

**Bryce L. Shriver**  
Senior Vice President and  
Chief Nuclear Officer

**PPL Susquehanna, LLC**  
769 Salem Boulevard  
Berwick, PA 18603  
Tel. 570.542.3120 Fax 570.542.1504  
blshriver@pplweb.com



OCT 27 2003

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Mail Station OP1-17  
Washington DC 20555

**SUSQUEHANNA STEAM ELECTRIC STATION  
REVISION TO EMERGENCY ACTION LEVELS  
PLA-5632**

---

**Docket Nos. 50-387  
and 50-388**

The purpose of this letter is to transmit for NRC review and approval revisions to the Susquehanna SES Emergency Action Levels. This revision implements new Emergency Action Levels based on NEI 99-01, Revision 4, "Methodology for Development of Emergency Action Levels."

Section 1 of the attachment contains a discussion on the classification of emergencies along with a discussion on the format of the new EALs. Section 2 contains the emergency classification descriptions and definitions used in the EALs. This section also contains the EALs and their Bases. The EALs and Bases are arranged in the following Recognition Categories:

- R – Abnormal Rad Levels / Radiological Effluent
- F – Fission Product Barrier Degradation
- M – System Malfunctions
- O – Hazards and Other Conditions
- E – ISFSI Malfunctions
- C – Cold Shutdown / Refueling System Malfunctions

PPL Susquehanna, LLC has taken exceptions to some of the NEI 99-01 Revision 4 methodology. These exceptions ensure consistency with SSES design and the EALs as implemented by the Commonwealth of Pennsylvania. Section 3 contains a listing of the deviations from NEI 99-01 Revision. Section 4 contains the justification for each of the deviations.

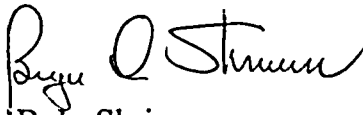
These proposed EALs have been discussed and agreed to by the Commonwealth of Pennsylvania and the counties of Columbia and Luzerne.

A045

We request that the revision to the Emergency Action Levels be approved by April 1, 2004 so that training can occur during the second quarter with implementation in the third quarter of 2004.

Should you have any questions regarding this submittal, please contact Mr. Jeffery N. Grisewood at (570) 542-1330.

Sincerely,



B. L. Shriver

Attachment: Susquehanna Emergency Action Levels, Rev. 0

Copy: NRC Region I  
Mr. R. V. Guzman, NRC Project Manager  
Mr. S. Hansell, NRC Sr. Resident Inspector  
Mr. R. Janati, DEP/BRP

# **Susquehanna Emergency Action Levels**

**Rev. 0  
September 1, 2003**

**(Based on NEI 99-01 Rev. 4)**



---

**SECTION 1**

**CLASSIFICATION OF EMERGENCIES**

---



## Section 1: Classification of Emergencies

This document provides the detailed set of Emergency Action Levels (EALs) applicable to the Susquehanna station. Technical Bases are included for each EAL.

Emergency conditions are grouped into four classifications that cover the entire spectrum of probable and postulated events and accidents. These classifications are Notification of Unusual Event, Alert, Site Area Emergency, and General Emergency. Action level criteria are specified for determining and declaring each emergency classification. Planning is coordinated with state and county agencies to ensure that this classification system is compatible with the system used by those agencies. The system provides for notification of appropriate emergency response organizations and for implementation of actions immediately applicable to a specific condition. Provisions are included for upgrading the classification level and the corresponding response in the event of a change in the emergency condition.

Recognition and action level criteria are based on readily available information such as Control Room instrumentation. Immediate actions for response to conditions involving plant operating parameters, such as Technical Specification Limiting Conditions for Operation (LCOs), are detailed in the Plant Procedures.

The emergency classification system, initiating conditions, and bases for each initiating condition are defined in Section 2 of this document. This section demonstrates how an initiating condition leads directly to the appropriate emergency classification based on the magnitude of the event. In many cases, the proper classification is immediately apparent from in-plant instrumentation. In other cases, more extensive assessment is necessary to determine the applicable emergency classification. Continuing reassessment is required to ensure that the classification is consistent with the conditions.

Classifications are based on an evaluation of each Unit. 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 indicators, or (3) by direct observation by plant personnel, such that the indicator's operability, the condition's existence, or the report's accuracy is considered credible. Implicit in this definition is the need for timely assessment. All emergency classifications shall be made within 15 minutes of having information necessary to make a declaration.

When two or more Emergency Action Levels are determined, declaration will be made on the highest classification level for the Station.

### 1.1 Emergency Action Levels (EALs)

Emergency Action Levels are the measurable, observable detailed conditions that must be met in order to classify the event. Classification shall not be made without referencing, comparing and satisfying the threshold values specified in the Emergency Action Levels. Mode Applicability provides the unit conditions when the Emergency Action Levels represent a threat. The Basis provides definitions of terms, explanations and justification for including the Initiating Condition and Emergency Action Level. Definitions are provided for terms having specific meaning as they relate to these EALs.

Notification of Unusual Event, Alert, Site Area Emergency, or General Emergency classifications are entered by meeting designated Emergency Action Levels (EALs) Threshold Values. These values are based on the criteria established under Revision 4 to NEI 99-01 (NUMARC/NESP-007), "Methodology for Development of Emergency Action Levels" (dated January 2003), and are labeled based on the six Recognition Categories outlined in NEI 99-01 Rev 4 (NUMARC/NESP-007):

- Abnormal Rad Levels / Radiological Effluent
- Fission Product Barrier Degradation
- System Malfunctions
- Hazards and Other Conditions
- ISFSI Malfunctions
- Cold Shutdown/Refueling System Malfunctions

EAL Threshold Values are sorted under common Initiating Conditions (ICs). These ICs can be Symptom-based, Event-based, or Barrier-based and applicable to all or only designated Operational Modes (Modes). The Initiating Conditions (IC) and associated EAL Threshold Values are summarized in the EAL Matrix (Section 2) according to Recognition Categories.

To aid the user in identifying applicable ICs, they are further sorted under the following Event Sub-Categories, and appropriate Mode designator provided:

- *Abnormal Rad Levels / Radiological Effluents ("R")*
  - Radiological Effluents
  - Abnormal Radiation Levels
  - Irradiated Fuel Accidents
- *Fission Product Barrier Degradation ("F")*
  - Fuel Clad Barrier
  - Reactor Coolant System Barrier, referred to as "RCS"
  - Primary Containment Barrier, referred to as "Containment"

- *System Malfunctions ("M")*
  - Loss of AC Power
  - Loss of DC Power
  - Failure of Reactor Protection System
  - Decay Heat Removal
  - Loss of Annunciators
  - RCS Leakage
  - Fuel Clad Degradation
  - Loss of Communications
  - Technical Specifications
  - Inadvertent Criticality
- *Hazards and Other Conditions ("O")*
  - Security Events
  - Control Room Evacuation
  - Natural or Man-Made Events
  - Fire / Explosion
  - Toxic or Flammable Gases
  - Discretionary
- *ISFSI Malfunctions ("E")*
  - Dry Fuel Storage
- *Cold Shutdown/Refueling System malfunctions ("C")*
  - Loss of AC Power
  - Loss of DC Power
  - Decay Heat Removal
  - RCS Leakage/RCS Draindown
  - Loss of RPV Inventory
  - Fuel Clad Degradation
  - Loss of Communications
  - Inadvertent Criticality

An emergency is classified by assessing plant conditions or other hazards and comparing abnormal conditions to ICs and Threshold Values for each EAL, based on the designated Operational Mode (Mode). Modes 1 through 5 are defined in the Technical Specifications (T.S.), for Units 1 and 2, based on Reactor Mode Switch Position and specific plant conditions. "Defueled" Mode was established for classification purposes under NEI 99-01 to reflect conditions where all fuel has been removed from the Reactor Pressure Vessel.

MODE	TITLE	Category / Matrix Applicability					
		R	F	M	O	E	C
1	Power Operation	X	X	X	X		
2	Startup	X	X	X	X		
3	Hot Shutdown	X	X	X	X		
4	Cold Shutdown	X			X		X
5	Refueling	X			X		X
D	Defueled	X			X		X
	NONE					X	

The EAL Matrices are designed to provide an evaluation of the Initiating Conditions from the worst conditions (General Emergencies) on the left to the relatively less severe conditions on the right (Notification of Unusual Event). Evaluating conditions from left to right will reduce the possibility that an event will be under-classified. All Recognition Categories should be reviewed for applicability prior to classification.

The Initiating Conditions are divided into recognition Categories, each of which is further divided into event sub-categories. An emergency is classified by assessing plant conditions and comparing abnormal operating conditions to Initiating Conditions defined on the respective Initiating Condition table.

The Fission Product Barrier Degradation (Table F) and the System Malfunctions (Table M) only apply while in Technical Specification defined operating modes 1, 2, and 3.

The Cold Shutdown / Refueling System Malfunctions (Table C) only applies in operating conditions 4, 5 or D. The Defueled condition is included in the EALs where the mode applicability is designated as ALL. Other EALs specifically associated with the Defueled condition are designated as such.

Abnormal Rad Levels / Radiological Effluent (Table R), Hazards and Other Conditions (Table O) are applicable in all modes. ISFSI Malfunctions (Table E) is independent of operating mode and is therefore listed as NONE.

An appropriate EAL numbering system is provided as a user aid. ICs are coded with a two letter and one number code. For example: **OA1**. The first letter is the Recognition Category designator. In this case, **O** stands for "Hazards and Other Conditions". The second letter is the Classification Level: "**U**" for Notification of Unusual Event, "**A**" for Alert, "**S**" for Site Area Emergency, and "**G**" for General Emergency. The number is a sequential number for that Recognition Category series. All Initiating Conditions, which are describing the severity of a common condition (series), will have the same number (e.g. RU1, RA1, RS1, and RG1).

A Fission Product Barrier status table is provided at the bottom of Table F-Fission Product barrier Degradation. This status table is used to determine the integrity of the Fuel Clad, RCS and Containment Barriers based on EAL Threshold values established in accordance with NEI 99-01 Rev 4 (NUMARC/NESP-007) (e.g., INTACT, LOSS, or POTENTIAL LOSS).

## 1.2 EAL Technical Bases

The Technical Bases are provided for each entry condition on the EAL Matrix. The following information is listed for each Initiating Condition (IC), sorted by Recognition Category:

- Initiating Condition
- Mode Applicability
- Threshold Value
- Basis
- References

The bases provide the EAL user with the background and justification behind the EAL Threshold Values identified using the guidance set forth in NEI 99-01 (NUMARC/NESP-007). The EAL user should refer to the bases information prior to making an emergency classification.

## 1.3 General EAL Implementation Philosophy

A broad spectrum of discretion in classifying events is provided in the "Discretionary" category under Hazards and Other Conditions and in the 'Emergency Director/Recovery Manager Judgement' category under the Fission Product Barrier Matrix. In using the "Discretionary" category and in classifying emergencies under circumstances which are not a straight-forward use of the EAL's, ERO members should be mindful that an approach is needed which is balanced and informed with respect to public, plant, and personnel safety and with respect to ensuring the adequacy of personnel and technical support. If there is any doubt with regard to the applicability of any EAL the technical basis should be reviewed. The highest appropriate EAL and classification associated with the Initiating Conditions should always be selected. Conservative decisions must be made if the Emergency Director or Recovery Manager has any doubt regarding the health and safety of the public.

Declaring a Notification of Unusual Event provides the Company and off-site agencies the opportunity for early information regarding the event and for early activation of resources and may be considered a "no consequence decision." Conversely, not declaring a Notification of Unusual Event when there are credible (but, not clear) bases for doing so, would appear to be less than open or candid and could have serious adverse consequences. Although the consequences of declaring a Notification of Unusual Event are limited, inappropriate classifications do not accurately indicate the significance of the event to the public and emergency responders and should be avoided.

At the Alert, Site Area and General Emergency levels, the threat to the plant and to the public is clearly at a heightened level. Rapid application of resources and preparation for providing for the public health and safety are appropriate. Because of the magnitude of resource mobilization and the potential disruption of normal public activities, an overly conservative or an inappropriately early declaration of these levels is not advisable.

Events that meet the Emergency Action Level criteria for event declaration, but which are terminated before they are identified and declared, should still be classified, declared and reported.

In the event of a "spike" which rapidly exceeds and then decreases below an EAL condition, entry into the Emergency Plan or escalation to the higher classification "in retrospect" is not appropriate unless the "spike" is indicative of continuing degrading conditions which will lead to an escalated emergency classification level. This statement does not apply if the EAL includes a "spike". Spurious alarms or parameters, which are known to be invalid indicators of actual plant conditions or of the emergency classification, should not be used to declare emergency classifications.

All EALs may not consider trends, rates of change, or status changes in equipment availability. In the event of rapidly changing parameters trending toward an increased emergency classification, it may be appropriate to decide that the higher level EAL will be exceeded and escalate the classification early. In the event of trends toward a decreased emergency classification, parameter values must be below the next level EALs to de-escalate.

The plant operating mode that existed at the time that the event occurred, prior to any protective system or operator action initiated in response to the condition, is compared to the mode applicability of the EALs. If an event occurs, and a lower or higher plant operating mode is reached before the emergency classification can be made, the declaration shall be based on the mode 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 mode applicability, even if Hot Shutdown (or a higher mode) is entered during any subsequent heat-up. In particular, the Fission Product Barrier Matrix EALs are applicable only to events that initiate in Hot Shutdown or higher.

#### 1.4 EAL Downgrading

When the risk posed by an emergency is clearly decreasing there are several approaches presently in use for emergency class downgrading. These approaches are:

- (D1) Terminate the emergency class declaration.
- (D2) Recovery from emergency class. This approach would be applicable to General Emergency Classifications.
- (D3) Downgrade to a lower emergency class. This is consistent with actions called for in NUREG-0654 Appendix 1. However, the preferred approach would be D1 or D2.

---

## **SECTION 2**

### **EMERGENCY ACTION LEVELS**

---



**EAL TABLE OF CONTENTS****RECOGNITION CATEGORY R****ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENT (Table R)**

<b>1. Radiological Effluents</b>	
RG1 (Modes: ALL) .....	R-2
RS1 (Modes: ALL).....	R-5
RA1 (Modes: ALL).....	R-8
RU1 (Modes: ALL).....	R-12
<b>2. Abnormal Radiation Levels</b>	
RA2 (Modes: ALL).....	R-16
RU2 (Modes: ALL).....	R-19
<b>3. Irradiated Fuel Accidents</b>	
RA3 (Modes: ALL).....	R-22

**RECOGNITION CATEGORY F****FISSION PRODUCT BARRIER DEGRADATION (Table F)**

<b>1. Fuel Clad Barrier (Modes: 1, 2 &amp; 3)</b>	
Fission Product Barrier Degradation.....	F-2
Reactor Coolant Activity Level (1.a) .....	F-3
RPV Level (1.b) .....	F-4
Drywell Radiation (1.e) .....	F-6
Emergency Director/Recovery Manager Judgement (1.f) .....	F-7
<b>2. Reactor Coolant System Barrier (Modes: 1, 2 &amp; 3)</b>	
RPV Level (2.b) .....	F-8
RCS Leak Rate or Containment Isolation Failure or Breach/Bypass (2.c) .....	F-9
Drywell Pressure (2.d).....	F-13
Drywell Radiation (2.e) .....	F-14
Emergency Director/Recovery Manager Judgement (2.f) .....	F-15
<b>3. Primary Containment Barrier (Modes: 1, 2 &amp; 3)</b>	
RPV Level (3.b) .....	F-16
RCS Leak rate or Containment Isolation Failure or Breach/Bypass (3.c) .....	F-18
Drywell Pressure (3.d).....	F-22
Drywell Radiation (3.e) .....	F-24
Emergency Director/Recovery Manager Judgement (3.f) .....	F-26

**RECOGNITION CATEGORY M****SYSTEM MALFUNCTIONS (Table M)**

<b>1. Loss of AC Power</b>	
MG1 (Modes: 1, 2 & 3) .....	M-2
MS1 (Modes: 1, 2 & 3) .....	M-4
MA1 (Modes: 1, 2 & 3) .....	M-6
MU1 (Modes: 1, 2 & 3) .....	M-8
<b>2. Loss of DC Power</b>	
MS2 (Modes: 1, 2 & 3) .....	M-9
<b>3. Failure of Reactor Protection System</b>	
MG3 (Modes: 1 & 2) .....	M-10
MS3 (Modes: 1 & 2) .....	M-14
MA3 (Modes: 1 & 2) .....	M-17
<b>4. Decay Heat Removal</b>	
MS4 (Modes: 1, 2 & 3) .....	M-19
<b>5. Loss of Annunciators</b>	
MS5 (Modes: 1, 2 & 3) .....	M-21
MA5 (Modes: 1, 2 & 3) .....	M-24
MU5 (Modes: 1, 2 & 3) .....	M-27
<b>6. Reactor Coolant System Leakage</b>	
MU6 (Modes: 1, 2, & 3) .....	M-29
<b>7. Fuel Clad Degradation</b>	
MU7 (Modes: 1, 2 & 3) .....	M-30
<b>8. Loss of Communications</b>	
MU8 (Modes: 1, 2 & 3) .....	M-32
<b>9. Technical Specifications</b>	
MU9 (Modes: 1, 2 & 3) .....	M-34
<b>10. Inadvertent Criticality</b>	
MU10 (Mode: 3) .....	M-35

**RECOGNITION CATEGORY O****HAZARDS AND OTHER CONDITIONS (Table O)****1. Security Events**

OG1 (Modes: ALL) .....	O-2
OS1 (Modes: ALL).....	O-3
OA1 (Modes: ALL).....	O-4
OU1 (Modes: ALL) .....	O-5

**2. Control Room Evacuation**

OS2 (Modes: ALL).....	O-7
OA2 (Modes: ALL).....	O-8

**3. Natural or Man-Made Events**

OA3 (Modes: ALL).....	O-9
OU3 (Modes: ALL) .....	O-13

**4. Fire / Explosion**

OA4 (Modes: ALL).....	O-17
OU4 (Modes: ALL) .....	O-20

**5. Toxic or Flammable Gases**

OA5 (Modes: ALL).....	O-22
OU5 (Modes: ALL) .....	O-24

**6. Discretionary**

OG6 (Modes: ALL) .....	O-26
OS6 (Modes: ALL).....	O-28
OA6 (Modes: ALL).....	O-30
OU6 (Modes: ALL) .....	O-32

**RECOGNITION CATEGORY E****ISFSI MALFUNCTIONS (Table E)****1. Dry Fuel Storage**

EU1 (Modes: NONE).....	E-2
------------------------	-----

**RECOGNITION CATEGORY C****COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS (Table C)**

<b>1. Loss of AC Power</b>	
CA1 (Modes: 4, 5 & D) .....	C-2
CU1 (Modes: 4 & 5) .....	C-3
<b>2. Loss of DC Power</b>	
CU2 (Modes: 4 & 5) .....	C-4
<b>3. Decay Heat Removal</b>	
CA3 (Modes: 4 & 5) .....	C-5
CU3 (Modes: 4 & 5) .....	C-7
<b>4. RCS Leakage/RCS Draindown</b>	
CG4 (Modes: 4 & 5) .....	C-9
CS4 (Mode: 4) .....	C-12
CA4 (Mode: 4) .....	C-14
CU4 (Mode: 4) .....	C-16
<b>5. Loss of RPV Inventory</b>	
CS5 (Mode: 5) .....	C-17
CA5 (Mode: 5) .....	C-19
CU5 (Mode: 5) .....	C-21
<b>6. Fuel Clad Degradation</b>	
CU6 (Modes: 4 & 5) .....	C-23
<b>7. Loss of Communications</b>	
CU7 (Modes: 4 & 5) .....	C-24
<b>8. Inadvertent Criticality</b>	
CU8 (Modes: 4 & 5) .....	C-26

**RECOGNITION CATEGORY C****COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS (Table C)**

<b>1. Loss of AC Power</b>	
CA1 (Modes: 4, 5 & D) .....	C-2
CU1 (Modes: 4 & 5) .....	C-3
<b>2. Loss of DC Power</b>	
CU2 (Modes: 4 & 5) .....	C-4
<b>3. Decay Heat Removal</b>	
CA3 (Modes: 4 & 5) .....	C-5
CU3 (Modes: 4 & 5) .....	C-7
<b>4. RCS Leakage/RCS Draindown</b>	
CG4 (Modes: 4 & 5) .....	C-9
CS4 (Mode: 4) .....	C-12
CA4 (Mode: 4) .....	C-14
CU4 (Mode: 4) .....	C-16
<b>5. Loss of RPV Inventory</b>	
CS5 (Mode: 5) .....	C-17
CA5 (Mode: 5) .....	C-19
CU5 (Mode: 5) .....	C-21
<b>6. Fuel Clad Degradation</b>	
CU6 (Modes: 4 & 5) .....	C-23
<b>7. Loss of Communications</b>	
CU7 (Modes: 4 & 5) .....	C-24
<b>8. Inadvertent Criticality</b>	
CU8 (Modes: 4 & 5) .....	C-26

## EMERGENCY CLASSIFICATION DESCRIPTIONS

There are three considerations related to emergency classes. These are:

- (1) The potential impact on radiological safety, either as now known or as can be reasonably projected;
- (2) How far the plant is beyond its predefined design, safety, and operating envelopes; and
- (3) Whether or not conditions that threaten health are expected to be confined to within the site boundary.

The ICs deal explicitly with radiological safety impact by escalating from levels corresponding to releases within regulatory limits to releases beyond EPA Protective Action Guideline (PAG) plume exposure levels. In addition, the "Discussion" sections below include offsite dose consequence considerations which were not included in NUREG-0654 Appendix 1.

**NOTIFICATION OF UNUSUAL EVENT:** Events are in process or have occurred which indicate a potential degradation of the level of safety of the plant. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.

### **Discussion:**

Potential degradation of the level of safety of the plant is indicated primarily by exceeding plant technical specification Limiting Condition for Operation (LCO) Required Action Time. Precursors of more serious events are included because they represent a potential degradation in the level of safety of the plant. Minor releases of radioactive materials are included. In this emergency classification, however, releases do not require monitoring or offsite response.

**ALERT:** Events are in process or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant. Any releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.

**Discussion:**

Rather than discussing the distinguishing features of "potential degradation" and "potential substantial degradation," a comparative approach is taken to determine whether increased monitoring of plant functions is warranted at the Alert level as a result of safety system degradation. This addresses the operations staff's need for help, independent of whether an actual decrease in plant safety is determined. This increased monitoring can then be used to better determine the actual plant safety state, whether escalation to a higher emergency class is warranted, or whether de-escalation or termination of the emergency class declaration is warranted.

**SITE AREA EMERGENCY:** Events are in process or have occurred which involve actual or likely major failures of plant functions needed for 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.

**Discussion:**

The discriminator (threshold) between Site Area Emergency and General Emergency is whether or not the EPA PAG plume exposure levels are expected to be exceeded outside the site boundary. This threshold, in addition to dynamic dose assessment considerations discussed in the EAL guidelines, clearly addresses NRC and offsite emergency response agency concerns as to timely declaration of a General Emergency.

**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. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.

**Discussion:**

The bottom line for the General Emergency is whether evacuation or sheltering of the general public is indicated based on EPA PAGs, and therefore should be interpreted to include radionuclide release regardless of cause. In addition, it should address concerns as to uncertainties in systems or structures (e.g. containment) response, and also events such as waste gas tank releases and severe spent fuel pool events postulated to occur at high population density sites. To better assure timely notification, EALs in this category must primarily be expressed in terms of plant function status, with secondary reliance on dose projection. In terms of fission product barriers, loss of two barriers with potential loss of the third barrier constitutes a General Emergency.

## DEFINITIONS

1. Emergency Plan Boundary – same as the Exclusion Area, i.e., that area around Susquehanna SES within a radius of 1800 feet determined in accordance with 10 CFR 100.11.
2. Emergency Planning Zone – there are two Emergency Planning Zones. The first is an area, approximately ten (10) miles in radius around the Susquehanna SES, for which emergency planning consideration of the plume exposure pathway has been given in order to ensure that prompt and effective actions can be taken to protect the public in the event of an accident. The second is an area approximately 50 miles in radius around the Susquehanna SES, for which emergency planning consideration of the ingestion pathway has been given.
3. Exclusion Area – that area around Susquehanna SES within a radius of 1,800 feet determined in accordance with 10CFR100.11.
4. Explosion – An explosion is a rapid, violent, unconfined combustion, or a catastrophic failure of pressurized equipment that potentially imparts significant energy to nearby structures and materials.
5. Facility – a structure that houses equipment used for normal operation of the plant. This consists of the Reactor Buildings, Control Structure, Turbine Buildings, Diesel Generator Buildings, Radwaste Building, ESSW Pumphouse, Circulating Water Pump House, and the Low Level Radwaste Holding Facility.
6. IDLH – an atmosphere that is Immediately Dangerous to Life and Health as defined by NIOSH/OSHA regulations.
7. Initiating Condition (IC) – one of a predetermined subset of nuclear power plant conditions where either the potential exists for a radiological emergency, or such an emergency has occurred.
8. Instrumentation Specified – EALs frequently specify specific instruments. Where available, alternate instrumentation may be used.
9. On-site – the area within the Exclusion Area boundary.
10. Owner Controlled Area Adjacent to Plant – includes the area within the expanded security perimeter, i.e. the areas that are bordered by the concrete vehicle barriers. The Owner Controlled Area encompasses the Security Owner Controlled Area (SOCA) and Monitored Owner Controlled Area (MOCA) as defined in Security Procedures.



11. Plant Vital Areas – consist of the following structures: ASCC, SCC, Control Structure, Diesel Generator Buildings, ESSW Pump House, and Reactor Buildings.
12. Plant Vital Structures – consist of the following structures: ASCC, SCC, Control Structure, Diesel Generator Buildings, ESSW Pump House, Spray Pond, ISFSI and Reactor Buildings.
13. Protected Area – the area within the station inner security fence (Protected Area Barrier) designated to implement the requirements of 10 CFR 73.
14. Safe Shutdown Systems/Equipment – consists of the following: Diesel Generators, HPCI, Core Spray, Standby Gas Treatment System, RCIC, 4kV Safeguard Buses, ESW, ADS, RHR, RHRSW, Remote Shutdown Panels and DC Vital Buses.
15. Site Boundary – that line beyond which the land is not owned, leased or otherwise controlled by the licensee. (PPL drawing C243786, Sh 1, Rev 1, "U-1 & 2 Site Facilities and Boundary Map.").
16. Station Structure – a structure that houses equipment used for normal or emergency operations of the plant. This includes the Control Structure, Reactor Buildings, Turbine Buildings, Diesel Generator buildings, Radwaste Building, ESSW Pumphouse, Spray Pond, Cooling Towers, Startup Transformers, ESS Transformers, Circulating Water Pump House, Security Control Center, Auxiliary Security Control Center, Dry Fuel Storage Modules, Low Level Radwaste Holding Facility, T-10 Tap 230 KV Switchyard and 230KV or 500KV Switchyard.
17. Sustained Winds – winds whose speed exceeds the specified value for greater than 1 minute. Wind gusts of shorter duration do not meet this criteria.
18. Unplanned – a parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative action.
19. 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 redundant indicators, or (3) by direct observation of 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.
20. ISFSI-Independent Spent Fuel Storage Facility – A series of adjacent concrete structures located within the SSES Protected Area that contain spent fuel storage canisters.

Category	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	NOTICE OF UNUSUAL EVENT
Radiological Effluents	<p>RG1 Pg R-2</p> <p>IC Dose At The Emergency Planning Boundary Resulting From An Actual Or Imminent Release Of Gaseous Radioactivity Exceeds 1000 mrem TEDE Or 5000 mrem Child Thyroid CDE For The Actual Or Projected Duration Of The Release Using Actual Meteorology.</p> <p>Modes: ALL</p> <p><u>EAL Threshold Value</u> (1 or 2 or 3 or 4 or 5)</p> <p><i>Note: If dose assessment results are available at the time of declaration, the classification should be based on EAL 2 instead of EAL 1. While necessary declarations should not be delayed awaiting results, the dose assessment should be initiated / completed in order to determine if the classification should be subsequently escalated.</i></p> <ol style="list-style-type: none"> <li>Valid Noble Gas vent stack monitor reading(s) that exceeds or is expected to exceed a site total release rate of <math>6.2E+9 \mu\text{Ci}/\text{min}</math> for greater than 15 minutes and Dose Projections are not available.</li> </ol> <p><u>OR</u></p> <ol style="list-style-type: none"> <li>Valid dose assessment using actual meteorology indicates projected doses greater than 1000 mrem TEDE or 5000 mrem child thyroid CDE at or beyond the EPB.</li> </ol> <p><u>OR</u></p> <ol style="list-style-type: none"> <li>A valid reading sustained for 15 minutes or longer on the RMS perimeter radiation monitoring system greater than 1000 mR/hr.</li> </ol> <p><u>OR</u></p> <ol style="list-style-type: none"> <li>Field survey results indicate EPB closed window dose rates exceeding 1000 mR/hr expected to continue for more than one hour.</li> </ol> <p><u>OR</u></p> <ol style="list-style-type: none"> <li>Analyses of field survey samples indicate child thyroid dose commitment at the EPB of 5000 mrem assuming one hour of inhalation.</li> </ol>	<p>RS1 Pg R-5</p> <p>IC Dose At The Emergency Planning Boundary Resulting From An Actual Or Imminent Release Of Gaseous Radioactivity Exceeds 100 mrem TEDE Or 500 mrem Child Thyroid CDE For The Actual Or Projected Duration Of The Release.</p> <p>Modes: ALL</p> <p><u>EAL Threshold Value</u> (1 or 2 or 3 or 4 or 5)</p> <p><i>Note: If dose assessment results are available at the time of declaration, the classification should be based on EAL 2 instead of EAL 1. While necessary declarations should not be delayed awaiting results, the dose assessment should be initiated / completed in order to determine if the classification should be subsequently escalated.</i></p> <ol style="list-style-type: none"> <li>Valid Noble Gas vent stack monitor reading(s) that exceeds or is expected to exceed a site total release rate of <math>6.2E+8 \mu\text{Ci}/\text{min}</math> for greater than 15 minutes and Dose Projections are not available.</li> </ol> <p><u>OR</u></p> <ol style="list-style-type: none"> <li>Valid dose assessment using actual meteorology indicates projected doses greater than 100 mrem TEDE or 500 mrem child thyroid CDE at or beyond the EPB.</li> </ol> <p><u>OR</u></p> <ol style="list-style-type: none"> <li>A valid reading sustained for 15 minutes or longer on the RMS perimeter radiation monitoring system greater than 100mR/hr.</li> </ol> <p><u>OR</u></p> <ol style="list-style-type: none"> <li>Field survey results indicate EPB closed window dose rates exceeding 100 mR/hr expected to continue for more than one hour.</li> </ol> <p><u>OR</u></p> <ol style="list-style-type: none"> <li>Analyses of field survey samples indicate child thyroid dose commitment at the EPB of 500 mrem assuming one hour of inhalation.</li> </ol>	<p>RA1 Pg R-8</p> <p>IC Any Unplanned Release Of Gaseous Or Liquid Radioactivity To The Environment That Exceeds 200 Times Technical Requirements Manual Limits For 15 Minutes Or Longer.</p> <p>Modes: ALL</p> <p><u>EAL Threshold Value</u> (1 or 2 or 3)</p> <ol style="list-style-type: none"> <li>Valid Noble Gas vent stack monitoring reading(s) that exceeds a site total release rate of <math>2.0E+8 \mu\text{Ci}/\text{min}</math> and that is sustained for 15 minutes or longer.</li> </ol> <p><u>OR</u></p> <ol style="list-style-type: none"> <li>Confirmed sample analyses for airborne releases indicate total site release rates for 15 minutes or longer resulting in dose rates at the Site Boundary of: <ol style="list-style-type: none"> <li>Noble gases <math>&gt; 1.0E+5</math> mrem/year whole body,</li> </ol> <p><u>OR</u></p> <ol style="list-style-type: none"> <li>Noble gases <math>&gt; 6.0E+5</math> mrem/year skin,</li> </ol> <p><u>OR</u></p> <ol style="list-style-type: none"> <li>I-131, I-133, H-3, and particulates with half-lives greater than 8 days <math>&gt; 3.0E+5</math> mrem/year to any organ (inhalation pathways only).</li> </ol> </li> </ol> <p><u>OR</u></p> <ol style="list-style-type: none"> <li>Confirmed sample analyses for liquid releases indicate concentrations in excess of 200 times the Technical Requirements Manual liquid effluent limits for 15 minutes or longer.</li> </ol>	<p>RU1 Pg R-12</p> <p>IC Any Unplanned Release Of Gaseous Or Liquid Radioactivity To The Environment That Exceeds Two Times The Technical Requirements Manual Limits For 60 Minutes Or Longer.</p> <p>Modes: ALL</p> <p><u>EAL Threshold Value</u> (1 or 2 or 3)</p> <ol style="list-style-type: none"> <li>Valid Noble Gas vent stack monitor reading(s) that exceeds a total site release rate of <math>2.0E+6 \mu\text{Ci}/\text{min}</math> and that is sustained for 60 minutes or longer.</li> </ol> <p><u>OR</u></p> <ol style="list-style-type: none"> <li>Confirmed sample analyses for airborne releases indicate total site release rates, with a release duration of 60 minutes or longer, resulting in dose rates at the Site Boundary of: <ol style="list-style-type: none"> <li>Noble gases <math>&gt; 1000</math> mrem/year whole body,</li> </ol> <p><u>OR</u></p> <ol style="list-style-type: none"> <li>Noble gases <math>&gt; 6000</math> mrem/year skin,</li> </ol> <p><u>OR</u></p> <ol style="list-style-type: none"> <li>I-131, I-133, H-3 and particulates with half-lives greater than 8 days <math>&gt; 3000</math> mrem/yr to any organ (inhalation pathway only).</li> </ol> </li> </ol> <p><u>OR</u></p> <ol style="list-style-type: none"> <li>Confirmed sample analyses for liquid releases indicate concentrations with a release duration of 60 minutes or longer in excess of two times the Technical Requirements Manual liquid effluent limits.</li> </ol>

