

Entergy Operations, Inc. 1448 S.R 333 Russellville, AR 72802 Tel 501 858 5000

0CAN060502

June 14, 2005

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

Subject: Arkansas Nuclear One – Supplement to Request for Additional Information for Proposed Upgraded Emergency Action Levels Arkansas Nuclear One – Units 1 and 2 Docket Nos. 50-313 and 50-368 License Nos. DPR-51 and NPF-6

References:

- February 27, 2004 letter to Document Control Desk, Arkansas Nuclear One – Proposed Upgraded Emergency Action Levels (letter number 0CAN020407)
 - 2 April 7, 2005 letter from Mr. Thomas Alexion, NRC, Request for Additional Information on Proposed Upgraded Emergency Action Levels (EALs) (letter number 0CNA040505)
 - 3 May 31, 2005 letter to Document Control Desk, Arkansas Nuclear One – Response to Request for Additional Information for Proposed Upgraded Emergency Action Levels (EALs) (letter number 0CAN050503)

Dear Sir or Madam:

Reference 1 provided Arkansas Nuclear One's (ANO) original submittal of proposed Emergency Action Levels (EAL) using the methodology outlined in NEI 99-01, *Methodology for Development of Emergency Action Levels* (Revision 4, January 2003). Reference 2 contains a Request for Additional Information (RAI) received from the NRC staff regarding the proposed EAL upgrade. ANO's response to this RAI is provided in reference 3.

On June 6, 2005, a conference call was conducted between ANO representatives (Emergency Planning and Licensing) and Messrs. Thomas Alexion and Joseph Anderson of the NRC staff to discuss minor inconsistencies associated with ANO's responses to RAI questions 2, 5, 11, and 20 contained in reference 3. The purpose of this letter is to provide the information that was determined to be necessary to resolve these identified discrepancies. Additionally, during this conference call a request was made for ANO to

ADDI

0CAN060502 Page 2

provide a complete copy of the proposed EAL Bases Document. This document is included as Attachment 2 of this letter.

This correspondence contains no new regulatory commitments. If you have any questions, please contact Mr. Robert Holeyfield, Manager, Emergency Planning at (479) 858-4995.

Sincerely.

Dale E James Acting Director, Nuclear Safety Assurance

Attachments:

Attachment 1 – Deviation Document Replacement Pages

Attachment 2 – Proposed Emergency Action Level Bases

0CAN060502 Page 3

cc: Dr. Bruce S. Mallett Regional Administrator U. S. Nuclear Regulatory Commission Region IV 611 Ryan Plaza Drive, Suite 400 Arlington, TX 76011-8064

> NRC Senior Resident Inspector Arkansas Nuclear One P.O. Box 310 London, AR 72847

U. S. Nuclear Regulatory Commission Attn: Mr. Tom Alexion Mail Stop 0-7 D1 Washington, DC 20555-0001

U. S. Nuclear Regulatory Commission Attn: Mr. Drew Holland Mail Stop 0-7 D1 Washington, DC 20555-0001 Attachment 1

- -

.

•

•

.

0CAN060502

Deviation Document Replacement Pages

Attachment 1 to 0CAN060502 Page 1 of 2

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

AA2

Initiating Condition -- ALERT

Damage to Irradiated Fuel or Loss of Water Level that Has or Will Result in the Uncovering of Irradiated Fuel Outside the Reactor Vessel.

Operating Mode Applicability: All

Example Emergency Action Levels: (1 or 2)

1. A VALID (site-specific) alarm or reading on one or more of the following radiation monitors: (site-specific monitors)

Refuel Floor Area Radiation Monitor Fuel Handling Building Ventilation Monitor Refueling Bridge Area Radiation Monitor

2. Water level less than (site-specific) feet for the reactor refueling cavity, spent fuel pool and fuel transfer canal that will result in irradiated fuel uncovering.

Differences:

None

Deviations:

EAL 2: ANO does not have indication of water level for the spent fuel pool or refueling canal to the level that would result in irradiated fuel becoming uncovered. Therefore, "VALID indication of uncontrolled water level drop in the refueling canal or spent fuel pool" was used in lieu of the specific water level described in NEI 99-01.

)

Attachment 1 to 0CAN060502 Page 2 of 2

FUEL CLAD BARRIER EXAMPLE EALS

6. Other (Site-Specific) Indications

LOSS: (Site specific) as applicable POTENTIAL LOSS: (Site specific) as applicable

Differences:

This EAL was re-numbered FCB5 and entitled "Core Damage Assessment."

Deviations:

None

Attachment 2

•

0CAN060502

Proposed Emergency Action Level Bases

٠

.

.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

AU1

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Any UNPLANNED release of gaseous or liquid radioactivity to the environment that exceeds two times the ODCM limits for \geq 60 minutes

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2 OR 3 OR 4)

1. VALID reading on any effluent monitor that exceeds two times the alarm setpoint established by a current release permit for \geq 60 minutes.

	EFFLUENT MONITORS – UNIT 1	
RX-9820	Containment Purge (Channel 7 or 9)	
RE-4830	Waste Gas Radiation Monitor	
RE-4642	Liquid Radwaste Monitor	
	EFFLUENT MONITORS – UNIT 2	
2RX-9820	Containment Purge (Channel 7 or 9)	
2RE-2429	Waste Gas Monitoring System	
2RE-2330	BMS Liquid Discharge Monitor	
2RE-4423	Radwaste Liquid Discharge Monitor	

<u>OR</u>

2. VALID reading on Channel 7 of one or more of the following radiation monitors that exceeds the reading shown for \geq 60 minutes:

	MONITORS – Unit 1	LIMIT
RX-9820	Containment Purge	5.90E-2 (µCi/cc)
RX-9825	Radwaste Area	5.36E-2 (µCi/cc)
RX-9830	Fuel Handling Area	4.54E-2 (μCi/cc)
RX-9835	Emergency Penetration Room	9.56E-1 (µCi/cc)
	MONITORS – Unit 2	LIMIT
2RX-9820	Containment Purge	4.46E-2 (µCi/cc)
2RX-9825	Radwaste Area	3.32E-2 (µCi/cc)
2RX-9830	Fuel Handling Area	4.46E-2 (μCi/cc)
2RX-9835	Emergency Penetration Room	8.84E-1 (μCi/cc)
2RX-9840	Post Accident Sampling Building	4.42E-1 (μCi/cc)
2RX-9845	Aux. Building Extension	1.26E-1 (µCi/cc)
2RX-9850	Low Level Radwaste Storage Building	1.77E-1 (µCi/cc)

OR (Continued on next page)

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT (AU1)

 Confirmed grab sample analyses for gaseous or liquid releases indicates concentrations or release rates, with a release duration of ≥ 60 minutes, in excess of two times the applicable values of the ODCM.

<u>OR</u>

4. RDACS data indicating NUE.

Basis:

This IC addresses a potential or actual reduction in the level of safety of the plant as indicated by a radiological release that exceeds regulatory commitments for an extended period of time. ANO 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 Offsite Dose Calculation Manual (ODCM). The occurrence of extended, uncontrolled radioactive releases to the environment is indicative of degradation in these features and/or controls.

The ODCM multiples are specified in **AU1** and **AA1** 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 should not be prorated or averaged over 60 minutes. For example, a release exceeding 4 times ODCM limits for 30 minutes does not meet the threshold for this IC.

The ODCM contains the site specific release limits and appropriate surveillance requirements which normally monitor these limits. The 60 minute time period allows sufficient time to isolate any release after exceeding ODCM limits. Releases continuing for more than 60 minutes represent inability to isolate or control the release.

"UNPLANNED", as used in this context, includes any release for which a liquid waste release or a gaseous waste release discharge permit was not prepared, or a release that exceeds the conditions (e.g., minimum dilution flow, maximum discharge flow, alarm set points, etc.) on the applicable release permit. Unplanned releases in excess of two times of the ODCM limit that continue for 60 minutes or longer represent an uncontrolled situation and a potential degradation in the level of safety of the plant. The SM/TSC Director/EOF 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 SM/TSC Director/EOF Director should, in the absence of data to the contrary, assume that the release has exceeded 60 minutes.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT (AU1)

EAL #1 addresses radioactivity releases, that for whatever reason, cause effluent radiation monitor readings to exceed two times the alarm setpoint and releases are not terminated within 60 minutes. This alarm setpoint may be associated with a planned batch release, or a continuous release path. In either case, the setpoint is established by the discharge permit to warn of a release that is not in compliance.

EAL #2 is similar to EAL #1, but is intended to address effluent or accident radiation monitors on release pathways for which a discharge permit would not be prepared for a non-routine release. The ODCM establishes a methodology for determining effluent radiation monitor setpoints. The monitor readings in EAL #2 were calculated based on the default source term as described in the ODCM and annual average meteorological conditions for the most limiting downwind sector. The monitor readings in EAL #2 are set to indicate two times the ODCM limit.

EAL #3 addresses uncontrolled releases that are detected by sample analyses, particularly on unmonitored pathways, (e.g., spills of radioactive liquids into storm drains, leakage into river water systems, lake, etc.).

EAL #4 addresses RDACS calculations for NUE. RDACS is a 60 minute rolling calculation and once alarmed, no additional 60 minutes are required.

Escalation is via AA1, AS1, or AG1.

