activity may have occurred which requires a threshold of proof for a reason to believe that no other possibility exists for the incident other than tampering.

UNIDENTIFIED LEAKAGE: As defined in T/S, shall be all leakage which is not **IDENTIFIED LEAKAGE**.

UNISOLABLE: A breach or leak that cannot be promptly isolated from the Control Room.

UNPLANNED: A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions.

VALID: An indication, report, or condition, is considered to be **VALID** when it is verified by (1) an instrument channel check, (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.

VALIDATED: **AIRCRAFT** threat call from the NRC that is confirmed to be authentic. Calls from the NRC are **VALIDATED** by use of the NRC provided authentication code or by making a return call to the NRC Headquarter Operations Center and confirming threat information with the NRC Operation Officer. **AIRCRAFT** threat calls from other agencies, NORAD, FAA, or FBI should be **VALIDATED** by calling the NRC Operations Officer.

VISIBLE DAMAGE: Damage to equipment or structure that is readily observable without measurements, testing, or analysis. Damage is sufficient to cause concern regarding the continued operability or reliability of the affected structure, system, or component. Example damage includes: deformation due to heat or impact, denting, penetration, rupture, cracking, and paint blistering. Surface blemishes (e.g., paint chipping, scratches) should not be included.

VITAL AREAS: Typically any site specific areas, normally within the **PROTECTED AREA**, that contains equipment, systems, components, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

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Attachment 4 – Glossary of Abbreviations & Acronyms

Acronyms and Abbreviations used in the ECG and ECG basis document are listed in this attachment.

AAAG	-	Accident Assessment Advisory Group (Delaware)
AC	-	Alternating Current
ADMSS	-	Administrative Support Supervisor - TSC
ADS	-	Automatic Depressurization System
AH	-	Amp-Hour
ALARA	-	As Low As Reasonably Achievable
APRM	-	Average Power Range Monitor
ARI	-	Alternate Rod Insertion
ARM	-	Area Radiation Monitor
ASAP	-	As Soon As Possible
ASM	-	Administrative Support Manager
ATWS	-	Anticipated Transient Without Scram
BKGD	-	Background
BKR	-	Breaker (electrical circuit)
BLDG	-	Building
BNE	-	Bureau of Nuclear Engineering (NJDEPE)
BWR	-	Boiling Water Reactor
CACS	-	Containment Atmosphere Control System
CAS	-	Central Alarm Station
CCPM	-	Corrected Counts per Minute
CEDE	-	Committed Effective Dose Equivalent
CDE	-	Committed Dose Equivalent
CFR	-	Code of Federal Regulations
CIS	-	Containment Isolation System
CNTMT/CT	-	Containment (Barrier)
CoC	-	Certificate of Compliance
CO_2	-	Carbon Dioxide
CP	-	Control Point
CPM	-	Counts Per Minute
CPS	-	Counts Per Second
CR	-	Control Room
CRS	-	Control Room Supervisor
CREF	-	Control Room Emergency Filter System
CRIDS	-	Control Room Integrated Display System
CRD	-	Control Rod Drive
CSS	-	Core Spray System

DC	-	Direct Current
DAPA	-	Drywell Atmosphere Post Accident (Radiation monitor)
DDE	-	Deep Dose Equivalent
DEI	-	Dose Equivalent Iodine
DEMA	-	Delaware Emergency Management Agency
DEP	-	Department of Environmental Protection (NJ)
DHS	-	Department of Homeland Security
DID	-	Direct Inward Dial (phone system)
DLD	-	Drywell Leak Detection
DOE	-	Department of Energy
DOT	-	Department of Transportation
DPCC/DCR	-	Discharge Prevention, Containment, & Countermeasures/Discharge Cleanup & Removal Plan
DPM	-	Disintegrations per Minute
DRCF	-	Dose Rate Conversion Factor
EACS	-	ESF Equipment Area Cooling System
EAL	-	Emergency Action Level
EAS	-	Emergency Alert System (Broadcast)
EC	-	Emergency Coordinator
ECCS	-	Emergency Core Cooling Systems
ECG	-	Event Classification Guide
ECL	-	Emergency Classification Level
EDG	-	Emergency Diesel Generator
EDO	-	Emergency Duty Officer
EERC	-	Energy & Environmental Resource Center (Old NTC)
EMRAD	-	Emergency Radio (NJ)
ENC	-	Emergency News Center
ENS	-	Emergency Notification System (NRC)
EOC	-	Emergency Operations Center (NJ & DE)
EOF	-	Emergency Operations Facility
EOP	-	Emergency Operating Procedure
EPA	-	Emergency Preparedness Advisor
EPA	-	Environmental Protection Agency
EPC	-	Emergency Preparedness Coordinator
EPG	-	Emergency Procedure Guideline
EPIP/EPEP	-	Emergency Plan Implementing Procedure
EPZ	-	Emergency Planning Zone
EQPT	-	Equipment
ERDS	-	Emergency Response Data System
ERM	-	Emergency Response Manager
ERO	-	Emergency Response Organization
ESF	-	Engineered Safety Feature
ESSX	-	Electronic Switch System Exchange (Centrex)