Category	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	NOTICE OF UNUSUAL EVENT
Abnormal Radiation Levels			<p>RA2 Pg R-16</p> <p>IC Release Of Radioactive Material Or Increases In Radiation Levels Within The Facility That Impedes Operation Of Systems Required To Maintain Safe Operations Or To Establish Or Maintain Cold Shutdown.</p> <p>Modes: ALL</p> <p><u>EAL Threshold Value</u> (1 or 2)</p> <ol style="list-style-type: none"><li>1. Valid radiation reading &gt; 15 mR/hr in the Control Room, or both the Security Control Center (SCC) and Alternate Security Control Center (ASCC).</li></ol> <p><u>OR</u></p> <ol style="list-style-type: none"><li>2. Valid radiation monitor readings &gt; 10 R/hr in areas requiring infrequent access to maintain plant safety functions as identified in Emergency Operating Procedure EO-000-104 (Table R-1).</li></ol> <p><u>AND</u></p> <p>Access is required for safe plant operation or to establish or maintain cold shutdown but is impeded due to radiation dose rates.</p>	<p>RU2 Pg R-19</p> <p>IC Unexpected Increase In Plant Radiation.</p> <p>Modes: ALL</p> <p><u>EAL Threshold Value</u> (1 or 2)</p> <ol style="list-style-type: none"><li>1. Uncontrolled water level decrease in the reactor refueling cavity, or spent fuel pool with all irradiated fuel assemblies remaining covered by water as indicated by:  Unexpected Fuel Pool Water Low Level alarm <u>OR</u> Skimmer Surge Tank Low Level alarm on either unit,  <u>AND</u><ol style="list-style-type: none"><li>A. Unplanned valid Refuel Floor Area Radiation Monitor (Table R-3) readings increase by a factor of 1000 over normal* levels.</li></ol> <u>OR</u><ol style="list-style-type: none"><li>B. Visual observation of an uncontrolled water level drop below either unit's fuel pool skimmer surge tank inlet <u>OR</u> observation of water draining down the outside wall of Primary Containment.</li></ol></li><li>2. Unplanned valid Area Radiation Monitor readings increase by a factor of 1000 over normal* levels.</li></ol> <p>*Normal levels can be considered as the highest reading in the past twenty-four hours excluding the current peak value.</p>
Irradiated Fuel Accidents			<p>RA3 Pg R-22</p> <p>IC Damage To Irradiated Fuel Or Loss Of Water Level That Has Or Will Result In The Uncovering Of Irradiated Fuel Outside The Reactor Vessel.</p> <p>Modes: ALL</p> <p><u>EAL Threshold Value</u> (1 or 2 or 3)</p> <ol style="list-style-type: none"><li>1. Unplanned valid Refuel Floor Area Radiation Monitor (Table R-2) readings greater than 500 mR/hr.</li></ol> <p><u>OR</u></p> <ol style="list-style-type: none"><li>2. Water level &lt; 22 feet above the RPV flange for the reactor refueling cavity that will result in irradiated fuel uncovering.</li></ol> <p><u>OR</u></p> <ol style="list-style-type: none"><li>3. Water level &lt; 22 feet above seated irradiated fuel for the spent fuel pool that will result in irradiated fuel uncovering.</li></ol>	

Table R-1  
Reactor Building Radiation Monitors

RB Area Elevation (ft)	ARM Number High Range	ARM Channel Description	Max Safe Radiation Per EO-000-104 (R/HR)
818	49	Refuel Floor Area	10
749	52	RWCU Recirc PP Access	10
	54	Fuel Pool PP Room	10
719	50	CRD North	10
	51	CRD South	10
670	53	Remote Shutdown Room	10
645	48	HPCI PP Turbine Room	10
	57	RCIC PP Turbine Room	10
	55	RHR A C PP Room	10
	56	RHR B D PP Room	10

Table R-2  
Refuel Floor Area Radiation Monitors

ARM Number	Description	Range (mR/hr)
14	Spent Fuel Pool Area	0.1 – 1000
47	Spent Fuel Pool Area	0.1 – 1000
49	Refuel Floor Area	10 <sup>2</sup> - 10 <sup>6</sup>

Table R-3  
Refuel Floor Area Radiation Monitors

ARM Number	Description	Range (mR/hr)
14	Spent Fuel Pool Area	0.1 – 1000
15 & 42	Refuel Floor Area	0.01-100
35	Refuel Floor Area	0.01-100
47	Spent Fuel Pool Area	0.1 – 1000
49	Refuel Floor Area	10 <sup>2</sup> - 10 <sup>6</sup>

---

**RECOGNITION CATEGORY R**

**ABNORMAL RAD LEVELS /  
RADIOLOGICAL EFFLUENT  
BASES**

---

<p style="text-align: center;"><b>RECOGNITION CATEGORY R</b> <b>ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENT</b> <b>RADIOLOGICAL EFFLUENTS</b> <b>RG1 – GENERAL EMERGENCY</b></p>
--

**IC Dose At The Emergency Planning Boundary Resulting From An Actual Or Imminent Release Of Gaseous Radioactivity Exceeds 1000 mrem TEDE Or 5000 mrem Child Thyroid CDE For The Actual Or Projected Duration Of The Release Using Actual Meteorology.**

**RG1 Modes: ALL**

**EAL Threshold Value (1 or 2 or 3 or 4 or 5)**

***Note:** If dose assessment results are available at the time of declaration, the classification should be based on EAL 2 instead of EAL 1. While necessary declarations should not be delayed awaiting results, the dose assessment should be initiated / completed in order to determine if the classification should be subsequently escalated.*

1. Valid Noble Gas vent stack monitor reading(s) that exceeds or is expected to exceed a site total release rate of  $6.2E+9$   $\mu\text{Ci}/\text{min}$  for greater than 15 minutes and Dose Projections are not available.

**OR**

2. Valid dose assessment using actual meteorology indicates projected doses greater than 1000 mrem TEDE or 5000 mrem child thyroid CDE at or beyond the EPB.

**OR**

3. A valid reading sustained for 15 minutes or longer on the RMS perimeter radiation monitoring system greater than 1000 mR/hr.

**OR**

4. Field survey results indicate EPB closed window dose rates exceeding 1000 mR/hr expected to continue for more than one hour.

**OR**

5. Analyses of field survey samples indicate child thyroid dose commitment at the EPB of 5000 mrem assuming one hour of inhalation.

**Basis**

This IC addresses radioactivity releases that result in doses at or beyond the EPB 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 ICs, this IC 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 EALs for a General Emergency are based on the SSES total site release rate as measured at effluent monitors through affected ventilation systems or are based on field monitoring data. For declaration of a General Emergency, the actual or projected TEDE dose EAL is 1 rem; the actual or projected child thyroid dose EAL is 5 rem.

For EAL 1, the Emergency Director should not wait until 15 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 15 minutes. The Noble Gas Vent Stack Monitor in EAL 1 monitors the SGTS exhaust ventilation stack and both unit's Turbine Building and Reactor Building exhaust ventilation stacks. (The Post Accident Vent Stack Monitor does not monitor the Reactor Building vent stacks which would be isolated whenever the Post Accident Vent Stack monitor is in service.) This General Emergency EAL threshold is based on a calculation which estimates an emergency plan boundary dose for a release of radionuclides from containment immediately following a severe core damage accident (Reference 1).

The EPA PAGs are expressed in terms of the projected sum of the effective dose equivalent (EDE) from external radiation and the committed effective dose equivalent (CEDE) incurred from inhalation of radioactive materials, or as the committed dose equivalent (CDE) to the thyroid. For the purpose of these IC/EALs, the projected dose quantity Total Effective Dose Equivalent (TEDE), as defined in 10CFR20 is used in lieu of "the projected sum of...EDE...and CEDE...", with CEDE considering significant dose from inhaled radionuclides during the early phase of the event. The EPA protective action guidance provides for the use of adult thyroid dose conversion factors. However, the Commonwealth of Pennsylvania requires the use of child thyroid CDE for purposes of comparison of projected thyroid CDE to the PAG for thyroid CDE.

The monitor reading threshold for EAL 1 was determined using a dose assessment method that backcalculates from the dose values specified in the IC. The meteorology and source term used are the same as that used for determining the monitor reading EAL in IC RS1. This protocol maintains an order of magnitude between the EALs for these two classifications. Since doses are generally not monitored in real-time, a release duration of one hour is assumed, and the EALs are based on an EPB dose of 1000 mrem TEDE. The inputs for this method (Reference 1) are as follows:

Stability Class:	D
Wind Speed:	4.7 mph
Wind Direction:	from 72 degrees
Source Term:	LOCA (Clad Failure)
Time after shutdown:	15 minutes
Release Duration:	1 hour

Since dose assessment is based on actual meteorology, whereas the monitor reading EAL 1 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 1. Classification should not be delayed pending the results of these dose assessments.

Because measurements in the field at a given location may not be continuous, judgement must be applied in using the available data to project doses and/or dose rates for comparison against the values specified in this EAL.

Plant conditions that may lead to a General Emergency declaration include ECCS room blowout panel releases with unfavorable meteorological conditions (e.g., stability classes D-G and/or low wind speeds), primary containment failure, or other indications of very large source terms and unmonitored release pathways.

### References

1. NEP Technical Basis #02-005, "Noble Gas Release Rate Limits for EALs", June 2002.
2. USEPA 400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, October 1991.
3. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL AG1.



**RECOGNITION CATEGORY R**  
**ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENT**  
**RADIOLOGICAL EFFLUENTS**  
**RS1 – SITE AREA EMERGENCY**

**IC     Dose At The Emergency Planning Boundary Resulting From An Actual Or Imminent Release Of Gaseous Radioactivity Exceeds 100 mrem TEDE Or 500 mrem Child Thyroid CDE For The Actual Or Projected Duration Of The Release.**

**RS1   Modes: ALL**

**EAL Threshold Value (1 or 2 or 3 or 4 or 5)**

***Note: If dose assessment results are available at the time of declaration, the classification should be based on EAL 2 instead of EAL 1. While necessary declarations should not be delayed awaiting results, the dose assessment should be initiated / completed in order to determine if the classification should be subsequently escalated.***

- 1. Valid Noble Gas vent stack monitor reading(s) that exceeds or is expected to exceed a site total release rate of  $6.2E+8$   $\mu\text{Ci}/\text{min}$  for greater than 15 minutes and Dose Projections are not available.**

**OR**

- 2. Valid dose assessment using actual meteorology indicates projected doses greater than 100 mrem TEDE or 500 mrem child thyroid CDE at or beyond the EPB.**

**OR**

- 3. A valid reading sustained for 15 minutes or longer on the RMS perimeter radiation monitoring system greater than 100 mR/hr.**

**OR**

- 4. Field survey results indicate EPB closed window dose rates exceeding 100 mR/hr expected to continue for more than one hour.**

**OR**

- 5. Analyses of field survey samples indicate child thyroid dose commitment at the EPB of 500 mrem assuming one hour of inhalation.**

### **Basis**

This IC addresses radioactivity releases that result in doses at or beyond the EPB that exceed a small fraction 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 ICs, this IC provides appropriate diversity and addresses events that 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 EALs for a Site Area Emergency are based on the SSES total site release rate as measured at effluent monitors through affected ventilation systems or are based on field monitoring data. For declaration of a Site Area Emergency, the TEDE dose is set at 10% of the EPA PAG, while the 500 mrem child thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

For EAL 1, the Emergency Director should not wait until 15 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 15 minutes. The Noble Gas Vent Stack Monitor in EAL 1 monitors the SGTS exhaust ventilation stack and both unit's Turbine Building and Reactor Building exhaust ventilation stacks. (The Post Accident Vent Stack Monitor does not monitor the Reactor Building vent stacks which would be isolated whenever the Post Accident Vent Stack monitor is in service.) This Site Area Emergency EAL threshold is based on a calculation which estimates an emergency plan boundary dose for a release of radionuclides from containment immediately following a severe core damage accident (Reference 1).

The EPA PAGs are expressed in terms of the projected sum of the effective dose equivalent (EDE) from external radiation and the committed effective dose equivalent (CEDE) incurred from inhalation of radioactive materials, or as the committed dose equivalent (CDE) to the thyroid. For the purpose of these IC/EALs, the projected dose quantity Total Effective Dose Equivalent (TEDE), as defined in 10 CFR 20 is used in lieu of "the projected sum of...EDE...and CEDE...", with CEDE considering significant dose from inhaled radionuclides during the early phase of the event. The EPA protective action guidance provides for the use of adult thyroid dose conversion factors. However, the Commonwealth of Pennsylvania requires the use of child thyroid CDE for purposes of comparison of projected thyroid CDE to the PAG for thyroid CDE.

The monitor reading threshold for EAL 1 was determined using a dose assessment method that backcalculates from the dose values specified in the IC. The meteorology and source term used are the same as that used for

determining the monitor reading EAL in IC RG1. This protocol maintains an order of magnitude between the EALs for these two classifications. Since doses are generally not monitored in real-time, a release duration of one hour is assumed, and the EALs are based on an EPB dose of 100 mrem TEDE. The inputs for this method (Reference 1) are as follows:

Stability Class:	D
Wind Speed:	4.7 mph
Wind Direction:	from 72 degrees
Source Term:	LOCA (Clad Failure)
Time after shutdown:	15 minutes
Release Duration:	1 hour

Since dose assessment is based on actual meteorology, whereas the monitor reading EAL 1 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 1. Classification should not be delayed pending the results of these dose assessments.

Because measurements in the field at a given location may not be continuous, judgement must be applied in using the available data to project doses and/or dose rates for comparison against the values specified in this EAL.

Escalation to a General Emergency would be based on increased dose at the EPB.

### References

1. NEP Technical Basis #02-005, "Noble Gas Release Rate Limits for EALs", June 2002.
2. USEPA 400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, October 1991.
3. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL AS1.

**RECOGNITION CATEGORY R  
ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENT  
RADIOLOGICAL EFFLUENTS  
RA1 – ALERT**

**IC Any Unplanned Release Of Gaseous Or Liquid Radioactivity To The Environment That Exceeds 200 Times Technical Requirements Manual Limits For 15 Minutes Or Longer.**

**RA1 Modes: ALL**

**EAL Threshold Value (1 or 2 or 3)**

1. Valid Noble Gas vent stack monitoring reading(s) that exceeds a site total release rate of  $2.0\text{E}+8$   $\mu\text{Ci}/\text{min}$  and that is sustained for 15 minutes or longer.

**OR**

2. Confirmed sample analyses for airborne releases indicate total site release rates for 15 minutes or longer resulting in dose rates at the Site Boundary of:

A. Noble gases  $> 1.0\text{E}+5$  mrem/year whole body,

**OR**

B. Noble gases  $> 6.0\text{E}+5$  mrem/year skin,

**OR**

C. I-131, I-133, H-3, and particulates with half-lives greater than 8 days  $> 3.0\text{E}+5$  mrem/year to any organ (inhalation pathways only).

**OR**

3. Confirmed sample analyses for liquid releases indicate concentrations in excess of 200 times the Technical Requirements Manual liquid effluent limits for 15 minutes or longer.

**Basis**

This IC addresses a potential or actual 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. Susquehanna SES incorporates features intended

to control the release of radioactive effluents to the environment. Further, there are administrative controls established to prevent unintentional releases, or control and monitor intentional releases. These controls are located in the Technical Requirements Manual. The occurrence of extended, uncontrolled radioactive releases to the environment is indicative of a degradation in these features and/or controls.

The declaration of an Alert is based on site total release rates that exceed two hundred times the SSES airborne effluent technical requirement limits. Any unplanned releases in excess of two hundred times the TRM limits that continue for fifteen minutes or longer represent an uncontrolled situation and hence, a potential degradation in the level of safety. The final integrated dose is not the primary concern. The concern is the degradation in plant control implied by the fact that the release was not isolated within 15 minutes. The Emergency Director should consider declaring the Alert as soon as it is determined that the release duration will exceed or is likely to exceed 15 minutes.

The TRM limits are specified in ICs RU1 and RA1 only to distinguish between non-emergency conditions, and from each other. While these multiples obviously correspond to an offsite dose or dose rate, the emphasis in classifying these events is the degradation in the level of safety of the plant, not the magnitude of the associated dose or dose rate. Releases shall not be prorated or averaged. For example, a release exceeding 100x TRM limits for 7.5 minutes does not meet the threshold for this IC.

Unplanned, as used in this context, includes any release for which a radioactivity discharge permit was not prepared or not applicable, or a release that exceeds the conditions (e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.) on the applicable permit. The Emergency Director should not wait until 15 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 15 minutes. Also, if an ongoing release is detected and the starting time for that release is unknown, the Emergency Director should, in the absence of data to the contrary, assume that the release has exceeded 15 minutes.

EAL 1 addresses radioactivity releases that for whatever reason cause effluent radiation monitor readings that exceed two hundred times the TRM limits and releases at those levels are not terminated within 15 minutes. The effluent monitor alarm setpoints are established by the ODCM to warn of a release that is not in compliance with the TRM. The ODCM establishes a methodology for determining effluent radiation monitor setpoints. The ODCM specifies default source terms and, for gaseous releases, prescribes the use of pre-determined annual average meteorology in the most limiting downwind sector for showing compliance with the regulatory commitments. EAL 1 directly correlates with the IC since annual average meteorology is required to be used in showing

compliance with the ODCM and is used in calculating the alarm setpoints. The fundamental basis of this IC is NOT a dose or dose rate, but rather the degradation in the level of safety of the plant implied by the uncontrolled release.

EAL 2 is based on ODCM methodology.

EAL 3 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. This EAL reflects the concern that releases in excess of 200 times TRM limits represent an uncontrolled situation and hence a potential degradation in the level of safety. Although the calculated dose is very low, it is the degradation in plant control as indicated by the failure to terminate the release that is of primary concern.

For a radiological liquid release, the calculated effluent concentration from a chemistry sample is compared to the emergency action level. Shift Management utilizes emergency response procedures to notify risk counties and to obtain river water samples.

Due to the uncertainty associated with meteorology, emergency implementing procedures call for the timely performance of dose assessments using actual (real-time) meteorology in the event of a gaseous radioactivity release of this magnitude. The results of these assessments should be compared to the ICs RS1 and RG1 to determine if the event classification should be escalated. Classification should not be delayed pending the results of these dose assessments.

The parameter values given above correspond to continuous release rates in excess of 200 times TRM Limits. The parameter value must be expected to be exceeded for 15 minutes to warrant the declaration of an Alert. For the vent stack monitors, this is accomplished by one valid 10-minute average reading. (Since the vent stack monitors only provide 10-minute averages, if one 10-minute value exceeds the ALERT level the declaration should be made on that basis unless it is clear that the release will not exceed the limiting values for 15 or more minutes.) In addition, the 15-minute average release rate data from PICSY may also be reviewed.

The Alert release rate was established at a factor of 100 above Notification of Unusual Event, which provides a logical emergency classification progression and is consistent with NEI 99-01 Rev 4 and EPA Protective Action guidance.

Escalation to a Site Area Emergency would be based on projected doses exceeding 10% of Protective Action Guidelines.

Note: NEI EAL AA1 #4 is not included in the Susquehanna SES EALs. The RMS perimeter radiation monitoring system is not normally operating or alarmed in the Control Room. The location of the perimeter monitors is closer to the EPB than to the site boundary and therefore the threshold limit applied to RMS would not be consistent with the TRM.

NEI EAL AA1 #5 is not included as Susquehanna SES does not have an automatic real-time dose assessment capability.

#### **References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL AA1.
2. Susquehanna Steam Electric Station, Offsite Dose Calculation Manual.
3. EPA-520/1-75-001A, Manual of Protective Actions for Nuclear Incidents, January 1990.
4. PPL Calculation OT-92-RKB-018, "General & Site Area Emergency Release Rate Parameters."
5. PPL Calculation EC-ENVR-1041, "Airborne Effluent Limiting Site Release Rate and Monitor Setpoint Determinations."

**RECOGNITION CATEGORY R  
ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENT  
RADIOLOGICAL EFFLUENTS  
RU1 -NOTIFICATION OF UNUSUAL EVENT**

**IC Any Unplanned Release Of Gaseous Or Liquid Radioactivity To The Environment That Exceeds Two Times The Technical Requirements Manual Limits For 60 Minutes Or Longer.**

**RU1 Modes: ALL**

**EAL Threshold Value (1 or 2 or 3)**

1. Valid Noble Gas vent stack monitor reading(s) that exceeds a total site release rate of  $2.0E+6$   $\mu\text{Ci}/\text{min}$  and that is sustained for 60 minutes or longer.

**OR**

2. Confirmed sample analyses for airborne releases indicate total site release rates, with a release duration of 60 minutes or longer, resulting in dose rates at the Site Boundary of :

A. Noble gases  $>1000$  mrem/year whole body,

**OR**

B. Noble gases  $>6000$  mrem/year skin,

**OR**

C. I-131, I-133, H-3 and particulates with half-lives greater than 8 days  $> 3000$  mrem/yr to any organ (inhalation pathway only).

**OR**

3. Confirmed sample analyses for liquid releases indicate concentrations with a release duration of 60 minutes or longer in excess of two times the Technical Requirements Manual liquid effluent limits.

**Basis**

This IC addresses a potential or actual 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. Susquehanna SES incorporates features intended



to control the release of radioactive effluents to the environment. Further, there are administrative controls established to prevent unintentional releases, or control and monitor intentional releases. These controls are located in the Technical Requirements Manual. The occurrence of extended, uncontrolled radioactive releases to the environment is indicative of a degradation in these features and/or controls.

The declaration of a Notification of Unusual Event is based on site total release rates in excess of two times the SSES airborne effluent technical requirement limits. Any unplanned releases in excess of two times the TRM 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 likely to be less than about 2 mrem TEDE or child thyroid CDE for a release at two times TRM limits for 60 minutes) is not the primary concern. The concern is the degradation in plant control implied by the fact that the release was not isolated within 60 minutes. The Emergency Director should consider declaring the Notification of Unusual Event as soon as it is determined that the release duration will exceed or is likely to exceed 60 minutes.

The TRM limits are specified in ICs RU1 and RA1 only to distinguish between non-emergency conditions, and from each other. While these multiples obviously correspond to an offsite dose or dose rate, the emphasis in classifying these events is the degradation in the level of safety of the plant, not the magnitude of the associated dose or dose rate. Releases shall not be prorated or averaged. For example, a release exceeding 4x TRM limits for 30 minutes does not meet the threshold for this IC.

Unplanned, as used in this context, includes any release for which a radioactivity discharge permit was not prepared or not applicable, or a release that exceeds the conditions (e.g., minimum dilution flow, maximum discharge flow, alarm setpoints, etc.) on the applicable permit. The Emergency Director should not wait until 60 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 60 minutes. Also, if an ongoing release is detected and the starting time for that release is unknown, the Emergency Director should, in the absence of data to the contrary, assume that the release has exceeded 60 minutes.

EAL 1 addresses radioactivity releases, that for whatever reason, cause effluent radiation monitor readings that exceed two times the TRM limit and releases at those levels are not terminated within 60 minutes. The effluent monitor alarm setpoints are established by the ODCM to warn of a release that is not in compliance with the TRM. The ODCM establishes a methodology for determining effluent radiation monitor setpoints. The ODCM specifies default source terms and, for gaseous releases, prescribes the use of pre-determined annual average meteorology in the most limiting downwind sector for showing

compliance with the regulatory commitments. EAL 1 directly correlates with the IC since annual average meteorology is required to be used in showing compliance with the ODCM and is used in calculating the alarm setpoints. The fundamental basis of this IC is NOT a dose or dose rate, but rather the degradation in the level of safety of the plant implied by the uncontrolled release.

EAL 2 is based on ODCM methodology.

EAL 3 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. This EAL reflects the concern that releases in excess of two times the TRM limits represent an uncontrolled situation and hence a potential degradation in the level of safety. Although the calculated dose is very low, it is the degradation in plant control as indicated by the failure to terminate the release that is of primary concern.

For a radiological liquid release, the calculated effluent concentration from a chemistry sample is compared to the emergency action level. Shift Management utilizes emergency response procedures to notify risk counties and to obtain river water samples.

Due to the uncertainty associated with meteorology, emergency implementing procedures call for the timely performance of dose assessments using actual (real-time) meteorology in the event of a gaseous radioactivity release of this magnitude. The results of these assessments should be compared to the ICs RS1 and RG1 to determine if the event classification should be escalated. Classification should not be delayed pending the results of these dose assessments.

The parameter values given above correspond to continuous release rates in excess of 2 times TRM Limits. The parameter value must be expected to be exceeded for 60 minutes to warrant the declaration of an Notification of Unusual Event.

Escalation to the Alert will be based on increasing the magnitude of the release to 200 times TRM limits for greater than 15 minutes.

Note: NEI EAL AU1 #4 is not included in the Susquehanna SES EALs. The RMS perimeter radiation monitoring system is not normally operating or alarmed in the Control Room. The location of the perimeter monitors is closer to the EPB than to the site boundary and therefore the threshold limit applied to RMS would not be consistent with the TRM.

NEI EAL AU1 #5 is not included as Susquehanna SES does not have an automatic real-time dose assessment capability.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL AU1.
2. PPL Calculation EC-ENVR-1041, "Airborne Effluent Limiting Site Release Rate and Monitor Setpoint Determinations."

**RECOGNITION CATEGORY R**  
**ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENT**  
**ABNORMAL RADIATION LEVELS**  
**RA2 – ALERT**

**IC Release Of Radioactive Material Or Increases In Radiation Levels Within The Facility That Impedes Operation Of Systems Required To Maintain Safe Operations Or To Establish Or Maintain Cold Shutdown.**

**RA2 Modes: ALL**

**EAL Threshold Value (1 or 2)**

1. Valid radiation reading > 15 mR/hr in the Control Room, or both the Security Control Center (SCC) and the Alternate Security Control Center(ASCC).

**OR**

2. Valid radiation monitor readings > 10 R/hr in areas requiring infrequent access to maintain plant safety functions as identified in Emergency Operating Procedure EO-000-104 (Table R-1).

**AND**

Access is required for safe plant operation or to establish or maintain cold shutdown but is impeded due to radiation dose rates.

**Table R-1**  
**Reactor Building Radiation Monitors**

<b>RB Area Elevation (ft)</b>	<b>ARM Number High Range</b>	<b>ARM Channel Description</b>	<b>Max Safe Radiation Per EO-000-104 (R/HR)</b>
818	49	Refuel Floor Area	10
749	52 54	RWCU Recirc Pp Access Fuel Pool Pump Area	10
719	50 51	CRD North CRD South	10
670	53	Remote Shutdown Room	10
645	48 57 55 56	HPCI PP & Turbine Room RCIC PP & Turbine Room RHR A C PP Room RHR B D PP Room	10 10 10 10

### **Basis**

This IC addresses increased radiation levels that impede necessary access to areas containing equipment that must be operated manually or that requires local monitoring, in order to maintain safe operation or perform a safe shutdown. It is this impaired ability to operate the plant OR maintain security that results in the actual or potential substantial degradation of the level of safety of the plant. The cause and/or magnitude of the increase in radiation levels is not a concern of this IC. The Emergency Director must consider the source or cause of the increased radiation levels and determine if any other IC may be involved. For example, a dose rate of 15 mR/hr in the control room, or both the SCC or ASCC may be a problem in itself. However, the increase may also be indicative of high dose rates in the containment due to a LOCA. In this latter case, a Site Area Emergency or General Emergency may be indicated by the fission product barrier matrix ICs. It is not the intent of this EAL that there be continuous radiation monitoring in the SCC or ASCC. However, if a Radiological release is in progress and there are indications that the release may affect the SCC and ASCC and dose rates in both areas were greater than 15 mR/hr, then an Alert should be declared based on EAL RA2.

This EAL could result in declaration of an Alert on one unit due to a radioactivity release or radiation shine resulting from a major accident at the other unit. This is appropriate if the increase impairs operations at the operating unit.

This IC is not meant to apply to increases in the containment radiation monitors as these are events which are addressed in the fission product barrier matrix ICs, nor is it intended to apply to anticipated temporary increases due to planned events (e.g., incore detector movement, radwaste container movement, depleted resin transfers, radiography, movement of large components, etc.)

Areas requiring continuous occupancy include the control room or both the SCC and ASCC. The value of 15mR/hr is derived from the General Design Criteria 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.

Access to the Reactor Building is required on an infrequent basis to maintain plant safety functions necessary for safe shutdown of the plant. The maximum amount of time that will be spent in any of the areas requiring infrequent access is estimated to be 2.5 hours. Dose guidelines for saving plant equipment and safe shutdown of the plant under emergency conditions is 25 Rem. Therefore, valid unexpected radiation levels of greater than 10 R/hr in the Reactor Building

represents an increase in radiation levels within the facility that will impede necessary access. As used here, impede, includes hindering or interfering provided that the interference or delay is sufficient to significantly threaten the safe operation of the plant.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL AA3.
2. EO-000-104, "Secondary Containment Control."

**RECOGNITION CATEGORY R  
ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENT  
ABNORMAL RADIATION LEVELS  
RU2 -NOTIFICATION OF UNUSUAL EVENT**

**IC     Unexpected Increase In Plant Radiation.**

**RU2           Modes: ALL**

**EAL Threshold Value (1 or 2)**

1. Uncontrolled water level decrease in the reactor refueling cavity, or spent fuel pool with all irradiated fuel assemblies remaining covered by water as indicated by:

Unexpected Fuel Pool Water Low Level alarm OR Skimmer Surge Tank Low Level alarm on either unit,

AND

- A. Unplanned valid Refuel Floor Area Radiation Monitor (Table R-2) readings increase by a factor of 1000 over normal\* levels.

OR

- B. Visual observations of an uncontrolled water level drop below either unit's fuel pool skimmer surge tank inlet OR observation of water draining down the outside wall of Primary Containment.

OR

2. Unplanned valid Area Radiation Monitor readings increase by a factor of 1000 over normal\* levels.

\*Normal levels can be considered as the highest reading in the past twenty-four hours excluding the current peak value.

Table R-3  
Refuel Floor Area Radiation Monitors

ARM Number	Description	Range (mR/hr)
14	Spent Fuel Pool Area	0.1 – 1000
15 & 42	Refuel Floor Area	0.01-100
35	Refuel Floor Area	0.01-100
47	Spent Fuel Pool Area	0.1 – 1000
49	Refuel Floor Area	10 <sup>2</sup> - 10 <sup>6</sup>

### Basis

EAL 1 - This IC addresses increased radiation levels as a result of water level decreases above the RPV flange or events that have resulted, or may result, in unexpected increases in radiation dose rates within plant buildings. These radiation increases represent a loss of control over radioactive material and may represent a potential degradation in the level of safety of the plant.

In light of Reactor Cavity Seal failure incidents at two different PWRs and loss of water in the Spent Fuel Pit/Fuel Transfer Canal at a BWR, explicit coverage of these types of events via EAL 1 is appropriate given their potential for increased doses to plant staff. Classification as a Notification of Unusual Event is warranted as a precursor to a more serious event. Indications include low fuel pool or skimmer surge tank level alarms coupled with increasing Refuel Floor area radiation monitor reading.

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, the reading on an area radiation monitor located on the refuel floor may increase due to planned evolutions such as head lift, or even a fuel assembly being raised in the manipulator mast. Generally, increased radiation monitor indications will need to be 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 CU2. This event escalates to an Alert per IC RA3 if irradiated fuel outside the reactor vessel is uncovered. For events involving irradiated fuel in the reactor vessel, escalation would be via the Fission Product Barrier Matrix for events in operating modes 1-4.

EAL 2 - This EAL addresses Unplanned increases in in-plant radiation levels that represent a degradation in the control of radioactive material and represent a potential degradation in the level of safety of the plant. All station ARMs are included in this EAL. Routine processes within the plant that produce anticipated increases in radiation levels are not an indication of an emergency.



This EAL addresses increased radiation levels that impede necessary access to areas containing equipment that must be operated manually or that require local monitoring in order to maintain safe operation or perform a shutdown. It is the impaired ability to operate the plant that results in the actual or potential substantial degradation of the level of safety of the plant. The cause and/or magnitude of the increase in radiation levels are not a concern for entry into this EAL. Consideration of the cause or source of the radiation should be evaluated for entry into the Emergency Plan under other EALs (e.g. high radiation levels could indicate a loss of fuel pool level).

Exceeding an ARM high limit setpoint causes an annunciation or instrument indication. This situation should be evaluated for potential entry into the Emergency Plan. The EAL entry is a reading or indication that has increased to 1000 times over normal levels. Normal levels are variable and are based upon routine changes to plant operating conditions. Normal can be considered as the highest reading in the past twenty-four hours excluding the current peak.

Alarm setpoints and trend information (used to determine normal levels) are available from PICSY and from ARM recorders. If a reading of 1000 times normal is beyond the range of the ARM indication, contact Health Physics for validation and confirmation.

This event escalates to an Alert per IC RA2 if the increase in dose rates impedes personnel access necessary for safe operation.

### **References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL AU2.
2. EO-000-104, "Secondary Containment Control."

**RECOGNITION CATEGORY R  
ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENT  
IRRADIATED FUEL ACCIDENTS  
RA3 – ALERT**

**IC     Damage To Irradiated Fuel Or Loss Of Water Level That Has Or Will Result In The Uncovering Of Irradiated Fuel Outside The Reactor Vessel.**

**RA3           Modes: ALL**

**EAL Threshold Value (1 or 2 or 3)**

1. Unplanned valid Refuel Floor Area Radiation Monitor (Table R-2) readings greater than 500 mR/hr.

**OR**

2. Water level < 22 feet above the RPV flange for the reactor refueling cavity that will result in irradiated fuel uncovering.

**OR**

3. Water level < 22 feet above seated irradiated fuel for the spent fuel pool that will result in irradiated fuel uncovering.

**Table R-2  
Refuel Floor Area Radiation Monitors**

<b>ARM Number</b>	<b>Description</b>	<b>Range (mR/hr)</b>
14	Spent Fuel Pool Area	0.1 – 1000
47	Spent Fuel Pool Area	0.1 – 1000
49	Refuel Floor Area	10 <sup>2</sup> - 10 <sup>6</sup>

**Basis**

This IC addresses specific events that have resulted, or may result, in unexpected 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 a degradation in the

level of safety of the plant. These events escalate from IC RU2 in that fuel activity has been released, or is anticipated due to fuel heatup. This IC applies to spent fuel requiring water coverage and is not intended to address spent fuel which is licensed for dry storage, which is discussed in IC EU1.