Reference Documents:

- 1. Calculation CL-1863, GERMS SPING-4 Setpoints
- 2. Offsite Dose Calculation Manual

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

AU2

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Unexpected rise in plant radiation

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2)

1. a. VALID indication of uncontrolled water level drop in the refueling canal or spent fuel pool with all irradiated fuel assemblies remaining covered by water.

<u>AND</u>

b. Unplanned VALID Area Radiation Monitor reading rise on any of the following:

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

<u>OR</u>

2. Unplanned VALID Area Radiation Monitor readings rise by a factor of 1000 over normal levels (highest reading in the past twenty-four hours excluding the current peak value)

Basis:

All of the above events tend to have long lead times relative to a potential for radiological release outside the site boundary; thus impact to public health and safety is very low.

This IC addresses elevated radiation levels as a result of lowered water level above the reactor vessel flange or events that have resulted, or may result, in unexpected rises in radiation dose rates within plant buildings. These radiation rises represent a loss of control over radioactive material and may represent a potential degradation in the level of safety of the plant.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT (AU2)

In light of reactor cavity seal failure incidents, explicit coverage of these types of events via EAL #1 is appropriate given their potential for higher doses to plant staff. Specific indications may include local area radiation monitors and personnel (e.g., refueling crew) reports.

Classification as a Notification of Unusual Event is warranted as a precursor to a more serious event.

While a radiation monitor could detect a rise 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 refueling bridge may rise due to planned evolutions such as head lift, or even a fuel assembly being raised in the manipulator mast. Generally, higher 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 reactor vessel flange, classification would be via **CU2**. This event escalates to an Alert per **AA2** 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 addresses UNPLANNED rises in in-plant radiation levels that represent degradation in the control of radioactive material, and represent a potential degradation in the level of safety of the plant. Normal levels can be considered as the highest reading in the past twenty-four hours excluding the current peak value.

This event escalates to an Alert per **AA3** if the rise in dose rates impedes personnel access necessary for safe operation.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

ALERT

Initiating Condition:

Any UNPLANNED release of gaseous or liquid radioactivity to the environment that exceeds 200 times the ODCM limits for \geq 15 minutes

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2 OR 3 OR 4)

1. VALID reading on any effluent monitor that exceeds 200 times the alarm setpoint established by a current release permit for ≥ 15 minutes.

EFFLUENT MONITORS – UNIT 1		
RX-9820	Containment Purge (Channel 7 or 9)	
RE-4830	Waste Gas Radiation Monitor	
RE-4642	Liquid Radwaste Monitor	
EFFLUENT MONITORS – UNIT 2		
2RX-9820	2RX-9820 Containment Purge (Channel 7 or 9)	
2RE-2429	Waste Gas Monitoring System	
2RE-2330	BMS Liquid Discharge Monitor	
2RE-4423	Radwaste Liquid Discharge Monitor	

<u>OR</u>

2. VALID reading on Channel 7 of one or more of the following radiation monitors that exceeds the reading shown for \geq 15 minutes:

	MONITORS – Unit 1	LIMIT
RX-9820	Containment Purge	5.90E0 (µCi/cc)
RX-9830	Fuel Handling Area	4.54E0 (µCi/cc)
RX-9825	Radwaste Area	5.36E0 (µCi/cc)
RX-9835	Emergency Penetration Room	9.56E+1 (µCi/cc)
J	MONITORS – Unit 2	LIMIT
2RX-9820	Containment Purge	4.46E0 (µCi/cc)
2RX-9825	Radwaste Area	3.32E0 (µCi/cc)
2RX-9830	Fuel Handling Area	4.46E0 (µCi/cc)
2RX-9835	Emergency Penetration Room	8.84E+1 (µCi/cc)
2RX-9840	Post Accident Sampling Building	4.42E+1 (µCi/cc)
2RX-9845	Aux. Building Extension	1.26E+1 (µCi/cc)
2RX-9850	Low Level Radwaste Storage Building	1.77E+1 (µCi/cc)

OR (Continued on next page)

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT (AA1)

3. Confirmed grab sample analyses for gaseous or liquid releases indicates concentrations or release rates, with a release duration of \geq 15 minutes, in excess of 200 times the applicable values of the ODCM.

<u>OR</u>

4. RDACS data indicating ALERT.

Basis:

This event escalates from the Notification of Unusual Event by escalating the magnitude of the release.

These EALs address a potential or actual drop in the level of safety of the plant as indicated by a radiological release that exceeds regulatory commitments for an extended period of time. ANO 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 ODCM. The occurrence of extended, uncontrolled radioactive releases to the environment is indicative of degradation in these features and/or controls.

The ODCM multiples are specified in **AA1** and **AU1** 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 should not be prorated or averaged. For example, a release exceeding 400 times ODCM limits for 7.5 minutes does not meet the threshold for this event classification.

"UNPLANNED", as used in this context, includes any release for which a liquid waste release or a gaseous waste release discharge permit was not prepared, or a release that exceeds the conditions (e.g., minimum dilution flow, maximum discharge flow, alarm set points, etc.) on the applicable package permit. The SM/TSC Director/EOF 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 SM/TSC Director/EOF 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 to exceed 200 times the alarm setpoint and are not terminated within 15 minutes. This alarm setpoint may be associated with a planned batch release or a continuous release path. In either case, the setpoint is established by the discharge permit to warn of a release that is not in compliance.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT (AA1)

EAL #2 is similar to EAL #1, but is intended to address effluent or accident radiation monitors on release pathways for which a discharge permit would not be prepared for a non-routine release. The ODCM establishes a methodology for determining effluent radiation monitor setpoints. The monitor readings in EAL #2 were calculated based on the default source term as described in the ODCM and annual average meteorological conditions for the most limiting downwind sector. The monitor readings in EAL #2 are set to indicate 200 times the ODCM limit.

EAL #3 addresses uncontrolled releases that are detected by sample analyses, particularly on unmonitored pathways, e.g., spills of radioactive liquids into storm drains, leakage into Lake Dardanelle, etc.

EALs #1 and #2 directly correlate with the ODCM 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 these ICs is not a dose or dose rate, but rather the degradation in the level of safety of the plant implied by the uncontrolled release that was not isolated within 15 minutes.

Due to the uncertainty associated with meteorology, emergency implementing procedures should call for the timely performance of dose assessments using actual (real-time and sector) meteorology in the event of a gaseous radioactivity release of this magnitude. The results of these assessments should be compared to **AS1** and **AG1** to determine if the event classification should be escalated. Classification should not be delayed pending the results of these dose assessments.

EAL #4 addresses RDACS calculations for ALERT. Once RDACS data indicates ALERT, no additional time is required.

Reference Documents:

- 1. Calculation CL-1863, GERMS SPING-4 Setpoints
- 2. Offsite Dose Calculation Manual

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

ALERT

Initiating Condition:

Damage to irradiated fuel or loss of water level that has or will result in the uncovering of irradiated fuel outside the reactor vessel

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2)

1. A VALID alarm on one or more of the following radiation monitors:

	Unit 1
RX-9820	Containment Purge (Channel 7 or 9)
RX-9825	Radwaste Area (Channel 7 or 9)
RX-9830	Fuel Handling Area (Channel 7 or 9)
RE-8060	Containment High Range Radiation Monitors
RE-8061	Containment High Range Radiation Monitors
RE-8009	Spent Fuel Area
RE-8017	Fuel Handling
	Unit 2
2RX-9820	Containment Purge (Channel 7 or 9)
2RX-9825	Radwaste Area (Channel 7 or 9)
2RX-9830	Fuel Handling Area (Channel 7 or 9)
2RE-8925-1	Containment High Range Radiation Monitors
2RE-8925-2	Containment High Range Radiation Monitors
2RE-8914	Spent Fuel Area
2RE-8915	Spent Fuel Area
2RE-8916	Spent Fuel Area
2RE-8912	Containment Incore Inst.

<u>OR</u>

2. VALID indication of uncontrolled water level drop in the refueling canal or spent fuel pool such that irradiated fuel will become uncovered.

Basis:

This IC and associated EALs address specific events that have resulted, or may result in unexpected rises 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 **AU2** in that fuel activity has been released, or is anticipated due to fuel heatup.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT (AA2)

These EALs apply to spent fuel requiring water coverage. There is time available to take corrective actions, and there is little potential for substantial fuel damage. Uncontrolled lowering of water level may be detected by visual observation, elevated radiation levels, or various other symptoms that consider valid indicators of the event. Fuel uncovery may be expected based on abnormal radiation level, visual observation, or best judgment of the SM/TSC Director/EOF Director based on present and past trends.

EAL #1 addresses radiation monitor indications of fuel uncovery and/or fuel damage. Elevated readings on ventilation monitors may be indicative of a radioactivity release from the fuel, confirming that damage has occurred. Elevated background at the monitor due to water level drop may mask elevated ventilation exhaust airborne activity and should be considered. While a radiation monitor could detect a rise 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 ICs requires understanding of the actual radiological conditions present in the vicinity of the monitor.

EAL #2 indicators may include instrumentation (such as local area radiation monitors) and personnel (e.g., refueling crew) reports.