FAA	-	Federal Aviation Administration
FBI	-	Federal Bureau of Investigation
FC	-	Fuel Clad (Barrier)
FEMA	-	Federal Emergency Management Agency
FFD	-	Fitness For Duty
FRVS	-	Filtration, Recirculation and Ventilation System
FSAR	-	Final Safety Analysis Report
FTS	-	Federal Telecommunications System (NRC)
GE	-	General Emergency
HCGS	-	Hope Creek Generating Station
HCTL	-	Heat Capacity Temperature Limit
HEPA	-	High Efficiency Particulate Absorbers
HOO	-	Headquarters Operations Officer
HPCI	-	High Pressure Coolant Injection
HTV	-	Hardened Torus Vent
HVAC	-	Heating, Ventilation & Air Conditioning
HWCI	-	Hydrogen Water Chemical Injection
HX	-	Heat Exchanger
IAW	-	In Accordance With
IC	-	Initiating Condition
ICMF	-	Initial Contact Message Form
IDLH	-	Immediately Dangerous to Life and Health
IPEEE	-	Individual Plant Examination of External Events
IRM	-	Intermediate Range Monitor
ISFSI	-	Independent Spent Fuel Storage Installation
I/S	-	In Service
K_{eff}	-	Effective Neutron Multiplication Factor
KI	-	Potassium Iodide
KV	-	Kilovolt
LAC	-	Lower Alloways Creek
LCO	-	Limiting Condition for Operation
LDC	-	Learning Development Center (aka – NAB or TB2)
LDE	-	Lens Dose Equivalent
LEL	-	Lower Explosive Limit
LER	-	Licensing Event Report
LFL	-	Lower Flammability Limit
LLD	-	Lowest Level Detectable
LOCA	-	Loss of Coolant Accident
LOP	-	Loss of Offsite Power

LPCI	-	Low Pressure Coolant Injection
LPZ	-	Low Population Zone
LWR	-	Light Water Reactor
MCR	-	Main Control Room
MDA	-	Minimum Detectable Amount
MEA	-	Minimum Exclusion Area
MEES	-	Major Equipment & Electrical Status (Form)
MET	-	Meteorological
MOU	-	Memorandum of Understanding
MRO	-	Medical Review Officer
MSCRWL	-	Minimum Steam Cooling RPV Water Level
MSCP	-	Minimum Steam Cooling Pressure
MSIV	-	Main Steam Isolation Valve
MSIVSS	-	Main Steam Isolation Valve Sealing System
MSL	-	Main Steam Line
MSL	-	Mean Sea Level
mR	-	milliRoentgen
MW	-	Megawatt
NAB	-	Nuclear Administrative Building
NAWAS	-	National Attack Warning Alert System
NCO	-	Nuclear Control Operator
NDAB	-	Nuclear Department Administration Building (TB2)
NEI	-	Nuclear Energy Institute
NEO	-	Nuclear Equipment Operator
NESP	-	National Environmental Studies Project
NETS	-	Nuclear Emergency Telecommunications System
NFE	-	Nuclear Fuels Engineer
NFPB	-	Normal Full Power Background
NJSP	-	New Jersey State Police
NOAA	-	National Oceanographic and Atmospheric Administration
NORAD	-	North American Aerospace Defense Command
NPP	-	Nuclear Power Plant
NPV	-	North Plant Vent
NRC	-	Nuclear Regulatory Commission
NSSSS	-	Nuclear Steam Supply Shutoff System
NUMARC	-	Nuclear Management and Resources Council
NWS	-	National Weather Service
OBE	-	Operating Basis Earthquake
OCA	-	Owner Controlled Area
ODCM	-	Offsite Dose Calculation Manual
OEM	-	Office of Emergency Management (NJ)
OHA	-	Overhead Annunciator

OPCON	-	Operational Condition
ORO	-	Offsite Response Organization
OSB	-	Operational Status Board (Form)
OSC	-	Operations Support Center
PA	-	Protected Area
PA	-	Public Address
PAG	-	Protective Action Guideline
PAR	-	Protective Action Recommendation
PC	-	Primary Containment (Barrier)
PCIG	-	Primary Containment Instrument Gas System
PCIS	-	Primary Containment Isolation System
PPC	-	Plant Process Computer
PRM	-	Process Radiation Monitor
PSEG	-	Public Service Enterprise Group
PSIG	-	Pounds Square Inch Gauge
R	-	Roentgen
RAD	-	Radiation
RAL	-	Reportable Action Level
RC	-	Reactor Coolant
RCA	-	Radiologically Controlled Area
RCAM	-	Repair and Corrective Action Mission
RCIC	-	Reactor Core Isolation Cooling
RCS	-	Reactor Coolant System (Barrier)
REM	-	Roentgen Equivalent Man
RHR	-	Residual Heat Removal (Containment Heat Removal)
RM	-	Recovery Manager
RM	-	Radiation Monitor
RMO	-	Recovery Management Organization
RMS	-	Radiation Monitoring System
RPS	-	Radiation Protection Supervisor
RPS	-	Reactor Protection System
RPV	-	Reactor Pressure Vessel
RRCS	-	Redundant Reactivity Control System
RSM	-	Radiological Support Manager
RWCU	-	Reactor Water Cleanup (System)
SACS	-	Safety Auxiliaries Cooling System
SAE	-	Site Area Emergency
SAM	-	Severe Accident Management
SAS	-	Secondary Alarm Station (Security)
SBO	-	Station Blackout
SCBA	-	Self Contained Breathing Apparatus
SCP	-	Security Contingency Procedure

Attachment 4 - Abbreviations & Acronyms

SDE	-	Shallow Dose Equivalent
SDM	-	Shutdown Margin
SLC	-	Standby Liquid Control
SJAE	-	Steam Jet Air Ejector
SM	-	Shift Manager
SNM	-	Special Nuclear Material
SNSS	-	Senior Nuclear Shift Supervisor
SOS	-	Systems Operations Supervisor (Security)
SPDS	-	Safety Parameter Display System
SPV	-	South Plant Vent
SRM	-	Source Range Monitor
SRO	-	Senior Reactor Operator
SRPT	-	Shift Radiation Protection Technician
SRV	-	Safety Relief Valve
SSC	-	Structure, System or Component
SSCL	-	Station Status Checklist
SSE	-	Safe Shutdown Earthquake
SSWS	-	Station Service Water System
SSNM	-	Strategic Special Nuclear Material
STA	-	Shift Technical Advisor
SW	-	Service Water
TAF	-	Top of Active Fuel
TDR	-	Technical Document Room
TEDE	-	Total Effective Dose Equivalent
TIP	-	Traversing Incore Probe
TLV	-	Threshold Limit Value
T/S	-	Technical Specifications
TSC	-	Technical Support Center
TSS	-	Technical Support Supervisor
TSTL	-	Technical Support Team Leader
TSTM	-	Technical Support Team Member
UE	-	Unusual Event
UFSAR	-	Updated Final Safety Analysis Report
UHS	-	Ultimate Heat Sink
USCG	-	United States Coast Guard
VDC	-	Volts Direct Current
WB	-	Whole Body