EAL 1 addresses radiation monitor indications of fuel uncover and/or fuel damage. Increased readings on ventilation monitors may be indication of a radioactivity release from the fuel, confirming that damage has occurred. Increased background at the 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, the 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. Application of these Initiating Conditions requires understanding of the actual radiological conditions present in the vicinity of the monitor.

In EAL 2 and 3, indications include instrumentation such as water level, personnel or remote video observations. The value 22 feet above seated irradiated fuel is the Technical Specifications limit and an uncontrolled level drop that would uncover irradiated fuel is an indicator of a lowering in the level of safety of the plant.

Escalation, if appropriate, would occur via IC RS1 or RG1 or Emergency Director / Recovery Manager judgment.

#### References

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL AA2.
2. EO-000-104, "Secondary Containment Control."

Barrier	1. Fuel Clad Barrier Pg F-3 to F-7		2. Reactor Coolant System Barrier Pg F-8 to F-15		3. Primary Containment Barrier Pg F-16 to F-26	
Parameter	Loss	Potential Loss	Loss	Potential Loss	Loss	Potential Loss
a. Reactor Coolant Activity Level	1. Reactor Coolant activity > 300µCi/gm I-131 Dose Equivalent.  <u>OR</u>  2. Clad damage calculations indicate > 5% fuel clad damage.	N/A	N/A	N/A	N/A	N/A
b. RPV Level	1. RPV Level < -205".	1. RPV Level < -161".	1. RPV Level < -161".	N/A	N/A	1. Entry into EP-DS-002, "RPV and Primary Containment Flooding Procedure"
c. RCS Leak Rate or Containment Isolation Failure or Breach/Bypass	N/A	N/A	1. Unisolable Main Steamline break as indicated by the failure of both MSIVs in any one line to close.  <u>AND</u>  A. High MSL Flow <u>AND</u> High Steam Tunnel Temperature annunciators.  <u>OR</u>  B. Direct report of steam release.	1. Unisolable RCS Leakage > 50 gpm inside Primary Containment.  <u>OR</u>  2. Unisolable primary system leakage outside Primary Containment as indicated by:  A. Any Reactor Building area exceeds Max Normal Temperature per Table F-1.  <u>OR</u>  B. Any Reactor Building area exceeds Max Normal Radiation Levels per Table F-2.	1. Failure of All automatic isolation valves in any one line penetrating Primary Containment to close resulting from an isolation actuation signal <u>AND</u> a downstream pathway to the environment exists.  <u>OR</u>  2. Intentional venting per EP-DS-004 is performed.  <u>OR</u>  3. Unisolable primary system leakage outside Primary Containment as indicated by:  A. Two or more Reactor Building areas exceed Max Safe Temperature per Table F-3.  <u>OR</u>  B. Two or more Reactor Building areas exceed Max Safe Radiation Levels per Table F-4.	N/A
d. Drywell Pressure	N/A	N/A	1. Drywell Pressure ≥ 1.72 psig.  <u>AND</u>  Indication of a RCS leak inside drywell.	N/A	1. Rapid, unexplained decrease in Drywell Pressure following initial increase in pressure above 1.72 psig.  <u>OR</u>  2. Drywell Pressure response not consistent with LOCA conditions indicating a containment breach.	1. Drywell Pressure > 53 psig and increasing.  <u>OR</u>  2. Drywell Hydrogen or Suppression Chamber Hydrogen > 6% <u>AND</u> Drywell Oxygen or Suppression Chamber Oxygen > 5%.
e. Drywell Radiation	1. Containment High Range Rad Monitor reading > 3000 R/hr.	N/A	1. Containment High Range Rad Monitor reading > 10 R/hr.	N/A	N/A	1. Containment High Range Rad Monitor reading > 40,000 R/hr.
f. Emergency Director/Recovery Manager Judgement	1. Any condition in the judgement of the Emergency Director or Recovery Manager that indicates Loss of the FUEL CLAD barrier.	1. Any condition in the judgement of the Emergency Director or Recovery Manager that indicates Potential Loss of the FUEL CLAD barrier.	1. Any condition in the judgement of the Emergency Director or Recovery Manager that indicates Loss of the RCS barrier.	1. Any condition in the judgement of the Emergency Director or Recovery Manager that indicates Potential Loss of the RCS barrier.	1. Any condition in the judgement of the Emergency Director or Recovery Manager that indicates Loss of the PRIMARY CONTAINMENT barrier.	1. Any condition in the judgement of the Emergency Director or Recovery Manager that indicates Potential Loss of the PRIMARY CONTAINMENT barrier.

Circle the X's in the table below for all applicable situations. Declare the EAL based upon all circled X's in any column.

Fission Product Barrier Status Table				FG1: General Emergency				FS1: Site Area Emergency				FA1: Alert				FU1: Notice of Unusual Event			
Modes: 1, 2, 3				Loss Of ANY Two Barriers <u>AND</u> Loss Or Potential Loss Of Third Barrier.				Loss Or Potential Loss Of ANY Two Barriers.				ANY Loss <u>OR</u> ANY Potential Loss Of EITHER Fuel Clad <u>OR</u> RCS.				ANY Loss <u>OR</u> ANY Potential Loss Of Primary Containment			
Fuel Clad – LOSS	X	X		X	X		X	X	X		X	X				X			
Fuel Clad – POTENTIAL LOSS			X			X	X		X		X	X				X			
RCS – LOSS	X	X	X		X		X					X	X			X			
RCS – POTENTIAL LOSS				X		X	X							X	X		X		
Primary Containment – LOSS	X		X	X				X		X		X		X				X	
Primary Containment – POTENTIAL LOSS		X								X		X		X					X

Table F-1  
Max Normal Reactor Building Temperature

RB Area Elevation (ft)		Max Normal Temp (°F)
818	General Area	110
779	General Area	110
749	General Area	110
	RWCU-Pump Room	120
	RWCU-Heat Exch Room	120
	RWCU-Penetration Room	120
719	General Area	110
	Main Steam Line Tunnel	157
683	General Area	110
	HPCI Pipe Routing Area	120
	RCIC Pipe Routing Area	120
670	General Area	110
645	HPCI-Equip Area	120
	HPCI-Emerg Area Cooler	120
645	RCIC-Emerg Area Cooler	120
	RCIC-Equip Area	120
645	RHR Equip Area 1	110
645	RHR Equip Area 2	110
645	CS Pump Room A	110
645	CS Pump Room B	110
645	RB Sump Room	110

Table F-2  
Max Normal Reactor Building Radiation Monitors

	ARM Number		Max Normal Radiation Levels Per EO-000-104
RB Area Elevation (ft)	High Range	Arm Channel Description	
818	49	Refuel Floor Area	Hi Alarm
749	52	RWCU Recirc PP Access	Hi Alarm
	54	Fuel Pool PP Area	
719	50	CRD North	Hi Alarm
	51	CRD South	
670	53	Remote Shutdown Room	Hi Alarm
645	48	HPCI PP & Turbine Room	Hi Alarm
	57	RCIC PP & Turbine Room	
	55	RHR A C PP Room	
	56	RHR B D PP Room	

Table F-3  
Max Safe Reactor Building Temperature

RB Area Elevation (ft)		Max Safe Temp (°F)
818	General Area	120
779	General Area	120
749	General Area	120
	RWCU-Pump Room	147
	RWCU-Heat Exch Room	147
	RWCU-Penetration Room	131
719	General Area	120
	Main Steam Line Tun	177
683	General Area	120
	HPCI Pipe Routing Area	167
	RCIC Pipe Routing Area	167
670	General Area	120
645	HPCI-Equip Area	167
	HPCI-Emerg Area Cooler	167
645	RCIC-Emerg Area Cooler	167
	RCIC-Equip Area	167
645	RHR Equip Area 1	142
645	RHR Equip Area 2	142
645	CS Pump Room A	142
645	CS Pump Room B	142
645	RB Sump Room	125

Table F-4  
Max Safe Reactor Building Radiation Monitors

RB Area Elevation (ft)	ARM Number	High Range	Arm Channel Description	Max Safe Radiation Levels Per EO-000-104 (R/HR)
818	49		Refuel Floor Area	10
749	52		RWCU Recirc PP Access	10
	54		Fuel Pool Pump Area	
719	50		CRD North	10
	51		CRD South	
670	53		Remote Shutdown Room	10
645	48		HPCI PP & Turbine Room	10
	57		RCIC PP & Turbine Room	
	55		RHR A C Pump Room	
	56		RHR B D Pump Room	

---

**RECOGNITION CATEGORY F**

**FISSION PRODUCT BARRIER DEGRADATION**

**BASES**

---

**RECOGNITION CATEGORY F  
FISSION PRODUCT BARRIER DEGRADATION  
FG1 - GENERAL EMERGENCY**

**FG1**        Modes: 1, 2, 3

Loss of ANY Two Barriers

AND

Loss or Potential Loss of Third Barrier

**RECOGNITION CATEGORY F  
FISSION PRODUCT BARRIER DEGRADATION  
FS1 - SITE AREA EMERGENCY**

**FS1**        Modes: 1, 2, 3

Loss Or Potential Loss Of ANY Two Barriers

**RECOGNITION CATEGORY F  
FISSION PRODUCT BARRIER DEGRADATION  
FA1 - ALERT**

**FA1**        Modes: 1, 2, 3

ANY Loss OR ANY Potential Loss of EITHER Fuel Clad OR RCS

**RECOGNITION CATEGORY F  
FISSION PRODUCT BARRIER DEGRADATION  
FU1 -Notification of Unusual Event**

**FU1**        Modes: 1, 2, 3

ANY Loss OR ANY Potential Loss Of Primary Containment



**RECOGNITION CATEGORY F  
FISSION PRODUCT BARRIER DEGRADATION  
FUEL CLAD BARRIER 1.a****IC Reactor Coolant Activity Level****Fuel Clad 1.a** Modes: 1, 2, 3**EAL Threshold Value**

<b>LOSS:</b>	1. Reactor Coolant activity level > 300 $\mu\text{Ci/gm}$ I-131 Dose Equivalent  <u>OR</u>  2. Clad damage calculations indicate > 5% fuel clad damage.
<b>POTENTIAL LOSS:</b>	N/A

**Basis**

Loss 1: The reactor coolant sample activity of 300  $\mu\text{Ci/gm}$  dose equivalent I-131 is an amount well above that expected for iodine spikes. This value corresponds to less than 5% fuel clad damage. This amount of activity represents a loss of the Fuel Clad Barrier.

Loss 2: Specific calculations of clad damage greater than 5% represent a loss of the Fuel Clad Barrier.

There is no equivalent Potential Loss EAL for this item.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, Table 5-F-2.
2. Calculation EC-RADN-0525 Rev 1, "Estimation of Containment High Range Radiation Monitor Response to a Loss of Coolant Accident for Emergency Planning Purposes," December 9, 1999.

**RECOGNITION CATEGORY F  
FISSION PRODUCT BARRIER DEGRADATION  
FUEL CLAD BARRIER 1.b****IC     RPV Level****Fuel Clad 1.b       Modes: 1, 2, 3****EAL Threshold Value**

<b>LOSS:</b>	1. RPV Level < -205"
<b>POTENTIAL LOSS:</b>	1. RPV Level < -161"

**Basis**

**Loss** - This EAL value corresponds to the level which is used in EOPs to preclude significant fuel damage. This value of -205" (Reference 2) is the minimum zero-injection RPV water level and is defined to be the lowest RPV water level at which the covered portion of the reactor core will generate sufficient steam to preclude clad temperature in the uncovered portion of the fuel from exceeding 1800°F. This water level is utilized to preclude significant fuel damage and hydrogen generation for as long as possible.

**Potential Loss** – This EAL value corresponds to the level which is used in EOPs to indicate a challenge to core cooling. This value is -161" (Reference 1) which corresponds to the top of active fuel. This is the minimum value to assure core cooling without further degradation of the clad.

An RPV Level of < -161" corresponds to the EAL for a RCS Barrier Loss (IC RCS 2.b), which is based on RPV water level at the top of the active fuel. Thus, this EAL indicates a Loss of RCS Barrier and a Potential Loss of the Fuel Clad Barrier.

A loss of water level indication due to an electrical problem without other indication of a loss of RPV level would not be considered a loss or potential loss of RPV Level under this EAL. Other indications of loss of RPV level may be a decreasing level trend prior to the loss of RPV level indication, Suppression pool level increases, containment pressure increases, or containment radiation level increases. If there are other confirmatory indications of a loss of level, then the loss of RPV level indication may be considered valid.

This EAL appropriately escalates the emergency class to a Site Area Emergency.

**References**

1. EO-000-102, "RPV Control."
2. EC-EOPC-0510, "Calculation of Work Sheet No 10 RPV Variables for BWROG Emergency Procedure & Severe Accident Guidelines."
3. P&ID M-142 Table 3, "Nuclear Boiler Instrumentation."
4. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, Table 5-F-2.

## RECOGNITION CATEGORY F

**FISSION PRODUCT BARRIER DEGRADATION  
FUEL CLAD BARRIER 1.e****IC Drywell Radiation**

Fuel Clad 1.e Modes: 1, 2, 3

**EAL Threshold Value**

LOSS:	1. Containment High Range Rad Monitor reading > 3000 R/hr
POTENTIAL LOSS:	N/A

**Basis**

Loss - A Containment High Range Radiation Monitor reading of > 3000 R/hr indicates the release of reactor coolant, with elevated activity indicative of fuel damage, into the drywell. The reading is calculated assuming the instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory associated with a concentration of 300  $\mu\text{Ci/gm}$  dose equivalent I-131 into the drywell atmosphere. Reactor coolant concentrations of this magnitude are several times larger than the maximum concentrations (including iodine spiking) allowed within Technical Specifications and are therefore indicative of fuel damage. This value is higher than that specified for RCS barrier Loss EAL 2.e. Thus, this EAL indicates a loss of both Fuel Clad barrier and RCS barrier.

This CHRRM value is calculated in Reference 1 to be 4408 R/hr immediately after shutdown based on 300  $\mu\text{Ci/gm}$  I-131 activity in the coolant (and an equivalent amount of noble gas activity) and 100% release of the coolant to the drywell. This value decreases to 2732 R/hr at one hour after shutdown. This more conservative value is rounded to 3000 R/hr for human factors consideration.

There is no Potential Loss EAL associated with this item.

**References**

1. Calculation EC-RADN-0525 Rev 1, "Estimation of Containment High Range Radiation Monitor Response to a Loss of Coolant Accident for Emergency Planning Purposes," December 9, 1999.
2. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, Table 5-F-2.

**RECOGNITION CATEGORY F  
FISSION PRODUCT BARRIER DEGRADATION  
FUEL CLAD BARRIER 1.f****IC Emergency Director/Recovery Manager Judgement****Fuel Clad 1.f Modes: 1, 2, 3****EAL Threshold Value**

<b>LOSS:</b>	1. Any condition in the judgement of the Emergency Director or Recovery Manager that indicates Loss of the FUEL CLAD barrier.
<b>POTENTIAL LOSS:</b>	1. Any condition in the judgement of the Emergency Director or Recovery Manager that indicates Potential Loss of the FUEL CLAD barrier.

**Basis**

This EAL addresses any other factors that are to be used by the Emergency Director or Recovery Manager in determining whether the Fuel Clad barrier is lost or potentially lost. In addition, the inability to monitor the barrier is also incorporated in this EAL as a factor in Emergency Director / Recovery Manager judgment that the barrier may be considered lost or potentially lost. (See also IC MG1, "Prolonged Loss of All Offsite Power and Prolonged Loss of All Onsite AC Power to Essential Busses", for additional information.)

Fully document your rationale for the declaration in your log after the declaration and notifications are completed.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, Table 5-F-2.

**RECOGNITION CATEGORY F  
FISSION PRODUCT BARRIER DEGRADATION  
REACTOR COOLANT SYSTEM BARRIER 2.b****IC     RPV Level****Reactor Coolant System 2.b     Modes: 1, 2, 3****EAL Threshold Value**

<b>LOSS:</b>	<b>1. RPV Level &lt; -161"</b>
<b>POTENTIAL LOSS:</b>	<b>N/A</b>

**Basis**

Loss – This EAL value corresponds to the level which is used in EOPs to indicate a challenge of core cooling. This value is -161" which corresponds to the top of active fuel. This is the minimum value to assure core cooling without further degradation of the clad.

An RPV Level of < -161" corresponds to the EAL for a Potential Loss of the Fuel Clad Barrier (IC RCS 1.b), which is based on RPV water level at the top of the active fuel. Thus, this EAL indicates a Loss of RCS Barrier and a Potential Loss of the Fuel Clad Barrier.

A loss of water level indication due to an electrical problem without other indication of a loss of RPV level would not be considered a loss or potential loss of RPV Level under this EAL. Other indications of loss of RPV level may be a decreasing level trend prior to the loss of RPV level indication, Suppression pool level increases, containment pressure increases, or containment radiation level increases. If there are other confirmatory indications of a loss of level, then the loss of RPV level indication may be considered valid.

This EAL appropriately escalates the emergency class to a Site Area Emergency.

There is no Potential Loss EAL corresponding to this item.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, Table 5-F-2.

**RECOGNITION CATEGORY F  
FISSION PRODUCT BARRIER DEGRADATION  
REACTOR COOLANT SYSTEM BARRIER 2.c**

**IC    RCS Leak Rate Or Containment Isolation Failure Or Breach/Bypass**

**Reactor Coolant System 2.c    Modes: 1, 2, 3**

**EAL Threshold Value**

<b>LOSS:</b>	<p>1. Unisolable Main Steamline break as indicated by the failure of both MSIVs in any one line to close</p> <p><u>AND</u></p> <p>A. High MSL Flow <u>AND</u> High Steam Tunnel Temperature annunciators</p> <p><u>OR</u></p> <p>B. Direct report of steam release.</p>
<b>POTENTIAL LOSS:</b>	<p>1. Unisolable RCS Leakage &gt; 50 gpm inside Primary Containment.</p> <p><u>OR</u></p> <p>2. Unisolable primary system leakage outside Primary Containment as indicated by:</p> <p>A. Any Reactor Building area exceeds <b>Max Normal Temperature per Table F-1.</b></p> <p><u>OR</u></p> <p>B. Any Reactor Building area exceeds <b>Max Normal Radiation Levels per Table F-2.</b></p>

Table F-1  
Max Normal Reactor Building Temperature

RB Area Elevation (ft)		Max Normal Temp (°F)
818	General Area	110
779	General Area	110
749	General Area	110
	RWCU-Pump Room	120
	RWCU-Heat Exch Room	120
	RWCU-Penetration Room	120
719	General Area	110
	Main Steam Line Tunnel	157
683	General Area	110
	HPCI Pipe Routing Area	120
	RCIC Pipe Routing Area	120
670	General Area	110
645	HPCI-Equip Area	120
	HPCI-Emerg Area Cooler	120
645	RCIC-Emerg Area Cooler	120
	RCIC-Equip Area	120
645	RHR Equip Area 1	110
645	RHR Equip Area 2	110
645	CS Pump Room A	110
645	CS Pump Room B	110
645	RB Sump Room	110



Table F-2  
Max Normal Reactor Building Radiation Monitors

<b>RB Area Elevation (ft)</b>	<b>ARM Number High Range</b>	<b>ARM Channel Description</b>	<b>Max Normal Radiation Levels Per EO-000-104</b>
818	49	Refuel Floor Area	Hi Alarm
749	52 54	RWCU Recirc PP Access Fuel Pool PP Area	Hi Alarm
719	50 51	CRD North CRD South	Hi Alarm
670	53	Remote Shutdown Room	Hi Alarm
645	48 57 55 56	HPCI PP Turbine Room RCIC PP Turbine Room RHR A C PP Room RHR B D PP Room	Hi Alarm

### Basis

An unisolable MSL break is a breach of the RCS barrier. Thus, this EAL is included for consistency with the Alert emergency classification.

When evaluating this EAL for unisolable primary system leakage, it is appropriate to attempt isolation from the Control Room prior to classification. This EAL does not require that the valve isolation function be accomplished through automatic valve closure. If the affected valve can be closed by prompt (within 1-2 minutes) Control Room actions at the time of the event (not at the time of discovery), entry into this EAL is not required. If the affected valves are discovered open an extended time (3-5 minutes) then entry into this EAL should be declared.

Loss 1 - High Steam Flow and High Steam Tunnel Temperature annunciations are both indicators of a Main Steam Line Break. Either parameter will cause an isolation of the MSIV's. Should both valves in any one line fail to isolate, this event would also be considered a Loss of Primary Containment per EAL 3.c and appropriately classified as a Site Area Emergency.

A direct report of steam release from a MSL is meant to provide an alternate means of classification if the High Steam Flow or the High Steam Tunnel Temperature annunciator fails to operate and the visual observation of conditions indicates a Main Steam Line Break in the judgement of the Emergency Director. This is not meant to cause a declaration based on leaks such as valve packing leaks where the offsite consequences would be negligible.

While a loss of condenser vacuum could result in fission products eventually getting to the environment as minor leakage from Turbine seals, etc., the intent of LOSS or POTENTIAL LOSS is that an unisolable steam line break has occurred. A loss of condenser vacuum with the condenser still intact provides a "containment" for fission products being released via the leak path. Should the condenser subsequently fail in a manner that allows large leakage flows, then escalation would be appropriate. Normal LLRT leakage past a closed MSIV is not considered a LOSS or POTENTIAL LOSS.

Potential Loss 1 - The potential loss of RCS 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 uncover is not a significant concern for a 50 gpm leak, however, break propagation leading to significantly larger loss of inventory is possible.

Potential Loss 2 - Potential loss of RCS based on primary system leakage outside the drywell is determined from EO-000-104 area temperatures or radiation levels. EO-000-104 directs the start/restart of appropriate ventilation systems. The EO-000-104 further directs that when area temperatures or radiation levels exceed the Max Normal levels all systems discharging into the area be isolated except those required to support emergency procedure actions or suppress a fire. If it is clearly known that the cause of exceeding the temperature limits is due to a fire then this EAL condition is not met. (The situation should be evaluated under the Fire EALs-Section O.) If the actions taken by EO-000-104 are not successful in isolating the leak or are not expected to be successful, then this entry condition is met. An unisolable leak which is indicated by exceeding a Max Safe alarm setpoint escalates to a Site Area Emergency when the Containment Barrier EAL 3.c is also exceeded and a General Emergency when the Fuel Clad Barrier criteria is also exceeded.

Cycling of SRVs to reduce primary system overpressure is not considered reactor coolant leakage. Inventory loss events, such as a stuck open SRV, venting and draining the RCS during cold shutdown or refueling, should not be considered when referring to "RCS leakage" because they are not indications of a break which could propagate. For these events entry into this EAL is not warranted.

### **References**

1. EO-000-104, "Secondary Containment Control."
2. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, Table 5-F-2.

**RECOGNITION CATEGORY F  
FISSION PRODUCT BARRIER DEGRADATION  
REACTOR COOLANT SYSTEM BARRIER 2.d****IC Drywell Pressure****Reactor Coolant System 2.d Modes: 1, 2, 3****EAL Threshold Value**

<b>LOSS:</b>	1. Drywell Pressure >1.72 psig  <u>AND</u>  Indication of a RCS leak inside drywell
<b>POTENTIAL LOSS:</b>	N/A

**Basis**

Loss - The 1.72 psig drywell pressure is based on the drywell high pressure set point which indicates a LOCA and which causes reactor scram, NSSSS isolations and ECCS initiations. If drywell pressure exceeds 1.72 psig, there is a clear indication that a leak of sufficient magnitude exists that prevents drywell pressure stabilization.

Indication of a RCS leak into the drywell is added to qualify the pressure indication to avoid declaring an emergency for situations where the pressure increase is clearly not due to a primary system leak. For example, an emergency declaration is not appropriate if the high drywell pressure is a result of a loss of drywell cooling. Indication of a leak should be determined by observing other containment indications such as sump level, ambient radiation, ambient temperature, and status of cooling systems.

Cycling of SRVs to reduce primary system overpressure is not considered reactor coolant leakage. Inventory loss events, such as a stuck open SRV, venting and draining the RCS during cold shutdown or refueling, should not be considered when referring to "RCS leakage" because they are not indications of a break which could propagate. For these events entry into this EAL is not warranted.

There is no Potential Loss EAL corresponding to this item.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, Table 5-F-2.

**RECOGNITION CATEGORY F  
FISSION PRODUCT BARRIER DEGRADATION  
REACTOR COOLANT SYSTEM BARRIER 2.e****IC Drywell Radiation****Reactor Coolant System 2.e Modes: 1, 2, 3****EAL Threshold Value**

<b>LOSS:</b>	1. Containment High Range Rad Monitor reading > 10 R/hr
<b>POTENTIAL LOSS:</b>	N/A

**Basis**

Loss - A Containment High Radiation Monitor reading >10 R/hr is a value which indicates the release of reactor coolant to the drywell. The reading is calculated assuming the instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory associated with normal operating concentrations (i.e., within Technical Specifications) into the drywell atmosphere. This reading will be less than that specified for Fuel Clad Barrier EAL 1.e. Thus, this EAL would be indicative of a RCS leak only. If the radiation monitor reading increased to that value specified by Fuel Clad Barrier EAL 1.e, fuel damage would also be indicated.

Reference 1 calculates values of the CHRRM readings to be approximately 2 R/hr assuming an instantaneous release of reactor coolant at normal operating concentrations of I-131 to the drywell atmosphere. Adding this value to the normal CHRRM background readings of 3-5 R/hr and rounding for human factors consideration a value of 10 R/hr is used for this EAL.

There is no Potential Loss EAL associated with this item.

**References**

1. Calculation EC-RADN-0525 Rev 1, "Estimation of Containment High Range Radiation Monitor Response to a Loss of Coolant Accident for Emergency Planning Purposes," December 9, 1991.
2. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, Table 5-F-2.

**RECOGNITION CATEGORY F  
FISSION PRODUCT BARRIER DEGRADATION  
REACTOR COOLANT SYSTEM BARRIER 2.f****IC Emergency Director/Recovery Manager Judgement****Reactor Coolant System 2.f Modes: 1, 2, 3****EAL Threshold Value**

<b>LOSS:</b>	1. Any condition in the judgement of the Emergency Director or Recovery Manager that indicates Loss of the RCS barrier.
<b>POTENTIAL LOSS:</b>	1. Any condition in the judgement of the Emergency Director or Recovery Manager that indicates Potential Loss of the RCS barrier.

**Basis**

This EAL addresses any other factors that are to be used by the Emergency Director or Recovery Manager in determining whether the Reactor Coolant System barrier is lost or potentially lost. In addition, the inability to monitor the barrier is also incorporated in this EAL as a factor in Emergency Director / Recovery Manager judgment that the barrier may be considered lost or potentially lost. (See also IC MG1, "Prolonged Loss of All Offsite Power and Prolonged Loss of All Onsite AC Power to Essential Busses", for additional information.)

Fully document your rationale for the declaration in your log after the declaration and notifications are completed.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, Table 5-F-2.

**RECOGNITION CATEGORY F  
FISSION PRODUCT BARRIER DEGRADATION  
PRIMARY CONTAINMENT BARRIER 3.b****IC     RPV Level****Primary Containment 3.b****Modes: 1, 2, 3****EAL Threshold Value**

<b>LOSS:</b>	N/A
<b>POTENTIAL LOSS:</b>	1. Entry into EP-DS-002, "RPV and Primary Containment Flooding Procedure"

**Basis**

Potential Loss - The entry into the RPV and Primary Containment Flooding emergency procedure indicates reactor vessel water level can not be restored and that a core melt sequence is in progress. EOPs direct the operators to enter RPV and Containment Flooding when Reactor Vessel Level cannot be restored to greater than -161" (top of active fuel) or is unknown. Under the conditions requiring primary containment flooding, the core can not be adequately cooled using all available RPV injection sources. The primary containment is then flooded to submerge the core and any core debris and to preserve containment integrity.

The conditions in this potential loss EAL represent imminent core melt sequences which, if not corrected, could lead to vessel failure and increased potential for containment failure. The condition (s) that warrant entry into EP-DS-002 include the inability to restore and maintain RPV level above -161". Therefore, this condition represents the loss of the RCS barrier and the potential LOSS of the Fuel Clad and Primary Containment barriers. Further degradation of RPV level to -205" would correspond to a LOSS of the Fuel Clad Barrier and result in declaration of a General Emergency-loss of the Fuel Clad and RCS barriers and potential loss of the Primary Containment barrier. If the emergency operating procedures have been ineffective in restoring reactor vessel level above the RCS and Fuel Clad Barrier Threshold Values, there is not a "success" path and a core melt sequence is in progress. Entry into RPV and Containment flooding procedures is a logical escalation in response to the inability to maintain reactor vessel level.

Severe accident analysis (e.g., NUREG-1150) have concluded that function restoration procedures can arrest core degradation with the reactor vessel in a significant fraction of the core damage scenarios, and the likelihood of containment failure is very small in these events. Given this, it is appropriate to provide a reasonable period of time to allow emergency operating procedures to arrest the core melt sequence prior to entering RPV and Containment Flooding. Whether or not the procedures will be effective should be apparent within the time provided. The Emergency Director should make the declaration as soon as it is determined that it is necessary to enter EP-DS-002.

There is no Loss EAL associated with this item.

### **References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, Table 5-F-2.
2. EP-DS-002, "RPV and Primary Containment Flooding."

**RECOGNITION CATEGORY F  
FISSION PRODUCT BARRIER DEGRADATION  
PRIMARY CONTAINMENT BARRIER 3.c****IC    RCS Leak Rate Or Containment Isolation Failure Or Breach/Bypass****Primary Containment 3.c       Modes: 1, 2, 3****EAL Threshold Value**

<b>LOSS:</b>	<p>1. Failure of All automatic isolation valves in any one line penetrating Primary Containment to close resulting from an isolation actuation signal <u>AND</u> a downstream pathway to the environment exists</p> <p><u>OR</u></p> <p>2. Intentional venting per EP-DS-004 is performed.</p> <p><u>OR</u></p> <p>3. Unisolable primary system leakage outside Primary Containment as indicated by:</p> <p style="padding-left: 40px;">A. Two or more Reactor Building areas exceed <b>Max Safe Temperature per Table F-3.</b></p> <p style="padding-left: 40px;"><u>OR</u></p> <p style="padding-left: 40px;">B. Two or more Reactor Building areas exceed <b>Max Safe Radiation Levels per Table F-4.</b></p>
<b>POTENTIAL LOSS:</b>	N/A



Table F-3  
Max Safe Reactor Building Temperature

RB Area Elevation (ft)		Max Safe Temp (°F)
818	General Area	120
779	General Area	120
749	General Area	120
	RWCU-Pump Room	147
	RWCU-Heat Exch Room	147
	RWCU-Penetration Room	131
719	General Area	120
	Main Steam Line Tunnel	177
683	General Area	120
	HPCI Pipe Routing Area	167
	RCIC Pipe Routing Area	167
670	General Area	120
645	HPCI-Equip Area	167
	HPCI-Emerg Area Cooler	167
645	RCIC-Emerg Area Cooler	167
	RCIC-Equip Area	167
645	RHR Equip Area 1	142
645	RHR Equip Area 2	142
645	CS Pump Room A	142
645	CS Pump Room B	142
645	RB Sump Room	125

Table F-4  
Max Safe Reactor Building Radiation Monitors

RB Area Elevation (ft)	ARM Number High Range	ARM Channel Description	Max Safe Radiation Levels Per EO-000-104 (R/HR)
818	49	Refuel Floor Area	10
749	52 54	RWCU Recirc PP Access Fuel Pool PP Area	10
719	50 51	CRD North CRD South	10
670	53	Remote Shutdown Room	10
645	48 57 55 56	HPCI PP & Turbine Room RCIC PP & Turbine Room RHR A C PP Room RHR B D PP Room	10

### Basis

This EAL is intended to cover the inability to isolate the containment when containment isolation is required.

Loss 1 - A failure of all isolation valves in any one line indicates a breach of the Primary Containment integrity. When evaluating this EAL for unisolable primary system leakage, it is appropriate to attempt isolation from the Control Room prior to classification. This EAL does not require that the valve isolation function be accomplished through automatic valve closure. If the affected valve or other containment isolation valve in the same line can be closed by prompt (within 1-2 minutes) Control Room actions at the time of the event (not at the time of discovery), entry into this EAL is not required. If the affected valves are discovered open an extended time (3-5 minutes) this should then be considered a Loss of Primary Containment.

This EAL is intended to cover containment isolation failures allowing a direct flow path to the environment such as a failure of both MSIVs to close with open valves downstream to the turbine or to the condenser. Leakage into a closed system (e.g., RHR, LPCI) is to be considered only if the closed system is breached and thereby creates a path to the environment.

Loss 2 - An intentional venting of primary containment for pressure control per EOPs to the secondary containment and/or the environment is considered a loss of containment. Containment venting for temperature or pressure when not in an accident situation should not be considered a loss of primary containment.

Loss 3 - Loss of Primary Containment based on primary system leakage outside the drywell is determined from EO-000-104 area temperatures or radiation levels. The Emergency Operating Procedures stipulate that when two or more area temperatures or radiation levels exceed the Max Safe levels immediate reactor shutdown is required. An unisolable leak that is indicated by exceeding Max Safe alarm setpoints escalates to a Site Area Emergency because the RCS barrier EAL 2.c is also exceeded. An unisolable leak which is indicated by a exceeding a Max Safe alarm setpoint escalates to a General Emergency when the Fuel Clad Barrier criteria is also exceeded.

There is no Potential Loss EAL associated with this item.

#### References

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, Table 5-F-2.
2. EO-000-104, "Secondary Containment Control."