Escalation, if appropriate, would occur via **AS1** or **AG1** or SM/TSC Director/EOF Director judgment.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

ALERT

Initiating Condition:

Release of radioactive material or elevated radiation levels within the facility that impede operation of systems required to maintain safe operations or to establish or maintain cold shutdown

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2)

- 1. VALID radiation readings > 15 mR/hr in any of the following areas:
 - Unit 1 Control Room
 - Unit 2 Control Room
 - Central Alarm Station
 - Secondary Alarm Station

<u>OR</u>

2. VALID radiation readings > 2.5 R/hr on any of the following monitors:

	Unit 1	
RI-8002	404' Computer Room	
RI-8004	317' Outside Stairway	
RI-8005	354' Sample Room Vestibule	
RI-8006	354' Radiochemistry Lab	
RI-8007	369' EDG Hallway	
RI-8010	386' CA Area	
RI-8011	335' Outside Stairway	
RI-8013	335' EFW Pump Area	
Unit 2		
2RITS-8900	317' General Area	
2RITS-8901	335' Coolant Charging Pumps Area	
2RITS-8902	335' 2F-3 Hallway	
2RITS-8903	354' Volume Control Tank Access Area	
2RITS-8907	372' EDG Hallway	
2RITS-8910	386' Emergency Chiller Hallway	
2RITS-8914	404' Spent Fuel Pool Cask Washdown Area	
2RITS-8917	354' Hot Lab Sample Room	

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT (AA3)

Basis:

This IC addresses elevated radiation levels that impede necessary access to operating stations, or other 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 that results in the actual or potential substantial degradation of the level of safety of the plant. The cause and/or magnitude of the rise in radiation levels is not a concern of these EALs. The SM/TSC Director/EOF Director must consider the source or cause of the elevated radiation levels and determine if any other EAL may be involved. For example, a 15 mR/hr dose rate in the control room or a high radiation monitor reading may be a problem in itself. However, the elevated radiation readings levels may also be indicative of high dose rates in the containment due to a LOCA. In this latter case, an SAE or GE may be indicated by the fission product barrier matrix EALs.

This IC is not meant to apply to elevated radiation levels in the containment as these are events which are addressed in the fission product barrier matrix EALs. This IC is not intended to apply to anticipated temporary rises due to planned events (e.g., incore detector movement, radwaste container movement, depleted resin transfers, etc.).

At ANO, the only areas that are required to be manned continuously in order to maintain safe operation or establish or maintain cold shutdown are the Control Rooms, Central Alarm Station, and Secondary Alarm Station. The reading on the Unit 1 Control Room Area Radiation Monitor (RE-8001) may be used as the indicator for both Control Rooms. The value of 15 mR/hr is derived from the GDC 19 value of 5 Rem in 30 days with adjustment for expected occupancy times. Although Section III.D.3 of NUREG-0737, *"Clarification of TMI Action Plan Requirements"*, provides that the 15 mR/hr value can be averaged over the 30 days, the value is used here without averaging, as a 30 day duration implies an event potentially more significant than an Alert.

For areas requiring infrequent access, the value of 2.5 R/hr was selected because it is a value with a specific action for Radiation Protection Superintendent approval addressed in RP-105, "Radiation Work Permits", that would result in exposure control measures intended to maintain doses within normal occupational guidelines and limits (i.e., 10CFR20), and in doing so, 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.

Applicable areas requiring infrequent access were developed from the site's Abnormal Operating Procedures and Emergency Operating Procedures.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

SITE AREA EMERGENCY

Initiating Condition:

Offsite dose resulting from an actual or imminent release of gaseous radioactivity exceeds 100 mR TEDE or 500 mR child thyroid CDE for the actual or projected duration of the release

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2 OR 3)

- **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 reading on Channel 9 of one or more of the following radiation monitors that exceeds or is expected to exceed the reading shown for ≥ 15 minutes:

	MONITORS - UNIT 1	LIMIT
RX-9820	Containment Purge	5.90E+1 (µCi/cc)
RX-9825	Radwaste Area	5.36E+1 (µCi/cc)
RX-9830	Fuel Handling Area	4.54E+1 (µCi/cc)
RX-9835	Emergency Penetration Room	9.56E+2 (µCi/cc)
	MONITORS - UNIT 2	LIMIT
2RX-9820	Containment Purge	4.46E+1 (µCi/cc)
2RX-9825	Radwaste Area	3.32E+1 (µCi/cc)
2RX-9830	Fuel Handling Area	4.46E+1 (µCi/cc)
2RX-9835	Emergency Penetration Room	8.84E+2 (µCi/cc)
2RX-9840	Post Accident Sampling Building	4.42E+2 (μCi/cc)
2RX-9845	Aux. Building Extension	1.26E+2 (µCi/cc)
2RX-9850	Low Level Radwaste Storage Building	1.77E+2 (µCi/cc)

<u>OR</u>

2. Dose assessment using actual meteorology indicates doses > 100 mR TEDE or 500 mR child thyroid CDE at or beyond the site boundary.

<u>OR</u>

 Field survey results indicate closed-window dose rates exceeding 100 mR/hr expected to continue for more than one hour; or analyses of field survey samples indicate child thyroid CDE ≥ 500 mR for one hour of inhalation, at or beyond the site boundary.

AS1

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT (AS1)

Basis:

This IC addresses radioactivity releases that result in doses at or beyond the site boundary 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 may be 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 (e.g., fuel handling accident in spent fuel building).

The actual or projected dose of 100 mR TEDE is set at 10% of the EPA Protective Action Guide (PAG) values given in EPA-400-R-92-001, while the 500 mR child thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE. The TEDE integrated dose value also provides a desirable gradient (one order of magnitude) between the Alert, Site Area Emergency and General Emergency Classes.

The SM/TSC Director/EOF 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 monitor list in EAL #1 includes monitors on all potential release pathways (plant stack, primarysecondary leak, fuel handling accident). The EPA PAGs are expressed in terms of the sum of the "effective dose equivalent (EDE)" and the "committed effective dose equivalent (CEDE)", or as the child thyroid "committed dose equivalent (CDE)". For the purpose of these ICs, the dose quantity "total effective dose equivalent (TEDE)", as defined in 10 CFR 20, is used in lieu of "...sum of EDE and CEDE...." The EPA PAG guidance in EPA-400R-92-001 provides for the use adult thyroid dose conversion factors.

The monitor readings in EAL #1 were determined by using the same meteorology and source term as those used for determining the monitor reading EALs in **AU1** and **AA1**. This protocol maintains intervals between the ICs for the four classifications. Since doses are not monitored in real-time, a release duration of one hour was assumed and the monitor readings are based on a site boundary (or beyond) dose of 100 mR/hour TEDE.

Since dose assessment in EAL #2 is based on actual meteorology, whereas the monitor readings in EAL #1 are 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 should call for performance of dose assessments within 15 minutes 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 EALs. However, classification should not be delayed pending the results of these dose assessments. If dose assessment team calculations cannot be completed in 15 minutes, then valid monitor readings should be used for emergency classification.

Field team surveys in EAL #3 should be performed at or beyond the SITE BOUNDARY and at the most accurate indicator of the condition. Field data are independent of release elevation and meteorology. The assumed release duration is one hour. Expected post accident source terms would be dominated by noble gases providing the dose rate value. Sampling of radioiodine by adsorption on a charcoal cartridge should determine the iodine value.

Escalation is via AG1.

Reference Documents:

- 1. Calculation CL-1863, GERMS SPING-4 Setpoints
- 2. Offsite Dose Calculation Manual

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

GENERAL EMERGENCY

Initiating Condition:

Offsite dose resulting from an actual or imminent release of gaseous radioactivity exceeds 1000 mR TEDE or 5000 mR child thyroid CDE for the actual or projected duration of the release using actual meteorology

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2 OR 3)

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 more accurately characterize the nature of the release.

1. VALID reading on Channel 9 of one or more of the following radiation monitors that exceeds or is expected to exceed the reading shown for 15 minutes or longer:

	MONITORS - UNIT 1	LIMIT
RX-9820	Containment Purge	5.90E+2 (µCi/cc)
RX-9825	Radwaste Area	5.36E+2 (µCi/cc)
RX-9830	Fuel Handling Area	4.54E+2 (µCi/cc)
RX-9835	Emergency Penetration Room	9.56E+3 (µCi/cc)
	MONITORS - UNIT 2	LIMIT
2RX-9820	Containment Purge	4.46E+2 (µCi/cc)
2RX-9825	Radwaste Area	3.32E+2 (µCi/cc)
2RX-9830	Fuel Handling Area	4.46E+2 (μCi/cc)
2RX-9835	Emergency Penetration Room	8.84E+3 (µCi/cc)
2RX-9840	Post Accident Sampling Building	4.42E+3 (μCi/cc)
2RX-9845	Aux. Building Extension	1.26E+3 (μCi/cc)
2RX-9850	Low Level Radwaste Storage Building	1.77E+3 (µCi/cc)

<u>OR</u>

2. Dose assessment using actual meteorology indicates doses > 1000 mR TEDE or 5000 mR child thyroid CDE at or beyond the site boundary.

<u>OR</u>

3. Field survey results indicate closed window dose rates > 1000 mR/hr expected to continue for more than one hour; or analyses of field survey samples indicate child thyroid CDE of 5000 mR for one hour of inhalation, at or beyond site boundary.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT (AG1)

Basis:

This IC and associated EALs address radioactivity releases that result in doses at or beyond the site boundary that exceed the EPA Protective Action Guides (PAGs). Public protective actions will be necessary. Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public and likely involve fuel damage. While these failures are addressed by other EALs, this EAL provides appropriate diversity and addresses events which may not be able to be classified on the basis of plant status alone. It is important to note that, for the more severe accidents, the release may be unmonitored or there may be large uncertainties associated with the source term and/or meteorology.