Attachment 4 - Abbreviations & Acronyms

Attachment 5 – HCGS-to-NEI 99-01 EAL Cross-Reference

This cross-reference is provided to facilitate association and location of a Hope Creek Generating Station EAL within the NEI 99-01, Rev. 05, IC/EAL identification scheme. Further information regarding the development of the HCGS EALs based on the NEI guidance can be found in the EAL Comparison Matrix.

HCGS	NEI 99-01	
EAL	IC	Example EAL
RU1.1	AU1	1
RU1.2	AU1	1
RU1.3	AU1	3
RU2.1	AU2	1
RU2.2	AU2	2
RA1.1	AA1	1
RA1.2	AA1	1
RA1.3	AA1	3
RA2.1	AA2	2
RA2.2	AA2	1
RA3.1	AA3	1
RS1.1	AS1	1
RS1.2	AS1	2
RS1.3	AS1	4
RG1.1	AG1	1
RG1.2	AG1	2
RG1.3	AG1	4
CU1.1	CU3	1
CU2.1	CU7	1
CU3.1	CU1	1
CU3.2	CU2	2
CU3.3	CU2	1
CU4.1	CU4	1

HCGS	NEI 99-01	
EAL	IC	Example EAL
CU4.2	CU4	2
CU5.1	CU6	1, 2
CU6.1	CU8	1
CA1.1	CA3	1
CA3.1	CA1	1
CA3.2	CA1	2
CA4.1	CA4	1, 2
CS3.1	CS1	1, 2
CS3.2	CS1	3
CG3.1	CG1	1
CG3.2	CG1	2
EU1.1	E-HU1	1
HU1.1	HU1	1
HU1.2	HU1	2
HU1.3	HU1	4
HU1.4	HU1	3
HU1.5	HU1	5
HU2.1	HU2	1
HU2.2	HU2	2
HU3.1	HU3	1
HU3.2	HU3	2
HU4.1	HU4	1, 2, 3
HU6.1	HU5	1
HA1.1	HA1	1
HA1.2	HA1	2
HA1.3	HA1	4
HA1.4	HA1	3
HA1.6	HA1	5

Attachment 5 – EAL Cross-Reference

HCGS	NEI 99-01	
EAL	IC	Example EAL
HA2.1	HA2	1
HA3.1	HA3	1
HA4.1	HA4	1, 2
HA5.1	HA5	1
HA6.1	HA6	1
HS4.1	HS4	1
HS5.1	HS2	1
HS6.1	HS3	1
HG4.1	HG1	1, 2
HG6.1	HG2	1
SU1.1	SU1	1
SU3.1	SU8	1
SU4.1	SU2	1
SU5.1	SU3	1
SU6.1	SU6	1, 2
SU7.1	SU4	1
SU7.2	SU4	2
SU8.1	SU5	1, 2
SA1.1	SA5	1
SA3.1	SA2	1
SA5.1	SA4	1
SS1.1	SS1	1
SS2.1	SS3	1
SS3.1	SS2	1
SS5.1	SS6	1
SG1.1	SG1	1
SG3.1	SG2	1

Fission Product Barrier EALs

HCGS	NEI 99-01
EAL	**Barrier Threshold**
FB3-L	FC Loss 1
FB1-L	FC Loss 2
FB2-L	FC Loss 4
FB4-L	FC Loss 6
FB1-P	FC P-Loss 2
FB2-P	FC P-Loss 6
RB2-L	RCS Loss 1
RB1-L	RCS Loss 2
RB3-L	RCS Loss 3
RB4-L	RCS Loss 3
RB5-L	RCS Loss 6
RB1-P	RCS P-Loss 3
RB2-P	RCS P-Loss 3
RB3-P	RCS P-Loss 6
CB1-L	CMT Loss 1
CB2-L	CMT Loss 1
CB3-L	CMT Loss 3
CB4-L	CMT Loss 3
CB5-L	CMT Loss 3
CB6-L	CMT Loss 6
CB2-P	CMT P-Loss 1
CB3-P	CMT P-Loss 1
CB4-P	CMT P-Loss 1
CB1-P	CMT P-Loss 2
CB5-P	CMT P-Loss 4
CB6-P	CMT P-Loss 6

Hope Creek Radiological EAL Setpoint Calculation Document
NEI 99-01, Rev. 05 EALs

Purpose:

This is a reference document that contains the methodology and calculations used in developing the thresholds for radiological release based Emergency Action Levels (EALs). The radiological EALs covered under this document are based on EALs AU1, AA1, AS1 and AG1 in NEI-99-01, Rev. 05, "Methodology for Development of Emergency Action Levels".