**RECOGNITION CATEGORY F  
FISSION PRODUCT BARRIER DEGRADATION  
PRIMARY CONTAINMENT BARRIER 3.d****IC Drywell Pressure****Primary Containment 3.d****Modes: 1, 2, 3****EAL Threshold Value**

<b>LOSS:</b>	<b>1. Rapid, unexplained decrease in Drywell Pressure following initial increase in pressure above 1.72 psig.</b>  <b><u>OR</u></b>  <b>2. Drywell Pressure response not consistent with LOCA conditions indicating a containment breach.</b>
<b>POTENTIAL LOSS:</b>	<b>1. Drywell Pressure &gt; 53 psig and increasing.</b>  <b><u>OR</u></b>  <b>2. Drywell Hydrogen or Suppression Chamber Hydrogen &gt; 6% <u>AND</u> Drywell Oxygen or Suppression Chamber Oxygen &gt; 5%.</b>

**Basis**

Loss 1 - Rapid unexplained loss of pressure (i.e., not attributable to drywell spray or condensation effects) following an initial pressure increase indicates a loss of containment integrity. Drywell pressure should increase as a result of mass and energy release into containment from a LOCA. Thus, drywell pressure not increasing under these conditions indicates a loss of containment integrity. The initial rise above 1.72 psig is indicative of a significant leak from the primary system into the drywell.

Loss 2 - This indicator relies on the operators recognition of an unexpected response for the condition and therefore does not have a specific value associated. The unexpected response is important because it is the indicator for a containment breach condition. Drywell pressure should rise as a result of mass and energy release into the containment from a Loss of Coolant Accident (LOCA). Thus, drywell pressure not rising under these conditions indicates a breach of containment integrity.

Potential Loss 1 – A drywell pressure of 53 psig is equal to the containment/drywell design pressure. If the containment design pressure is exceeded this represents a challenge to the containment structure because assumptions used in the accident analysis are no longer valid and an unanalyzed condition exists.

Potential Loss 2 – This EAL is based on determination of explosive mixture in accordance with the EOPs. EO-000-103 requires control of drywell and suppression chamber atmosphere gas concentrations to less than 6% H<sub>2</sub> and less than 5% O<sub>2</sub> to assure that an explosive mixture does not exist.

### References

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, Table 5-F-2.
2. EO-000-103, "Primary Containment Control."

**RECOGNITION CATEGORY F  
FISSION PRODUCT BARRIER DEGRADATION  
PRIMARY CONTAINMENT BARRIER 3.e****IC Drywell Radiation****Primary Containment 3.e****Modes: 1, 2, 3****EAL Threshold Value**

<b>LOSS:</b>	N/A
<b>POTENTIAL LOSS:</b>	1. Containment High Range Rad Monitor reading > 40,000 R/hr.

**Basis**

Potential Loss - A Containment High Range Rad Monitor reading > 40,000 R/hr is a value which indicates significant fuel damage well in excess of that required for loss of RCS and Fuel Clad. A major failure of fuel cladding which allows radioactive material to be released from the core into the reactor coolant could result in a major release of radioactivity requiring offsite protective actions. 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. NUREG-1228, "Source Estimations During Incident Response to Severe Nuclear Power Plant Accidents," indicates that such conditions do not exist when the amount of clad damage is less than 20%. This radiation monitor reading corresponds to 20% fuel clad damage.

This CHRRM value is calculated in Reference 1 to be 4408 R/hr immediately after shutdown based on 300  $\mu\text{Ci/gm}$  I-131 activity in the coolant (and an equivalent amount of noble gas activity) and 100% release of the coolant to the drywell. This value decreases to 2732 R/hr at one hour after shutdown. Correcting this value for the specified 20% fuel clad damage results in a reading of 42754 R/hr. This more conservative value is rounded to 40000 R/hr for human factors consideration.

There is no "Loss" EAL associated with this item.

**References**

1. Calculation EC-RADN-0525 Rev 1, "Estimation of Containment High Range Radiation Monitor Response to a Loss of Coolant Accident for Emergency Planning Purposes," December 9, 1999.
2. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, Table 5-F-2.

**RECOGNITION CATEGORY F  
FISSION PRODUCT BARRIER DEGRADATION  
PRIMARY CONTAINMENT BARRIER 3.f****IC Emergency Director/Recovery Manager Judgement****Primary Containment 3.f Modes: 1, 2, 3****EAL Threshold Value**

<b>LOSS:</b>	1. Any condition in the judgement of the Emergency Director or Recovery Manager that indicates Loss of the Primary Containment barrier.
<b>POTENTIAL LOSS:</b>	1. Any condition in the judgement of the Emergency Director or Recovery Manager that indicates Potential Loss of the Primary Containment barrier.

**Basis**

This EAL addresses any other factors that are to be used by the Emergency Director or Recovery Manager in determining whether the Primary Containment barrier is lost or potentially lost. In addition, the inability to monitor the barrier is also incorporated in this EAL as a factor in Emergency Director / Recovery Manager judgment that the barrier may be considered lost or potentially lost. (See also IC MG1, "Prolonged Loss of All Offsite Power and Prolonged Loss of All Onsite AC Power to Essential Busses", for additional information.)

Fully document your rationale for the declaration in your log after the declaration and notifications are completed.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, Table 5-F-2.



TABLE M - SYSTEM MALFUNCTIONS Rev 0

09/01/03

Page 1 of 3

Category	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	NOTICE OF UNUSUAL EVENT
Loss of AC Power	<p>MG1 Pg M-2 IC Prolonged Loss Of All Offsite Power And Prolonged Loss Of All Onsite AC Power To Essential Busses.</p> <p>Modes: 1, 2, 3</p> <p><u>EAL Threshold Value</u></p> <p>1. Loss of power from Startup Transformer 10 <u>AND</u> 20 to either unit for &gt; 15 minutes.</p> <p><u>AND</u></p> <p>All 4.16 KV ESS Buses on either unit are de-energized.</p> <p><u>AND</u></p> <p>A. Restoration of at least two 4.16 KV ESS Buses on each unit within 4 hours is not likely.</p> <p><u>OR</u></p> <p>B. RPV Water Level &lt;-161".</p>	<p>MS1 Pg M-4 IC Loss Of All Offsite Power And Loss Of All Onsite AC Power To Essential Busses.</p> <p>Modes: 1, 2, 3</p> <p><u>EAL Threshold Value</u></p> <p>1. Loss of power from Startup Transformer 10 <u>AND</u> 20 to either unit for &gt; 15 minutes.</p> <p><u>AND</u></p> <p>All 4.16 KV ESS Buses on either unit are de-energized.</p>	<p>MA1 Pg M-6 IC AC Power Capability To Essential Busses Reduced To A Single Power Source For Greater Than 15 Minutes Such That Any Additional Single Failure Would Result In Station Blackout.</p> <p>Modes: 1, 2, 3</p> <p><u>EAL Threshold Value</u> (1 or 2)</p> <p>1. Loss of power from Startup Transformer 10 <u>AND</u> 20 to either unit for &gt; 15 minutes.</p> <p><u>AND</u></p> <p>Onsite AC power is reduced to a single 4.16 KV ESS Bus on either unit.</p> <p><u>OR</u></p> <p>2. Loss of power from Startup Transformer 10 <u>OR</u> 20 to either unit for &gt; 15 minutes.</p> <p><u>AND</u></p> <p>Onsite AC power is not available.</p>	<p>MU1 Pg M-8 IC Loss Of All Offsite Power To Essential Busses For Greater Than 15 Minutes.</p> <p>Modes: 1, 2, 3</p> <p><u>EAL Threshold Value</u></p> <p>1. Loss of power from Startup Transformer 10 <u>AND</u> 20 to either unit for &gt; 15 minutes.</p>
Loss of DC Power		<p>MS2 Pg M-9 IC Loss Of All Vital DC Power.</p> <p>Modes: 1, 2, 3</p> <p><u>EAL Threshold Value</u></p> <p>1. Loss of all vital DC power to either unit based on less than 105 volts on the 125 VDC main distribution buses 1D612 (2D612), 1D622 (2D622), 1D632 (2D632), <u>AND</u> 1D642 (2D642) for &gt; 15 minutes.</p> <p>NOTE: Buses do not trip on undervoltage condition.</p>		
Failure of Reactor Protection System	<p>MG3 Pg M-10 IC Failure Of The Reactor Protection System To Complete An Automatic Scram Once A Reactor Protection System Setpoint Has Been Exceeded And Manual Scram Was NOT Successful And There Is Indication Of An Extreme Challenge To The Ability To Cool The Core.</p> <p>Modes: 1, 2</p> <p><u>EAL Threshold Value</u></p> <p>1. Indication(s) exist that indicate that Reactor Protection System setpoint was exceeded.</p> <p><u>AND</u></p> <p>RPS, ARI, and Manual Scram/ARI fail to initiate and complete a scram that reduces reactor power to &lt; 5%.</p> <p><u>AND</u></p> <p>A. Reactor water level cannot be maintained &gt; -161".</p> <p><u>OR</u></p> <p>B. The combination of RPV Pressure and Suppression Pool Temperature cannot be maintained below the HCTL curve, Figure M-1.</p> <p>NOTE: Although the HCTL curve is not evaluated in EO-000-103 until the reactor is shutdown, the curve must be used to consider entry into this EAL.</p>	<p>MS3 Pg M-14 IC Failure Of Reactor Protection System To Complete Or Initiate An Automatic Reactor Scram Once A Reactor Protection System Setpoint Has Been Exceeded And Manual Scram Was NOT Successful.</p> <p>Modes: 1, 2</p> <p><u>EAL Threshold Value</u></p> <p>1. Indication(s) exist that indicate that Reactor Protection System setpoint was exceeded.</p> <p><u>AND</u></p> <p>RPS, ARI, and Manual Scram/ARI fail to initiate and complete a scram that reduces reactor power to &lt; 5%.</p>	<p>MA3 Pg M-17 IC Failure Of Reactor Protection System To Complete Or Initiate An Automatic Reactor Scram Once A Reactor Protection System Setpoint Has Been Exceeded And Manual Scram Was Successful.</p> <p>Modes: 1, 2</p> <p><u>EAL Threshold Value</u></p> <p>1. Indication(s) exist that indicate that Reactor Protection System setpoint was exceeded</p> <p><u>AND</u></p> <p>RPS automatic scram did not occur</p> <p><u>AND</u></p> <p>A Manual Scram or ARI Initiates and reduces reactor power to &lt; 5%.</p>	

TABLE M - SYSTEM MALFUNCTIONS Rev 0

09/01/03

Page 2 of 3

Category	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	NOTICE OF UNUSUAL EVENT
Decay Heat Removal		<p>MS4 Pg M-19</p> <p><b>IC Complete Loss Of Heat Removal Capability.</b></p> <p>Modes: 1, 2, 3</p> <p><u>EAL Threshold Value</u></p> <p>1. The combination of RPV Pressure and Suppression Pool Temperature cannot be maintained below the Heat capacity temperature Limit (HCTL) curve, Figure M-1.</p>		
Loss of Annunciators		<p>MS5 Pg M-21</p> <p><b>IC Inability To Monitor A Significant Transient In Progress.</b></p> <p>Modes: 1, 2, 3</p> <p><u>EAL Threshold Value</u></p> <p>1. Loss of <b>MOST</b> or <b>ALL</b> of:</p> <ul style="list-style-type: none"><li>◦ Safety System Annunciators (Table M-3).</li></ul> <p><u>AND</u></p> <ul style="list-style-type: none"><li>◦ Safety Function Annunciators (Table M-4).</li></ul> <p><u>AND</u></p> <ul style="list-style-type: none"><li>◦ A Significant Transient is in progress. (Table M-2).</li></ul> <p><u>AND</u></p> <ul style="list-style-type: none"><li>◦ SPDS, PICSY and other compensatory non-alarming indications are not available.</li></ul>	<p>MA5 Pg M-24</p> <p><b>IC Unplanned Loss Of Most Or All Safety System Annunciation Or Indication In Control Room With Either (1) A Significant Transient In Progress, Or (2) Compensatory Non-Alarming Indicators Are Unavailable for greater than 15 minutes.</b></p> <p>Modes: 1, 2, 3</p> <p><u>EAL Threshold Value</u></p> <p>1. Unplanned loss of <b>MOST</b> or <b>ALL</b> of <b>EITHER</b>:</p> <ul style="list-style-type: none"><li>◦ Safety System Annunciators (Table M-3).</li></ul> <p><u>OR</u></p> <ul style="list-style-type: none"><li>◦ Safety Function Annunciators (Table M-4).</li></ul> <p><u>AND</u></p> <ul style="list-style-type: none"><li>◦ A Significant Transient is in progress. (Table M-2).</li></ul> <p><u>OR</u></p> <ul style="list-style-type: none"><li>◦ SPDS, PICSY and other compensatory non-alarming indications are not available.</li></ul>	<p>MU5 Pg M-27</p> <p><b>IC Unplanned Loss Of Most Or All Safety System Annunciation Or Indication In The Control Room For &gt; 15 Minutes.</b></p> <p>Modes: 1, 2, 3</p> <p><u>EAL Threshold Value</u></p> <p>1. Unplanned loss for &gt; 15 minutes of <b>MOST</b> or <b>ALL</b> of <b>EITHER</b>:</p> <ul style="list-style-type: none"><li>◦ Safety System Annunciators (Table M-3).</li></ul> <p><u>OR</u></p> <ul style="list-style-type: none"><li>◦ Safety Function Annunciators (Table M-4).</li></ul>
Reactor Coolant System Leakage				<p>MU6 Pg M-29</p> <p><b>IC Reactor Coolant System Leakage.</b></p> <p>Modes: 1, 2, 3</p> <p><u>EAL Threshold Value</u> (1 or 2)</p> <p>1. Unidentified primary system leakage &gt; 10 gpm into the drywell.</p> <p><u>OR</u></p> <p>2. Identified primary system leakage &gt; 25 gpm into the drywell.</p>
Fuel Clad Degradation				<p>MU7 Pg M-30</p> <p><b>IC Fuel Cladding Degradation</b></p> <p>Modes: 1, 2, 3</p> <p><u>EAL Threshold Value</u> (1 or 2)</p> <p>1. Reactor coolant activity, determined by sample analysis <math>\geq 4 \mu\text{Ci/gm}</math> of I-131 Dose Equivalent.</p> <p><u>OR</u></p> <p>2. Valid Off-gas Pre-treatment Monitor high high radiation alarm</p>

Category	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	NOTICE OF UNUSUAL EVENT
Loss of Communications				<div>MU8 Pg M-32</div> <div>Unplanned Loss Of All Onsite Or Offsite Communications Capabilities.</div> <div>Modes: 1, 2, 3</div> <div>EAL Threshold Value (1 or 2)</div> <div>1. Unplanned loss of all onsite communications capability per Table M-1 affecting the ability to perform routine operations.</div> <div>OR</div> <div>2. Unplanned loss of all offsite communications capability per Table M-1.</div>
Technical Specifications				<div>MU9 Pg M-34</div> <div>Inability To Reach Required Shutdown Within Technical Specification Limits.</div> <div>Modes: 1, 2, 3</div> <div>EAL Threshold Value</div> <div>1. Plant is not brought to required operating mode within Technical Specifications LCO Action Statement Time.</div>
Inadvertent Criticality				<div>MU10 Pg M-35</div> <div>Inadvertent Criticality.</div> <div>Modes: 3</div> <div>EAL Threshold Value</div> <div>An Unplanned extended positive period observed on nuclear instrumentation.</div>

TABLE M-1

ONSITE/OFFSITE COMMUNICATIONS CAPABILITY

SYSTEM	ONSITE	OFFSITE
UHF Radio	X	
VHF Radio	X	X
ETN (Electronic Tandem Network)	X	X
CTN (Centrex Telephone System)	X	X
FTS-2001 (ENS)		X
Plant PA System	X	
Portable Cellular Telephone		X

Table M-2  
Significant Transients

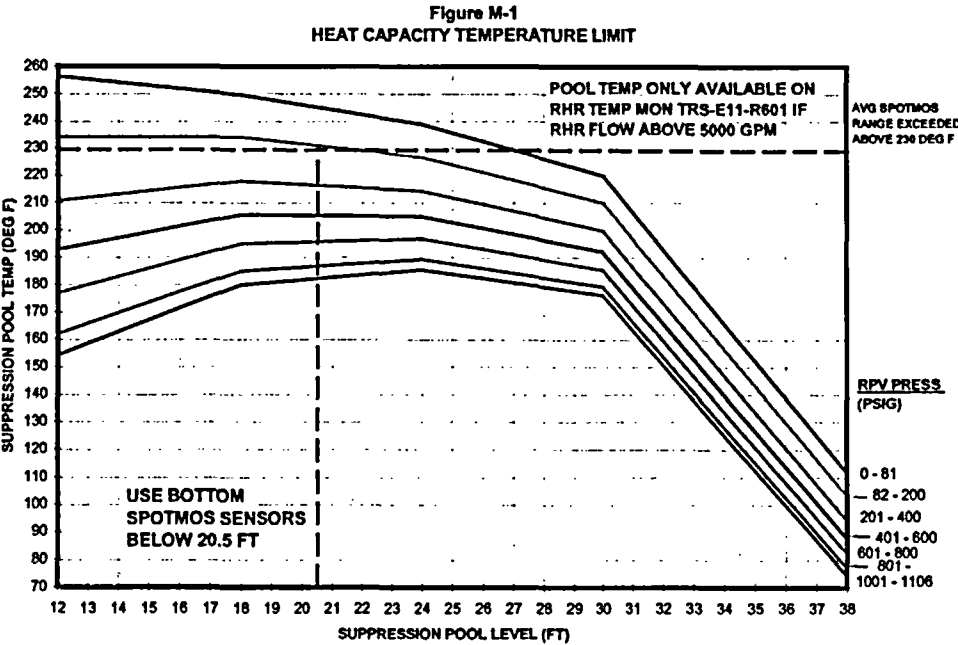
SCRAM
Recirc Runback (>25% thermal power changes)
ECCS Actuations
Stuck open SRVs
Unplanned Thermal Power Changes >15 %

Table M-3  
Safety System Annunciators

ECCS
Containment Isolation
Reactor Trip
Process or Effluent Radiation Monitors
Electrical Distribution/Diesel Generators

Table M-4  
Safety Function Annunciators

Reactor Power
Decay Heat Removal
Containment Safety Functions



---

**RECOGNITION CATEGORY M**

**SYSTEM MALFUNCTIONS**

**BASES**

---

**RECOGNITION CATEGORY M  
SYSTEM MALFUNCTION  
LOSS OF AC POWER  
MG1 – GENERAL EMERGENCY**

**IC Prolonged Loss Of All Offsite Power And Prolonged Loss Of All Onsite AC Power To Essential Busses.**

**MG1 Modes: 1, 2, 3**

**EAL Threshold Value**

1. Loss of power from Startup Transformer 10 AND 20 to either unit for > 15 minutes.

**AND**

All 4.16 kV ESS Buses on either unit are de-energized.

**AND**

- A. Restoration of at least two 4.16 kV ESS Buses on each unit within 4 hours is not likely.

**OR**

- B. RPV Level is < -161".

**Basis**

Loss of all AC power compromises all plant safety systems requiring electric power including RHR, ECCS, Containment Heat Removal and the Ultimate Heat Sink. Prolonged loss of all AC power may lead to loss of fuel clad, RCS, and containment. The 4 hours to restore AC power is based on the station blackout coping analysis.

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 the declaration of a General Emergency occurs as early as is appropriate, based on a reasonable assessment of the event.

With the loss of all AC power sources and indication that fission product barrier degradation has occurred or prompt power restoration is unlikely, the condition of the plant has degraded to the point that a General Emergency classification is warranted.

Based on the Susquehanna SES IPE, it is necessary to restore at least two 4.16 kV ESS buses to avoid jeopardizing decay heat removal and vessel makeup capability. All combinations of two 4.16 kV buses on both units do not result in plant damage unless additional failures exist. Therefore, if two or more 4.16 kV buses cannot be restored within 4 hours it is appropriate to escalate the emergency declaration to the General Emergency level.

The likelihood of restoring at least two emergency buses 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. Although it may be difficult to predict when power can be restored, it is necessary to give the Emergency Director / Recovery Manager a reasonable idea of how quickly (s)he may need to declare a General Emergency based on two major considerations:

1. Are there any present indications that core cooling is already degraded to the point that Loss or Potential Loss of Fission Product Barriers is imminent?
2. If there are no present indications of such core cooling degradation, how likely is it that power can be restored in time to assure that a loss of two barriers with a potential loss of the third barrier can be prevented?

Thus, indication of continuing core cooling degradation must be based on Fission Product Barrier monitoring with particular emphasis on Emergency Director / Recovery Manager judgment as it relates to imminent Loss or Potential Loss of fission product barriers and degraded ability to monitor fission product barriers. Declaration of the General Emergency should be via this EAL.

#### References

1. EC-SBOR-0501 Rev 3 12/04/1998, Coping Assessment During A Station Blackout.
2. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL SG1.

**RECOGNITION CATEGORY M  
SYSTEM MALFUNCTION  
LOSS OF AC POWER (OPERATING)  
MS1 – SITE AREA EMERGENCY**

**IC     Loss Of All Offsite Power And Loss Of All Onsite AC Power To  
Essential Busses.**

**MS1            Modes: 1, 2, 3**

**EAL Threshold Value**

1. Loss of power from Startup Transformer 10 AND 20 to either unit  
for > 15 minutes.

**AND**

All 4.16 kV ESS Buses on either unit are de-energized.

**Basis**

Loss of all AC power compromises all plant safety systems requiring electric power including RHR, ECCS, Containment Heat Removal and the Ultimate Heat Sink. Prolonged loss of all AC power will cause core uncover and loss of containment integrity.

Fifteen minutes has been selected to exclude transient or momentary power losses. However, a Site Area Emergency should be declared in less than 15 minutes if it is expected that the power loss will continue for greater than 15 minutes.

Although loss of 3 of 4 4.16 kV ESS buses on either unit does not meet the threshold for this EAL, the Susquehanna SES IPE states that with only one 4.16 kV bus available either plant damage will occur or the units will be forced to share the same equipment. Thus, for this condition it is important that the Fission Product Barrier matrix be reviewed for possible EAL entry conditions based on actual plant conditions other than loss of AC power.

Based on the Susquehanna SES IPE, it is necessary to restore at least two 4.16 kV ESS buses to avoid jeopardizing decay heat removal and vessel makeup capability. All combinations of two 4.16 kV buses on both units do not result in plant damage unless additional failures exist. Therefore, if two or more 4.16 kV buses cannot be restored within 4 hours it is appropriate to escalate the emergency declaration to the General Emergency level.

Escalation to General Emergency is via Fission Product Barrier Degradation or IC MG1, "Prolonged Loss of All Offsite Power and Prolonged Loss of All Onsite AC Power to Essential Busses."

**References**

1. FSAR Chapter 8 Electrical Power.
2. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL SS1.



**RECOGNITION CATEGORY M  
SYSTEM MALFUNCTION  
LOSS OF AC POWER (OPERATING)  
MA1 – ALERT**

**IC AC Power Capability To Essential Busses Reduced To A Single Power Source For Greater Than 15 Minutes Such That Any Additional Single Failure Would Result In Station Blackout.**

**MA1 Modes: 1, 2, 3**

**EAL Threshold Value (1 or 2)**

1. Loss of power from Startup Transformer 10 AND 20 to either unit for > 15 minutes.

**AND**

Onsite AC power is reduced to a single 4.16 kV ESS Bus on either unit.

**OR**

2. Loss of power from Startup Transformer 10 OR 20 to either unit for > 15 minutes.

**AND**

Onsite AC power is not available.

**Basis**

This IC and the associated EALs are intended to provide an escalation from IC MU1, "Loss of All Offsite Power To Essential Busses for Greater Than 15 Minutes." The condition is a degradation of the offsite and onsite power systems such that any additional single failure would result in a station blackout. This condition could be due to a loss of offsite power with a concurrent failure of all but one of the emergency diesel generators to supply power to the emergency busses. Another related condition could be the loss of all four emergency diesel generators with only one offsite power supply providing power to the emergency busses. The subsequent loss of this single power source would escalate the event to a Site Area Emergency in accordance with IC MS1, "Loss of All Offsite and Loss of All Onsite AC Power to Essential Busses."

If Onsite AC power is reduced to a single 4.16 kV ESS Bus on either unit the Susquehanna SES IPE states that either plant damage will occur or the units will be forced to share the same equipment. Thus, for this condition it is important that the Fission Product Barrier matrix be reviewed for possible EAL entry conditions based on actual plant conditions other than loss of AC power.

Fifteen minutes has been selected to exclude transient or momentary power losses. However, an Alert should be declared in less than 15 minutes if it is expected that the power loss will continue for greater than 15 minutes.

#### **References**

1. FSAR Chapter 8 Electrical Power.
2. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL SA5.

**RECOGNITION CATEGORY M  
SYSTEM MALFUNCTION  
LOSS OF AC POWER  
MU1 –NOTIFICATION OF UNUSUAL EVENT**

**IC     Loss Of All Offsite Power To Essential Busses For Greater Than  
15 Minutes.**

**MU1           Modes: 1, 2, 3**

**EAL Threshold Value**

1. Loss of power from Startup Transformer 10 AND 20 to either unit for > 15 minutes.

**Basis**

Loss of power from Startup Transformers 10 and 20 will cause a reactor trip and result in rendering many BOP systems unavailable to remove heat and cooldown, i.e., the Circulating Water System would be lost which would result in eventual loss of Condenser Vacuum and make the Condenser unavailable for steam dump.

Prolonged loss of 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 (e.g., Station Blackout). Fifteen minutes was selected as a threshold to exclude transient or momentary power losses. However, a Notification of Unusual Event should be declared in less than 15 minutes if it is expected that the power loss will continue for greater than 15 minutes.

Escalation of this event to an Alert is under MA1 "AC Power Capability to Essential Busses Reduced to A Single Power Source for Greater than 15 Minutes Such That Any Additional Single Failure Would Result In Station Blackout." This is based on AC power capability to essential busses reduced to a single power source for greater than 15 minutes such that any additional single failure would result in station blackout MA1.

**References**

1. FSAR Chapter 8 Electrical Power.
2. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL SU1.

**RECOGNITION CATEGORY M  
SYSTEM MALFUNCTION  
LOSS OF DC POWER  
MS2 – SITE AREA EMERGENCY**

**IC     Loss Of All Vital DC Power.**

**MS2            Modes: 1, 2, 3**

**EAL Threshold Value**

1. Loss of all vital DC power to either unit based on less than 105 volts on the 125 VDC main distribution buses 1D612 (2D612), 1D622 (2D622), 1D632 (2D632), AND 1D642 (2D642) for > 15 minutes.

**NOTE:**     Buses do not trip on undervoltage condition.

**Basis**

The DC buses do not have an undervoltage trip. A loss of all DC power on either unit compromises the ability to monitor and control plant functions on that unit. The DC system provides control power to engineered safety features valve actuation, diesel generator auxiliaries, plant alarm and indication circuits as well as the control power for the associated load group. If DC power is lost for an extended period of time (greater than 15 minutes) critical plant functions such as RPS Logic, Alternate Rod Insertion, 4.16KV Breaker Controls, HPCI, RCIC and RHR pump controls, and motor operated valves required to maintain safe plant conditions may not operate. Core uncover with subsequent reactor coolant system and primary containment failure might occur.

Escalation to a General Emergency would occur by Abnormal Rad Levels/Radiological Effluent, Fission Product Barrier Degradation, or Emergency Director Judgment ICs. Fifteen minutes was selected as a threshold to exclude transient or momentary power losses.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL SS3.
2. FSAR Section 8.3.2, "DC Power Systems."
3. ON-102/202-001 - Loss of 125V DC.
4. PPL Drawing No. E107159, "Single Line Meter & Relay Diagram 125 VDC, 250 VDC & 120 VAC Systems."

**RECOGNITION CATEGORY M  
SYSTEM MALFUNCTION  
FAILURE OF REACTOR PROTECTION SYSTEM  
MG3 – GENERAL EMERGENCY**

**IC Failure Of The Reactor Protection System To Complete An Automatic Scram Once A Reactor Protection System Setpoint Has Been Exceeded And Manual Scram Was NOT Successful And There Is Indication Of An Extreme Challenge To The Ability To Cool The Core.**

**MG3 Modes: 1, 2**

**EAL Threshold Value**

1. Indication(s) exist that indicate that Reactor Protection System setpoint was exceeded.

**AND**

RPS, ARI, and Manual Scram/ARI fail to initiate and complete a scram that reduces reactor power to < 5%.

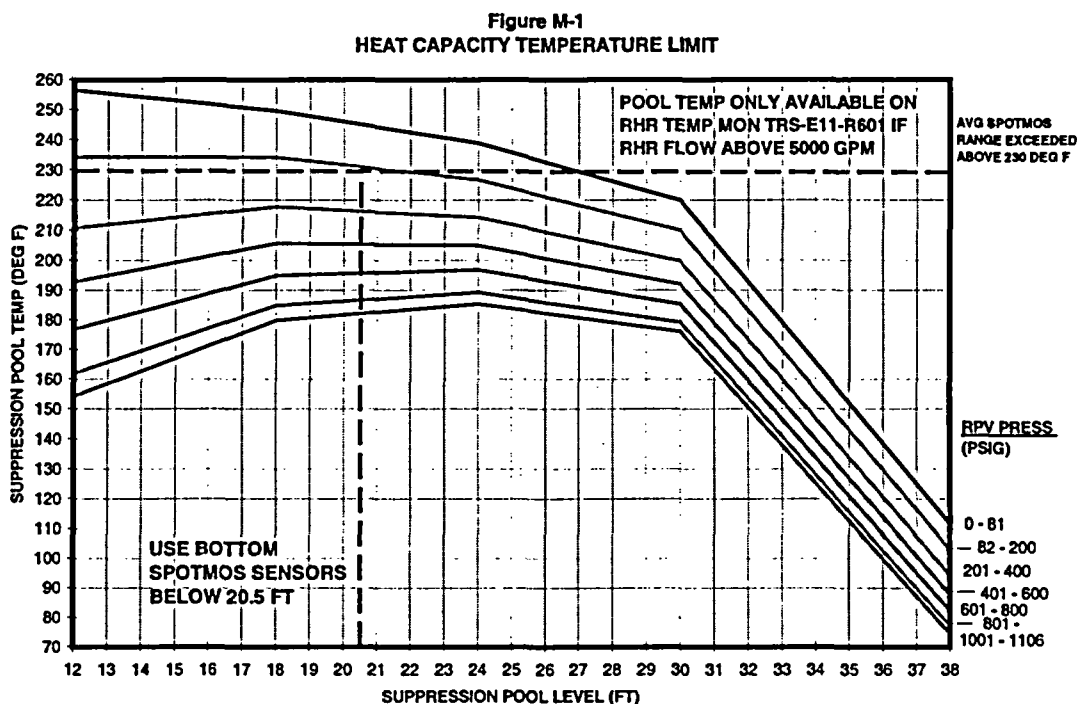
**AND**

- A. Reactor water level cannot be maintained > -161".

**OR**

- B. The combination of RPV Pressure and Suppression Pool Temperature cannot be maintained below the HCTL curve.

**NOTE:** Although the HCTL curve, Figure M-1, is not evaluated in EO-000-103 until the reactor is shutdown, the curve must be used to consider entry into this EAL.



### Basis

This EAL is met if a valid automatic or manual scram signal is present as indicated by control room indications and/or alarms and APRM indication is greater than 5% power. In addition, control room instrumentation indicates that operation cannot be maintained below the HCTL Curve (EO-000-103, Figure 2) or RPV level is < -161 inches. The HCTL curve is exceeded when the combination of temperature and level is above the curves provided. It is considered to be exceeded when pool levels are off of the chart.

A valid automatic and/or manual scram signal is present as indicated by control room indications and/or alarms. 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 failure) or the Control Rod Drive system to permit the control rods to insert (hydraulic failure).

A failure of the Reactor Protection System to shut down the reactor (as indicated by reactor power remaining above 5%) is a degraded plant condition that together with suppression pool temperature approaching 110°F requires the injection of boron to shut down the reactor.

The Emergency Operating Procedures establishes 5% power coincident with loss of scram capability as the initiating condition for various plant responses to ATWS events. With Reactor Power less than 5% the heat being generated in the core can be removed from the RPV and containment while actions are taken to bring the reactor subcritical.

A manual scram is defined as any set of actions by the reactor operator(s) at the reactor control console which causes control rods to be rapidly inserted into the core and brings the reactor subcritical (i.e., mode switch to shutdown, manual scram push buttons, or manual ARI initiation). Taking the mode switch to shutdown as part of the actions required by trip procedure is considered a manual scram action.

While the plant is being shutdown, significant heat is being generated in the core and the heat up rate of the Suppression Pool (due to heat rejection through SRVs) can rise which could approach the Suppression Pool temperature limit prior to shutting down. As the Suppression Pool heat rises towards the limiting temperature, the probability of causing a major over-pressure event rises substantially.

Failure of all automatic and manual trip functions coincident with a high Suppression Pool temperature will place the plant in a condition where reactivity control capability is jeopardized and heat removal capability is severely limited.

RPV level < -161 inches indicates an extreme challenge to the ability to cool the core.

The EO-000-113 establishes 5% power coincident with loss of scram capability as the initiating condition for various plant responses to ATWS events. The timely initiation of Standby Liquid Control (prior to Suppression Pool temperature reaching 110°F) may bring the reactor to < 5 % power before Suppression Pool temperature approaches the heat capacity temperature limit curve limitations.

With reactor power remaining above 5% containment integrity is threatened, as the ability of systems to remove all of the heat transferred to the containment may be exceeded. As the energy contained in the containment rises there may be degradation in the ability to remove heat generated by the "at power" reactor core. There is therefore a potential loss of the containment or the fuel cladding (caused by overheating).

Under ATWS conditions it is important to assure continuous, stable steam condensation capability. An elevated Suppression Pool temperature above the HCTL curve would result in unstable steam condensation should rapid reactor depressurization occur (ADS activation). Maintaining the ability to condense steam will preclude the pressurization of the containment and prevent possible containment failure.

Containment over-pressurization, which would be an eventual result of sustained operation with heat being added to the containment and high Suppression Pool temperature would result in the loss of containment integrity and the inability to remove the heat generated from the fuel. Fuel clad failure would result from the overheating of the fuel.

#### References

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL SG2.
2. EO-000-113, "Level/Power Control."
3. EO-000-102, "RPV Control."
4. IPE Analysis for ATWS, NPE-91-001, December 1991.