The actual or projected dose of 1000 mR TEDE and 5000 mR child thyroid CDE integrated doses are based on the EPA Protective Action Guide (PAG) values given in EPA-400-R-92-001, which indicates that public protective actions are indicated if doses exceed these values. This is consistent with the emergency class description of a General Emergency.

The SM/TSC Director/EOF 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 monitor list in EAL #1 includes monitors on all potential release pathways (Plant stack, Primary/Secondary Leak, Fuel Handling Accident). The EPA PAGs are expressed in terms of the sum of the "effective dose equivalent (EDE)" and the "committed effective dose equivalent (CEDE)", or as the child thyroid "committed dose equivalent (CDE)". For the purpose of these ICs, the dose quantity "total effective dose equivalent (TEDE)", as defined in 10 CFR 20, is used in lieu of "...sum of EDE and CEDE...." The EPA PAG guidance EPA-400R-92-001 provides for the use of adult thyroid dose conversion factors.

The monitor readings in EAL #1 were determined by using the same meteorology and source term as those used for determining the monitor reading EALs in **AU1** and **AA1**. This protocol maintains intervals between the ICs for the four classifications. Since doses are not monitored in real-time, a release duration of one hour was assumed and the monitor readings are based on a site boundary (or beyond) dose of 1000 mR/hour TEDE.

Since dose assessment in EAL #2 is based on actual meteorology, whereas the monitor reading in EAL #1 are not, the results from these assessments may indicate that the classification is not warranted. For this reason, emergency implementing procedures should call for performance of dose assessments within 15 minutes 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 EALs. However, classification should not be delayed pending the results of these dose assessments. If dose assessment team calculations cannot be completed in 15 minutes, then valid monitor readings should be used for emergency classification.

Field team surveys in EAL #3 should be performed at or beyond the SITE BOUNDARY and at the most accurate indicator of the condition. Field data are independent of release elevation and meteorology. The assumed release duration is one hour. Expected post accident source terms would be dominated by noble gases providing the dose rate value. Sampling of radioiodine by adsorption on charcoal cartridge should determine the iodine value.

Reference Documents:

- 1. Calculation CL-1863, GERMS SPING-4 Setpoints
- 2. Offsite Dose Calculation Manual

CU1

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

RCS leakage

Operating Mode Applicability:

Cold Shutdown (Mode 5)

Emergency Action Level(s): (1 OR 2)

1. Unidentified or pressure boundary leakage > 10 gpm.

<u>OR</u>

2. Identified leakage > 25 gpm.

Basis:

This IC is included as an NUE because it is considered to be a potential degradation of the level of safety of the plant. The 10 gpm value for the unidentified and pressure boundary leakage was selected as it is sufficiently large to be observable via normally installed instrumentation (e.g., pressurizer level, RCS loop level instrumentation, etc.) or reduced inventory instrumentation such as level hose indication. Lesser values must generally be determined through time consuming surveillance tests (e.g., mass balances). 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. Prolonged loss of RCS inventory may result in escalation to the ALERT level via either IC **CA1** or **CA4**.

The difference between **CU1** and **CU2** 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 means such as pressurizer level indication and makeup volume control tank levels are normally available.

CU2

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

UNPLANNED loss of RCS inventory with irradiated fuel in the reactor vessel

Operating Mode Applicability:

Refueling (Mode 6)

Emergency Action Level(s): (1 OR 2)

1. UNPLANNED reactor vessel level drop below the reactor vessel flange for \geq 15 minutes.

<u>OR</u>

2. a. Loss of RCS inventory as indicated by unexplained Reactor Building Sump, Reactor Drain Tank, Aux. Building Equipment Drain Tank, Aux. Building Sump, or Quench Tank level rise.

<u>AND</u>

b. Reactor vessel level cannot be monitored.

Basis:

This IC is included as an NUE 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. Refueling evolutions that lower RCS water level below the reactor vessel flange are carefully planned and procedurally controlled. An UNPLANNED event that results in water level dropping below the reactor vessel flange warrants declaration of an NUE 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 that a more serious condition exists. Continued loss of RCS inventory will result in escalation to the ALERT level via either IC CA2 or CA4.

The difference between **CU1** and **CU2** deals with the RCS conditions that exist between cold shutdown and refueling modes. In cold shutdown the RCS will normally be intact and standard indications of RCS inventory are available.

In the refueling mode, normal means of core temperature indication and Reactor vessel level indication may not be available. Redundant means of reactor vessel 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 RCS inventory loss was occurring by observing sump and tank level changes. Sump and tank level rises 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. Escalation to ALERT would be via either CA2 or CA4.

EAL #1 involves a drop in Reactor vessel level below the top of the reactor vessel flange that continues for 15 minutes due to an UNPLANNED event. This EAL is not applicable to lowering levels in flooded refueling canal level (covered by **AU2**, EAL #1) until such time as the level lowering to the level of the vessel flange.

If the reactor vessel level continues to lower and reaches the bottom of the reactor coolant system hot leg penetration into the vessel, then escalation to **CA2** would be appropriate.

CU3

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

UNPLANNED loss of decay heat removal capability with irradiated fuel in the reactor vessel

Operating Mode Applicability:

Cold Shutdown (Mode 5) Refueling (Mode 6)

Emergency Action Level(s): (1 OR 2)

1. An UNPLANNED event results in RCS temperature exceeding 200°F.

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

Basis:

This IC is included as an NUE 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 loss of 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 many hours after the reactor has been shut down. 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 reactor vessel. In addition, the operators should be able to monitor RCS temperature and reactor vessel level so that escalation to the ALERT level via CA2 or CA4 will occur if required.

Loss of forced decay heat removal at reduced inventory may result in more rapid rises in reactor coolant temperatures depending on the time since shutdown. Escalation to the Alert level via **CA4** is provided should an UNPLANNED event result in RCS temperature exceeding the Technical Specification cold shutdown temperature limit for greater than 30 minutes with CONTAINMENT CLOSURE not established.

Unlike the cold shutdown mode, normal means of core temperature indication and reactor vessel level indication may not be available in the refueling mode. Redundant means of reactor vessel level indication are procedurally installed to assure that the ability to monitor level will not be interrupted. However, if all level and temperature indication were to be lost in either the cold shutdown or refueling modes, EAL #2 would result in declaration of an NUE if either temperature or level indication cannot be restored within 15 minutes from the loss of both means of indication. Escalation to ALERT would be via CA2 based on an inventory loss or CA4 based on exceeding its temperature criterion.

The SM/TSC Director/EOF Director 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 SM/TSC Director/EOF Director, an imminent situation is at hand, the classification should be made as if the threshold has been exceeded.

CU4

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Fuel clad degradation

Operating Mode Applicability:

Cold Shutdown (Mode 5) Refueling (Mode 6)

Emergency Action Level(s): (1 OR 2)

1. Failed Fuel Iodine radiation monitor reading indicates fuel clad degradation > Technical Specification allowable limits.

<u>Unit 1:</u>

RI-1237S reads > 1.3×10^5 counts per minute.

<u>Unit 2:</u>

2RITS-4806B reads > 6.5×10^4 counts per minute.

2. RCS sample activity indicates fuel clad degradation > Technical Specification allowable limits.

<u>Unit 1:</u>

> 3.50 µCi/gm IDE
> 72/Ē µCi/gm Gross Activity

<u>Unit 2:</u>

- > 1.0 µCi/gm IDE
- > 100/Ē µCi/gm Gross Activity

Basis:

The condition noted in this EAL 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 addresses the Unit 1 Letdown Radiation Monitor alarm setpoint that is indicative of RCS Iodine levels that may exceed the Technical Specification limit. EAL #2 addresses reactor coolant samples exceeding Technical Specification limits for iodine spikes that are indicative of a loss of fuel clad integrity.

Reference Documents:

1. ANO-2005-2-0029, Expected Response of 2RITS-4806B to TS Iodine Activity

CU5

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Loss of all offsite power to vital 4.16 KV busses for > 15 minutes

Operating Mode Applicability:

Cold Shutdown (Mode 5) Refueling (Mode 6)

Emergency Action Level(s):

1. a. Loss of power to all Startup Transformers for > 15 minutes.

<u>AND</u>

b. At least one vital 4.16 KV bus powered from an independent diesel generator.

Basis:

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.

Escalation is via CA5.

5

CU6

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

UNPLANNED loss of required DC power for > 15 minutes

Operating Mode Applicability:

Cold Shutdown (Mode 5) Refueling (Mode 6)

Emergency Action Level(s):

1. a. UNPLANNED Loss of Vital DC power to required DC busses based on bus voltage < 105 volts.

<u>AND</u>

b. Failure to restore power to at least one required DC bus within 15 minutes from the time of loss.

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 since the operating crew may not have necessary indication and control of equipment needed to respond to the loss.

UNPLANNED is included in this IC and EAL to preclude the declaration of an emergency as a result of planned maintenance activities. Routinely, plants perform maintenance on a train related basis during shutdown periods. It is intended that the loss of the operating (operable) train is to be considered.