Reference Materials:

- NEI 99-01, Rev. 05 - Methodology for Development of Emergency Action Levels, EALs AU1, AA1, AS1 and AG1
- NEI 99-01, Rev. 05 – Appendix A: Basis for Radiological Effluent EALs
- Hope Creek ODCM Rev. 24
- EPA 400-R-92-001, Manual or Protective Action Guides and Protective Actions for Nuclear Incidents

Terms & Calculation Constants and origin:

- ODCM – Offsite Dose Calculation Manual
- Hours in one year: 365.25 days X 24 hrs/day = 8766 hours
- EDE – Effective Dose Equivalent
- CDE - Committed Dose Equivalent
- CEDE - Committed Effective Dose Equivalent = CDE X Weighting Factor (thyroid per 10CFR20)
- TEDE – Total Effective Dose Equivalent = EDE + CDE
- FRVS – Filtration Recirculation Vent System
- NPV – North Plant Vent
- SPV – South Plant Vent
- HTV – Hardened Torus Vent
- PAG – Protective Action Guideline: Per EPA = 1000mRem TEDE dose or 5000 mRem thyroid dose. Actual or projected values above these guidelines will require offsite protective actions to be implemented.

Hope Creek Radiological EAL Setpoint Calculation Document NEI 99-01, Rev. 05 EALs

- ODCM Rad Effluent Limit - 500 mRem/year is a total site Noble Gas limit that includes Salem 1, Salem 2 and Hope Creek. Therefore, Hope Creek will have an administratively controlled limit of ½ the total site limit or 250 mRem/year for EAL calculation purposes.

- Allocation Factor (AF) = .5 – As defined in the Hope Creek ODCM, (page 85) this is an administrative control imposed to ensure that the combined releases from Salem Units 1 and 2 and Hope Creek will not exceed the regulatory limit from the site. The Site AF is only used in the UE and Alert EALs.

- X/Q = Site Specific Atmospheric dispersion to the site boundary.
  Hope Creek Value = 2.14E-06 sec/m3. Origin – Hope Creek ODCM, Rev. 24, Table 2-2, Parameters for Gaseous Alarm Setpoint Determinations.

- DRCF = Site Specific Dose Rate Conversion Factor. Hope Creek = 7.8E+03 mrem/year per uCi/ m^3.
  Origin – Hope Creek ODCM, Rev. 24, Table C-1, Effective Dose Factors, Noble Gases – Total Body and Skin – Total Body Effective Dose Factor.

<u>Hope Creek EALS -Index</u>: (Radiological Release EAL Calculations) **<u>Page #:</u>**

Hope Creek Radiological EAL Setpoint Calculation Document NEI 99-01, Rev. 05 EALs

Submitted By: ______Craig Banner______________________________ Date: 12-15-2009_

EP Review By: _______Gary Young____________________________ Date: 12-17-2009_

Technical Review: _____Jenny Shelton__________________________ Date: 06-04-2010_

Salem SFAM Review: ____NA________________________________ Date: ___NA_____

HC SFAM Review: _____John Molner__________________________ Date: 06-04-2010_

CFAM Approval: ______David Burgin __________________________ Date: 06-09-2010_

Hope Creek Radiological EAL Setpoint Calculation Document
NEI 99-01, Rev. 05 EALs

Calculation for: **Unusual Event EAL AU1.1 – (Default Release Rate EAL)**

Objective of Calculation:

Provide a Hope Creek Radiological Release Rate value that equates to a Release that is > 2 times the ODCM limit of 500 mRem/year.

Discussion:

The ODCM limit of 500 mRem/year is a total site limit that includes Salem 1, Salem 2 and Hope Creek. Therefore, Hope Creek will have an administratively controlled limit of ½ the total site limit or 250 mRem/year for EAL calculation purposes.

This EAL does not include Iodine Release Rates, since the Plant Vent does not have an Iodine detector.

Release Rate = Total Noble Gas Release Rate from Hope Creek (FRVS, NPV, SPV, HTV) which would result in a TEDE Dose Rate of 250 mRem/year. The EAL value will be 2 times the release rate.

Derivation / Calculation:

ODCM Limit Calculation for Noble Gas:

$$\text{Release Rate (uCi/Sec)} = \frac{ODCMLimit(m\,\mathrm{Re}\,m\,/\,year) * (SiteAllocationFactor)}{(ODCM\,X\,/\,Q) * (ODCM\,DRCF)}$$

ODCM Limit = 500 mRem/Year
Hope Creek ODCM X/Q = 2.14E-06 sec/m^3
Hope Creek ODCM DRCF = 7.80E+03 mRem/yr/uCi/m^3
Site Allocation Factor = 5.00E-01

$$\text{Release Rate (uCi/Sec)} = \frac{(500m\,\mathrm{Re}\,m\,/\,yr) * (5.00E-01)}{(2.14E-06\sec/\,m^3) * (7.80E+03m\,\mathrm{Re}\,m\,/\,yr\,/\,\mu Ci\,/\,m^3)}$$

Release Rate = 1.50E+04 uCi/Sec (Also the Tech Spec/ODCM Limit Release Rate Value)

EAL Value = 2 times the Release Rate

UE EAL Value: *(EAL # RU1.1)*

Total Hope Creek Noble Gas Release Rate > 3.00E+04 μCi/sec

Hope Creek Radiological EAL Setpoint Calculation Document
NEI 99-01, Rev. 05 EALs

Calculation for: **Unusual Event EAL AU1.3 – (Sample Analysis Concentration)**

Objective of Calculation:

Provide a Radiological Release Noble Gas and Iodine Sample Concentration that equates to a Release that is >2 times the ODCM limit of 500 mRem/year.

Discussion:

The ODCM limit of 500 mRem/year (Noble Gas/Total Body) and 1500mRem/year (I-131/Child Thyroid) is a total site limit that includes Salem 1, Salem 2 and Hope Creek. Therefore, Hope Creek will have an administratively controlled limit (allocation factor) of ½ the total site limit or 250 mRem/year (Noble Gas/Total Body) and 750 mRem/year (I-131/Child Thyroid) for EAL calculation purposes. This allocation factor is used in the calculation that derived the Noble Gas and Iodine release rates.

Hope Creek has three release points for which sample concentration thresholds are needed.