**RECOGNITION CATEGORY M  
SYSTEM MALFUNCTION  
FAILURE OF REACTOR PROTECTION SYSTEM  
MS3 – SITE AREA EMERGENCY**

**IC     Failure Of Reactor Protection System To Complete Or Initiate An Automatic Reactor Scram Once A Reactor Protection System Setpoint Has Been Exceeded And Manual Scram Was NOT Successful.**

**MS3            Modes: 1, 2**

**EAL Threshold Value**

1. Indication(s) exist that indicate that Reactor Protection System setpoint was exceeded.

**AND**

RPS, ARI, and Manual Scram/ARI fail to initiate and complete a scram that reduces reactor power to < 5%.

**Basis**

This EAL is not applicable if a manual scram is initiated and no RPS set points are exceeded. Taking the mode switch to shutdown is considered a manual scram action. This may cause an RPS Set point to be exceeded due to the change in Nuclear Instrumentation Scram set point when the mode switch is taken out of the Run position. If the RPS then fails to initiate a scram, then this should be evaluated as an automatic RPS set point being exceeded.

A valid automatic and/or manual scram signal is present as indicated by control room indications and/or alarms. 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 failure) or the Control Rod Drive system to permit the control rods to insert (hydraulic failure).

A failure of the Reactor Protection System to shut down the reactor (as indicated by reactor power remaining above 5%) is a degraded plant condition that together with suppression pool temperature approaching 110°F requires the injection of boron to shut down the reactor.

The Emergency Operating Procedures establishes 5% power coincident with loss of scram capability as the initiating condition for various plant responses to ATWS events. With Reactor Power less than 5% the heat being generated in the core can be removed from the RPV and containment while actions are taken to bring the reactor subcritical.

A manual scram is defined as any set of actions by the reactor operator(s) at the reactor control console which causes control rods to be rapidly inserted into the core and brings the reactor subcritical (i.e., mode switch to shutdown, manual scram push buttons, or manual ARI initiation). Taking the mode switch to shutdown as part of the actions required by trip procedure is considered a manual scram action.

While the plant is being shutdown, significant heat is being generated in the core and the heat up rate of the Suppression Pool (due to heat rejection through SRVs) can rise which could approach the Suppression Pool temperature limit prior to shutting down. As the Suppression Pool heat rises towards the limiting temperature, the probability of causing a major over-pressure event rises substantially.

After an ATWS event, there is a potential that the Main Steam Isolation Valves (MSIV) will remain open. There is additional guidance in the Emergency Operating procedures to ensure that the MSIVs remain open even if RPV level is intentionally lowered to below the normal MSIV isolation level. This situation would allow the plant to remove heat and provide makeup through the normal steam/feed cycle. If this path is not available, or becomes unavailable during the transient, heat rejection will be to the Suppression Pool.

With Standby Liquid Control initiated and with partial or no control rod insertion, there is a possibility that the neutron flux profile in the reactor core may become uneven or distorted. Localized clad damage is possible, if localized power levels rise significantly.

With reactor power remaining above 5% containment integrity is threatened, as the ability of systems to remove all of the heat transferred to the containment may be exceeded. As the energy contained in the containment rises there may be degradation in the ability to remove heat generated by the "at power" reactor core. There is therefore a potential loss of the containment or the fuel cladding (caused by overheating).

This event escalation is based on rising Suppression Pool Temperature or lowering RPV water level that would result in the loss of containment integrity and the inability to remove the heat generated from the fuel per MG3.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL SS2.
2. EO-000-113, "Level/Power Control."
3. EO-000-102, "RPV Control."
4. IPE Analysis for ATWS, NPE-91-001, December 1991.

**RECOGNITION CATEGORY M  
SYSTEM MALFUNCTION  
FAILURE OF REACTOR PROTECTION SYSTEM  
MA3 – ALERT**

**IC    Failure Of Reactor Protection System To Complete Or Initiate An Automatic Reactor Scram Once A Reactor Protection System Setpoint Has Been Exceeded And Manual Scram Was Successful.**

**MA3            Modes: 1, 2**

**EAL Threshold Value**

1. Indication(s) exist that indicate that Reactor Protection System setpoint was exceeded.

**AND**

RPS automatic scram did not occur.

**AND**

A Manual Scram or ARI initiates and reduces reactor power to < 5%.

**Basis**

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 reactor protection system did not function in response to a plant transient and thus plant safety has been compromised, and the design limits of the fuel may have been exceeded. An Alert is indicated because conditions exist that lead to potential loss of fuel clad or RCS.

The Reactor Protection System setpoint being exceeded is specified here because failure of the automatic protection system is the issue.

This EAL is not applicable if a manual scram is initiated and no RPS set points are exceeded. Taking the mode switch to shutdown is considered a manual scram action. This may cause an RPS Set point to be exceeded due to the change in Nuclear Instrumentation Scram set point when the mode switch is taken out of the Run position. If the RPS then fails to initiate a scram, then this should be evaluated as an automatic RPS set point being exceeded.

A manual scram is any set of actions by the reactor operator(s) at the reactor control console which causes control rods to be rapidly inserted into the core and brings the reactor subcritical (e.g., mode switch to shutdown, manual scram push buttons, or manual ARI initiation ).

An alternate means to insert control rods would be required to bring the reactor sub-critical (e.g., manual reactor scram, ARI). Failure of this alternate means and failure to reduce reactor power < 5% would escalate the event to a Site Area Emergency.

#### **References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL SA2.
2. EO-000-113, "Level/Power Control."
3. EO-000-102, "RPV Control."
4. IPE Analysis for ATWS, NPE-91-001, December 1991.

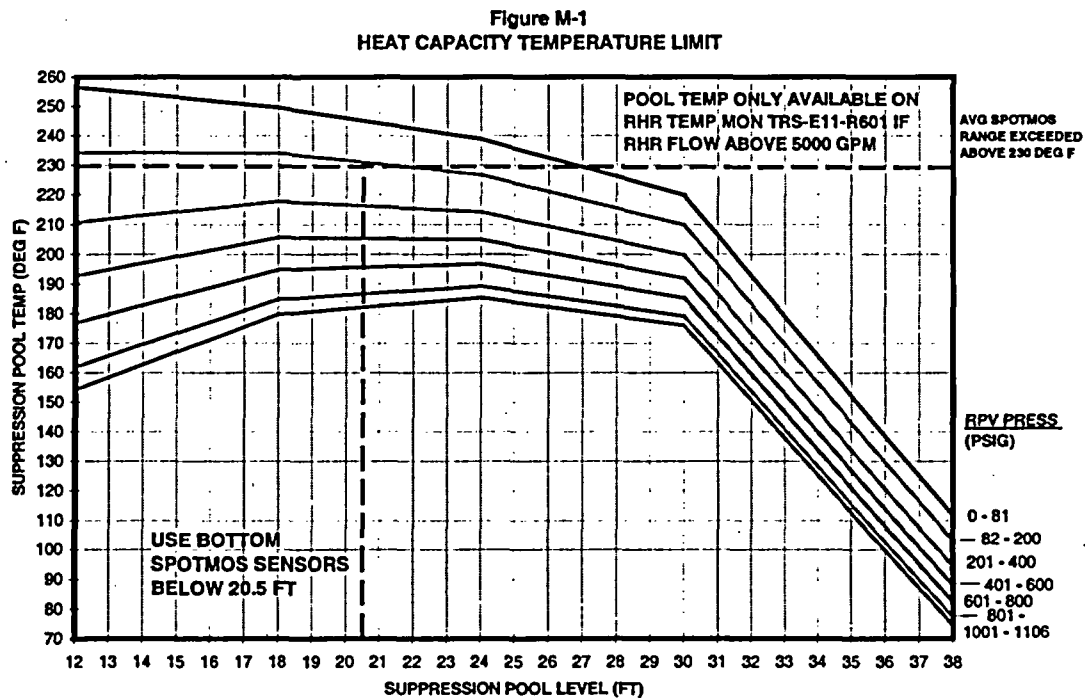
**RECOGNITION CATEGORY M  
SYSTEM MALFUNCTION  
DECAY HEAT REMOVAL  
MS4 – SITE AREA EMERGENCY**

**IC Complete Loss Of Heat Removal Capability.**

**MS4 Modes: 1, 2, 3**

**EAL Threshold Value**

1. The combination of RPV Pressure and Suppression Pool Temperature cannot be maintained below the HCTL curve, Figure M-1.



**Basis**

This EAL addresses complete loss of functions, including ultimate heat sink, required for hot shutdown with the reactor at pressure and temperature. Reactivity control is addressed in other EALs. EO-000-103 requires a rapid RPV depressurization when the Heat Capability Temperature Limit (HCTL) curve is exceeded. The HCTL curve is exceeded when the combination of temperature and level is above the curves provided. It is considered to be exceeded when pool levels are off of the chart.

This EAL is concerned with the combination of suppression pool temperature and level. It is not appropriate to make a Site Area Emergency classification for conditions which direct a RPV Rapid Depressurization other than the condition of exceeding the HCTL limits. If low Suppression Pool level alone directs a RPV Rapid Depressurization, it is not appropriate to make an entry into this EAL. This is because the rapid depressurization is performed prior to reaching those Suppression Pool levels which may cause a loss of containment capability due to uncovering downcomers or excessive SRV tailpipe stresses.

With the limits of the HCTL curve exceeded, there is an actual major failure of a system intended for protection of the public. Thus, declaration of a Site Area Emergency is warranted. Escalation to General Emergency would be via Abnormal Rad Levels / Radiological Effluent, Emergency Director Judgment, or Fission Product Barrier Degradation ICs.

### **References**

1. EO-000-103, "Primary Containment Control."
2. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL SS4.

**RECOGNITION CATEGORY M  
SYSTEM MALFUNCTION  
LOSS OF ANNUNCIATORS  
MS5 – SITE AREA EMERGENCY**

**IC Inability To Monitor A Significant Transient In Progress.**

**MS5 Modes: 1, 2, 3**

**EAL Threshold Value**

**1. Loss of MOST or ALL of:**

- Safety System Annunciators (Table M-3).

**AND**

- Safety Function Annunciators (Table M-4).

**AND**

- A Significant Transient is in progress (Table M-2).

**AND**

- SPDS, PICSY and other compensatory non-alarming indications are not available.

**Basis**

This EAL is intended to recognize the inability of the Control Room staff to monitor the plant response to a transient. When the loss of safety system or safety function annunciators is complicated by a Significant Transient as well as loss of SPDS, PICSY and other indications needed to monitor essential safety functions a Site Area Emergency is considered to exist. This declaration is prudent because the Control Room staff cannot monitor safety functions needed for protection of the public.

"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 an ameliorating factor.



For the purposes of quantification of "most" it is estimated that if approximately 75% of the safety system 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.

The annunciators or indicators for this EAL include those identified in the Alarm Response Procedures (Refer to Table M-3 and M-4), Off-Normal Operating Procedures, Emergency Operating Procedures, and other EALs (e.g., area, process, and/or effluent rad monitors, etc.).

Compensatory non-alarming indications include SPDS, PICSY, plant recorders, or plant instrument displays in the Control Room.

Due to the limited number of safety systems in operation during cold shutdown, refueling and defueled modes, no IC is indicated during these modes of operation.

Escalation to a General Emergency will be based on exceeding parameters for other EALs.

Table M-2  
Significant Transients

SCRAM
Recirc Runback (>25% thermal power changes)
ECCS Actuations
Stuck open SRVs
Unplanned Thermal Power Changes >15 %

Table M-3  
Safety System Annunciators

ECCS
Containment Isolation
Reactor Trip
Process or Effluent Radiation Monitors
Electrical Distribution/Diesel Generators

Table M-4  
Safety Function Annunciators

Reactor Power
Decay Heat Removal
Containment Safety Functions

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL SS6.

<p style="text-align: center;"><b>RECOGNITION CATEGORY M</b> <b>SYSTEM MALFUNCTION</b> <b>LOSS OF ANNUNCIATORS</b> <b>MA5 – ALERT</b></p>
---

**IC     Unplanned Loss Of Most Or All Safety System Annunciation Or Indication In Control Room With Either (1) A Significant Transient In Progress, Or (2) Compensatory Non-Alarming Indicators Are Unavailable for greater than 15 minutes.**

**MA5           Modes: 1, 2, 3**

**EAL Threshold Value**

Unplanned loss of **MOST** or **ALL** of **EITHER**:

- Safety System Annunciators (Table M-3).

OR

- Safety Function Annunciators (Table M-4).

AND

- Significant Transient is in progress (Table M-2).

OR

- SPDS, PICSY and other compensatory non-alarming indications are not available.

**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 transient or when the loss of indicators is complicated by the loss of the SPDS and PICSY. Fifteen minutes was selected as a threshold value to exclude momentary power losses or transients. The declaration of an Alert will ensure that adequate resources are available to monitor and control plant systems so that any further degraded conditions can be detected and responded to.

Unplanned loss of annunciators excludes scheduled maintenance and testing activities.

For the purposes of quantification of "most" it is estimated that if approximately 75% of the safety system 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.

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 is addressed by the Technical Specifications. If the shutdown is not in compliance with the Technical Specification action, the event classification is based on MU9 "Inability to Reach Required Shutdown Within Technical Specification Limits."

The annunciators or indicators for this EAL include those identified in the Alarm Response Procedures (Refer to Table M-3 and M-4), Off-Normal Operating Procedures, in the Emergency Operating Procedures, and in other EALs (e.g., area, process, and/or effluent rad monitors, etc.).

Compensatory non-alarming indications includes SPDS, PICSY, plant recorders, or plant instrument displays in the Control Room.

Due to the limited number of safety systems in operation during cold shutdown, refueling and defueled modes, no IC is indicated during these modes of operation.

This Alert will be escalated to a Site Area Emergency if the operating crew cannot monitor the transient in progress.

Table M-2  
Major Plant Transients

SCRAM
Recirc Runback (>25% thermal power changes)
ECCS Actuations
Stuck open SRVs
Unplanned Thermal Power Changes >15 %

Table M-3  
Safety System Annunciators

ECCS
Containment Isolation
Reactor Trip
Process or Effluent Radiation Monitors
Electrical Distribution/Diesel Generators

Table M-4  
Safety Function Annunciators

Reactor Power
Decay Heat Removal
Containment Safety Functions

#### **References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL SA4.

**RECOGNITION CATEGORY M  
SYSTEM MALFUNCTION  
LOSS OF ANNUNCIATORS  
MU5 –NOTIFICATION OF UNUSUAL EVENT**

**IC      Unplanned Loss Of Most Or All Safety System Annunciation Or  
Indication In The Control Room For > 15 Minutes.**

**MU5            Modes: 1, 2, 3**

**EAL Threshold Value**

Unplanned loss of **MOST** or **ALL** of **EITHER**:

- Safety System Annunciators (Table M-3).

**OR**

- Safety Function Annunciators (Table M-4).

**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. If annunciators are partially or completely lost, it is still possible to use other systems to indicate plant conditions (e.g., SPDS or PICSY). However, it is prudent to declare a Notification of Unusual Event since there is a greater risk that a degraded condition could go undetected. Fifteen minutes was selected as a threshold value to exclude momentary power losses or transients.

For the purposes of quantification of "most" it is estimated that if approximately 75% of the safety system 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.

Unplanned loss of annunciators excludes scheduled maintenance and testing activities.

The annunciators or indicators for this EAL include those identified in the Alarm Response Procedures, Off-Normal Operating Procedures, in the Emergency Operating Procedures, and in other EALs (e.g., area, process, and/or effluent rad monitors, etc.).

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 is addressed by the Technical Specifications. If the shutdown is not in compliance with the Technical Specification action, the event classification is based on MU9 "Inability to Reach Required Shutdown Within Technical Specification Limits."

Due to the limited number of safety systems in operation during cold shutdown, refueling, and defueled modes, no IC is indicated during these modes of operation.

This event will be escalated to an Alert if a transient is in progress during the loss of annunciation or indication.

Table M-3  
Safety System Annunciators

ECCS
Containment Isolation
Reactor Trip
Process or Effluent Radiation Monitors
Electrical Distribution/Diesel Generators

Table M-4  
Safety Function Annunciators

Reactor Power
Decay Heat Removal
Containment Safety Functions

### References

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL SU3.

**RECOGNITION CATEGORY M  
SYSTEM MALFUNCTIONS  
REACTOR COOLANT SYSTEM LEAKAGE  
MU6 –NOTIFICATION OF UNUSUAL EVENT**

**IC     Reactor Coolant System Leakage.**

**MU6           Modes: 1, 2, 3**

**EAL Threshold Value (1 or 2)**

1. Unidentified primary system leakage > 10 gpm into the drywell.

**OR**

2. Identified primary system leakage > 25 gpm into the drywell.

**Basis**

This EAL is included as a Notification of Unusual Event 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.

EAL 1 - The 10 gpm value for the unidentified primary system leakage was selected as it is twice the Technical Specification value, indicating an increase beyond that assumed in the safety analysis. This level of leakage is observable with normal control room indications.

EAL 2 - The EAL for identified leakage is set at a higher value due to the lesser significance of identified leakage in comparison to unidentified primary system leakage. This leakage comes from known, monitored locations such as valve packing and pump seals which do not represent a "leak before break" concern.

Escalation of this IC to the Alert level is via Fission Product Barrier Degradation ICs.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL SU5.



<p style="text-align: center;"><b>RECOGNITION CATEGORY M</b> <b>SYSTEM MALFUNCTIONS</b> <b>FUEL CLAD DEGRADATION</b> <b>MU7 –NOTIFICATION OF UNUSUAL EVENT</b></p>
--

**IC     Fuel Clad Degradation**

**MU7           Modes: 1, 2, 3**

**EAL Threshold Value (1 or 2)**

1. Reactor coolant activity, determined by sample analysis  $\geq 4 \mu\text{Ci/gm}$  of I-131 Dose Equivalent.

**OR**

2. Valid Off-gas Pre-treatment Monitor high high radiation alarm.

**Basis**

This IC is included as a Notification of Unusual Event because it is considered to be a potential degradation in the level of safety of the plant and a potential precursor of more serious problems.

EAL 1 - Coolant samples exceeding the short-term concentration permitted by Technical Specifications are representative of minor fuel cladding degradation. A Notification of Unusual Event is classified because Reactor Coolant Activity levels exceeding Technical Specification limits is considered to be a potential degradation in the level of safety of the plant and a potential precursor of more serious problems. Iodine equivalence is per Technical Specifications definition for Dose Equivalent I-131.

EAL 2 - The Offgas Pre-treatment high high radiation alarm is based on the offgas Technical Specification Limit of 330 millicuries/sec and is representative of minor fuel cladding degradation. A Notification of Unusual Event is classified because the Offgas Pre-treatment high high radiation alarm is considered to be an indication of a potential degradation in the level of safety of the plant and a potential precursor of more serious problems.

Escalation of this IC to the Alert level is via the Fission Product Barrier Degradation Monitoring ICs. Though the referenced Technical Specification limits are mode dependent, it is appropriate that the EAL's be applicable in modes 1, 2 and 3, as they indicate a potential degradation in the level of safety of the plant.

The companion IC to MU7 for the Cold Shutdown/Refueling modes is CU6.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL SU4.
2. Technical Specification 3.4.7, "RCS Specific Activity."

**RECOGNITION CATEGORY M  
SYSTEM MALFUNCTIONS  
LOSS OF COMMUNICATIONS  
MU8 –NOTIFICATION OF UNUSUAL EVENT**

**IC     Unplanned Loss Of All Onsite Or Offsite Communications Capabilities.**

**MU8            Modes: 1, 2, 3**

**EAL Threshold Value (1 or 2)**

1. Unplanned loss of all onsite communications capability per Table M-1 affecting the ability to perform routine operations.

**OR**

2. Unplanned loss of all offsite communications capability per Table M-1.

**Table M-1  
Onsite/Offsite Communications Capability**

<b>SYSTEM</b>	<b>ONSITE</b>	<b>OFFSITE</b>
UHF Radio	X	
VHF Radio	X	X
ETN (Electronic Tandem Network)	X	X
CTN (Centrex Telephone System)	X	X
FTS-2001 (ENS)		X
Plant PA System	X	
Portable Cellular Telephone		X

**Basis**

The purpose of this IC and its associated EALs is to recognize a loss of communications capability that either defeats the plant operations staff's ability to perform routine tasks necessary for plant operations or the ability to communicate problems with offsite authorities.

The availability of one method of ordinary offsite communications is sufficient to inform state and local authorities of plant problems. This EAL is intended to be used only when extraordinary means (e.g., relaying of information from radio transmissions, individuals being sent to offsite locations, etc.) are being utilized to make communications possible.

Table M-1 details the communications systems that must be lost to classify a Notification of Unusual Event.

#### **References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL SU6.

**RECOGNITION CATEGORY M  
SYSTEM MALFUNCTIONS  
TECHNICAL SPECIFICATIONS  
MU9 –NOTIFICATION OF UNUSUAL EVENT**

**IC Inability To Reach Required Shutdown Within Technical Specification Limits.**

**MU9 Modes: 1, 2, 3**

**EAL Threshold Value**

1. Plant is not brought to required operating mode within Technical Specifications LCO Action Statement Time.

**Basis**

Limiting Conditions of Operation (LCOs) require the plant to be brought to a required shutdown mode when the Technical Specification required configuration cannot be restored.

The plant is within its safety envelope when shut down within the allowable action statement time in the Technical Specifications. If the times specified within the action statements are not met, the plant may be placed in an unsafe condition since exceeding the LCO action times puts the unit in an unanalyzed condition. However, if another Technical Specifications provide alternate means of compliance, the Notification of Unusual Event should not be declared unless that action time is exceeded.

A Notification of Unusual Event declaration is required when the plant is not brought to the required operating mode within the allowable action statement times in the Technical Specifications. The declaration is based on the time at which the LCO-specified action statement time period elapses and is not related to how long a plant condition may have existed.

Escalation to higher classifications will be based on exceeding parameters for other System Malfunction, Hazards, or Fission Product Barrier Degradation EALs.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL SU2.

**RECOGNITION CATEGORY M  
SYSTEM MALFUNCTIONS  
INADVERTANT CRITICALITY  
MU10 –NOTIFICATION OF UNUSUAL EVENT**

**IC     Inadvertent Criticality.**

**MU10       Modes: 3**

**EAL Threshold Value**

An Unplanned extended / sustained positive period observed on nuclear instrumentation.

**Basis**

This IC addresses inadvertent criticality events. While the primary concern of this IC is criticality events that occur in Cold Shutdown or Refueling modes (NUREG 1449, Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States), the IC is applicable in other modes in which inadvertent criticalities are possible. This IC indicates a potential degradation of the level of safety of the plant, warranting a Notification of Unusual Event classification. This IC excludes inadvertent criticalities that occur during planned reactivity changes associated with reactor startups (e.g., criticality earlier than estimated). The Cold Shutdown/Refueling IC is CU8.

This condition is identified using period monitors. The terms "extended" and "sustained" are 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.

Escalation would be by the Fission Product Barrier Matrix, as appropriate to the operating mode at the time of the event, or by Emergency Director judgment.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL SU8.

TABLE O – HAZARDS AND OTHER CONDITIONS

09/01/03

Page 1 of 4

Category	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	NOTICE OF UNUSUAL EVENT
Security Events	<p>OG1 Pg O-2 IC Security Event Resulting In Loss Of Physical Control Of The Facility.</p> <p>Mode: ALL</p> <p><u>EAL Threshold Value</u> (1 or 2)</p> <p>1. Loss of physical control of the Control Room due to a security event.</p> <p><u>OR</u></p> <p>2. Loss of physical control of either unit's remote shutdown capability due to a security event.</p>	<p>OS1 Pg O-3 IC Confirmed Security Event In A Plant Vital Area.</p> <p>Mode: ALL</p> <p><u>EAL Threshold Value</u> (1 or 2)</p> <p>1. Intrusion into the plant Vital Area by a Hostile Force as confirmed by the Security or Assistant Security Shift Supervisor.</p> <p><u>OR</u></p> <p>2. Any act of sabotage as confirmed by the Security or Assistant Security Shift Supervisor which results in actual or likely major failures of plant functions needed for protection of the public as judged by the Shift Manager / Emergency Director.</p>	<p>OA1 Pg O-4 IC Confirmed Security Event In A Plant Protected Area.</p> <p>Mode: ALL</p> <p><u>EAL Threshold Value</u> (1 or 2)</p> <p>1. Intrusion into the Protected Area by a Hostile Force as confirmed by the Security or Assistant Security Shift Supervisor.</p> <p><u>OR</u></p> <p>2. Any act of sabotage as confirmed by the Security or Assistant Security Shift Supervisor which results in an actual or potential substantial degradation of the level of safety of the plant as judged by the Shift Manager / Emergency Director.</p>	<p>OU1 Pg O-5 IC Confirmed Security Event Which Indicates A Potential Degradation In The Level Of Safety Of The Plant.</p> <p>Mode: ALL</p> <p><u>EAL Threshold Value</u> (1 or 2 or 3)</p> <p>1. A credible site-specific security threat notification as confirmed by the Security or Assistant Security Shift Supervisor.</p> <p><u>OR</u></p> <p>2. Attempted entry or attempted sabotage as confirmed by the Security or Assistant Security Shift Supervisor of the Owner Controlled Area Adjacent to the Plant.</p> <p><u>OR</u></p> <p>3. Any attempted act of sabotage as confirmed by the Security or Assistant Security Shift Supervisor which is deemed legitimate in the judgment of the Shift Manager / Emergency Director, and affects plant operation or impacts the ISFSI.</p>
Control Room Evacuation		<p>OS2 Pg O-7 IC Control Room Evacuation Has Been Initiated And Plant Control Cannot Be Established.</p> <p>Mode: ALL</p> <p><u>EAL Threshold Value</u> (1 and 2)</p> <p>1. Control room evacuation initiated</p> <p><u>AND</u></p> <p>2. Control of either unit per ON-100(200)-009 at the Remote Shutdown Panels not established within 15 minutes.</p>	<p>OA2 Pg O-8 IC Control Room Evacuation Has Been Initiated.</p> <p>Mode: ALL</p> <p><u>EAL Threshold Value</u></p> <p>1. Control room evacuation initiated per ON-100(200)-009.</p>	

TABLE O – HAZARDS AND OTHER CONDITIONS

09/01/03

Page 2 of 4

Category	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	NOTICE OF UNUSUAL EVENT
Natural or Man-Made Events			<p>IC                      OA3 Pg O-9 Natural And Destructive Phenomena Affecting The Plant Vital Area.</p> <p>Mode: ALL</p> <p><u>EAL Threshold Value</u> (1 or 2 or 3 or 4 or 5 or 6)</p> <p>1. Earthquake at greater than operating basis earthquake (OBE) levels.</p> <p><u>OR</u></p> <p>2. Tornado or sustained high winds of greater than 80 mph within the Protected Area boundary resulting in visible damage to plant Vital Structures. (Table O-2)</p> <p><u>OR</u></p> <p>3. Vehicle crash within Protected Area boundary resulting in visible damage to plant Vital Structures. (Table O-2)</p> <p><u>OR</u></p> <p>4. Turbine failure-generated missiles resulting in any visible damage to or penetration of any plant Vital Structures. (Table O-2)</p> <p><u>OR</u></p> <p>5. Flooding that exceeds the maximum safe water level in two or more Areas of the plant as designated by Table O-1 requiring a reactor shutdown.</p> <p><u>OR</u></p> <p>6. Report of any visible damage to plant Vital Structures (Table O-2) caused by other natural or destructive phenomena.</p>	<p>IC                      OU3 Pg O-13 Natural And Destructive Phenomena Affecting The Protected Area.</p> <p>Mode: ALL</p> <p><u>EAL Threshold Value</u> (1 or 2 or 3 or 4 or 5 or 6)</p> <p>1. Earthquake detected by seismic instrumentation systems.</p> <p><u>OR</u></p> <p>2. Tornado or sustained high winds greater than 70 mph impact on site within the Protected Area.</p> <p><u>OR</u></p> <p>3. Vehicle crash causing damage to plant structures or systems within Protected Area boundary.</p> <p><u>OR</u></p> <p>4. Report by plant personnel of an unanticipated explosion within the Protected Area resulting in visible damage to permanent structures or equipment.</p> <p><u>OR</u></p> <p>5. Report of turbine failure resulting in casing penetration or damage to turbine or generator seals.</p> <p><u>OR</u></p> <p>6. Flooding that exceeds the maximum normal water level in Vital Areas of the plant as designated by Table O-1.</p>
Fire / Explosion			<p>IC                      OA4 Pg O-17 Fire Or Explosion Affecting The Operability Of Plant Safety Systems Required To Establish Or Maintain Safe Shutdown.</p> <p>Mode: ALL</p> <p><u>EAL Threshold Value</u></p> <p>1. ANY of the following are made potentially inoperable due to a fire or explosion:</p> <ul style="list-style-type: none"><li>• 2 or more Safe Shutdown Systems (Table O-3)</li><li>• 2 or more subsystems of a Safe Shutdown System (Table O-3)</li></ul> <p><u>OR</u></p> <p>Plant personnel report visible damage to 1 or more plant Vital Structures (Table O-2) containing Safe Shutdown Equipment.</p>	<p>IC                      OU4 Pg O-20 Fire Within Protected Area Boundary Not Extinguished Within 15 Minutes Of Detection.</p> <p>Mode: ALL</p> <p><u>EAL Threshold Value</u></p> <p>1. Fire in buildings or areas contiguous to any of the following areas not extinguished within 15 minutes of control room notification or verification of a control room alarm:</p> <ul style="list-style-type: none"><li>• Control Structure</li><li>• Diesel Generator Buildings</li><li>• ESSW Pump House</li><li>• Radwaste Building</li><li>• Reactor Buildings</li><li>• Turbine Buildings</li><li>• Interim Spent Fuel Storage Installation (ISFSI)</li></ul>



TABLE O – HAZARDS AND OTHER CONDITIONS

09/01/03

Page 3 of 4

Category	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	NOTICE OF UNUSUAL EVENT
Toxic or Flammable Gases			<p>OA5 Pg O-22  <b>IC Release Of Toxic Or Flammable Gases Within Or Contiguous To A Vital Area Which Jeopardizes Operation Of Safety Systems Required To Establish Or Maintain Safe Shutdown.</b></p> <p>Mode: ALL</p> <p><u>EAL Threshold Value (1 or 2)</u></p> <p>1. Report or detection of toxic gases within or contiguous to a plant Vital Area in concentrations that may result in an atmosphere Immediately Dangerous to Life and Health (IDLH)</p> <p><u>AND.</u></p> <p>Access to this area is required for the safe operation of the plant but personnel are not able to access this area.</p> <p><u>OR</u></p> <p>2. Report or detection of flammable gases within or contiguous to a plant Vital Area in concentrations that will affect the safe operation of the plant.</p>	<p>OU5 Pg O-24  <b>IC Release Of Toxic Or Flammable Gases Deemed Detrimental To Normal Operation Of The Plant.</b></p> <p>Mode: ALL</p> <p><u>EAL Threshold Value (1 or 2)</u></p> <p>1. Report or detection of Toxic or Flammable gases that have or could enter the site boundary in amounts that can affect normal plant operations.</p> <p><u>OR</u></p> <p>2. Report by Local, County or State Officials for evacuation or sheltering of site personnel based on an offsite event.</p>
Discretionary	<p>OG6 O-26  <b>IC Other Conditions Existing Which In The Judgment Of The Emergency Director / Recovery Manager Warrant Declaration Of General Emergency.</b></p> <p>Mode: ALL</p> <p><u>EAL Threshold Value</u></p> <p>1. Other conditions exist which in the judgment of the Emergency Director / Recovery Manager indicate that events are in process or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity. Releases can be reasonably expected to exceed Protective Action Guideline exposure levels offsite for more than the immediate site area.</p>	<p>OS6 Pg O-28  <b>IC Other Conditions Existing which In The Judgment Of The Emergency Director / Recovery Manager Warrant Declaration Of Site Area Emergency.</b></p> <p>Mode: ALL</p> <p><u>EAL Threshold Value</u></p> <p>1. Other conditions exist which in the judgment of the Emergency Director / Recovery Manager indicate that events are in process or have occurred which involve actual or likely major failures of plant functions needed for protection of the public. Releases, if any, are not expected to result in exposure levels which exceed Protective Action Guideline exposure levels beyond the site boundary.</p>	<p>OA6 Pg O-30  <b>IC Other Conditions Existing Which In The Judgment Of The Emergency Director / Recovery Manager Warrant Declaration Of An Alert.</b></p> <p>Mode: ALL</p> <p><u>EAL Threshold Value</u></p> <p>1. Other conditions exist which in the judgment of the Emergency Director / Recovery Manager indicate that events are in process or have occurred which involve actual or likely potential substantial degradation of the level of safety of the plant. Releases, if any, are expected to be limited to small fractions of the Protective Action Guideline exposure levels.</p>	<p>OU6 Pg O-32  <b>IC Other Conditions Existing Which In The Judgment Of The Emergency Director / Recovery Manager Warrant Declaration Of An Unusual Event.</b></p> <p>Mode: ALL</p> <p><u>EAL Threshold Value</u></p> <p>1. Other conditions exist which in the judgment of the Emergency Director / Recovery Manager indicate that events are in process or have occurred which indicate a potential degradation of the level of safety of the plant. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.</p>

Table O-1  
Reactor Building Water Level

RB Area (645 Foot Elevation)	Max Normal Water Level	Max Safe Water Level (inches)
HPCI EQUIPMENT AREA	HI ALARM	27
RCIC EQUIPMENT AREA	HI ALARM	24
RHR PUMP ROOM A	HI ALARM	86
RHR PUMP ROOM B	HI ALARM	86
CS PUMP ROOM A	HI ALARM	24
CS PUMP ROOM B	HI ALARM	24

Table O-2 Plant Vital Structures

- Reactor Buildings
- Control Structure
- Diesel Generator Buildings
- Spray Pond
- ESSW Pump House
- ISFSI
- Security Control Center
- Alternate Security Control Center

Table O-3 Safe Shutdown Systems

- Diesel generators
- HPCI
- RCIC
- Core Spray
- RHR
- 4KV ESS buses
- ESW
- RHR SW
- SBGTS
- ADS
- Remote Shutdown Panels
- DC Vital Buses

---

**RECOGNITION CATEGORY O**

**HAZARDS AND OTHER CONDITIONS**

**BASES**

---

**RECOGNITION CATEGORY O  
HAZARDS AND OTHER CONDITIONS  
SECURITY EVENTS  
OG1 – GENERAL EMERGENCY**

**IC Security Event Resulting In Loss Of Physical Control Of The Facility.**

**OG1 Mode: ALL**

**EAL Threshold Value (1 or 2)**

1. Loss of physical control of the Control Room due to a security event.

**OR**

2. Loss of physical control of either unit's remote shutdown capability due to a security event.

**Basis**

The event represents a condition where a hostile force has taken physical control of areas within either unit required to maintain safety functions and control of that equipment cannot be transferred to and operated from another location. This includes areas that are required to reach and maintain cold shutdown. Loss of remote shutdown capability would occur if the control function of either unit's Remote Shutdown Panels were lost. This loss could be due to physical loss of control or by the damage of Safe Shutdown Systems equipment.