The specified bus voltage indication, 105 volts, is based on the minimum bus voltage necessary for the operation of safety related equipment.

If the loss of DC power results in the inability to maintain cold shutdown, the escalation to an ALERT will be per **CA4**.

CU7

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Inadvertent criticality

Operating Mode Applicability:

Cold Shutdown (Mode 5) Refueling (Mode 6)

Emergency Action Level(s):

1. An UNPLANNED sustained positive startup rate 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 misloading events and inadvertent dilution events. This condition indicates a potential degradation of the level of safety of the plant warranting an NUE classification. The 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 **SU10**.

This condition can be identified using the startup rate monitor. The term "sustained" is used in order to allow exclusion of expected short term positive startup rates from planned fuel bundle or control rod movements during core alteration. These short term positive startup rates are the result of the rise in neutron population due to subcritical multiplication.

Escalation would be by SM/TSC Director/EOF Director judgment.

CU8

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

UNPLANNED loss of all onsite or offsite communications capabilities

Operating Mode Applicability:

Cold Shutdown (Mode 5) Refueling (Mode 6)

Emergency Action Level(s): (1 OR 2)

1. Loss of all onsite communications capability (Table C1) affecting the ability to perform routine operations.

Table C1	
Onsite Communications Equipment	
	Station radio system
	Plant paging system
	In-plant telephones
	Gaitronics

<u>OR</u>

2. Loss of all offsite communications capability (Table C2).

Table C2
Offsite Communications Equipment
All telephone lines (commercial and microwave)
Station radio system
ENS

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 to 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., individuals being sent to offsite locations, etc.) are being utilized to make communications possible.

CA1

ALERT

Initiating Condition:

Loss of RCS inventory

Operating Mode Applicability:

Cold Shutdown (Mode 5)

Emergency Action Level(s): (1 OR 2)

1. Loss of RCS inventory as indicated by:

Unit 1: RVLMS Levels 1 through 8 indicate DRY Unit 2: RVLMS Levels 1 through 5 indicate DRY

<u>OR</u>

2. a. Loss of RCS inventory as indicated by unexplained Reactor Building Sump, Reactor Drain Tank, Aux. Building Equipment Drain Tank, Aux. Building Sump, or Quench Tank level rise.

<u>AND</u>

b. Reactor vessel level cannot be monitored for > 15 minutes.

Basis:

These EALs serve as precursors to a loss of the ability to adequately cool the core. The magnitude of this loss of water indicates that makeup systems have not been effective and may not be capable of preventing further reactor vessel level drop and potential core uncovery. This condition will result in a minimum classification of ALERT. The bottom of the RCS hot leg penetration into the reactor vessel is approximately RLVMS Level 8 (Unit 1) or RVLMS Level 5 (Unit 2). Below this level, remote Reactor vessel level indication may be lost and loss of suction to decay heat removal systems will occur. 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 several hours 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 reactor vessel. The above forms the basis for needing both a cold shutdown specific IC (CA1) and a refueling specific IC (CA2).

In cold shutdown, 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 rises 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 CS1 Site Area Emergency EAL duration. The 15-minute duration allows CA1 to be an effective precursor to CS1. 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 CS1 basis. Therefore, this EAL meets the definition for an Alert emergency class.

The difference between **CA1** and **CA2** deals with the reactor conditions that exist between cold shutdown and refueling mode applicability. In cold shutdown the reactor vessel will normally be intact and standard reactor vessel level monitoring means are available.

If reactor vessel level continues to drop, then escalation to Site Area Emergency will be via CS1.

CA2

ALERT

Initiating Condition:

Loss of RCS inventory with irradiated fuel in the reactor vessel

Operating Mode Applicability:

Refueling (Mode 6)

Emergency Action Level(s): (1 OR 2)

1. Loss of RCS inventory as indicated by:

Unit 1: Reactor vessel level < 368 ft., 0 in. Unit 2: Reactor vessel level < 369 ft., 1.5 in.

<u>OR</u>

2. a. Loss of RCS inventory as indicated by unexplained Reactor Building Sump, Reactor Drain Tank, Aux. Building Equipment Drain Tank, Aux. Building Sump, or Quench Tank level rise.

<u>AND</u>

b. Reactor vessel 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 reactor vessel level drop and potential core uncovery. This condition will result in a minimum classification of ALERT. The bottom of the RCS hot leg penetration into the reactor vessel is 368 ft., 0 in. (Unit 1) or 369 ft., 1.5 in. (Unit 2). Below this level, Reactor vessel level indication will be lost and loss of suction to decay heat removal systems will occur. 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 several hours 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 reactor vessel. The above forms the basis for needing both a cold shutdown specific IC (CA1) and a refueling specific IC (CA2).
COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION (CA2)

In the refueling mode, normal means of reactor vessel level indication may not be available. Redundant means of reactor vessel 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 RCS inventory loss was occurring by observing sump and tank level changes. Sump and tank level rises must be evaluated against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of reactor vessel leakage. The 15-minute duration for the loss of level indication was chosen because it is half of the **CS2** Site Area Emergency EAL duration. The 15-minute duration allows **CA2** to be an effective precursor to **CS2**. 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 **CS2** basis. Therefore, this EAL meets the definition for an ALERT.

The difference between **CA1** and **CA2** deals with the reactor conditions that exist between cold shutdown and refueling mode applicability. In cold shutdown the reactor vessel will normally be intact and standard reactor vessel level monitoring means are available. In the refueling mode the reactor vessel is not intact and RCS inventory is monitored by different means.

If reactor vessel level continues to drop, then escalation to Site Area Emergency will be via CS2.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CA3

ALERT

Initiating Condition:

Inability to maintain plant in cold shutdown with irradiated fuel in the reactor vessel

Operating Mode Applicability:

Cold Shutdown (Mode 5) Refueling (Mode 6)

Emergency Action Level(s): (1 OR 2 OR 3)

 With CONTAINMENT CLOSURE <u>and</u> RCS integrity not established, an UNPLANNED event results in RCS temperature exceeding 200°F.

<u>OR</u>

2. With CONTAINMENT CLOSURE established <u>AND</u> either RCS integrity <u>not</u> established <u>or</u> RCS inventory reduced, an UNPLANNED event results in RCS temperature exceeding 200°F for > 20 minutes¹.

<u>OR</u>

3. An UNPLANNED event results in RCS temperature exceeding 200°F for > 60 minutes¹ or results in an RCS pressure rise of > 10 psi.

¹Note: <u>IF</u> decay heat removal system (Decay Heat or Shutdown Cooling) is in operation within this time frame <u>AND</u> RCS temperature is being reduced, <u>THEN</u> this EAL is not applicable.

Basis:

This IC and its associated EALs are based on concerns raised by Generic Letter 88-17, *Loss of Decay Heat Removal.* A number of phenomena such as pressurization, vortexing, steam generator U-tube draining, RCS level differences when operating at a mid-loop condition, decay heat removal system design, and level instrumentation problems can lead to conditions where decay heat removal is lost and core uncovery can occur. NRC analyses show that sequences of events can cause core uncovery in 15 to 20 minutes and severe core damage within an hour after decay heat removal is lost.

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

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION (CA3)

The SM/TSC Director/EOF Director 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 SM/TSC Director/EOF Director, an imminent situation is at hand, the classification should be made as if the threshold has been exceeded.

EAL #1 addresses complete loss of functions required for core cooling during refueling and cold shutdown modes when neither CONTAINMENT CLOSURE nor RCS integrity are established. RCS integrity is in place when the RCS pressure boundary is in its normal condition to be pressurized (e.g., no freeze seals or nozzle dams). No delay time is allowed for EAL #1 because the evaporated reactor coolant that may be released into the 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 greater than 20 minutes during refueling and cold shutdown modes when CONTAINMENT CLOSURE is established but RCS integrity is not established or RCS inventory is reduced (e.g., mid-loop operation). As in EAL #1, RCS integrity should be assumed to be in place when the RCS pressure boundary is in its normal condition to be pressurized (e.g., no freeze seals or nozzle dams). 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 containment barrier to fission product release is established. Note 1 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 greater than 60 minutes during refueling and cold shutdown modes 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 to be pressurized (e.g., no freeze seals or nozzle dams). The status of CONTAINMENT CLOSURE 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 a substantial degradation in plant safety. The 10 psi pressure rise covers situations where, due to high decay heat loads, the time provided to restore temperature control should be less than 60 minutes. The RCS pressure setpoint chosen is 10 psi, which can be read on installed control board instrumentation. Note 1 indicates that EAL 3 is not applicable if actions are successful in restoring a shutdown cooling system to operation and RCS temperature is being reduced within the 60-minute time frame assuming that the RCS pressure rise has remained less than 10 psi.

Escalation to Site Area Emergency would be via **CS1** or **CS2** should boiling result in significant reactor vessel level loss leading to core uncovery.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION .

CA5

ALERT

Initiating Condition:

Loss of all offsite power and loss of all onsite AC power to Vital 4.16 KV busses

Operating Mode Applicability:

Cold Shutdown (Mode 5) Refueling (Mode 6) Defueled

Emergency Action Level(s):

1. a. Loss of power to all Startup transformers.

<u>AND</u>

b. Failure of all Diesel Generators to supply power to Vital 4.16 KV busses.