- FRVS – Filtration Recirculation Vent System
- NPV – North Plant Vent
- SPV – South Plant Vent

Derivation / Calculation:

Calculation of the threshold sample concentrations are as follows:

Formula: Concentration (uCi/cc) = $\frac{ODCM\ ReleaseRate * 2}{ConversionFactor * VentFlowRate}$

$$FRVS\ Noble\ Gas\ Sample\ Concentration = \frac{1.50E+04\mu Ci/\sec * 2}{472x9000cfm}$$ = **7.10E-03 μCi/cc**

$$FRVS\ I\text{-}131\ \ Sample\ Concentration = \frac{1.74E+01\mu Ci/\sec * 2}{472x9000cfm}$$ = **8.20E-06 μCi/cc**

$$NPV\ Noble\ Gas\ \ Sample\ Concentration = \frac{1.50E+04\mu Ci/\sec * 2}{472x4.19E+04cfm}$$ = **1.52E-03 μCi/cc**

$$NPV\ I\text{-}131\ \ Sample\ Concentration = \frac{1.74E+01\mu Ci/\sec * 2}{472x4.19E+04cfm}$$ = **1.80E-06 μCi/cc**

$$SPV\ Noble\ Gas\ \ Sample\ Concentration = \frac{1.50E+04\mu Ci/\sec * 2}{472x4.40E+05cfm}$$ = **1.44E-04 μCi/cc**

Hope Creek Radiological EAL Setpoint Calculation Document
NEI 99-01, Rev. 05 EALs

SPV I-131 $\quad$ $Sample\ Concentration = \frac{1.74E+01 \mu Ci/\sec * 2}{472x4.40E+05 cfm}$ = **1.68E-07 μCi/cc**

Where:

- ODCM limit Release Rate of 1.50E+04 μCi/sec per calculation performed for EAL AU1.1.
- ODCM limit (Thyroid/I-131) Release Rate of 17.4 uCi/Sec as per ODCM, Rev. 24, Section 2.3.2 -
- 2 = EAL criteria of 2X Tech Spec/ODCM value
- 472 = conversion factor (28,317 cc/ft^3 x 1 min./60 sec.)
- 9000 cfm = FRVS Vent Flow (maximum) (ODCM Table 2-2)
- 4.19E+04 cfm = NPV Vent Flow (maximum) (ODCM Table 2-2)
- 4.40E+05 cfm = SPV Vent Flow (maximum) (ODCM Table 2-2)

UE EAL Values: *(EAL# RU1.3)*

FRVS Noble Gas Sample Concentration	**> 7.10E-03 μCi/cc**
FRVS I-131 Sample Concentration	**> 8.20E-06 μCi/cc**
NPV Noble Gas Sample Concentration	**> 1.52E-03 μCi/cc**
NPV I-131 Sample Concentration	**> 1.80E-06 μCi/cc**
SPV Noble Gas Sample Concentration	**> 1.44E-04 μCi/cc**
SPV I-131 Sample Concentration	**> 1.68E-07 μCi/cc**

Hope Creek Radiological EAL Setpoint Calculation Document
NEI 99-01, Rev. 05 EALs

Calculation for: **ALERT EAL AA1.1 – (Default Release Rate EAL)**

Objective of Calculation:

Provide a Radiological Release Rate value that equates to a Release that is > 200 times the ODCM limit of 500 mRem/year.

Discussion:

The ODCM limit of 500 mRem/year is a total site limit that includes Salem 1, Salem 2 and Hope Creek. Therefore, Hope Creek will have an administratively controlled limit of ½ the total site limit or 250 mRem/year for EAL calculation purposes.

This EAL does not include Iodine Release Rates, since the Plant Vent does not have an Iodine detector.

Release Rate = Total Noble Gas Release Rate from Hope Creek (FRVS, NPV, SPV, HTV) which would result in a TEDE Dose Rate of 250 mRem/year. The EAL value will be 200 times the release rate.

Derivation / Calculation:

ODCM Limit Calculation for Noble Gas:

$$\text{Release Rate (uCi/Sec)} = \frac{TS/ODCMLimit(m\mathrm{Re}m/year)*(SiteAllocationFactor)}{(ODCM\,X/Q)*(ODCM\,DRCF)}$$

ODCM Limit = 500 mRem/Year
Hope Creek ODCM X/Q = 2.14E-06 sec/m^3
Hope Creek ODCM DRCF = 7.80E+03 mRem/yr/uCi/m^3
Site Allocation Factor = 5.00E-01

$$\text{Release Rate (uCi/Sec)} = \frac{(500m\mathrm{Re}m/yr)*(5.00E-01)}{(2.14E-06\sec/m^3)*(7.80E+03m\mathrm{Re}m/yr/\mu Ci/m^3)}$$

Release Rate = 1.50E+04 uCi/Sec (ODCM Limit Release Rate Value)

EAL Value = 200 times the Release Rate

UE EAL Value: *(EAL# RA1.1)*

Total Hope Creek Noble Gas Release Rate > 3.00E+06 μCi/sec

Hope Creek Radiological EAL Setpoint Calculation Document NEI 99-01, Rev. 05 EALs

Calculation for: **ALERT EAL AA1.3 – (Sample Analysis Concentration)**

Objective of Calculation:

Provide a Radiological Release Noble Gas and Iodine Sample Concentration that equates to a Release that is 200 times the ODCM limit of 500 mRem/year.

Discussion:

The ODCM limit of 500 mRem/year (Noble Gas/Total Body) and 1500mRem/year (I-131/Child Thyroid) is a total site limit that includes Salem 1, Salem 2 and Hope Creek. Therefore, Hope Creek will have an administratively controlled limit (allocation factor) of ½ the total site limit or 250 mRem/year (Noble Gas/Total Body) and 750 mRem/year (I-131/Child Thyroid) for EAL calculation purposes. This allocation factor is used in the calculation that derived the Noble Gas and Iodine release rates.