Security events which meet the threshold for declaration of a General Emergency are physical loss of the Control Room or either unit's Remote Shutdown Panels.

This situation leaves either unit in a very unstable condition with a high potential of multiple barrier failures.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL HG1.

**RECOGNITION CATEGORY O  
HAZARDS AND OTHER CONDITIONS  
SECURITY EVENTS  
OS1 – SITE AREA EMERGENCY**

**IC     Confirmed Security Event In A Plant Vital Area.**

**OS1            Mode: ALL**

**EAL Threshold Value (1 or 2)**

1. Intrusion into the plant Vital Area by a Hostile Force as confirmed by the Security or Assistant Security Shift Supervisor.

**OR**

2. Any act of sabotage as confirmed by the Security or Assistant Security Shift Supervisor which results in actual or likely major failures of plant functions needed for protection of the public as judged by the Shift Manager / Emergency Director.

**Basis**

This class of security events represents an escalated threat to plant safety above that contained in the Alert IC in that a Hostile Force has progressed from the Protected Area to a Vital Area. This event represents a threat to the safety of either unit, since there has been a hostile intrusion into the areas of the plant that contain equipment important to maintaining either unit in a safe condition. This EAL is satisfied if physical evidence supporting the hostile intrusion or act in the Vital Area exists.

An act of sabotage against the Interim Spent Fuel Storage Facility Installation (ISFSI) may result in the release of radioactivity. Therefore, acts against the ISFSI meet the criteria of this EAL. Acts against the ISFSI should also be evaluated under the Radiological Effluents EALs for possible escalation to a General Emergency.

Escalation to a General Emergency is based upon the loss of physical control of the Control Room or other areas required to achieve and maintain cold shutdown on either unit.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL HS1.

<p style="text-align: center;"><b>RECOGNITION CATEGORY O</b> <b>HAZARDS AND OTHER CONDITIONS</b> <b>SECURITY EVENTS</b> <b>OA1 – ALERT</b></p>
--

**IC     Confirmed Security Event In A Plant Protected Area.**

**OA1           Mode: ALL**

**EAL Threshold Value (1 or 2)**

1. Intrusion into the Protected Area by a Hostile Force as confirmed by the Security or Assistant Security Shift Supervisor.

**OR**

2. Any act of sabotage as confirmed by the Security or Assistant Security Shift Supervisor which results in an actual or potential substantial degradation of the level of safety of the plant as judged by the Shift Manager / Emergency Director.

**Basis**

This class of security event represents an escalated threat to the level of safety of the plant. This EAL is satisfied if physical evidence supporting the hostile intrusion or act of sabotage exists. A hostile act of sabotage is a confirmed tampering of equipment within the Protected Area and determined to be with malevolent intent. As the intrusion moves closer to Vital Areas of the plant the number of systems and components important to plant safety increases and therefore, additional anticipatory action from the onsite security force and plant operations personnel is warranted.

Malevolent or hostile intent can be indicated by unauthorized possession of weapons, chemical or biological agents, explosives, or unauthorized SSES specific information (e.g., pictures, design drawings, etc. that are not normally available to the public).

Escalation to a Site Area Emergency is based upon a hostile intrusion or act of sabotage in plant Vital Areas or the Interim Spent Fuel Storage Installation (ISFSI).

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL HA4.

**RECOGNITION CATEGORY O  
HAZARDS AND OTHER CONDITIONS  
SECURITY EVENTS  
OU1 –NOTIFICATION OF UNUSUAL EVENT**

**IC      Confirmed Security Event Which Indicates A Potential Degradation In  
The Level Of Safety Of The Plant.**

**OU1            Mode: ALL**

**EAL Threshold Value (1 or 2 or 3)**

1. A credible site-specific security threat notification as confirmed by the Security or Assistant Security Shift Supervisor.

**OR**

2. Attempted entry or attempted sabotage as confirmed by the Security or Assistant Security Shift Supervisor of the Owner Controlled Area Adjacent to the Plant.

**OR**

3. Any attempted act of sabotage as confirmed by the Security or Assistant Security Shift Supervisor which is deemed legitimate in the judgment of the Shift Manager / Emergency Director, and affects plant operation or impacts the ISFSI.

**Basis**

A security threat that is identified as being directed towards the station represents a potential degradation in the level of safety of the plant.

For EAL 1, a threat is considered site specific and credible if:

(1) AND (2 OR 3 OR 4)

1. The threat is specific to SSES.

**AND**

2. Physical evidence supporting the threat exists, OR
3. Information independent from the actual threat message exists and supports the threat, (e.g., the NRC, FBI, or Local Law Enforcement Agencies have determined the threat to be credible), OR

4. A specific group or organization, deemed by Security as having the capability of carrying out the threat, claims responsibility for the threat.
  - The threat must be direct and specific.
  - The threat suggests that definite steps have been taken.
  - The threat may compare closely to other events inside or outside of the nuclear industry.

EAL 2 is entered based upon receipt of a report from Security of either of the following:

(1 OR 2)

1. An attempted entry, with malevolent or hostile intent, of the owner controlled area adjacent to the site, or
2. Attempted sabotage, with malevolent or hostile intent, of the owner-controlled area adjacent to the site.

Malevolent or hostile intent can be indicated by unauthorized possession of weapons, chemical or biological agents, explosives, or unauthorized SSES specific information (e.g., pictures, design drawings, etc. that are not normally available to the public).

Strike action or civil disobedience in which unauthorized personnel have come or remain on-site with the intent of inflicting harm to the plant meet this EAL criteria.

EAL 3 covers an attempted act of sabotage not covered under EALs 1 or 2. For example, it covers acts outside the area adjacent to the plant that can affect plant operation (e.g., a hostile or malevolent act at the River Water Intake Structure, 230 kV switchyard, the Transformer 10 Switchyard, Emergency Operations Facility).

Sabotage also includes acts whose nature is designed to negatively impact plant operations or security of the plant. Some examples would be:

- An unauthorized job action where operations or security personnel walk off the job
- Extortion or a hostage situation in which the demands require taking unsafe plant actions or require violation of the Technical Specifications or Security Plan

### References

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL HU4.
2. NEI Letter, Lynnette Hendricks to Bruce Boger, NRC, December 18, 2001.



**RECOGNITION CATEGORY O  
HAZARDS AND OTHER CONDITIONS  
CONTROL ROOM EVACUATION  
OS2 – SITE AREA EMERGENCY**

**IC     Control Room Evacuation Has Been Initiated And Plant Control Cannot Be Established.**

**OS2            Mode: ALL**

**EAL Threshold Value (1 and 2)**

1. Control room evacuation initiated

AND

2. Control of either unit per ON-100(200)-009 at the Remote Shutdown Panels not established within 15 minutes.

**Basis**

Transfer of safety system control has not been performed in an expeditious manner but it is unknown if any damage has occurred to the fission product barriers. The 15-minute time limit for transfer of control is based on a reasonable time period for personnel to leave the control room, arrive at the remote shutdown areas, and reestablish plant control to preclude core uncover and/or core damage.

The determination of whether or not control is established at the remote shutdown panels is based on Shift Manager / Emergency Director (ED) judgement. The ED is expected to make a reasonable, informed judgement within 15 minutes that control of both units has been established from the remote shutdown panels.

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. Typically, 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 establish a heat sink).

This event will be escalated based upon system malfunctions or damage consequences.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL HS2.

**HAZARDS AND OTHER CONDITIONS  
CONTROL ROOM EVACUATION  
OA2 – ALERT**

**IC Control Room Evacuation Has Been Initiated.**

**OA2 Mode: ALL**

**EAL Threshold Value**

1. Control room evacuation initiated per ON-100 (200)-009.

**Basis**

Control Room evacuation requires establishment of plant control from outside the control room (local control and remote shutdown panel) and support from the Technical Support Center, Alternate Technical Support Center and/or other emergency facilities as necessary. Control Room evacuation represents a serious plant situation since much of the instrumentation, controls and assessment tools available in the Control Room are not accessible at the Remote Shutdown Panel.

Escalation to a Site Area Emergency would be based on control not being established within fifteen (15) minutes.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL HA5.

**RECOGNITION CATEGORY O  
HAZARDS AND OTHER CONDITIONS  
NATURAL OR MAN-MADE EVENTS  
OA3 – ALERT**

**IC Natural And Destructive Phenomena Affecting The Plant Vital Area.**

**OA3 Mode: ALL**

**EAL Threshold Value (1 or 2 or 3 or 4 or 5 or 6)**

1. Earthquake at greater than operating basis earthquake (OBE) levels.

OR

2. Tornado or sustained high winds of greater than 80 mph within the Protected Area boundary resulting in visible damage to plant Vital Structures (Table O-2).

OR

3. Vehicle crash within Protected Area boundary resulting in visible damage to plant Vital Structures (Table O-2).

OR

4. Turbine failure-generated missiles resulting in any visible damage to or penetration of any plant Vital Structures (Table O-2).

OR

5. Flooding that exceeds the maximum safe water level in two or more Areas of the plant as designated by Table O-1 requiring a reactor shutdown.

OR

6. Report of any visible damage to plant Vital Structures (Table O-2) caused by other natural or destructive phenomena.

Table O-1  
Reactor Building Water Level

RB Area (645 Foot Elevation)	Max Normal Water Level	Max Safe Water Level (Inches)
HPCI EQUIPMENT AREA	HI ALARM	27
RCIC EQUIPMENT AREA	HI ALARM	24
RHR PUMP ROOM A	HI ALARM	86
RHR PUMP ROOM B	HI ALARM	86
CS PUMP ROOM A	HI ALARM	24
CS PUMP ROOM B	HI ALARM	24

Table O-2 Plant Vital Structures

- |  |
|--|
| <ul style="list-style-type: none"> <li>• Reactor Buildings</li> <li>• Control Structure</li> <li>• Diesel Generator Buildings</li> <li>• Spray Pond</li> <li>• ESSW Pump House</li> <li>• ISFSI</li> <li>• Security Control Center</li> <li>• Alternate Security Control Center</li> </ul> |
|--|

### Basis

The EALs in this IC escalate from the Notification of Unusual Event EALs in OU3 in that the occurrence of the event has resulted in visible damage to plant Vital Structures or the Interim Spent Fuel Storage Installation (ISFSI). The occurrence of visible damage 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 event to a higher emergency classification will be based on damage consequences covered under other initiating conditions.

EAL 1 - A seismic event that exceeds Operating Basis Earthquake (OBE) levels can cause damage to safety systems. Detection of the event will be based on seismic instrumentation in the control room recording level greater than an Operating Basis Earthquake.

EAL 2 - If a tornado touches down within the Protected Area with high wind velocities, there is a greater potential that damage will occur to plant structures containing systems or functions required for safe shutdown of the units.

If a hurricane or sustained high winds greater than 80 mph impacts the exclusion area with these wind velocities or damages vital plant structures, there is a greater potential that damage will occur to plant structures containing systems or functions required for safe shutdown of either unit.

Sustained Winds are winds whose speed exceeds the specified value for greater than 1 minute. Wind gusts of shorter duration that may occur during a thunderstorm do not meet this criteria.

In order to appropriately classify this event, it is critical that you obtain accurate information concerning any tornado impact. Declaration of an event for hurricane impact is based on wind velocities. Consider the following questions:

- What Vital Structures were impacted by any tornado?
- What is the extent of tornado damage to the Vital structures?
- Are there any signs of a funnel cloud?
- Are there any fires caused by the weather condition? Consider Fire/ Explosion EALs OA4 or OU4.
- Is there any loss of the security fence or security E-fields? Review the Security Plan for impact.

Since tornado wind velocities and classifications are determined by the National Weather Service and that information may not be immediately available to Control Room personnel, it is prudent to declare a Notification of Unusual Event based on EAL OU3.

EAL 3 – This EAL addresses crashes of vehicles that have caused damage to plant Vital Structures including the ISFSI, and thus damage may be assumed to have occurred to safe shutdown systems. No attempt should be made to assess the magnitude of damage to plant Vital Structures prior to classification. The observation of damage to a structure is sufficient to make a declaration. A vehicle crash affecting Vital Structures is intended to cover aircraft, trains and large motor vehicles. Consideration should also be given to the Security Event EALs OU1 through OG1.

In order to appropriately classify this event, it is critical that you obtain accurate information. Consider the following questions:

- What is the location of the crash?
- Is it near a Vital Structure?
- Were any missiles generated due to the crash?
- Were there any injuries?
- Is the crash, missile, etc. impacting normal operations or the ability to safely shutdown the plant?
- Is there fluid leaking? Consider Fire/ Explosion EALs OA4 or OU4 or Toxic/Flammable Gas EALs OA5 or OU5.

EAL 4 – This EAL addresses the threat to safety related equipment imposed by missiles generated by main turbine rotating component failures.

EAL 5 – This EAL addresses the effect of internal flooding that has resulted in degraded performance of systems affected by the flooding, or has created industrial safety hazards that preclude necessary access to operate or monitor safety equipment. The inability to operate or monitor safety equipment represents a potential for substantial degradation of the level of safety of the plant. This flooding may have been caused by internal events such as component failures, equipment misalignment, or outage activity mishaps. Table O-1 is found as Table 10 of EO-000-104.

The lowest grade of the plant site is 670 ft msl (USGS Mean Sea Level datum) which is approximately 175 ft above the Susquehanna SES River flood plain. The controlling flood level, as discussed in FSAR Subsection 2.4.2.2, is 548 ft msl. Consequently, the plant is secure against river flooding.

Safety-related equipment in the ESSW pump house is housed on the operating floor which is at elevation 685.5 ft msl. Flooding can occur only if the water level in the spray pond were to rise to this level which is precluded by the design of the emergency spillway.

EAL 6 – This EAL is used in conjunction with damage that might occur from events described in EALs 1 & 2. Visible structural damage is intended to be indicative of observed physical degradation of a plant structure that has the potential to affect plant safety systems or functions required to establish or maintain cold shutdown. A detailed description or assessment of damage is not intended to be used to meet the intent of this EAL.

### References

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL HA1.
2. EO-000-104, "Secondary Containment Control."

**RECOGNITION CATEGORY O  
HAZARDS AND OTHER CONDITIONS  
NATURAL OR MAN-MADE EVENTS  
OU3 –NOTIFICATION OF UNUSUAL EVENT**

**IC Natural And Destructive Phenomena Affecting The Protected Area.**

**OU3 Mode: ALL**

**EAL Threshold Value (1 or 2 or 3 or 4 or 5 or 6)**

1. Earthquake detected by seismic instrumentation systems.

OR

2. Tornado or sustained high winds greater than 70 mph impact on site within the Protected Area.

OR

3. Vehicle crash causing damage to plant structures or systems within Protected Area boundary.

OR

4. Report by plant personnel of an unanticipated explosion within the Protected Area resulting in visible damage to permanent structures or equipment.

OR

5. Report of turbine failure resulting in casing penetration or damage to turbine or generator seals.

OR

6. Flooding that exceeds the maximum normal water level in Vital Areas of the plant as designated by Table O-1.

Table O-1  
Reactor Building Water Level

RB Area (645 Foot Elevation)	Max Normal Water Level	Max Safe Water Level (inches)
HPCI EQUIPMENT AREA	HI ALARM	27
RCIC EQUIPMENT AREA	HI ALARM	24
RHR PUMP ROOM A	HI ALARM	86
RHR PUMP ROOM B	HI ALARM	86
CS PUMP ROOM A	HI ALARM	24
CS PUMP ROOM B	HI ALARM	24

### Basis

EAL 1 - A seismic event may cause some minor damage to plant structures or systems, but it is not expected to have any impact on overall plant safety functions. The level of the earthquake should be of sufficient magnitude to be either felt by personnel through vibrating ground motion or monitored by the seismic instrumentation. Escalation of this event will be based on seismic instrumentation reading an Operating Basis Earthquake.

EAL 2 - If a tornado or sustained high winds greater than 70 mph impacts within the Protected Area, there is a potential that damage will occur to plant structures containing systems or functions required for safe shutdown of the plant or the Interim Spent Fuel Storage Installation (ISFSI). Since tornado and hurricane wind velocities and classifications are determined by the National Weather Service and that information may not be immediately available to the Control Room personnel, it is prudent to declare a Notification of Unusual Event based on visual observation or report to the Control Room of a tornado or hurricane impacting within the Protected Area. This event will be escalated based on tornado or high wind impacts causing visible damage to plant Vital Structures.

In order to appropriately classify this event, it is critical that you obtain accurate information concerning any tornado impact. Declaration of an event for hurricane impact is based on wind velocities. Consider the following questions:



- What site structures were impacted by any tornado?
- What is the extent of tornado damage to the site structures?
- Are there any signs of a funnel cloud?
- Are there any fires caused by the weather condition? Consider Fire/ Explosion EALs OA4 or OU4.
- Is there any loss of the security fence or security E-fields? Review the Security Plan for impact.

Sustained Winds are winds whose speed exceeds the specified value for greater than 1 minute. Wind gusts of shorter duration that may occur during a thunderstorm do not meet this criteria.

EAL 3 – This EAL addresses crashes of vehicles large enough to cause damage to plant structures within the Protected Area. If the crash is confirmed to affect a plant Vital Structure the event may be escalated. Consideration should also be given to the Security Event EALs OU1 through OG1. A vehicle crash affecting plant structures is intended to cover aircraft, trains and large motor vehicles.

In order to appropriately classify this event, it is critical that you obtain accurate information. Consider the following questions:

- What is the location of the crash?
- Is it near a vital structure?
- Has it impacted a Station Structure?
- What is the extent of damage to Station Structures?
- Were there any missiles generated due to the crash?
- Were there any injuries?
- Is there any evidence that the crash was an act of sabotage?  
CONSIDER EAL 16
- Is the crash, missile, etc. impacting normal operations or the ability to safely shutdown the plant?
- Is there fluid leaking? Consider Fire/ Explosion EALs OA4 or OU4 or Toxic/Flammable Gas EALs OA5 or OU5.

EAL 4 – This EAL addresses only those explosions of sufficient force to damage permanent structures or equipment within the Protected Area. No attempt is made in this EAL to assess the actual magnitude of the damage. The occurrence of the explosion with reports of evidence of damage is sufficient for declaration. Security aspects of the explosion should be considered if applicable.

EAL 5 – 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. Of major concern is the potential for leakage of combustible fluids (used as lubricating oils) and gases (such as hydrogen which is used for generator cooling) to the plant environs. This EAL is consistent with the definition

of a Notification of Unusual Event while maintaining the anticipatory nature desired and recognizing the risk to non-safety equipment. Escalation of the emergency classification is based on potential damage done by missiles generated by the failure or by the radiological releases.

EAL 6 – This EAL addresses the effect of flooding caused by internal events such as component failures, equipment misalignment, or outage activity mishaps. Table O-1 is found as Table 10 of EO-000-104. The threshold value is the entry condition for EO-000-104. Escalation of the emergency classification is based on exceeding the maximum safe water levels in two or more of the areas designated in the EO procedure.

The lowest grade of the plant site is 670 ft msl (USGS Mean Sea Level datum) which is approximately 175 ft above the Susquehanna SES River flood plain. The controlling flood level, as discussed in FSAR 2.4.2.2, is 548 ft msl. Consequently, the plant is secure against river flooding.

Safety-related equipment in the ESSW pumphouse is housed on the operating floor which is at elevation 685.5 ft msl. Flooding can occur only if the water level in the spray pond were to rise to this level which is precluded by the design of the emergency spillway.

#### References

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL HU1.
2. FSAR Section 2.4.1.1, "Site and Facilities."
3. EO-000-104, "Secondary Containment Control."

**RECOGNITION CATEGORY O  
HAZARDS AND OTHER CONDITIONS  
FIRE / EXPLOSION  
OA4 – ALERT**

**IC     Fire Or Explosion Affecting The Operability Of Plant Safety Systems  
Required To Establish Or Maintain Safe Shutdown.**

**OA4                    Mode: ALL**

**EAL Threshold Value**

1. ANY of the following are made potentially inoperable due to a fire or explosion:

- 2 or more Safe Shutdown Systems (Table O-3)
- 2 or more subsystems of a Safe Shutdown System (Table O-3)

**OR**

Plant personnel report Visible Damage to 1 or more plant Vital Structures (Table O-2) containing Safe Shutdown Equipment.

**Basis**

In order to appropriately classify this event, it is critical that you obtain accurate information. Consider the following questions:

- What is the location and magnitude of the fire-particularly near Safe Shutdown Systems or equipment?
- Was there an explosion associated with the event? Consider EAL OA5 or OU5.
- Did the fire or explosion appear to damage or safe shutdown equipment?
- Was there a release of Toxic Gas? Consider EAL OA5 or OU5.

This EAL addresses a Fire / Explosion and not the degradation in performance of affected systems. System degradation is addressed in the System Malfunction EALs. The reference to damage of systems is used to identify the magnitude of the Fire / Explosion and to discriminate against minor Fires / Explosions. The reference to Safe Shutdown Systems and Vital Structures is included to discriminate against Fires / Explosions in areas having a low probability of affecting the ability to establish or maintain safe shutdown. **The significance here is not that a safety system was degraded but the fact that the Fire / Explosion was large enough to cause damage to these systems. A fire**

caused by a malfunction of a safety system lasting more than 15 minutes should be classified under OU4 unless that fire affects the operability of safety systems other than the one that has malfunctioned.

**Explosion** – An explosion is a rapid, violent, unconfined combustion, or a catastrophic failure of pressurized equipment that potentially imparts significant energy to nearby structures and materials.

EAL entry conditions would be:

- 2 or more of the systems listed in Table O-3 are affected by the fire/explosion. For example HPCI and RCIC, etc. If only one system is affected then this EAL entry condition is not met.
- 2 or more subsystems of the systems listed in Table O-3 are affected. For example 2 Diesel Generators or both divisions of RHR. If only one subsystem e.g. one division of RHR is affected then this EAL entry condition is not met.
- Structural damage to the Vital structures listed in Table O-2.

This situation is not the same as removing equipment for maintenance that is covered by a plant's Technical Specifications. Removal of equipment for maintenance is a planned activity controlled in accordance with procedures and, as such, does not constitute a substantial degradation in the level of safety of the plant.

An explosion is a rapid, violent, unconfined combustion, or a catastrophic failure of pressurized equipment that potentially imparts significant energy to nearby structures and materials.

The inclusion of a "report of Visible Damage" 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 occurrence of the Explosion with reports of evidence of damage is sufficient for declaration. The declaration of an Alert and the activation of the Technical Support Center will provide the Emergency Director with the resources needed to perform these damage assessments. The Emergency Director also needs to consider any security aspects of the Explosion, if applicable.

**Table O-2 Plant Vital Structures**

- Reactor Buildings
- Control Structure
- Diesel Generator Buildings
- Spray Pond
- ESSW Pump House
- ISFSI
- Security Control Center
- Alternate Security Control Center

**Table O-3 Safe Shutdown Systems**

Diesel generators  
HPCI  
RCIC  
Core Spray  
RHR  
4KV ESS buses  
ESW  
RHR SW  
SBGTS  
ADS  
Remote Shutdown Panels  
DC Vital Buses

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL HA2.

<p style="text-align: center;"><b>HAZARDS AND OTHER CONDITIONS</b> <b>FIRE / EXPLOSION</b> <b>OU4 –NOTIFICATION OF UNUSUAL EVENT</b></p>
--

**IC     Fire Within Protected Area Boundary Not Extinguished Within  
15 Minutes of Detection.**

**OU4            Mode: ALL**

**EAL Threshold Value**

1. Fire in buildings or areas contiguous to any of the following areas not extinguished within 15 minutes of control room notification or verification of a control room alarm:

- Control Structure
- Diesel Generator Buildings
- ESSW Pump House
- Radwaste Building
- Reactor Buildings
- Turbine Buildings
- Interim Spent Fuel Storage Installation (ISFSI)

**Basis**

In order to appropriately classify this event, it is critical that you obtain accurate information. Consider the following questions:

- What is the location and magnitude of the fire.
- Was there a release of Toxic Gas? Consider EAL OA5 or OU5.

The purpose of this EAL is to address the magnitude and extent of fires that may be potentially significant precursors to damage to safety systems. As used here, *Detection* is visual observation and report by plant personnel or sensor alarm indication. The 15-minute time period begins with a credible notification that a fire is occurring, or indication of a valid fire detection system alarm. Verification of a fire detection system alarm includes actions that can be taken within the control room or other nearby location to ensure that the alarm is not spurious. A verified alarm is assumed to be an indication of a fire unless it is disproved within the 15-minute period by personnel dispatched to the scene. In other words, a personnel report from the scene may be used to disprove a sensor alarm if received within 15 minutes of the alarm, but shall not be required to verify the alarm.

The intent of the 15-minute duration is to size the fire and to discriminate against small fires that are readily extinguished (e.g., smoldering waste paper basket). The fires are those occurring in buildings containing or areas contiguous (in actual contact with or immediately adjacent) to plant Vital areas or other significant buildings or areas. It does not include administration facilities, warehouses, or other small fires that do not potentially affect safety systems. Thus, fires within administration buildings and other small fires of no safety significance are excluded from this EAL.

The event will be escalated to a higher emergency class OA4 if the fire affects the operability of plant safety systems required for the current operating mode.

### **References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL HU2.

<p style="text-align: center;"><b>RECOGNITION CATEGORY O</b> <b>HAZARDS AND OTHER CONDITIONS</b> <b>TOXIC OR FLAMMABLE GAS</b> <b>OA5 – ALERT</b></p>
---

**IC      Release Of Toxic Or Flammable Gases Within Or Contiguous To A  
Vital Area Which Jeopardizes Operation Of Safety Systems Required  
To Establish Or Maintain Safe Shutdown.**

**OA5            Mode: ALL**

**EAL Threshold Value (1 or 2)**

1. Report or detection of toxic gases within or contiguous to a plant Vital Area in concentrations that may result in an atmosphere Immediately Dangerous to Life and Health (IDLH)

**AND.**

Access to this area is required for the safe operation of the plant but personnel are not able to access this area.

**OR**

2. Report or detection of flammable gases within or contiguous to a plant Vital Area in concentrations that will affect the safe operation of the plant.

**Basis**

In order to appropriately classify this event, it is critical that you obtain accurate information. Consider the following questions:

- What is the location of the gas?
- How large an area is affected?
- Is the gas affecting safe operation?
- Could the release of gas be sabotage? CONSIDER EALs OG1 though OU1.
- Are respirators **required** - consider EAL entry.
- Are respirators **prudent** - may not be an EAL entry.
- Where is the gas spreading?
- Is the source isolated?
- Are there any injuries?

This EAL is based on gases that affect the safe operation of either unit and applies to buildings and areas contiguous to plant Vital Areas. The intent is not to include buildings (e.g. warehouses) or other areas that are not contiguous or immediately adjacent to plant Vital Areas.



EAL 1 is met if measurement of toxic gas concentration results in an atmosphere that is IDLH within a VITAL AREA or any area or building contiguous to VITAL AREA and required access to this area to operate safety systems is impeded. An atmosphere that is IDLH may be determined by:

- Direct measurement, or
- Other indication of personal ill effects from exposure, or
- A judgement that respirators must be worn for entry to the area.

Exposure to an IDLH atmosphere will result in immediate harm to unprotected personnel, and would preclude access to any such affected areas. A report or detection of toxic gases within or in the vicinity of a facility in concentrations that present a hazard that is IDLH is a degradation of the level of safety of the plant and warrants the declaration of an Alert.

EAL 2 is met when the flammable gas concentration in a Vital Area or any building or area contiguous to a Vital Area exceed the Lower Flammability Limit. 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 addresses concentrations at which gases can ignite/support combustion. 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. Once it has been determined that an uncontrolled release is occurring, then sampling must be done to determine if the concentration of the released gas is within this range.

Escalation to a higher emergency class, if appropriate, will be based on System Malfunction, Fission Product Barrier Degradation, Abnormal Rad Levels / Radioactive Effluent, or Emergency Director / Recovery Manager Judgment ICs.

### References

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL HA3.

**RECOGNITION CATEGORY O  
HAZARDS AND OTHER CONDITIONS  
TOXIC OR FLAMMABLE GAS  
OU5 -NOTIFICATION OF UNUSUAL EVENT**

**IC     Release Of Toxic Or Flammable Gases Deemed Detrimental To Normal Operation Of The Plant.**

**OU5            Mode: ALL**

**EAL Threshold Value (1 or 2)**

1. Report or detection of Toxic or Flammable gases that have or could enter the site boundary in amounts that can affect normal plant operations.

**OR**

2. Report by Local, County or State Officials for evacuation or sheltering of site personnel based on an offsite event.

**Basis**

In order to appropriately classify this event, it is critical that you obtain accurate information. Consider the following questions:

- What is the location of the gas?
- How large an area is affected?
- Is the gas affecting safe operation?
- Could the release of gas be sabotage? CONSIDER EALs OG1 though OU1.
- Are respirators **required** - consider EAL entry.
- Are respirators **prudent** - may not be an EAL entry.
- Where is the gas spreading?
- Is the source isolated?
- Are there any injuries?

EAL 1 is based on the existence of uncontrolled releases of toxic or flammable gasses that are within, or may enter, the site boundary and affect normal plant operations. It is intended that releases of toxic or flammable gases are of sufficient quantity, and the release point of these gases is such that normal plant operations would be affected. This would preclude small or incidental releases, or releases that do not impact structures or personnel needed for plant operation. For example, normal venting at the offsite hydrogen and oxygen tank farm are excluded. This EAL is not intended to require significant assessment or quantification. This EAL assumes an uncontrolled process that has the potential

to affect plant operations or personal safety. Examples would include events such as chemical spills which prevent security or firewatch personnel from performing their required rounds, and toxic or flammable gas releases resulting from motor vehicle accidents which require use of the Control Room Emergency Outside Air Supply System.

EAL 2 addresses a report from offsite officials that events are in progress which will affect the normal operation of the plant because the plant is within the evacuation area of an offsite event. Site personnel include any affected personnel within the Protected Area. This EAL addresses the release of material from an off-site source that may affect the health of plant personnel or affect the safe operation of either unit or if the release is such that a portion of the SSES site falls within the evacuation zone for the material being released.

Escalation to an Alert is based on toxic or flammable gases within or contiguous to a plant Vital Area that jeopardizes the operation of systems required to establish or maintain safe shutdown.

#### References

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL HU3.

**RECOGNITION CATEGORY O  
HAZARDS AND OTHER CONDITIONS  
DISCRETIONARY  
OG6 – GENERAL EMERGENCY**

**IC Other Conditions Existing Which In The Judgment Of The Emergency Director / Recovery Manager Warrant Declaration Of General Emergency.**

**OG6 Mode: ALL**

**EAL Threshold Value**

1. Other conditions exist which in the judgment of the Emergency Director / Recovery Manager indicate that events are in process or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity. Releases can be reasonably expected to exceed Protective Action Guideline exposure levels offsite for more than the immediate site area.

**Basis**

This EAL provides the Emergency Director, or the Recovery Manager the flexibility to declare a General Emergency if in their judgement unanticipated conditions not explicitly covered elsewhere warrant declaration of a General Emergency. The declaration of a General Emergency indicates that there is a very high probability that the fuel has been damaged and the loss of containment integrity is possible or other conditions exist that may result in a release to the environment that may result in doses greater than the EPA Protective Action Guidelines at distances beyond the emergency plan boundary.

To assess if an emergency event can be declared using the general criteria, review other EALs and determine if the specific situation is comparable in severity to a General Emergency under other EALs.

Another situation that might result in a General Emergency declaration could be a situation where there are multiple independent events occurring but none of the events individually would require a General Emergency declaration. However, the combination of those independent events might represent degradation in the level of safety of the plant that may indicate that a General Emergency declaration is appropriate.

All emergency classifications shall be made within 15 minutes of having information necessary to make a declaration.

Fully document your rationale for the declaration in your log after the declaration and notifications are completed.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL HG2.

**RECOGNITION CATEGORY O  
HAZARDS AND OTHER CONDITIONS  
DISCRETIONARY  
OS6 – SITE AREA EMERGENCY**

**IC Other Conditions Existing Which In The Judgment Of The Emergency Director / Recovery Manager Warrant Declaration Of Site Area Emergency.**

**OS6 Mode: ALL**

**EAL Threshold Value**

1. Other conditions exist which in the judgment of the Emergency Director / Recovery Manager indicate that events are in process or have occurred which involve actual or likely major failures of plant functions needed for protection of the public. Releases, if any, are not expected to result in exposure levels which exceed Protective Action Guideline exposure levels beyond the site boundary.

**Basis**

This EAL allows the Emergency Director, or the Recovery Manager to declare a Site Area Emergency upon determination of an actual or likely major failure of plant functions needed for protection of the public, but which is not explicitly addressed by other EALs.

Releases are not expected to result in exposure levels, which exceed the EPA Protective Action Guidelines, except within the site boundary and will be classified under EAL RS1, "Radiological Effluent."

Escalation to a General Emergency will be based on core degradation or melting with a potential loss of containment integrity, or a release off-site that exceeds EPA PAGs.

This does not mean that there must be a release in progress. It only means that any releases will be below Protective Action Guideline Levels except inside the EPB. Any releases would be evaluated against the criteria of EAL 15 Radiological Effluent.