<u>AND</u>

c. Failure to restore power to at least one Vital 4.16 KV bus within 15 minutes from the time of loss of both offsite and onsite AC power.

Basis:

Loss of all AC power compromises all plant safety systems requiring electric power including DHR/shutdown cooling, emergency core cooling, containment cooling, spent fuel pool cooling, and the ultimate heat sink. When in the cold shutdown, refueling, or defueled mode the event can be classified as an Alert because of the significantly reduced decay heat and lower temperature and pressure which allow raising the time to restore one of the emergency busses, relative to that specified for the Site Area Emergency EAL. Fifteen minutes was selected as a threshold to exclude transient or momentary power losses. Escalating to Site Area Emergency, if appropriate, is by Abnormal Rad Levels/Radiological Effluent, or SM/TSC Director/EOF Director judgment ICs.

Consideration should be given to available loads necessary to remove decay heat or provide reactor vessel makeup capability when evaluating loss of AC power to vital busses. Even though a vital bus may be energized, if necessary loads (i.e., loads that, if lost, would inhibit decay heat removal capability or reactor vessel makeup capability) are not available on the energized bus, then the bus should not be considered available.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CS1

SITE AREA EMERGENCY

Initiating Condition:

Loss of RCS inventory affecting core decay heat removal capability

Operating Mode Applicability:

Cold Shutdown (Mode 5)

Emergency Action Level: (1 <u>OR</u> 2)

- 1. With CONTAINMENT CLOSURE **not** established:
 - a. RCS inventory as indicated by:

Unit 1: RVLMS Levels 1 through 9 indicate DRY Unit 2: RVLMS Levels 1 through 6 indicate DRY

<u>OR</u>

b. Reactor vessel level cannot be monitored for > 30 minutes with a loss of RCS inventory as indicated by unexplained Reactor Building Sump, Reactor Drain Tank, Quench Tank, Aux. Building Equipment Drain Tank, or Aux. Building Sump level rise.

<u>OR</u>

- 2. With CONTAINMENT CLOSURE established:
 - a. RCS inventory as indicated by:

Unit 1: RLVMS Levels 1 through 9 indicate DRY Unit 2: RVLMS Levels 1 through 7 indicate DRY

<u>OR</u>

- b. Reactor vessel level cannot be monitored for >30 minutes with a loss of RCS inventory as indicated by either:
 - Unexplained Reactor Building Sump, Reactor Drain Tank, Quench Tank, Aux. Building Equipment Drain Tank, or Aux. Building Sump level rise
 - Erratic source range monitor indication

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION (CS1)

Basis:

Under the conditions specified by these EALs, continued lowering in reactor vessel level is indicative of a loss of inventory control. Inventory loss may be due to a reactor vessel breach, pressure boundary leakage, or continued boiling in the reactor vessel.

If all reactor vessel level indications were to be lost during a loss of RCS inventory event, the operators would need to determine that RCS inventory loss was occurring by observing containment sump level, reactor drain tank level, or quench tank level change. Containment sump level, reactor drain tank level, or quench tank level against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of RCS leakage. This EAL is 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 (mid-loop, reduced level/flange level, head in place, cavity flooded, RCS venting strategy, decay heat removal system design, vortexing pre-disposition, or steam generator U-tube draining) 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 uncovery; therefore, 30 minutes was chosen to be conservative.

The 30-minute duration allowed when CONTAINMENT CLOSURE is established allows sufficient time for actions to be performed to recover needed cooling equipment and is considered to be conservative. As water level in the reactor vessel lowers, the dose rate above the core will rise. Additionally, studies indicate that the installed nuclear instrumentation will operate erratically when the core is uncovered and can be used as a tool for making such determinations. Since effluent release is not expected with closure established, declaration of a Site Area Emergency is warranted under the conditions specified.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CS2

SITE AREA EMERGENCY

Initiating Condition:

Loss of RCS inventory affecting core decay heat removal capability with irradiated fuel in the reactor vessel

Operating Mode Applicability:

Refueling (Mode 6)

Emergency Action Level(s):

- 1. Reactor vessel level cannot be monitored with core uncovery indicated by one or more of the following:
 - Containment High Range Radiation Monitor reading > 10 R/hr
 - Erratic source range monitor indication
 - Core Exit Thermocouples indicate superheat

Basis:

Under the conditions specified by these EALs, continued drop in reactor vessel level is indicative of a loss of inventory control. Inventory loss may be due to a reactor vessel breach, pressure boundary leakage, or continued boiling in the reactor vessel.

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 several hours 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 reactor vessel (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 (**CS1**) and a refueling specific IC (**CS2**).

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION (CS2)

If all reactor vessel level indication were to be lost during a loss of RCS inventory event, the operators would need to determine that RCS inventory loss was occurring by observing containment sump level, reactor drain tank level, or quench tank level change. Containment sump level, reactor drain tank level, or quench tank level against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of RCS leakage. This EAL is 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, (mid-loop, reduced level/flange level, head in place, cavity flooded, RCS venting strategy, decay heat removal system design, vortexing pre-disposition, or steam generator U-tube draining) 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 uncovery; therefore, 30 minutes was chosen to be conservative.

As water level in the reactor vessel lowers, the dose rate above the core will rise. The dose rate due to core shine should result in up-scaled Containment High Range Monitor indication. A reading of greater than or equal to 10 R/hr may be indicative of fuel damage. The basis for 10 R/hr is that it is sufficiently above the normal indication of 0.74 R/hr (nominal shutdown) to avoid an unnecessary entry into the EAL but substantially lower than the calculated values for RCS barrier failure (100 R/hr) and fuel clad barrier failure (1000 R/hr) for barrier losses in Section F(Fission Product Barrier) to give an early indication of vessel level lowering to the point of potential fuel damage. The 10 R/hr is also high enough to be indicative of potential fuel uncovery.

The 30-minute duration allowed when CONTAINMENT CLOSURE is established allows sufficient time for actions to be performed to recover needed cooling equipment and is considered to be conservative. As water level in the reactor vessel lowers, the dose rate above the core will rise. Additionally, studies indicate that the installed nuclear instrumentation will operate erratically when the core is uncovered and can be used as a tool for making such determinations. In the refueling mode, normal means of reactor vessel level indication is not available; however, a temporary means of reactor vessel level indication is normally installed to assure that the ability to monitor level will not be interrupted. This temporary means of level indication will only indicate to the bottom of the hot leg. Since effluent release is not expected with closure established, declaration of a Site Area Emergency is warranted under the conditions specified.

Declaration of an Site Area Emergency is warranted under the conditions specified by the IC. Escalation to a General Emergency is via **CG1** or **AG1**.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CG1

GENERAL EMERGENCY

Initiating Condition:

Loss of RCS inventory affecting fuel clad integrity with containment challenged with irradiated fuel in the reactor vessel

Operating Mode Applicability:

Cold Shutdown (Mode 5) Refueling (Mode 6)

Emergency Action Level(s): (1 AND 2 AND 3)

1. Loss of RCS inventory as indicated by unexplained Reactor Building Sump, Reactor Drain Tank, Quench Tank, Aux. Building Equipment Drain Tank, or Aux. Building Sump level rise.

<u>AND</u>

- 2. Reactor vessel level:
 - a. (MODE 5 ONLY) Less than the top of active fuel for > 30 minutes:
 Unit 1: RVLMS Levels 1 through 9 indicate DRY
 Unit 2: RVLMS Levels 1 through 7 indicate DRY

<u>OR</u>

- b. Cannot be monitored with indication of core uncovery for > 30 minutes as evidenced by one or more of the following:
 - Containment High Range Radiation Monitor reading > 10 R/hr
 - Erratic source range monitor indication
 - Core exit thermocouples indicate superheat

<u>AND</u>

- 3. CONTAINMENT is challenged as indicated by one or more of the following:
 - An explosive mixture exists in containment.
 - Containment pressure with CONTAINMENT INTEGRITY established is: Unit 1: > 59 psig
 Unit 2: > 73 7 psig
 - **Unit 2:** > 73.7 psia
 - CONTAINMENT CLOSURE not established.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION (CG1)

Basis:

For EAL #1 the operators would need to determine that RCS inventory loss was occurring by observing sump and tank level changes. Sump and tank level rises 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 reactor vessel level above the top of active fuel. Fuel damage is probable if reactor vessel level cannot be restored, as available decay heat will cause boiling further reducing the reactor vessel level. 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 (e.g., mid-loop, reduced level/flange level, head in place, cavity flooded, RCS venting strategy, decay heat removal system design, vortexing pre-disposition, or steam generator U-tube draining) 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 uncovery; therefore, 30 minutes was chosen to be conservative. As water level in the reactor vessel lowers, the dose rate above the core will rise. Additionally, post-TMI studies indicated that the installed nuclear instrumentation will operate erratically when the core is uncovered and that this should be used as a tool for making such determinations. The GE is declared on the occurrence of the loss or imminent loss of function of all three barriers. Based on the above discussion, RCS barrier failure resulting in core uncovery for 30 minutes or more may cause fuel clad failure. With the CONTAINMENT breached or challenged, 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.

As water level in the reactor vessel lowers, the dose rate above the core will rise. The dose rate due to core shine should result in up-scaled Containment High Range Monitor indication. 10 R/hr was selected as the setpoint for this EAL because it is sufficiently above the expected normal shutdown reading to preclude unnecessary entry into the EAL. 10 R/hr is also high enough to be indicative of potential fuel uncovery.