Hope Creek has three release points for which sample concentration thresholds are needed.

- FRVS – Filtration Recirculation Vent System
- NPV – North Plant Vent
- SPV – South Plant Vent

Derivation / Calculation:

Calculation of the threshold sample concentrations are as follows:

Formula: Concentration (uCi/cc) = $\dfrac{ODCM\ ReleaseRate * 200}{ConversionFactor * VentFlowRate}$

Refer to Basis Section for EAL 6.1.1.d for the 10CFR20, Appendix B Noble Gas and Thyroid Committed Dose release rate calculations.

Calculation of the threshold sample concentrations are as follows:

$$FRVS\ Noble\ Gas\ Sample\ Concentration = \frac{1.50E+04\mu Ci/\sec * 200}{472x9000cfm} = \mathbf{7.10E\text{-}01\ \mu Ci/cc}$$

$$FRVS\ I\text{-}131 \quad Sample\ Concentration = \frac{1.74E+01\mu Ci/\sec * 200}{472x9000cfm} = \mathbf{8.20E\text{-}04\ \mu Ci/cc}$$

$$NPV\ Noble\ Gas \quad Sample\ Concentration = \frac{1.50E+04\mu Ci/\sec * 200}{472x4.19E+04cfm} = \mathbf{1.52E\text{-}01\ \mu Ci/cc}$$

Hope Creek Radiological EAL Setpoint Calculation Document
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NPV I-131 $\quad Sample\ Concentration = \dfrac{1.74E+01\mu Ci/\sec * 200}{472x4.19E+04cfm}$ = **1.80E-04 µCi/cc**

SPV Noble Gas $\quad Sample\ Concentration = \dfrac{1.50E+04\mu Ci/\sec * 200}{472x4.40E+05cfm}$ = **1.44E-02 µCi/cc**

SPV I-131 $\quad Sample\ Concentration = \dfrac{1.74E+01\mu Ci/\sec * 200}{472x4.40E+05cfm}$ = **1.68E-05 µCi/cc**

Where:

- Hope Creek ODCM limit Release Rate of 1.50E+04 µCi/sec per calculation performed for EAL AU1.1.
- Hope Creek ODCM limit (Thyroid/I-131) Release Rate of 17.4 uCi/Sec as per ODCM, Rev. 24, Section 2.3.2 -
- 200 = EAL criteria of 200X Tech Spec/ODCM value
- 472 = conversion factor (28,317 cc/ft^3 x 1 min./60 sec.)
- 9000 cfm = FRVS Vent Flow (maximum) (ODCM Table 2-2)
- 4.19E+04 cfm = NPV Vent Flow (maximum) (ODCM Table 2-2)
- 4.40E+05 cfm = SPV Vent Flow (maximum) (ODCM Table 2-2)

UE EAL Values: *(EAL# RA1.3)*

FRVS Noble Gas Sample Concentration	**> 7.10E-01 µCi/cc**
FRVS I-131 Sample Concentration	**> 8.20E-04 µCi/cc**
NPV Noble Gas Sample Concentration	**> 1.52E-01 µCi/cc**
NPV I-131 Sample Concentration	**> 1.80E-04 µCi/cc**
SPV Noble Gas Sample Concentration	**> 1.44E-02 µCi/cc**
SPV I-131 Sample Concentration	**> 1.68E-05 µCi/cc**

Hope Creek Radiological EAL Setpoint Calculation Document NEI 99-01, Rev. 05 EALs

Calculation for: **SITE AREA EMERGENCY - EAL AS1.1 – (Default Release Rate EAL)**

Objective of Calculation:

Provide a Radiological Release Rate value that equates to a Release resulting in an offsite dose of > 100 mrem TEDE at or beyond the site boundary.

Discussion:

This IC addresses radioactivity releases that result in doses at or beyond the site boundary that exceed 10% of the EPA Protective Action Guides (PAGs). Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public.

The monitor reading EALs should be determined using a dose assessment method that back calculates from the dose values specified in the IC. Since doses are generally not monitored in real-time, it is suggested that a release duration of one hour be assumed, and that the EALs be based on a site specific boundary (or beyond) dose of 100 mrem whole body. Iodine Release Rates for this EAL are excluded since the Plant Vent Radiation Monitoring System does not include an Iodine detector.

The meteorology and source term used are the same as used for determining AU1 and AA1 monitor reading EALs.

Release Rate = Total Noble Gas Release Rate from Hope Creek which would result in a TEDE Dose Rate of > 100mRem/hr at the site boundary or beyond.

Derivation / Calculation:

ODCM Limit Calculation for Noble Gas:

Release Rate (uCi/Sec) = $\dfrac{(10\% of PAG) mRem (accumulated in 1 hour)}{(ODCM\ X/Q) * (ODCM\ DRCF)}$

10% of PAG = 100 mRem/hr dose accumulated in 1 hour
Hope Creek ODCM X/Q = 2.14E-06 sec/m^3
HC ODCM DRCF = 8.9E-01 mRem/hr/uCi/m^3 (7.80E+03 mRem/yr/uCi/ m^3 / 8766 hrs/yr)
Site Allocation Factor = not used for SAE and GE EALs

Release Rate (uCi/Sec) = $\dfrac{100 mRem (dose accumulated in 1 hour)}{(2.14E-06 sec/m^3) * (8.9E-01 mRem/hr/uCi/m3)}$

SAE EAL Value: *(EAL# RS1.1)*

Total Hope Creek Noble Gas Release Rate > 5.25E+07 uCi/Sec

Hope Creek Radiological EAL Setpoint Calculation Document NEI 99-01, Rev. 05 EALs

Calculation for: **SITE AREA EMERGENCY - EAL AS1.2 – (Dose Assessment)**

Objective of Calculation:

Using actual meteorology, provide a dose assessment SSCL threshold TEDE 4-Day Dose value that is equivalent to a TEDE dose of > 100 mRem and a Thyroid-CDE Dose of > 500 mRem.