To assess if an emergency event can be declared using the general criteria, review other EALs and determine if the specific situation is comparable in severity to other EAL's.

Another situation that might result in a Site Area Emergency declaration could be a situation where there are multiple independent events occurring but none of the events individually would require a Site Area Emergency declaration. However, the combination of those independent events might represent degradation in the level of safety of the plant that may indicate that a Site Area Emergency declaration is appropriate.

All emergency classifications shall be made within 15 minutes of having information necessary to make a declaration.

Fully document your rationale for the declaration in your log after the declaration and notifications are completed.

Escalation to a General Emergency will be based on core degradation or melting with a potential loss of containment integrity, or a release off-site that exceeds EPA PAGs (see EAL 15.0).

#### **References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL HS3.

**RECOGNITION CATEGORY O  
HAZARDS AND OTHER CONDITIONS  
DISCRETIONARY  
OA6 – ALERT**

**IC Other Conditions Existing Which In The Judgment Of The Emergency Director / Recovery Manager Warrant Declaration Of An Alert.**

**OA6 Mode: ALL**

**EAL Threshold Value**

1. Other conditions exist which in the judgment of the Emergency Director / Recovery Manager indicate that events are in process or have occurred which involve actual or likely potential substantial degradation of the level of safety of the plant. Releases, if any, are expected to be limited to small fractions of the Protective Action Guideline exposure levels.

**Basis**

This EAL allows the Emergency Director / Recovery Manager to declare an Alert upon the determination that the level of safety of the plant has substantially degraded but is not explicitly addressed by other EALs.

Releases, if any, are expected to be limited to a small fraction of the EPA Protective Action Guidelines and will be classified under EAL RA1, "Radiological Effluent."

Escalation to a Site Area Emergency will be based on actual or likely major failures in plant functions.

This does not mean that there must be a release in progress. It only means that any releases will be well below Protective Action Guideline Levels. Any releases would be evaluated against the criteria of EAL 15 Radiological Effluent.

To assess if an emergency event can be declared using the general criteria, review other EALs and determine if the specific situation is comparable in severity to other EAL's.

Another situation that might result in an Alert declaration could be a situation where there are multiple independent events occurring but none of the events individually would require an Alert declaration. However, the combination of those independent events might represent degradation in the level of safety of the plant that may indicate that an Alert declaration is appropriate.



All emergency classifications shall be made within 15 minutes of having information necessary to make a declaration.

Fully document your rationale for the declaration in your log after the declaration and notifications are completed.

Escalation to a Site Area Emergency will be based on actual or likely major failures in plant functions.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL HA6.

**RECOGNITION CATEGORY O  
HAZARDS AND OTHER CONDITIONS  
DISCRETIONARY  
OU6 –NOTIFICATION OF UNUSUAL EVENT**

**IC Other Conditions Existing Which In The Judgement Of The Emergency Director / Recovery Manager Warrant Declaration Of A Notification of Unusual Event.**

**OU6 Mode: ALL**

**EAL Threshold Value**

1. Other conditions exist which in the judgment of the Emergency Director / Recovery Manager indicate that events are in process or have occurred which indicate a potential degradation of the level of safety of the plant. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.

**Basis**

This EAL allows the Emergency Director / Recovery Manager to declare a Notification of Unusual Event upon the determination that the level of safety of the plant has degraded but is not explicitly addressed by other EALs.

Releases of radioactive materials requiring offsite response or monitoring are not expected to occur at this level unless further degradation of safety systems occurs. However, if one does occur, it will be classified under Abnormal Rad Levels / Radiological Effluents.

To assess if an emergency event can be declared using the general criteria, review other EALs and determine if the specific situation is comparable in severity to other EAL's.

Another situation that might result in an Unusual Event declaration could be a situation where there are multiple independent events occurring but none of the events individually would require an event declaration. However, the combination of those independent events might represent degradation in the level of safety of the plant that may indicate that an Unusual Event declaration is appropriate.

Escalation to an Alert would be based on an actual degradation of plant safety systems.

All emergency classifications shall be made within 15 minutes of having information necessary to make a declaration.

Fully document your rationale for the declaration in your log after the declaration and notifications are completed.

From a broad perspective, one area that may warrant Emergency Director /Recovery Manager judgment is related to likely or actual breakdown of site-specific event mitigating actions. Examples to consider include inadequate emergency response procedures, transient response either unexpected or not understood, failure or unavailability of emergency systems during an accident in excess of that assumed in accident analysis, or insufficient availability of equipment and/or support personnel.

### **References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL HU5.

Category	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	NOTICE OF UNUSUAL EVENT
Dry Fuel Storage				<div>EU1 Pg E-2</div> <div>IC      Damage to a loaded cask confinement boundary.</div> <div>Mode: N/A</div> <div>EAL Threshold Value (1 or 2 or 3)</div> <div>1. From the point the cask is being lowered from the refuel floor, situations are occurring or have occurred during the transport of the irradiated spent fuel to the onsite storage facility, which jeopardize the integrity of the spent fuel or its container as indicated by:<div>A. Radiological readings exceed 2 R/hour at the external surface of any transfer cask or horizontal storage module.</div><div>OR</div><div>B. Radiological readings exceed 1 R/hour one foot away from the external surface of any transfer cask or horizontal storage module.</div><div>OR</div><div>2. Situations are occurring or have occurred at the irradiated spent fuel storage facility, which jeopardize the integrity of the dry cask storage system as indicated by:<div>A. Radiological readings exceed 2 R/hour at the external surface of any transfer cask or horizontal storage module.</div><div>OR</div><div>B. Radiological readings exceed 1 R/hour one foot away from the external surface of any transfer cask or horizontal storage module.</div><div>OR</div><div>3. Any condition in the judgement of the Emergency Director / Recovery Manager that indicates loss of loaded fuel storage cask integrity.</div></div></div>

---

**RECOGNITION CATEGORY E**

**ISFSI MALFUNCTIONS  
BASES**

---

**RECOGNITION CATEGORY E  
ISFSI MALFUNCTIONS  
DRY FUEL STORAGE  
EU1 -NOTIFICATION OF UNUSUAL EVENT**

**IC     Damage to a loaded cask confinement boundary.**

**EU1                      Mode: NONE**

**EAL Threshold Value (1 or 2 or 3)**

1. From the point the cask is being lowered from the refuel floor, situations are occurring or have occurred during the transport of the irradiated spent fuel to the onsite storage facility, which jeopardize the integrity of the spent fuel or its container as indicated by:

- A. Radiological readings exceed 2 R/hour at the external surface of any transfer cask or horizontal storage module.

**OR**

- B. Radiological readings exceed 1 R/hour one foot away from the external surface of any transfer cask or horizontal storage module.

**OR**

2. Situations are occurring or have occurred at the irradiated spent fuel storage facility, which jeopardize the integrity of the dry cask storage system as indicated by:

- A. Radiological readings exceed 2 R/hour at the external surface of any transfer cask or horizontal storage module.

**OR**

- B. Radiological readings exceed 1 R/hour one foot away from the external surface of any transfer cask or horizontal storage module.

**OR**

3. Any condition in the judgement of the Emergency Director / Recovery Manager that indicates loss of loaded fuel storage cask integrity.

**Basis**

This EAL applies to potential emergency conditions, which might develop during the transport of irradiated spent fuel to the Independent Spent Fuel Storage Installation an, or to emergency conditions resulting from natural phenomena or other accident conditions affecting a loaded fuel storage cask or dry fuel storage module. This EAL provides for a Notification of Unusual Event classification, which may be entered in the event that conditions occur during transportation that have the potential for damaging or degrading the fuel, but no releases of radioactive material requiring offsite response or monitoring are expected.

It must be confirmed that the readings reflect dose rates from material inside the cask or storage module and not from discrete radioactive particles on the outside surface.

Escalations above the Notification of Unusual Event are not warranted due to lack of a threat for conditions warranting a declaration of Alert or higher classification. Multiple cask failures could result in radiological conditions warranting evaluation under EAL for Radiological Effluents. Security events impacting the spent fuel storage facility would be evaluated under Security Events EALs.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL E-HU1.
2. NEP Technical Basis 99-001, Dry Cask Storage Facility EAL, August 2, 1999.

TABLE C - COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS Rev 0

09/01/03

Page 1 of 3

Category	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	NOTICE OF UNUSUAL EVENT
Loss of AC Power			<p>CA1 Pg C-2 IC Loss Of All Offsite Power And Loss Of All Onsite AC Power To Essential Busses.</p> <p>Modes: 4, 5, D</p> <p><u>EAL Threshold Value</u></p> <p>1. Loss of power from Startup Transformer 10 <u>AND</u> 20 to either unit for &gt; 15 minutes.</p> <p><u>AND</u></p> <p>All 4.16 KV ESS Buses on either unit are de-energized.</p>	<p>CU1 Pg C-3 IC Loss Of All Offsite Power To Essential Busses For Greater Than 15 Minutes.</p> <p>Modes: 4, 5</p> <p><u>EAL Threshold Value</u></p> <p>1. Loss of power from Startup Transformer 10 <u>AND</u> 20 to either unit for &gt; 15 minutes.</p>
Loss of DC Power				<p>CU2 Pg C-4 IC Unplanned Loss Of Required DC Power For Greater Than 15 Minutes.</p> <p>Modes: 4, 5</p> <p><u>EAL Threshold Value</u></p> <p>1. Unplanned loss of all vital DC power to either unit based on less than 105 volts on the 125 VDC main distribution buses 1D612 (2D612), 1D622 (2D622), 1D632 (2D632), <u>AND</u> 1D642 (2D642) for &gt; 15 minutes.</p> <p>Note: Buses do not trip on undervoltage condition.</p>
Decay Heat Removal			<p>CA3 Pg C-5 IC Inability To Maintain Plant In Cold Shutdown With Irradiated Fuel In The RPV.</p> <p>Modes: 4, 5</p> <p><u>EAL Threshold Value</u> (1 or 2 or 3)</p> <p>1. With Secondary Containment and RCS Integrity<sup>1</sup> not established an Unplanned event results in RCS temperature &gt; 200°F.</p> <p><u>OR</u></p> <p>2. With Secondary Containment established and RCS Integrity<sup>1</sup> not established an Unplanned event results in RCS temperature &gt; 200°F for &gt; 20 minutes<sup>2</sup>.</p> <p><u>OR</u></p> <p>3. With RCS integrity<sup>1</sup> established an Unplanned event results in RCS temperature &gt; 200°F for &gt; 60 minutes<sup>2</sup> or results in an RCS pressure increase of greater than 20 psig.</p> <p><sup>1</sup>NOTE: By definition, in Mode 5 RCS Integrity is not established.</p> <p><sup>2</sup>NOTE: If an RCS heat removal system is in operation within this time frame and RCS temperature is being reduced then this EAL is not applicable.</p>	<p>CU3 Pg C-7 IC Unplanned Loss Of Decay Heat Removal Capability With Irradiated Fuel In The RPV.</p> <p>Modes: 4, 5</p> <p><u>EAL Threshold Value</u> (1 or 2)</p> <p>1. An Unplanned event results in RCS temperature &gt; 200°F, the Technical Specification cold shutdown temperature limit.</p> <p><u>OR</u></p> <p>2. Loss of all RCS temperature and RPV level indication for &gt; 15 minutes.</p>



TABLE C - COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS Rev 0

09/01/03

Page 2 of 3

Category	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	NOTICE OF UNUSUAL EVENT
RCS Leakage/RCS Draindown	<p>CG4 Pg C9</p> <p><b>IC Loss Of RPV Inventory Affecting Fuel Clad Integrity With Containment Challenged With Irradiated Fuel In The RPV.</b></p> <p>Modes: 4, 5</p> <p><u>EAL Threshold Value</u> (1 and 2 and 3)</p> <p>1. Loss of RPV inventory as indicated by unexplained Drywell or Reactor Building Sump and Drywell Equipment Drain Tank level increase, or Suppression Pool level increase, or other indications of loss of RPV inventory,</p> <p><u>AND</u></p> <p>2. RPV Level:</p> <p>A. &lt; -161" (TAF) for &gt; 30 minutes</p> <p><u>OR</u></p> <p>B. RPV level cannot be monitored concurrent with indication of core uncover for &gt; 30 minutes as evidenced by one of the following:</p> <ul style="list-style-type: none"> <li>Unexplained Containment High Range Rad Monitor significantly increased over normal shutdown levels,</li> <li>Visual Indication.</li> </ul> <p><u>AND</u></p> <p>3. Primary Containment not established</p> <p><u>OR</u></p> <p>Indication of Primary Containment challenged as indicated by one or more of the following:</p> <ul style="list-style-type: none"> <li>Drywell Pressure &gt; 53 psig and increasing OR</li> <li>Drywell Hydrogen or Suppression Chamber Hydrogen &gt; 6% AND Drywell Oxygen or Suppression Chamber Oxygen &gt; 5% OR</li> <li>Two or more Reactor Building areas exceed Max Safe Radiation Levels per Table C-1.</li> </ul>	<p>CS4 Pg C-12</p> <p><b>IC Loss Of RPV Inventory Affecting Core Decay Heat Removal Capability.</b></p> <p>Mode: 4</p> <p><u>EAL Threshold Value</u> (1 or 2)</p> <p>1. Loss of RPV inventory as indicated by RPV level &lt; -135" (6" below the Low Level ECCS actuation setpoint).</p> <p><u>OR</u></p> <p>2. Loss of RPV inventory as indicated by unexplained Drywell or Reactor Building Sump and Drywell Equipment Drain Tank level increase, or Suppression Pool level increase, or other indications of loss of RPV inventory,</p> <p><u>AND</u></p> <p>RPV level cannot be monitored for &gt; 30 minutes.</p>	<p>CA4 Pg C-14</p> <p><b>IC Loss Of RCS Inventory.</b></p> <p>Mode: 4</p> <p><u>EAL Threshold Value</u> (1 or 2)</p> <p>1. Loss of RCS inventory as indicated by RPV level &lt; -129"</p> <p><u>OR</u></p> <p>2. Loss of RCS inventory as indicated by unexplained Drywell or Reactor Building Sump and Drywell Equipment Drain Tank level increase, or Suppression Pool level increase, or other indications of loss of RPV inventory,</p> <p><u>AND</u></p> <p>RCS level cannot be monitored for &gt; 15 minutes.</p>	<p>CU4 Pg C-16</p> <p><b>IC RCS Leakage.</b></p> <p>Mode: 4</p> <p><u>EAL Threshold Value</u> (1 or 2)</p> <p>1. Unidentified primary system leakage &gt; 10 gpm into the drywell.</p> <p><u>OR</u></p> <p>2. Identified primary system leakage &gt; 25 gpm into the drywell.</p>
Loss of RPV Inventory		<p>CS5 Pg C-17</p> <p><b>IC Loss Of RPV Inventory Affecting Core Decay Heat Removal Capability With Irradiated Fuel In The RPV.</b></p> <p>Mode: 5</p> <p><u>EAL Threshold Value</u> (1 or 2)</p> <p>1. Loss of RPV inventory as indicated by RPV level &lt; -135" (6" below the Low Level ECCS actuation setpoint)</p> <p><u>OR</u></p> <p>2. RPV Level cannot be monitored with indication of core uncover as evidenced by one of the following:</p> <ul style="list-style-type: none"> <li>Unexplained Containment High Range Rad Monitor increased 3 times normal shutdown levels *,</li> <li>Visual Indication.</li> </ul> <p>* NOTE: Normal levels can be considered as the highest reading in the past twenty-four hours excluding the current peak value.</p>	<p>CA5 Pg C-19</p> <p><b>IC Loss Of RPV Inventory With Irradiated Fuel In The RPV.</b></p> <p>Mode: 5</p> <p><u>EAL Threshold Value</u> (1 or 2)</p> <p>1. Loss of RPV inventory as indicated by RPV level &lt; -129"</p> <p><u>OR</u></p> <p>2. Loss of RPV inventory as indicated by unexplained Drywell or Reactor Building Sump and Drywell Equipment Drain Tank level increase, or Suppression Pool level increase, or other indications of loss of RPV inventory,</p> <p><u>AND</u></p> <p>RPV level cannot be monitored for &gt; 15 minutes.</p>	<p>CU5 Pg C-21</p> <p><b>IC Unplanned Loss Of RCS Inventory With Irradiated Fuel In The RPV.</b></p> <p>Mode: 5</p> <p><u>EAL Threshold Value</u> (1 or 2)</p> <p>1. Unplanned RCS level decrease below the RPV flange for &gt; 15 minutes,</p> <p><u>OR</u></p> <p>2. Loss of RPV inventory as indicated by unexplained Drywell or Reactor Building Sump and Drywell Equipment Drain Tank level increase, or Suppression Pool level increase, or other indications of loss of RPV inventory,</p> <p><u>AND</u></p> <p>RPV level cannot be monitored.</p>

TABLE C - COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS Rev 0

09/01/03

Page 3 of 3

Category	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	NOTICE OF UNUSUAL EVENT
Fuel Clad Degradation				IC CU6 Pg C-23 Fuel Clad Degradation. Modes: 4, 5 <u>EAL Threshold Value</u> 1. Reactor coolant activity, determined by sample analysis $\geq 4 \mu\text{Ci/gm}$ of I-131 dose equivalent.
Loss of Communications				IC CU7 Pg C-24 UNPLANNED Loss Of All Onsite Or Offsite Communications Capabilities. Modes: 4, 5 <u>EAL Threshold Value</u> (1 or 2) 1. Unplanned loss of all onsite communications capability per Table C-2 affecting the ability to perform routine operations. OR 2. Unplanned loss of all offsite communications capability per Table C-2.
Inadvertent Criticality				IC CU8 Pg C-26 Inadvertent Criticality. Modes: 4, 5 <u>EAL Threshold Value</u> 1. An Unplanned extended positive period observed on nuclear instrumentation.

Table C-1

Reactor Building Radiation Monitors

RB Area Elevation (ft)	ARM Number	ARM Channel Description	Max Safe Radiation Levels Per EO-000-104 (R/HR)
	High Range		
818	49	Refuel Floor Area	10
749	52 54	RWCU Recirc PP Fuel Pool PP Area	10
719	50 51	CRD North CRD South	10
670	53	Remote Shutdown Room	10
645	48 57 55 56	HPCI PP & Turbine Room RCIC PP & Turbine Room RHR A C PP Room RHR B D PP Room	10

Table C-2

Onsite/Offsite Communications Capability

SYSTEM	ONSITE	OFFSITE
UHF Radio	X	
VHF Radio	X	X
ETN (Electronic Tandem Network)	X	X
CTN (Centrex Telephone System)	X	X
FTS-2001 (ENS)		X
Plant PA System	X	
Portable Cellular Telephone		X

---

**RECOGNITION CATEGORY C**

**COLD SHUTDOWN / REFUELING SYSTEM  
MALFUNCTIONS  
BASES**

---

**RECOGNITION CATEGORY C  
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS  
LOSS OF AC POWER  
CA1 - ALERT**

**IC    Loss Of All Offsite Power And Loss Of All Onsite AC Power  
      To Essential Busses.**

**CA1   Modes:        4, 5, D**

**EAL Threshold Value**

1. Loss of power from Startup Transformer 10 AND 20 to either unit for  
   > 15 minutes.

**AND**

All 4.16 kV ESS Buses on either unit are de-energized.

**Basis**

Loss of all AC power compromises all plant safety systems requiring electric power including ECCS, Containment Heat Removal, Spent Fuel Heat Removal and the Ultimate Heat Sink. When in cold shutdown, refueling, or defueled mode the event can be classified as an Alert. This is because of the significantly reduced decay heat, lower temperature and pressure that exists in this condition. Thus, increasing the time to restore one of the emergency busses, relative to that specified for the Site Area Emergency EAL. Escalating to Site Area Emergency, if appropriate, is by Abnormal Rad Levels / Radiological Effluent, or Emergency Director / Recovery Manager Judgment ICs. Fifteen minutes was selected as a threshold to exclude transient or momentary power losses.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL CA3.

**RECOGNITION CATEGORY C  
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS  
LOSS OF AC POWER  
CU1 -NOTIFICATION OF UNUSUAL EVENT**

**IC     Loss Of All Offsite Power To Essential Busses For Greater Than  
15 Minutes.**

**CU1           Modes: 4, 5**

**EAL Threshold Value**

1. Loss of power from Startup Transformer 10 AND 20 to either unit  
for > 15 minutes.

**Basis**

Loss of power from Startup Transformers 10 and 20 will result in loss of many systems normally used for heat removal.

Prolonged loss of 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 (e.g., Station Blackout). Fifteen minutes was selected as a threshold to exclude transient or momentary power losses. However, a Notification of Unusual Event should be declared in less than 15 minutes if it is expected that the power loss will continue for greater than 15 minutes.

Escalation of this event to an Alert would be based on having a loss of all offsite AC power coincident with a loss of all onsite AC power.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL CU3.

**RECOGNITION CATEGORY C  
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS  
LOSS OF DC POWER  
CU2 –NOTIFICATION OF UNUSUAL EVENT**

**IC      Unplanned Loss Of Required DC Power For Greater Than 15 Minutes.**

**CU2            Modes: 4, 5**

**EAL Threshold Value**

1. Unplanned loss of all vital DC power to either unit based on less than 105 volts on the 125 VDC main distribution buses 1D612 (2D612), 1D622 (2D622), 1D632 (2D632), AND 1D642 (2D642) for > 15 minutes.

NOTE: Buses do not trip on undervoltage condition.

**Basis**

The purpose of this IC 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. This EAL is intended to be anticipatory in as much as the operating crew may not have necessary indication and control of equipment needed to respond to the loss.

The word "Unplanned" is included in this IC and EAL to preclude the declaration of an emergency as a result of planned maintenance activities. Routinely plants will perform maintenance on a train related basis during shutdown periods. During such times it is intended that any loss of an operable bus is to be considered for purposes of this EAL.

If the loss of DC power results in the inability to maintain cold shutdown, the escalation to an Alert will be per CA3 "Inability to Maintain Plant in Cold Shutdown with Irradiated Fuel in the RPV."

The bus voltage is based on the minimum bus voltage necessary for the operation of safety related equipment. This voltage value incorporates a margin of at least 15 minutes of operation before the onset of inability to operate those loads.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL CU7.
2. FSAR Section 8.3.2, "DC Power Systems."
3. ON-102/202-610, 620, 630, 640 – Loss of 125V DC.

**RECOGNITION CATEGORY C  
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS  
DECAY HEAT REMOVAL  
CA3 - ALERT**

**IC Inability To Maintain Plant In Cold Shutdown With Irradiated Fuel In The RPV.**

**CA3 Modes: 4, 5**

**EAL Threshold Value (1 or 2 or 3)**

1. With Secondary Containment and RCS integrity<sup>1</sup> not established an Unplanned event results in RCS temperature > 200°F.

**OR**

2. With Secondary Containment established and RCS integrity<sup>1</sup> not established an Unplanned event results in RCS temperature > 200°F for > 20 minutes<sup>2</sup>.

**OR**

With RCS integrity<sup>1</sup> established an Unplanned event results in RCS temperature > 200°F for > 60 minutes<sup>2</sup> or results in an RCS pressure increase of greater than 20 psig.

<sup>1</sup>NOTE: By definition, in Mode 5 RCS integrity is not established.

<sup>2</sup>NOTE: If an RCS heat removal system is in operation within this time frame and RCS temperature is being reduced then this EAL is not applicable.

**Basis**

EAL 1 addresses complete loss of functions required for core cooling during refueling and cold shutdown modes when neither Secondary Containment 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. No delay time is allowed for EAL1 because the evaporated reactor coolant that may be released into the Secondary Containment during this heatup condition could also be directly released to the environment.

EAL 2 addresses the complete loss of functions required for core cooling for >20 minutes during refueling and cold shutdown modes when Secondary Containment is established but RCS integrity is not established. As in EAL 1, RCS integrity should be assumed to be in place when the RCS pressure

boundary is in its normal condition for the cold shutdown mode of operation. The allowed 20 minute time frame was included to allow operator action to restore the heat removal function, if possible. The allowed time frame is consistent with the guidance provided by Generic Letter 88-17, "Loss of Decay Heat Removal" and is believed to be conservative given that a low pressure Secondary Containment barrier to fission product release is established. Note 2 indicates that EAL 2 is not applicable if actions are successful in restoring an RCS heat removal system to operation and RCS temperature is being reduced within the 20 minute time frame.

EAL 3 addresses complete loss of functions required for core cooling for > 60 minutes during cold shutdown mode when RCS integrity is established. As in EAL 1 and 2, 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. The status of Secondary Containment in this EAL 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 there being a substantial degradation in plant safety. The pressure setpoint of 20 psig is the lowest pressure reading that can be reasonably read using installed Control Room instrumentation. Note 2 indicates that EAL 3 is not applicable if actions are successful in restoring an RCS heat removal system to operation and RCS temperature is being reduced within the 60 minute time frame assuming that the RCS pressure has remained less than 20 psig .

Escalation to Site Area Emergency would be via CS4, Loss of RPV Inventory Affecting Core Decay Heat Removal Capability, or CS5, Loss of RPV Inventory Affecting Core Decay Heat Removal Capability with Irradiated Fuel in the RPV should boiling result in significant RPV level loss leading to core uncover.

A loss of Technical Specification components alone is not intended to constitute an Alert. The same is true of a momentary Unplanned excursion above 200F when the heat removal function is available.

The Emergency Director / Recovery Manager must remain alert to events or conditions that lead to the conclusion that exceeding the EAL threshold is imminent. If, in the judgment of the Emergency Director, an imminent situation is at hand, the classification should be made as if the threshold has been exceeded.

### References

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL CA4.



**RECOGNITION CATEGORY C  
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS  
DECAY HEAT REMOVAL  
CU3 – NOTIFICATION OF UNUSUAL EVENT**

**IC     Unplanned Loss Of Decay Heat Removal Capability With Irradiated Fuel In The RPV.**

**CU3            Modes: 4, 5**

**EAL Threshold Value (1 or 2)**

1. An Unplanned event results in RCS temperature > 200°F, the Technical Specification cold shutdown temperature limit.

**OR**

2. Loss of all RCS temperature and RPV level indication for > 15 minutes.

**Basis**

This IC is included as a Notification of Unusual Event because it may 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 mode a large inventory of water is available to keep the core covered. 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 mode. Entry into cold shutdown conditions may be attained within hours of operating at power. Entry into the refueling mode procedurally may not occur for typically 100 hours 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 mode 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). In addition, the operators should be able to monitor RCS temperature and RPV level so that escalation to the alert level via CA3, Inability to Maintain Plant in Cold Shutdown with Irradiated Fuel in the RPV, or CA4, Loss of RCS Inventory will occur if required.

During refueling the level in the RPV will normally be maintained well 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 RCS/RPV temperatures depending on the time since shutdown. Escalation to the Alert level via CA3 is provided should an Unplanned event result in RCS temperature exceeding the Technical Specification cold shutdown temperature limit with Secondary Containment and RCS integrity not established.

Unlike the cold shutdown mode, normal means of core temperature indication and RCS 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 for > 15 minutes in either the cold shutdown or refueling modes, EAL 2 would result in declaration of a Notification of Unusual Event. Escalation to Alert would be via CA5, Loss of RPV Inventory with Irradiated Fuel in the RPV based on an inventory loss or CA3, Inability to Maintain Plant in Cold Shutdown with Irradiated Fuel in the RPV based on exceeding its temperature criteria.

The Emergency Director / Recovery Manager must remain attentive to events or conditions that lead to the conclusion that exceeding the EAL threshold is imminent. If, in the judgment of the Emergency Director, an imminent situation is at hand, the classification should be made as if the threshold has been exceeded.

#### References

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL CU4.

**RECOGNITION CATEGORY C**  
**COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS**  
**RCS LEAKAGE / RCS DRAINDOWN**  
**CG4 – GENERAL EMERGENCY**

**IC Loss Of RPV Inventory Affecting Fuel Clad Integrity With Containment Challenged With Irradiated Fuel In The RPV.**

**CG4 Modes: 4, 5**

**EAL Threshold Value** (1 and 2 and 3)

1. Loss of RPV inventory as indicated by unexplained Drywell or Reactor Building Sump and Drywell Equipment Drain Tank level increase, or Suppression Pool level increase, or other indications of loss of RPV inventory,

**AND**

2. RPV Level:

A. < -161" (TAF) for > 30 minutes

**OR**

B. RPV level cannot be monitored concurrent with indication of core uncover for > 30 minutes as evidenced by one of the following:

- Unexplained Containment High Range Rad Monitor significantly increased over normal shutdown levels,
- Visual indication.

**AND**

3. Primary Containment not established

**OR**

Indication of Primary Containment challenged as indicated by one or more of the following:

- Drywell Pressure > 53 psig and increasing OR
- Drywell Hydrogen or Suppression Chamber Hydrogen > 6% AND Drywell Oxygen or Suppression Chamber Oxygen > 5% OR
- Two or more Reactor Building areas exceed Max Safe Radiation Levels per Table C-1.

Table C-1Reactor Building Radiation Monitors

RB Area Elevation (ft)	ARM Number High Range	ARM Channel Description	Max Safe Radiation Levels Per EO-000-104 (R/HR)
818	49	Refuel Floor Area	10
749	52	RWCU Recirc PP	10
	54	Fuel Pool PP Area	
719	50	CRD North	10
	51	CRD South	
670	53	Remote Shutdown Room	10
645	48	HPCI PP & Turbine Room	10
	57	RCIC PP & Turbine Room	
	55	RHR A C PP Room	
	56	RHR B D PP Room	

Basis

For EAL 1 in the cold shutdown mode, normal RCS level and RPV level instrumentation systems will normally be available. However, if all level indication were to be lost during a loss of RCS inventory event, the operators would need to determine that RPV inventory loss was occurring by observing sump and tank level changes. Sump and tank level increases must be evaluated against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of RCS leakage.

For EAL 1 in the refueling mode, normal means of RPV level indication may not be available. Redundant means of RPV level indication will be normally 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 RCS inventory event, the operators would need to determine that RPV inventory loss was occurring by observing sump and tank level changes.

For both cold shutdown and refueling modes sump and tank level increases must be evaluated against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of RCS leakage.

EAL 2 represents the inability to restore and maintain RPV level to above the top of active fuel. Fuel damage is probable if RPV level cannot be restored, as available decay heat will cause boiling, further reducing the RPV level. A significant increase in general area containment radiation levels (greater than 3 times normal readings for the past 24 hours-excluding the current peak) may also be indicative of fuel damage.

EAL 3 represents conditions for which Primary Containment is not established or considered challenged and therefore not available as a barrier.

These EALs are based on concerns raised by Generic Letter 88-17, Loss of Decay Heat Removal, SECY 91-283, Evaluation of Shutdown and Low Power Risk Issues, NUREG-1449, Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States, and, NUMARC 91-06, Guidelines for Industry Actions to Assess Shutdown Management. A number of variables, such as initial vessel level, or shutdown heat removal system design can have a significant impact on heat removal capability challenging the fuel clad barrier. Analysis in the above references indicates that core damage may occur within an hour following continued core uncovering therefore, conservatively, 30 minutes was chosen.

As water level in the RPV lowers, the dose rate above the core will increase. The dose rate due to this core shine will result in significantly increased Containment High Range Radiation Monitor readings and possible alarms. Readings greater than 3 times normal readings for the past 24 hours-excluding the current peak-should be considered for entry into this EAL.

The GE is declared on the occurrence of the loss or imminent loss of function of all three fission product barriers. Based on the above discussion, RCS barrier failure resulting in core uncovering for 30 minutes or more may cause fuel clad failure. With the Primary Containment not established 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 GE.

The pressure at which Primary Containment is considered challenged is based on the drywell design pressure.

The use of Reactor Building radiation monitors provides indication of increased releases that may be indicative of a challenge to secondary containment. The radiation monitor values are based on the EOP "maximum safe values" because these values are easily recognizable and have an emergency basis.

In the early stages of a core uncovering event, it is unlikely that hydrogen buildup due to a core uncovering could result in an explosive mixture of dissolved gases in Primary Containment. However, Primary Containment monitoring and/or sampling should be performed to verify this assumption and a General Emergency declared if it is determined that an explosive mixture exists.

### **References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL CG1.
2. EO-000-104, "Secondary Containment Control."

**RECOGNITION CATEGORY C**  
**COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS**  
**RCS LEAKAGE / RCS DRAINDOWN**  
**CS4 – SITE AREA EMERGENCY**

**IC Loss Of RPV Inventory Affecting Core Decay Heat Removal Capability.**

**CS4 Mode: 4**

**EAL Threshold Value (1 or 2)**

1. Loss of RPV inventory as indicated by RPV level < - 135" (6" below the Low Level ECCS actuation setpoint)

**OR**

2. Loss of RPV inventory as indicated by unexplained Drywell or Reactor Building Sump and Drywell Equipment Drain Tank level increase, or Suppression Pool level increase, or other indications of loss of RPV inventory,

**AND**

RPV level cannot be monitored for > 30 minutes.

**Basis**

Under the conditions specified by this IC, continued decrease in RPV level is indicative of a loss of inventory control. Inventory loss may be due to an RPV breach, pressure boundary leakage, or continued boiling in the RPV.

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 mode. Entry into cold shutdown conditions may be attained within hours of operating at power or hours after refueling is completed. Entry into the refueling mode procedurally may not occur for typically 100 hours 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 mode 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). The above forms the basis for needing both a cold shutdown specific IC (CS4) and a refueling specific IC (CS5).

In the cold shutdown mode, normal RCS level indication will be available. However, if all level indication were to be lost during a loss of RCS inventory

event, the operators would need to determine that RPV inventory loss was occurring by observing sump and tank level changes. Sump and tank level increases must be evaluated against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of RCS leakage.

These EALs are based on concerns raised by Generic Letter 88-17, Loss of Decay Heat Removal, SECY 91-283, Evaluation of Shutdown and Low Power Risk Issues, NUREG-1449, Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States, and, NUMARC 91-06, Guidelines for Industry Actions to Assess Shutdown Management. A number of variables, such as initial vessel level, or shutdown heat removal system design can have a significant impact on heat removal capability challenging the fuel clad barrier. Analysis in the above references indicates that core damage may occur within an hour following continued core uncover therefore, conservatively, 30-minutes was chosen.