In the context of EAL #3, containment closure is the action taken to secure containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions. Containment closure should not be confused with refueling containment integrity as defined in technical specifications. Site shutdown contingency plans provide for re-establishing containment closure following a loss of heat removal or RCS inventory functions. If the closure is re-established prior to exceeding the temperature or level thresholds of the RCS barrier and fuel clad barrier EALs, escalation to GE would not occur.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION (CG1)

The pressure at which containment is considered challenged is based on the condition of the containment. If containment integrity is established, then the containment will be challenged at the design pressure. This is consistent with the owners groups' Emergency Response Procedures. Since no significant pressurization is expected during cold shutdown/refueling operations, there is no specific pressure setpoint at which the containment is considered to be challenged. Plant procedures provide for the establishment of containment closure when required and for the monitoring of the status of containment closure.

In the early stages of a core uncovery event, it is unlikely that hydrogen buildup due to a core uncovery could result in an explosive mixture of dissolved gasses in containment. However, containment monitoring and/or sampling should be performed to verify this assumption and a General Emergency declared if it is determined that an explosive mixture exists.

- 1. ULD-1-SYS-24, Unit 1 Inadequate Core Cooling
- 2. ULD-2-SYS-24, Unit 2 Inadequate Core Cooling

EVENTS RELATED TO ISFSI

E-HU1

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Damage to a loaded cask CONFINEMENT BOUNDARY

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2 OR 3)

- 1. Natural phenomena events affecting a loaded cask CONFINEMENT BOUNDARY:
 - a. Tornado/High winds resulting in:
 - Missile impact causing a loss of shielding
 - Blockage of air inlets for > 24 hours

<u>OR</u>

b. Flooding resulting in blockage of air inlets for > 24 hours.

<u>OR</u>

c. Seismic event resulting in cask tip-over causing a loss of shielding.

<u>OR</u>

- 2. Accident conditions affecting a loaded cask CONFINEMENT BOUNDARY:
 - a. Cask drop of > 11 inches.

<u>OR</u>

b. Blockage of air inlets for > 24 hours

<u>OR</u>

c. Fire or explosion resulting in a loss of shielding

<u>OR</u>

d. Cask tip-over causing a loss of shielding.

<u>OR</u>

3. Any condition in the opinion of the SM/TSC Director/EOF Director that indicates loss of loaded fuel storage cask CONFINEMENT BOUNDARY.

EVENTS RELATED TO ISFSI (E-HU1)

Basis:

An NUE would be declared on the basis of the occurrence of an event of sufficient magnitude that a loaded cask CONFINEMENT BOUNDARY is damaged or violated. This includes classification based on a loaded fuel storage cask CONFINEMENT BOUNDARY loss leading to the degradation of the fuel during storage or posing an operational safety problem with respect to its removal from storage.

For EAL #1 and EAL #2, the results of the ISFSI Safety Analysis Report (SAR) referenced in the cask('s) Certificate of Compliance and the related NRC Safety Evaluation Report are used to develop a list of natural phenomena events and accident conditions. These EALs address responses to a dropped cask, a tipped-over cask, explosion, missile damage, fire damage or natural phenomena affecting a cask (e.g., seismic event, tornado, etc.).

For EAL #3, any condition not explicitly detailed as an EAL threshold value, which, in the judgment of the SM/TSC Director/EOF Director, is a potential degradation in the level of safety of the ISFSI. SM/TSC Director/EOF Director judgment is to be based on known conditions and the expected response to mitigating activities within a short time period.

Possible damage modes to the storage cask involve loss of shielding from impact damage due to tornado- or wind-generated missiles. Cask containment loss due to a tornado is not postulated except long-term loss of heat transfer due to blockage of air inlets as discussed in following paragraphs.

There is no fully immersing flood that might move or tip-over the cask postulated for the ANO site. The Maximum Probable Flood blocks the air inlets of the Holtec casks above site Elevation 354 feet.

The VSC-24 storage cask drop accident is a cask drop of 5 feet onto an essentially unyielding surface. The Holtec storage cask drop accident is a cask drop of 11 inches onto an essentially unyielding surface. 11 inches was selected in the interest of conservatism. Any similar drop or tip-over of a loaded canister while being transported in a site transfer cask can also potentially affect a confinement boundary.

The full blockage of air inlets event is a postulated blockage of the airflow inlets for greater than 24 hours for the VSC-24 casks and 72 hours (or 24 hours with the difference between the average air outlet temperature and the ISFSI ambient temperature equal to or greater than 126°F) for the Holtec casks. In the interest of conservatism, 24 hours was selected as the EAL threshold value. The cask has four air inlets and the classification is not based on a loss of confinement boundary, but the condition could lead to the degradation of the fuel during storage or posing an operational safety problem with respect to its removal from storage.

A fire inside the ISFSI fence or explosion that generates missiles that enter the ISFSI area could lead to the degradation of the fuel during storage or pose an operational safety problem with respect to its removal from storage.

EVENTS RELATED TO ISFSI

E-HU2

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Confirmed security event with potential loss of level of safety of the ISFSI

Operating Mode Applicability:

All

Emergency Action Level(s):

1. Security event as determined from the ANO Safeguards Contingency Plan and reported by ANO Security shift supervision.

Basis:

This EAL is based on ANO Security Plans. Security events which do not represent a potential degradation in the level of safety of the ISFSI are reported under 10 CFR 73.71 or in some cases under 10 CFR 50.72.

Security shift supervision are the designated personnel qualified and trained to confirm that a security event is occurring or has occurred. Training on security event classification confirmation is closely controlled due to the strict secrecy controls placed on the Security Plan.

FU1

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

ANY loss or ANY potential loss of containment

Operating Mode Applicability:

Power Operations (Mode 1) Startup (Mode 2) Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s):

Comparison of conditions/values with those listed in fission product barrier matrix indicates:

Loss or potential loss of containment.

Containment Barrier EALs:

(CNB1 <u>OR</u> CNB2 <u>OR</u> CNB3 <u>OR</u> CNB4 <u>OR</u> CNB5 <u>OR</u> CNB6 <u>OR</u> CNB7)

Basis:

The fuel cladding and the reactor coolant system are weighted more heavily than the containment barrier.

Loss of the containment would be a potential degradation in the level of plant safety.

ALERT

Initiating Condition:

ANY loss or ANY potential loss of EITHER fuel clad or RCS

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2) Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s): (1 **OR** 2)

Comparison of conditions/values with those listed in fission product barrier matrix indicates: 1. Loss or potential loss of fuel clad.

<u>OR</u>

2. Loss or potential loss of RCS.

Fuel Clad Barrier EALs:	(FCB1 <u>OR</u> FCB2 <u>OR</u> FCB3 <u>OR</u> FCB4 <u>OR</u> FCB5 <u>OR</u> FCB6)
	<u>OR</u> ·
RCS Barrier EALs:	(RCB1 <u>OR</u> RCB2 <u>OR</u> RCB3 <u>OR</u> RCB4)

Basis:

The fuel cladding and the reactor coolant system are weighted more heavily than the containment barrier.

Loss of either the fuel cladding or the reactor coolant system would be a substantial degradation in the level of plant safety.

SITE AREA EMERGENCY

FS1

Initiating Condition:

Loss or potential loss of ANY two barriers

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2) Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s): (ANY 2 of the 3)

Comparison of conditions/values with those listed in fission product barrier Matrix indicates **ANY 2** of the following:

Loss or Potential Loss of the fuel clad. Loss or Potential Loss of the RCS. Loss or Potential Loss of the containment.

Fuel Clad Barrier EALs:	(FCB1 <u>OR</u> FCB2 <u>OR</u> FCB3 <u>OR</u> FCB4 <u>OR</u> FCB5 <u>OR</u> FCB6)
RCS Barrier EALs:	(RCB1 <u>OR</u> RCB2 <u>OR</u> RCB3 <u>OR</u> RCB4)
Containment Barrier EALs:	(CNB1 <u>OR</u> CNB2 <u>OR</u> CNB3 <u>OR</u> CNB4 <u>OR</u> CNB5 <u>OR</u> CNB6 <u>OR</u> CNB7)

Basis:

Loss of 2 fission product barriers would be a major failure of plant systems needed for protection of the public.

FG1

GENERAL EMERGENCY

Initiating Condition:

Loss of ANY two barriers AND loss or potential loss of third barrier

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2) Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s): (1 AND 2)

Comparison of conditions/values with those listed in fission product barrier matrix indicates:

1. Loss of 2 fission product barriers.

<u>AND</u>

2. Loss or potential loss of third.

Fuel Clad Barrier EALs:	(FCB1 <u>OR</u> FCB2 <u>OR</u> FCB3 <u>OR</u> FCB4 <u>OR</u> FCB5 <u>OR</u> FCB6)
RCS Barrier EALs:	(RCB1 <u>OR</u> RCB2 <u>OR</u> RCB3 <u>OR</u> RCB4 <u>OR</u> RCB5)
Containment Barrier EALs:	(CNB1 <u>OR</u> CNB2 <u>OR</u> CNB3 <u>OR</u> CNB4 <u>OR</u> CNB5 <u>OR</u> CNB6 <u>OR</u> CNB7)

Basis:

Conditions/events causing the loss of 2 Fission Product Barriers with the loss or potential loss of the third could reasonably be expected to cause a release beyond the immediate site area exceeding EPA Protective Action Guidelines.