Discussion:

This IC addresses radioactivity releases that result in doses at or beyond the site boundary that exceed 10% of the EPA Protective Action Guides (PAGs). Public protective actions will be necessary. Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public and involve fuel damage.

Derivation / Calculation:

The dose assessment output on the SSCL is reported at varying distances from the plant as a TEDE 4-Day dose. This TEDE 4-day dose assumes a 4 hr release duration. To obtain the approximate dose for a projected release condition of 1 hour, the TEDE 4-day dose value would need to be divided by 4.

A TEDE 4-Day Dose > 4.0E+02 mRem correspond directly to an EDE dose rate value of 100 mRem/hr and exceeds 10% of the EPA Protective Actions Guides (PAGs). The Thyroid-CDE Dose > 2.0E+03 mRem correspond directly to an CDE dose rate value of 500 mRem/hr and exceeds 10% of the EPA Protective Actions Guides (PAGs) which was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE..

Dose Assessment using actual meteorological data provides an accurate indication of release magnitude. The use of dose assessment based EALs is therefore preferred over the use of Release Rate based EALs which utilize calculations which have built-in inaccuracies because ODCM default Meteorological data is used.

SAE EALs Values: *(EAL# RS1.2)*

Dose Assessment TEDE 4-Day Dose > 4.0E+02 mRem

Dose Assessment CDE Dose > 2.0E+03 mRem - based on Dose Assessment using Plant Vent effluent isotopic sample analysis as input to MIDAS and NOT based on a default Noble Gas to Iodine Ratio

Hope Creek Radiological EAL Setpoint Calculation Document NEI 99-01, Rev. 05 EALs

Calculation for: **SITE AREA EMERGENCY - EAL AS1.4 – (PA boundary dose rate)**

Objective of Calculation:

Provide a **PROTECTED AREA** Boundary dose rate that equates to an offsite dose of > 100 mRem TEDE.

Discussion:

This IC addresses radioactivity releases that result in field survey results (closed window) dose rates greater than 100 mR/hr expected to continue for 60 minutes or longer at or beyond the site boundary. This value exceeds 10% of the EPA Protective Action Guides (PAGs). Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public.

Derivation / Calculation:

A Field Measured Dose Rate of > 1.0E+02 mRem/hr corresponds directly to a dose values that exceed 10% of the EPA Protective Actions Guides (PAGs).

SAE EAL Value: *(EAL# RS1.3)*

Dose Rate > 100 mRem/hr

Hope Creek Radiological EAL Setpoint Calculation Document NEI 99-01, Rev. 05 EALs

Calculation for: **SITE AREA EMERGENCY - EAL AS1.4 – (I-131 Field Survey Sample Analysis)**

Objective of Calculation:

Provide a Field Survey Sample Analysis value that equates to an offsite release that would result in a dose of > 500 mRem Thyroid CDE at or beyond the **PROTECTED AREA** Boundary.

Discussion:

This EAL addresses a radioactivity release field survey I-131 sample concentration or count rate that would result in a Thyroid CDE dose of greater than 500 mRem for one hour of inhalation at or beyond the site boundary. This value exceeds 10% of the EPA Protective Action Guides (PAGs). Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public.

The Iodine-131 field survey sample concentration and count rate threshold is based on I-131 dose conversion factors (DCFs) from EPA-400. The thresholds are based on a Thyroid-CDE Dose Rate of > 500 mRem/hr for I-131.

Field Survey I-131 Sample Analysis results are provided as sample concentration in units of uCi/cc for field samples counted in a Multi-Channel-Analyzer (MCA).

Derivation / Calculation:

The release sample concentration calculations are as follows.

The sample concentration is calculated using the I-131 Dose Conversion Factor from EPA-400: Solving the following equation for µCi/cc:

mRem/hr = (µCi/cc)(Dose Conversion Factor)

Then;

I-131 Sample Concentration (µCi/cc) = $\left(\frac{500 m\mathrm{Re}m / hr}{1.30E+09 m\mathrm{Re}m / \mu Ci / cc / hr}\right)$ = **3.85E-07 µCi/cc**

Where 1.30E+09 mRem/µCi/cc/hr is the Dose Conversion Factor from EPA-400, Table 5-4, Thyroid Dose, and includes the EPA breathing rate.

SAE EAL Values: *(EAL# RS1.3)*

I-131 Concentration > 3.85E-07 µCi/cc

Hope Creek Radiological EAL Setpoint Calculation Document NEI 99-01, Rev. 05 EALs

Calculation for: **GENERAL EMERGENCY - EAL AG1.1 – (Default Release Rate EAL)**

Objective of Calculation:

Provide a Radiological Release Rate value that equates to a Release resulting in an offsite dose of > 1000 mrem TEDE at or beyond the site boundary.

Discussion:

This IC addresses radioactivity releases that result in doses at or beyond the site boundary that exceed the EPA Protective Action Guides (PAGs). Public protective actions will be necessary. Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public and likely involve fuel damage.

The monitor reading EALs should be determined using a dose assessment method that back calculates from the dose values specified in the IC. Since doses are generally not monitored in real-time, it is suggested that a release duration of one hour be assumed, and that the EALs be based on a site specific boundary (or beyond) dose of > 1000 mrem whole body. Iodine Release Rates for this EAL are excluded since the Plant Vent Radiation Monitoring System does not include an Iodine detector.

The meteorology and source term used are the same as used for determining AU1 and AA1 monitor reading EALs.

Release Rate = Total Noble Gas Release Rate from Hope Creek which would result in a TEDE Dose Rate of > 1000 mRem/hr at the site boundary or beyond.