A declaration of a Site Area Emergency is warranted under the conditions specified by the IC. Escalation to a General Emergency is via CG4 (Loss of RPV Inventory Affecting Fuel Clad Integrity with Containment Challenged with Irradiated Fuel in the RPV). Escalation to a General Emergency is also via radiological effluent IC RG1 (Dose At The Emergency Planning Boundary Resulting From An Actual Or Imminent Release Of Gaseous Radioactivity Exceeds 1000 mrem TEDE Or 5000 mrem Child Thyroid CDE For The Actual Or Projected Duration Of The Release Using Actual Meteorology.)

### References

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL CS1.

<p style="text-align: center;"><b>RECOGNITION CATEGORY C</b> <b>COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS</b> <b>RCS LEAKAGE / RCS DRAINDOWN</b> <b>CA4 - ALERT</b></p>
---

**IC    Loss Of RCS Inventory.**

**CA4   Mode: 4**

**EAL Threshold Value (1 or 2)**

1. Loss of RCS inventory as indicated by RPV level < -129"

**OR**

2. Loss of RCS inventory as indicated by unexplained Drywell or Reactor Building Sump and Drywell Equipment Drain Tank level increase, or Suppression Pool level increase, or other indications of loss of RPV inventory,

**AND**

RCS level cannot be monitored for > 15 minutes.

**Basis**

These EALs serve as precursors 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 uncover. This condition will result in a minimum classification of Alert. The Low Low ECCS Actuation Setpoint was chosen because it is a setpoint at which all available injection systems automatically start. The inability to restore and maintain level after reaching this setpoint would therefore be indicative of a failure of the RCS barrier.

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 mode. Entry into cold shutdown conditions may be attained within hours of operating at power or hours after refueling is completed. Entry into the refueling mode procedurally may not occur for typically 100 hours 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 mode 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). The above forms the basis for needing both a cold shutdown specific IC (CA4) and a refueling specific IC (CA5).



In the cold shutdown mode, normal RCS level and RPV level instrumentation systems will normally be available. However, if all level indication were to be lost during a loss of RCS inventory event, the operators would need to determine that RPV inventory loss was occurring by observing Drywell Sump and Drywell Equipment Drain Tank level changes. Drywell Sump and Drywell Equipment Drain Tank level increases must be evaluated against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of RCS leakage. The 15-minute duration for the loss of level indication was chosen because it is half of the CS4 Site Area Emergency EAL duration. The 15-minute duration allows CA4 to be an effective precursor to CS4. 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 CS4 basis. Therefore this EAL meets the definition for an Alert emergency.

The difference between CA4 and CA5 deals with the RCS conditions that exist between cold shutdown and refueling mode applicability. In cold shutdown the RCS will normally be intact and standard RCS inventory and level monitoring means are available. In the refueling mode the RCS is not intact and RPV level and inventory are monitored by different means.

If RPV level continues to decrease then escalation to Site Area will be via CS4 (Loss of Inventory Affecting Core Decay Heat Removal Capability).

#### References

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL CA1.

**RECOGNITION CATEGORY C  
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS  
RCS LEAKAGE / RCS DRAINDOWN  
CU4 – NOTIFICATION OF UNUSUAL EVENT**

**IC     RCS Leakage.**

**CU4   Mode: 4**

**EAL Threshold Value (1 or 2)**

1. Unidentified primary system leakage > 10 gpm into the drywell.

**OR**

2. Identified primary system leakage > 25 gpm into the drywell.

**Basis**

This IC is included as a Notification of Unusual Event because it is considered to be a potential degradation of the level of safety of the plant.

EAL 1 - The 10 gpm value for the unidentified and pressure boundary leakage was selected as it is sufficiently large to be observable with normal control room indications.

EAL 2 - 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. This leakage comes from known, monitored locations such as valve packing and pump seals.

A prolonged loss of RCS Inventory may result in escalation to the Alert level via either IC CA4 (Loss of RCS Inventory with Irradiated Fuel in the RPV) or CA3 (Inability to Maintain Plant in Cold Shutdown).

The difference between CU4 and CU5 deals with the RCS conditions that exist between cold shutdown and refueling mode applicability. In cold shutdown the RCS will normally be intact and RCS inventory and level monitoring are normally available. In the refueling mode the RCS is not intact and RPV level and inventory are monitored by different means.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL CU1.

**RECOGNITION CATEGORY C**  
**COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS**  
**LOSS OF RPV INVENTORY**  
**CS5 – SITE AREA EMERGENCY**

**IC    Loss Of RPV Inventory Affecting Core Decay Heat Removal Capability With Irradiated Fuel In The RPV.**

**CS5   Mode: 5**

**EAL Threshold Value** (1 or 2)

1. Loss of RPV inventory as indicated by RPV level < -135" (6" below the Low Level ECCS actuation setpoint)

**OR**

2. RPV Level cannot be monitored concurrent with indication of core uncover as evidenced by one of the following:
  - Unexplained Containment High Range Rad Monitor increased 3 times normal shutdown levels.\*
  - Visual indication.

\*NOTE: Normal levels can be considered as the highest reading in the past twenty-four hours excluding the current peak value.

**Basis**

Under the conditions specified by this IC, continued decrease in RPV level is indicative of a loss of inventory control. Inventory loss may be due to an RPV breach or continued boiling in the RPV. Since BWRs have RCS penetrations below the setpoint, continued level decrease may be indicative of pressure boundary leakage.

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 mode. Entry into cold shutdown conditions may be attained within hours of operating at power or hours after refueling is completed. Entry into the refueling mode procedurally may not occur for typically 100 hours 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 mode 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). The above forms the basis for needing both a cold shutdown specific IC (CS4) and a refueling specific IC (CS5).

For EAL 2 in the refueling mode, normal means of RPV level indication may not be available. Redundant means of RPV level indication will be normally installed (including the ability to monitor level visually) to assure that the ability to monitor level will not be interrupted.

As water level in the RPV lowers, the dose rate above the core will increase. The dose rate due to this core shine will result in significantly increased Containment High Range Radiation Monitor readings (greater than 3 times normal readings for the past 24 hours-excluding the current peak) and possible alarms.

These EALs are based on concerns raised by Generic Letter 88-17, Loss of Decay Heat Removal, SECY 91-283, Evaluation of Shutdown and Low Power Risk Issues, NUREG-1449, Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States, and, NUMARC 91-06, Guidelines for Industry Actions to Assess Shutdown Management. A number of variables, such as initial vessel level, or shutdown heat removal system design can have a significant impact on heat removal capability challenging the fuel clad barrier. Analysis in the above references indicates that core damage may occur within an hour following continued core uncover.

Thus, declaration of a Site Area Emergency is warranted under the conditions specified by the IC. Escalation to a General Emergency is via CG4 (Loss of RPV Inventory Affecting Fuel Clad Integrity with Containment Challenged with Irradiated Fuel in the RPV). Escalation to a General Emergency is also via radiological effluent IC RG1 (Dose At The Emergency Planning Boundary Resulting From An Actual Or Imminent Release Of Gaseous Radioactivity Exceeds 1000 mrem TEDE Or 5000 mrem Child Thyroid CDE For The Actual Or Projected Duration Of The Release Using Actual Meteorology).

#### **References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL CS2.

**RECOGNITION CATEGORY C**  
**COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS**  
**LOSS OF RPV INVENTORY**  
**CA5 - ALERT**

**IC            Loss Of RPV Inventory With Irradiated Fuel In The RPV.**

**CA5            Mode: 5**

**EAL Threshold Value (1 or 2)**

1. Loss of RPV inventory as indicated by RPV level < -129".

**OR**

2. Loss of RPV inventory as indicated by unexplained Drywell or Reactor Building Sump and Drywell Equipment Drain Tank level increase, or Suppression Pool level increase, or other indications of loss of RPV inventory.

**AND**

RPV level cannot be monitored for > 15 minutes.

**Basis**

These EALs serve as precursors to a loss of heat removal. 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 uncover. This condition will result in a minimum classification of Alert. The Low Level ECCS Actuation Setpoint was chosen because it is a setpoint at which all available injection systems automatically start. The inability to restore and maintain level after reaching this setpoint would therefore be indicative of a failure of the RCS barrier.

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 mode. Entry into cold shutdown conditions may be attained within hours of operating at power or hours after refueling is completed. Entry into the refueling mode procedurally may not occur for typically 100 hours 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 mode 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). The above forms the basis for needing both a cold shutdown specific IC (CA4) and a refueling specific IC (CA5).

In the refueling mode, normal means of RPV level indication may not be available. Redundant means of RPV level indication will be normally 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 sump and tank level changes. Sump and tank level increases must be evaluated against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of RCS leakage. The 15-minute duration allows CA5 to be an effective precursor to CS5. 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 CS5 basis. Therefore this EAL meets the definition for an Alert.

The difference between CA4 and CA5 deals with the RCS conditions that exist between cold shutdown and refueling mode applicability. In cold shutdown the RCS will normally be intact and standard RCS inventory and level monitoring means are available. In the refueling mode the RCS is not intact and RPV level and inventory are monitored by different means.

If RPV level continues to decrease then escalation to Site Area will be via CS5 (Loss of Inventory Affecting Core Decay Heat Removal Capability with Irradiated Fuel in the RPV).

#### References

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL CA2.

**RECOGNITION CATEGORY C  
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS  
LOSS OF RPV INVENTORY  
CU5 – NOTIFICATION OF UNUSUAL EVENT**

**IC     Unplanned Loss Of RCS Inventory With Irradiated Fuel In The RPV.**

**CU5   Mode: 5**

**EAL Threshold Value (1 or 2)**

1. Unplanned RCS level decrease below the RPV flange for > 15 minutes,

**OR**

2. Loss of RPV inventory as indicated by unexplained Drywell or Reactor Building Sump and Drywell Equipment Drain Tank level increase, or Suppression Pool level increase, or other indications of loss of RPV inventory,

**AND**

RPV level cannot be monitored.

**Basis**

This IC is included as a Notification of Unusual Event 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. Refueling evolutions that decrease RCS water level below the RPV flange are carefully planned and procedurally controlled.

EAL 1 - An Unplanned event that results in water level decreasing below the RPV flange warrants declaration of a Notification of Unusual Event due to the reduced RCS 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.

EAL 1 involves a decrease in RCS 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 (covered by RU2) until such time as the level decreases to the level of the vessel flange. If RPV level continues to decrease and reaches the Low Level ECCS Actuation Setpoint then escalation to CA5 would be appropriate.

EAL 2 – In the refueling mode, normal means of RCS 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 RCS inventory event, the operators would need to determine that RPV inventory loss was occurring by observing sump and tank level changes. Sump and tank level increases must be evaluated against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of RCS leakage.

Continued loss of RCS Inventory will result in escalation to the Alert level via either IC CA5 (Loss of RPV Inventory with Irradiated Fuel in the RPV) or CA3 (Inability to Maintain Plant in Cold Shutdown with Irradiated Fuel in the RPV).

The difference between CU4 and CU5 deals with the RCS conditions that exist between cold shutdown and refueling modes. In cold shutdown the RCS will normally be intact and standard RCS inventory and level monitoring means are available. In the refueling mode the RCS is not intact and RPV level and inventory are monitored by different means.

#### References

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL CU2.



**RECOGNITION CATEGORY C  
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS  
FUEL CLAD DEGRADATION  
CU6 – NOTIFICATION OF UNUSUAL EVENT**

**IC Fuel Clad Degradation.**

**CU6 Modes: 4, 5**

**EAL Threshold Value**

1. Reactor coolant activity, determined by sample analysis  $\geq 4 \mu\text{Ci/gm}$  of I-131 dose equivalent.

**Basis**

This IC is included as a Notification of Unusual Event because it is considered to be a potential degradation in the level of safety of the plant and a potential precursor of more serious problems. Coolant samples exceeding the short-term concentration permitted by Technical Specifications are representative of minor fuel cladding degradation. A Notification of Unusual Event is classified because Reactor Coolant Activity levels exceeding Technical Specification limits is considered to be a potential degradation in the level of safety of the plant and a potential precursor of more serious problems. Iodine equivalence is per Technical Specifications definition for Dose Equivalent I-131.

As used in this EAL the reactor coolant sample is a sample representative of the total reactor coolant system volume and not the result of a maintenance activity such as fuel sipping.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL CU5.
2. FSAR Section 15.6.4 "Steam System Piping Break Outside Containment."

**RECOGNITION CATEGORY C**  
**COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS**  
**LOSS OF COMMUNICATIONS**  
**CU7 – NOTIFICATION OF UNUSUAL EVENT**

**IC UNPLANNED Loss Of All Onsite Or Offsite Communications Capabilities.**

**CU7 Modes: 4, 5**

**EAL Threshold Value (1 or 2)**

1. Unplanned loss of all onsite communications capability (Table C-2) affecting the ability to perform routine operations.

**OR**

2. Unplanned loss of all offsite communications capability (Table C-2).

**Table C-2**

**Onsite/Offsite Communications Capability**

<b>SYSTEM</b>	<b>ONSITE</b>	<b>OFFSITE</b>
UHF Radio	X	
VHF Radio	X	X
ETN (Electronic Tandem Network)	X	X
CTN (Centrex Telephone System)	X	X
FTS-2001 (ENS)		X
Plant PA System	X	
Portable Cellular Telephone		X

**Basis**

The purpose of this IC and its associated EALs 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 problems with offsite authorities. The loss of offsite 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 offsite communications is sufficient to inform state and local authorities of plant problems. This EAL is intended to be used only when extraordinary means (e.g., relaying of information from radio transmissions, individuals being sent to offsite locations, etc.) are being utilized to make communications possible.

Table C-2 details the communications systems that must be lost to classify a Notification of Unusual Event.

#### **References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL CU6.

**RECOGNITION CATEGORY C  
COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTIONS  
INADVERTANT CRITICALITY  
CU8 – NOTIFICATION OF UNUSUAL EVENT**

**IC     Inadvertent Criticality.**

**CU8            Modes: 4, 5**

**EAL Threshold Value**

1. An Unplanned extended positive period observed on nuclear instrumentation.

**Basis**

This IC addresses criticality events that occur in Cold Shutdown or Refueling modes (NUREG 1449, Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States) such as fuel mis-loading events. This IC indicates a potential degradation of the level of safety of the plant, warranting a Notification of Unusual Event classification. This IC excludes inadvertent criticalities that occur during planned reactivity changes associated with reactor startups (e.g., criticality earlier than estimated) which are addressed in the companion IC MU10.

This condition is identified using period monitors. The term extended is used in order to allow exclusion of expected short term positive periods from planned fuel bundle or control rod movements during core alterations or reactor physics testing performed in Mode 5 (rod pulls to determine worths, local criticals, etc.). These short term positive periods are the result of the increase in neutron population due to subcritical multiplication.

Escalation would be by Emergency Director / Recovery Manager Judgment.

**References**

1. NEI 99-01, Rev 4, (NUMARC/NESP-007), January 2003, EAL CU8.

---

## **SECTION 3**

### **DEVIATIONS TO NEI 99-01 REV. 4**

---

**Susquehanna Deviations to NEI 99-01 Rev 4  
Initiating Conditions and Emergency Actions Levels**

This document contains a table listing all of the NEI initiating conditions along with a correlation to the corresponding Susquehanna SES ICs. A description to any deviations from the NEI EALs is given.

NEI IC Reference	Initiating Condition	Susquehanna IC Designation	Deviations
AU1	Any UNPLANNED Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds Two Times the Radiological Effluent Technical Specifications for 60 Minutes or Longer. <i>Op. Modes: All</i>	RU1	EAL #4 is not used – the Susquehanna perimeter monitoring system is not normally operating or alarmed in the Control Room. EAL #5 is not used as Susquehanna does not have an automatic dose tracking system.
AA1	Any UNPLANNED Release of Gaseous or Liquid Radioactivity to the Environment that Exceeds 200 Times the Radiological Effluent Technical Specifications for 15 Minutes or Longer. <i>Op. Modes: All</i>	RA1	EAL #4 is not used – the Susquehanna perimeter monitoring system is not normally operating or alarmed in the Control Room. EAL #5 is not used as Susquehanna does not have an automatic dose tracking system.
AS1	Offsite Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 100 mR TEDE or 500 mR Thyroid CDE for the Actual or Projected Duration of the Release. <i>Op. Modes: All</i>	RS1	NEI EAL #4 is divided into two EALs #4 and #5 for Susquehanna. EAL #5 utilizes Child Thyroid CDE instead of Adult Thyroid as directed by the State of Pennsylvania.
AG1	Offsite Dose Resulting from an Actual or Imminent Release of Gaseous Radioactivity Exceeds 1000 mR TEDE or 5000 mR Thyroid CDE for the Actual or Projected Duration of the Release Using Actual Meteorology. <i>Op. Modes: All</i>	RG1	NEI EAL #4 is divided into two EALs #4 and #5 for Susquehanna. EAL #5 utilizes Child Thyroid CDE instead of Adult Thyroid as directed by the State of Pennsylvania.
AU2	Unexpected Increase in Plant Radiation. <i>Op. Modes: All</i>	RU2	None

NEI IC Reference	Initiating Condition	Susquehanna IC Designation	Deviations
CS2	Loss of RPV Inventory Affecting Core Decay Heat Removal Capability with Irradiated Fuel in the RPV. <i>Op. Modes: Refueling</i>	CS5	EAL #2 is not used. It is conservative to only use EAL#1 as no credit for Secondary Containment Closure is taken. EAL #1 is divided into two EALs for Susquehanna EAL #1 Erratic Source Range Monitor Indication is not used.
CU3	Loss of All Offsite Power to Essential Busses for Greater Than 15 Minutes. <i>Op. Modes: Cold Shutdown, Refueling</i>	CU1	NEI condition "b" is conservatively not included.
CA3	Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Busses. <i>Op. Modes: Cold Shutdown, Refueling, Defueled</i>	CA1	NEI condition "c" is conservatively not included.
CU4	UNPLANNED Loss of Decay Heat Removal Capability with Irradiated Fuel in the RPV. <i>OP. Modes: Cold Shutdown, Refueling</i>	CU3	None
CA4	Inability to Maintain Plant in Cold Shutdown with Irradiated Fuel in the RPV. <i>Op. Modes: Cold Shutdown, Refueling</i>	CA3	None
CU5	Fuel Clad Degradation. <i>Op. Mode: Refueling</i>	CU6	EAL #1 is not used. SSES Off-Gas Pretreatment Radiation monitor does not function in the refueling mode.
CU6	UNPLANNED Loss of All Onsite or Offsite Communications Capabilities. <i>Op. Modes: Cold Shutdown, Refueling</i>	CU7	None



NEI IC Reference	Initiating Condition	Susquehanna IC Designation	Deviations
CU7	UNPLANNED Loss of Required DC Power for Greater than 15 Minutes. <i>Op. Modes: Cold Shutdown, Refueling</i>	CU2	None
CU8	Inadvertent Criticality. <i>Op Modes:, Cold Shutdown, Refueling</i>	CU8	Only EAL #1 applies to Susquehanna.
E-HU1	Damage to a loaded cask CONFINEMENT BOUNDARY. <i>Op. Mode: Not Applicable</i>	EU1	Natural Phenomena EAL #1 not included as the Susquehanna ISFSI is within the Protected Area boundary. This IC would therefore be covered by OU3. NEI EAL #2 is divided into two EALs, #1 and #2 for Susquehanna. Fire Damage to the ISFSI is covered by EALs OA4 and OU4.
E-HU2	Confirmed security event with potential loss of level of safety of the ISFSI. <i>Op. Mode: Not Applicable</i>	None	This EAL is not used as the Susquehanna ISFSI is within the Protected Area boundary. This IC would therefore be covered by OU1.
FU1	ANY Loss or ANY Potential Loss of Containment. <i>Op. Modes: Power Operation, Hot Standby, Startup, Hot Shutdown</i>	FU1	In the loss or potential loss of Primary Containment added the term breach to the initiating condition. The term breach provides additional indication of the fact that containment is or may be lost.
FA1	ANY Loss or ANY Potential Loss of EITHER Fuel Clad OR RCS <i>Op. Modes: Power Operation, Hot Standby, Startup, Hot Shutdown</i>	FA1	None

NEI IC Reference	Initiating Condition	Susquehanna IC Designation	Deviations
FS1	Loss or Potential Loss of ANY Two Barriers. <i>Op. Modes: Power Operation, Hot Standby, Startup, Hot Shutdown</i>	FS1	None
FG1	Loss of ANY Two Barriers AND Loss or Potential Loss of Third Barrier. <i>Op. Modes: Power Operation, Hot Standby, Startup, Hot Shutdown</i>	FG1	None
HU1	Natural and Destructive Phenomena Affecting the PROTECTED AREA. <i>Op. Modes: All</i>	OU3	EAL #7 is not used as there are no unique site specific phenomena for Susquehanna.
HA1	Natural and Destructive Phenomena Affecting the Plant VITAL AREA. <i>Op. Modes: All</i>	OA3	None
HU2	FIRE Within PROTECTED AREA Boundary Not Extinguished Within 15 Minutes of Detection. <i>Op. Modes: All</i>	OU4	None
HA2	FIRE or EXPLOSION Affecting the Operability of Plant Safety Systems Required to Establish or Maintain Safe Shutdown. <i>Op. Modes: All</i>	OA4	None
HU3	Release of Toxic or Flammable Gases Deemed Detrimental to Safe Operation of the Plant. <i>Op. Modes: All</i>	OU5	None
HA3	Release of Toxic or Flammable Gases Within or Contiguous to a VITAL AREA Which Jeopardizes Operation of Safety Systems Required to Establish or Maintain Safe Shutdown. <i>Op. Modes: All</i>	OA5	None

NEI IC Reference	Initiating Condition	Susquehanna IC Designation	Deviations
HU4	Confirmed Security Event Which Indicates a Potential Degradation in the Level of Safety of the Plant. <i>Op. Modes: All</i>	OU1	None
HA4	Confirmed Security Event in a Plant PROTECTED AREA. <i>Op. Modes: All</i>	OA1	None
HS1	Confirmed Security Event in a Plant VITAL AREA. <i>Op. Modes: All</i>	OS1	None
HG1	Security Event Resulting in Loss of Physical Control of the Facility. <i>Op. Modes: All</i>	OG1	EAL #1 is divided into two EALs, #1 and #2 for Susquehanna.
HU5	Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of a NOUE. <i>Op. Modes: All</i>	OU6	None
HA6	Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of an Alert. <i>Op. Modes: All</i>	OA6	None
HS3	Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of Site Area Emergency. <i>Op. Modes: All</i>	OS6	None
HG2	Other Conditions Existing Which in the Judgment of the Emergency Director Warrant Declaration of General Emergency. <i>Op. Modes: All</i>	OG6	None
HA5	Control Room Evacuation Has Been Initiated. <i>Op. Modes: All</i>	OA2	None
HS2	Control Room Evacuation Has Been Initiated and Plant Control Cannot Be Established. <i>Op. Modes: All</i>	OS2	None

NEI IC Reference	Initiating Condition	Susquehanna IC Designation	Deviations
SU1	Loss of All Offsite Power to Essential Busses for Greater Than 15 Minutes. <i>Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown</i>	MU1	NEI condition "b" is conservatively not included.
SA5	AC power capability to essential busses reduced to a single power source for greater than 15 minutes such that any additional single failure would result in station blackout. <i>Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown</i>	MA1	Two EALs are used for this condition as a result of Susquehanna's specific design.
SS1	Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Busses. <i>Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown</i>	MS1	No power restoration time criteria is utilized for this EAL.
SG1	Prolonged Loss of All Offsite Power and Prolonged Loss of All Onsite AC Power to Essential Busses. <i>Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown</i>	MG1	None
SA2	Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was Successful. <i>Op. Modes: Power Operation, Startup, Hot Standby</i>	MA3	None

NEI IC Reference	Initiating Condition	Susquehanna IC Designation	Deviations
SS2	Failure of Reactor Protection System Instrumentation to Complete or Initiate an Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded and Manual Scram Was NOT Successful. <i>Op. Modes: Power Operation, Startup</i>	MS3	None
SG2	Failure of the Reactor Protection System to Complete an Automatic Scram and Manual Scram was NOT Successful and There is Indication of an Extreme Challenge to the Ability to Cool the Core. <i>Op. Modes: Power Operation, Startup</i>	MG3	None
SU2	Inability to Reach Required Shutdown Within Technical Specification Limits. <i>Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown</i>	MU9	None
SA3	Deleted		None
SS4	Complete Loss of Heat Removal Capability. <i>Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown</i>	MS4	None
SU3	UNPLANNED Loss of Most or All Safety System Annunciation or Indication in The Control Room for Greater Than 15 Minutes <i>Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown</i>	MU5	None

NEI IC Reference	Initiating Condition	Susquehanna IC Designation	Deviations
SA4	UNPLANNED Loss of Most or All Safety System Annunciation or Indication in Control Room With Either (1) a SIGNIFICANT TRANSIENT in Progress, or (2) Compensatory Non-Alarming Indicators are Unavailable. <i>Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown</i>	MA5	None
SS6	Inability to Monitor a SIGNIFICANT TRANSIENT in Progress. <i>Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown</i>	MS5	None
SU7	Deleted		None
SA1	Deleted		None
SS3	Loss of All Vital DC Power. <i>Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown</i>	MS2	None
SU4	Fuel Clad Degradation. <i>Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown</i>	MU7	None
SU5	RCS Leakage. <i>Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown</i>	MU6	None
SS5	Deleted		None
SU6	UNPLANNED Loss of All Onsite or Offsite Communications Capabilities. <i>Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown</i>	MU8	None
SU8	Inadvertent Criticality. <i>Op Modes: Hot Standby, Hot Shutdown</i>	MU10	SSES does not have installed startup rate meters.

---

**SECTION 4**

**DEVIATIONS TO NEI 99-01 REV. 4**

**JUSTIFICATION**

---

## NEI EAL DEVIATION JUSTIFICATION

1. NEI EAL AU1 and AA1 - Any UNPLANNED Release of Gaseous or Liquid Radioactivity to the Environment.

- EAL #4 - Valid reading of perimeter radiation monitoring system is not used.
- EAL #5 - Valid indication of automatic real time dose tracking system is not used

Justification:

- EAL #4 is based upon exceeding Plant Technical Specifications for Radiological Effluents which are based on the Susquehanna SES ODCM (Offsite Dose Calculation Manual). The locations for the Susquehanna SES perimeter monitoring system are not aligned with the locations used in the ODCM to calculate the effluent Plant Technical Specifications limits. Therefore use of the perimeter monitoring system would not accurately reflect exceeding the Plant Technical Specifications limits.
- EAL 5 is not used since Susquehanna SES does not have an automatic real time dose tracking system.

2. NEI EAL AS1, AG1 - Offsite dose readings from actual or imminent release.  
NEI EAL AA2 - Damage to Irradiated Fuel

- AS1 & AG1 - NEI EAL #4 is divided into two EAL's #4 and #5 for Susquehanna. AS1 & AG1 - EAL #5 utilizes Child Thyroid CDE instead of Adult Thyroid.
- AA2 - NEI EAL #2 is divided into two EAL's, #2 and #3 for Susquehanna.

Justification:

- The EAL's were divided into two separate EAL's to facilitate clarity and ease of use by Control Room and NERO personnel.
- While the EPA PAG guidance provides for the use of adult thyroid dose conversion factors, the Commonwealth of Pennsylvania requires the use of child thyroid CDE.

3. NEI EAL CS1 and CS2 - Loss of RPV Inventory Affecting Core Decay Heat Removal. Capability

- EAL #2 - Secondary Containment available is not used at Susquehanna SES.
- CS2 - NEI EAL #1 is divided into two EAL's for Susquehanna.
- CS2 - NEI EAL #1 Erratic Source Range Monitor Indication (SRM) is not used.



**Justification:**

- In Cold Shutdown and Refueling modes, Secondary Containment may not be available. In a plant situation as defined by the initiating conditions for CS1 and CS2 with Secondary Containment unavailable, it would be difficult to verify that Secondary Containment is established or re-established. Therefore, Susquehanna SES has taken a conservative approach and does not take credit for Containment Closure for these initiating conditions.
- EAL #1 was divided into two separate EAL's to facilitate clarity and ease of use by Control Room and NERO personnel.
- Source Range Monitor Indications are not used for EAL #1. This indication is difficult to quantify and assess since there are other causes of erratic SRM indications. Without a clear definition or ability to quantify the erratic indications there is a possibility to make an inappropriate emergency declaration under this EAL. Therefore that indication was not used.

**4. CU3 - Loss of All Offsite Power to Essential Busses for Greater Than 15 Minutes.**

- NEI condition "b" – emergency diesel generators available is not used

**Justification:**

- Typically, Susquehanna SES would only have one unit shutdown and the other unit operating at power. The design of the off-site power sources for Susquehanna SES is such that a loss of both sources of offsite power would result in loss of the operating unit. Even if onsite power sources were available, this situation represents degradation in the level of safety of the plant that is consistent with the intent of a NOUE and represents a situation similar to NEI EAL SU1. Therefore, as a conservative approach to this EAL, no credit is taken for having diesel generators available and a NOUE declaration is appropriate.

**5. CA3 - Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Busses.**

- NEI condition "c" restoration of diesel generator in fifteen minutes is not used.

**Justification:**

- The design of the off-site power sources for Susquehanna SES is such that a loss of both sources would result in loss of both units. The design of the on-site (diesel generator) emergency buses is such that this EAL would need to specify which specific diesel generators can be restored within the fifteen minute requirement depending upon the specific plant condition that existed at the time of the loss of offsite power. Therefore, as a conservative approach to this EAL, no credit is taken for having diesel generators available and an Alert declaration is appropriate.

6. NEI EAL CU5 - Fuel Clad Degradation.

- EAL #1 Off-gas Pretreatment Radiation Monitor is not used for this EAL.

Justification:

- The Susquehanna SES Off-Gas Pretreatment Radiation Monitors are not designed to be in service during the refuel mode.

7. NEI EAL CU8 - Inadvertent Criticality.

- EAL #2 - Any UNPLANNED sustained positive startup rate observed on nuclear instrumentation-is not applicable to Susquehanna SES.

Justification:

- SUSQUEHANNA SES Control Room indication is for positive period rather than startup rate.

8. NEI EAL E-HU1 - Damage to a loaded cask Confinement Boundary.

- EAL #1 - Natural Phenomena events affecting a loaded cask Confinement Boundary is not included in Susquehanna SES EAL EU1.
- EAL #2 is divided into two EALs , #1 and # 2 for Susquehanna.
- EAL #2 concerning fire damage to the ISFSI is not included in EAL EU1.

Justification:

- EAL #1 - Natural Phenomena events affecting a loaded cask Confinement Boundary is not included in the Susquehanna SES EALs since the ISFSI at Susquehanna SES is included within the Protected Area. As such these events that can affect the ISFSI are included in EAL OU3 Natural and Destructive Phenomena Affecting The Protected Area.
- EAL #2 was divided into two separate EAL's to facilitate clarity and ease of use by Control Room and NERO personnel.
- Fire Damage to the ISFSI is covered by EAL OA4 and OU4.

9. NEI EAL E-HU2 - Security Event affecting ISFSI.

- EAL not used at Susquehanna SES.

Justification:

- At Susquehanna SES the ISFSI is inside the protected area. Therefore a security event dealing with the ISFSI is covered by NEI EAL OU1-Intrusion into the Protected Area.

10. NEI EAL FU1 - ANY loss OR ANY Potential Loss of Primary Containment.

- IC RCS Leak rate or Containment Isolation Failure or Breach/Bypass.

Justification:

- The term bypass can indicate a situation where there has been damage to the containment diaphragm slab or represent a situation where there is leakage past water sealed penetrations. Adding the term breach to the indication of containment failure provides additional indication of the fact that there is a loss or potential loss of containment.

11. NEI EAL HU1 - Natural and Destructive Phenomena.

- EAL #7 dealing with other site specific phenomena is not used.

Justification:

- Any site phenomena applicable to Susquehanna SES are covered by NEI EAL's #1 through #6.

12. NEI EAL HG1 - Security Event resulting in Loss of physical control of the facility.

- EAL #1 is divided into two EAL's, #1 and # 2 for Susquehanna.

Justification:

- The EAL's were divided into two separate EAL's to facilitate clarity and ease of use by Control Room and NERO personnel.

13. NEI EAL SU1 - Loss of All Offsite Power to Essential Busses for Greater Than 15 Minutes.

- NEI EAL Condition "b" - Diesel Generator availability is not used.

Justification:

- SU1 - The design of the off-site power sources for Susquehanna SES is such that a loss of both sources would result in loss of both units. Even if onsite power sources were available, this situation represents degradation in the level of safety of the plant that is consistent with the intent of a NOUE. Therefore, as a conservative approach to this EAL, no credit is taken for having diesel generators available and a NOUE declaration is appropriate.

14. NEI EAL SA5 - AC power capability to essential busses reduced to a single power source for greater than 15 minutes such that any additional single failure would result in station blackout.

- SA5 - Two EAL's are used to declare this event.

Justification:

- Susquehanna SES has two offsite power sources that can supply power to either unit, and there are four on site diesel generators.

As a result SA5 was divided into two EAL's for clarity due to the Susquehanna SES design. In the first EAL both Startup Transformers are lost and only one diesel generator is supplying power to one 4KV bus on either unit. Therefore a loss of that diesel results in a station blackout condition as defined in the NEI EAL guidance.

In the second EAL only one source of off-site power is available and all on-site diesel generators are unavailable. In this situation a loss of the offsite power source results in a station blackout condition as defined in the NEI EAL guidance.

15. NEI EAL SS1 - Loss of All Offsite Power and Loss of All Onsite AC Power to Essential Busses.

- SS1 - Ability to restore power to one emergency bus not included in this EAL.

Justification:

- SS1 - The design of the on-site (diesel generator) emergency buses is such that this EAL would need to specify which specific diesel generators are available depending upon the specific plant condition that existed at the time of the loss of offsite power. Therefore, as a conservative approach to this EAL, no credit is taken for restoration of a diesel generators within a time period.

16. NEI EAL SU8 - Inadvertent Criticality.

- EAL #2 - Any UNPLANNED sustained positive startup rate observed on nuclear instrumentation-is not applicable to Susquehanna SES.

Justification:

- Susquehanna SES Control Room indication is for positive period rather than startup rate.