Derivation / Calculation:

ODCM Limit Calculation for Noble Gas:

$$\text{Release Rate (uCi/Sec)} = \frac{(100\% ofPAG) m\,\mathrm{Re}\,m(accumulatedin1hour)}{(ODCM\,X/Q)*(ODCM\,DRCF)}$$

100% of PAG = 1000 mRem/hr dose accumulated in 1 hour
Hope Creek ODCM X/Q = 2.14E-06 sec/m^3
HC ODCM DRCF = 8.9E-01 mRem/hr/uCi/m^3 (7.80E+03 mRem/yr/uCi/ m^3 / 8766 hrs/yr)
Site Allocation Factor = not used for SAE and GE EALs

$$\text{Release Rate (uCi/Sec)} = \frac{1000 m\,\mathrm{Re}\,m(doseaccumulatedin1hour)}{(2.14E-06\sec/m^3)*(8.9E-01m\,\mathrm{Re}\,m/hr/uCi/m3)}$$

GE EAL Value: *(EAL# RG1.1)*

Total Hope Creek Noble Gas Release Rate > 5.25E+08 uCi/Sec

Hope Creek Radiological EAL Setpoint Calculation Document
NEI 99-01, Rev. 05 EALs

Calculation for: **GENERAL EMERGENCY - EAL AG1.2 – (Dose Assessment)**

Objective of Calculation:

Using actual meteorology, provide a dose assessment SSCL threshold TEDE 4-Day Dose value that is equivalent to a TEDE dose of > 1000 mRem and a Thyroid-CDE Dose of > 5000 mRem.

Discussion:

This IC addresses radioactivity releases that result in doses at or beyond the site boundary that exceed the EPA Protective Action Guides (PAGs). Public protective actions will be necessary. Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public and involve fuel damage.

Derivation / Calculation:

The dose assessment output on the SSCL is reported at varying distances from the plant as a TEDE 4-Day dose. This TEDE 4-day dose assumes a 4 hr release duration. To obtain the approximate dose for a projected release condition of 1 hour, the TEDE 4-day dose value would need to be divided by 4.

A TEDE 4-Day Dose > 4.0E+03 mRem correspond directly to an EDE dose rate value of > 1000 mRem/hr and exceeds the EPA Protective Actions Guides (PAGs). The Thyroid-CDE Dose > 2.0E+04 mRem correspond directly to an CDE dose rate value of > 5000 mRem/hr and exceeds the EPA Protective Actions Guides (PAGs) which was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE..

Dose Assessment using actual meteorological data provides an accurate indication of release magnitude. The use of dose assessment based EALs is therefore preferred over the use of Release Rate based EALs which utilize calculations which have built-in inaccuracies because ODCM default Meteorological data is used.

GE EAL Values: *(EAL# RG1.2)*

Dose Assessment TEDE 4-Day Dose > 4.0E+03 mRem

Dose Assessment CDE Dose > 2.0E+04 mRem - based on Dose Assessment using Plant Vent effluent isotopic sample analysis as input to MIDAS and NOT based on a default Noble Gas to Iodine Ratio

Hope Creek Radiological EAL Setpoint Calculation Document
NEI 99-01, Rev. 05 EALs

Calculation for: **GENERAL EMERGENCY - EAL AG1.4 – (PA boundary dose rate)**

Objective of Calculation:

Provide a **PROTECTED AREA** Boundary dose rate that equates to an offsite dose of >1000 mRem TEDE.

Discussion:

This IC addresses radioactivity releases that result in doses at or beyond the site boundary that exceed the EPA Protective Action Guides (PAGs). Public protective actions will be necessary. Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public and likely involve fuel damage.

Derivation / Calculation:

A Field Measured Dose Rate of > 1.0E+03 mRem/hr corresponds directly to a dose values that exceed the EPA Protective Actions Guides (PAGs).

GE EAL Value: *(EAL# RG1.3)*

Dose Rate > 1000 mRem/hr

Hope Creek Radiological EAL Setpoint Calculation Document NEI 99-01, Rev. 05 EALs

Calculation for: **GENERAL EMERGENCY - EAL AG1.4 – (I-131 Field Survey Sample Analysis)**

Objective of Calculation:

Provide a Field Survey Sample Analysis value that equates to an offsite release that would result in a dose of > 5000 mRem Thyroid CDE at or beyond the **PROTECTED AREA** Boundary.

Discussion:

This EAL addresses a radioactivity release field survey I-131 sample concentration or count rate that would result in a Thyroid CDE dose of greater than 5000 mRem for one hour of inhalation at or beyond the site boundary. This value exceeds the EPA Protective Action Guides (PAGs). Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public.

The Iodine-131 field survey sample concentration and count rate threshold is based on I-131 dose conversion factors (DCFs) from EPA-400. The thresholds are based on a Thyroid-CDE Dose Rate of > 5000 mRem/hr for I-131.

Field Survey I-131 Sample Analysis results are provided as sample concentration in units of uCi/cc for field samples counted in a Multi-Channel-Analyzer (MCA).

Derivation / Calculation:

The release sample concentration calculations are as follows.

The sample concentration is calculated using the I-131 Dose Conversion Factor from EPA-400: Solving the following equation for μCi/cc:

mRem/hr = (μCi/cc)(Dose Conversion Factor)

Then;

I-131 Sample Concentration (μCi/cc) = $\left(\frac{5000 m\mathrm{Re}m / hr}{1.30E+09 m\mathrm{Re}m / \mu Ci / cc / hr}\right)$ = **3.85E-06 μCi/cc**

Where 1.30E+09 mRem/μCi/cc/hr is the Dose Conversion Factor from EPA-400, Table 5-4, Thyroid Dose, and includes the EPA breathing rate.

GE EAL Values: *(EAL# RG1.3)*

I-131 Concentration > 3.85E-06 μCi/cc