FUEL CLAD BARRIER EALs: FCB1 OR FCB2 OR FCB3 OR FCB4 OR FCB5 OR FCB6

The fuel clad barrier is the zircalloy tubes that contain the fuel pellets.

1. Primary Coolant Activity Level (FCB1)

Loss:

Coolant activity > 300 μ Ci/gm dose equivalent I-131 activity by Chemistry sample

<u>OR</u>

Radiation levels > 1000 mR/hr

Unit 1: at SA-229 Unit 2: at 2TCD-19

Potential Loss: None

None

Basis:

An RCS concentration of 300 μ Ci/gm dose equivalent I-131 has been determined to correspond to approximately 2.9% failed clad for Unit 1, and 2.1% clad damage for Unit 2, which is consistent with the NUMARC EAL Task Force Assessment that this level corresponds to less than 5% clad damage. This amount of radioactivity is well above that expected for Iodine spikes and thus indicates significant clad damage and thus the fuel clad barrier is considered lost.

A reading of greater than 1000 mR/hr within at one foot from the RCS sample lines (SA-229 for Unit 1, 2TCD-19 for Unit 2) has been determined to correspond to fuel clad failure of approximately 2-5%, and thus the fuel clad barrier is considered lost. This reading is well above that expected for iodine spikes and thus indicates significant clad damage and thus the fuel clad barrier is considered lost.

There is no equivalent potential loss EAL for this item.

Reference Documents

1. ANO Calculation 03-E-0002-01, Radiation Monitor EAL Setpoints for Fission Product Barrier Degradation

FUEL CLAD BARRIER EALS: FCB1 OR FCB2 OR FCB3 OR FCB4 OR FCB5 OR FCB6

The fuel clad barrier is the zircalloy tubes that contain the fuel pellets.

2. Core Exit Thermocouple Readings (FCB2)

Loss:

> 1200°F CET temperature

Potential Loss:

Unit 1: ICC exists as evidenced by CETs indicating superheated conditions

Unit 2: Average CETs indicate superheat for current RCS pressure.

Basis:

The loss EAL reading corresponds to significant superheating of the coolant. The loss EAL of greater than or equal to 1200°F for Unit 2 is consistent with the generic value and is also consistent with recommendations from CE in reference document #5. The elevated temperature corresponds to significant superheating of the coolant and is indicative of a loss of the fuel clad barrier. Figure 5-2 of reference document #5 is the bases for Figure 1-2 of reference document #4, used to estimate core damage using core exit thermocouples for either unit, and indicates that clad rupture due to high temperature is not expected for CET temperature readings of less than 1200°F.

For Unit 1, the loss EAL is consistent with the treatment of inadequate core cooling (ICC) in the EOPs, which is based on a pressure-temperature curve. The basis for Region 3 of this curve from the BWOG EOP Technical Basis Document states, "If the RCS P-T reaches Region Three, then cladding temperature in the high power regions of the core may be 1400°F or higher." This is consistent with the Intent of the 1200°F CET reading recommendation, as CET temperature will be lower than fuel clad temperature.

The potential loss EAL corresponds to a loss of subcooling. For Unit 2, there is a Functional Recovery EOP (2202.009), and the core and RCS heat removal acceptance criteria for safety function status checks include determination of RCS superheated.

For Unit 1, the RCS P-T in Region 2 (CET temperatures above saturation for indicated pressure) of the EOP Figure 4 corresponds to a loss of subcooling. This is consistent with EOP 1202.005, "Inadequate Core Cooling".

Note that the loss or potential loss EAL for this category will occur after a loss of adequate sub-cooling margin, which represents a loss of the RCS barrier in EAL **RCB1**, and therefore represents the loss of two barriers, resulting in a Site Area Emergency per **FS1**. Any loss or potential loss of the containment barrier at that point would escalate to a General Emergency.

- 1. Unit 1 EOP 1202.005, "Inadequate Core Cooling"
- 2. Unit 1 EOP 1202.013, EOP Figures
- 3. Unit 2 OP 2202.009, "Functional Recovery"
- 4. ANO Procedure OP 1302.022, "Core Damage Assessment"
- 5. CE-NPSD-241, Development of the Comprehensive Procedure Guideline for Core Damage Assessment, Task 467
- 6. BWOG EOP Technical Bases Document, Vol. 3, Chapter III.F

FUEL CLAD BARRIER EALS: FCB1 OR FCB2 OR FCB3 OR FCB4 OR FCB5 OR FCB6

The fuel clad barrier is the zircalloy tubes that contain the fuel pellets.

3. Reactor Vessel Water Level (FCB3)

Loss:

None

Potential Loss:

Unit 1: RVLMS levels 1 through 9 indicate DRY

Unit 2: RVLMS levels 1 through 7 indicate DRY

Basis:

The Reactor Vessel Level Monitoring Systems at ANO do not provide positive indication of core uncovery. The above core level indication provided is used to monitor the approach to and recovery from ICC conditions, but the CETs are used to identify core uncovery, and are the only positive indication of core uncovery.

Per reference document #1, the reactor vessel level indicators installed in Unit 1 extend from the top of the reactor vessel to the fuel alignment plate, and information in reference document #2 indicates that the lowest sensor is greater than 2 feet above the top of active fuel. If any of the 4 RCPs are running, flow induced turbulence produced by the pumps renders the reactor vessel level indicator readings invalid.

Per reference document #3, only the reactor vessel level indicators above the core are considered part of the ICC monitoring system. Per reference document #4, the lowest sensor above the core, RVLMS LVL 6 on the ICC monitoring panel 2C388, is 47 inches above the top of the core. If any of the 4 RCPs are running, flow induced turbulence produced by the pumps renders the reactor vessel level indicator readings invalid.

For either unit then, should CET indication be unavailable and reactor vessel level indication be unavailable due to RCP operation or any other cause, a degraded ability to monitor the barrier would exist.

- 1. ULD-1-SYS-24, Unit 1 Inadequate Core Cooling System
- 2. Calculation 84-EQ-0080-02, Loop Error Analysis for Reactor Vessel Level Monitoring System
- 3. ULD-2-SYS-24, Unit 2 Inadequate Core Cooling Monitoring System
- 4. Calculation 90-E-0116-01, Unit 2 EOP Setpoint Document, Setpoint R.3

FUEL CLAD BARRIER EALs: FCB1 OR FCB2 OR FCB3 OR FCB4 OR FCB5 OR FCB6

The fuel clad barrier is the zircalloy tubes that contain the fuel pellets.

4. Containment Radiation Monitoring (FCB4)

Loss:

Containment high range rad monitor reading > 1000 R/hr

Potential Loss:

None

Basis:

The 1000 R/hr reading on the containment high range radiation monitors (RE-8060 or RE-8061 for Unit 1, 2RE-8925-1 or 2RE-8925-2 for Unit 2) is a value that indicates the release of reactor coolant, with elevated activity indicative of fuel damage, into the containment. The reading was calculated assuming the instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory associated with an RCS concentration of 300 μ Ci/gm dose equivalent I-131 into the containment atmosphere. Reactor coolant concentrations of this magnitude are several times larger than that expected for iodine spikes and are therefore indicative of fuel damage. This value is higher than that specified for RCS barrier loss EAL **RCB3**. Therefore, this EAL condition represents a potential loss of both the fuel clad and the RCS barriers, and represents a Site Area Emergency per **FS1**.

There is no potential loss EAL associated with this item.

- 1. NUREG 1228, Source Term Estimation During Incident Response to Severe Nuclear Power Plant Accidents
- 2. ANO Calculation 03-E-0002-01, Radiation Monitor EAL Setpoints for Fission Product Barrier Degradation

FUEL CLAD BARRIER EALs: FCB1 OR FCB2 OR FCB3 OR FCB4 OR FCB5 OR FCB6

The fuel clad barrier is the zircalloy tubes that contain the fuel pellets.

5. Core Damage Assessment (FCB5)

Loss:

At least 5% fuel clad damage as determined from core damage assessment

Potential Loss:

None

Basis:

This level is consistent with other fuel clad barrier loss EALs indicative of significant fuel clad damage, but uses core damage assessment evaluations by Technical Support personnel. The fuel clad barrier is considered lost.

If this determination is made from the high range containment radiation monitor readings, or if accompanied by other indications of a loss or potential loss of the RCS barrier, this EAL condition represents a Site Area Emergency per **FS1**.

There is no potential loss EAL associated with this item.

Reference Documents

1. ANO Procedure OP-1302.022, "Core Damage Assessment"

FUEL CLAD BARRIER EALs: FCB1 OR FCB2 OR FCB3 OR FCB4 OR FCB5 OR FCB6

The Fuel Clad Barrier is the zircalloy tubes that contain the fuel pellets.

6. SM/TSC Director/EOF Director Judgment (FCB6)

Any condition in the opinion of the SM/TSC Director/EOF Director that indicates loss or potential loss of the fuel clad barrier based on:

- Imminent barrier degradation (within 2 hours) due to degraded safety system performance
- Degraded ability to monitor barrier

Basis:

This EAL addresses any other factors that are to be used by the SM/TSC Director/EOF Director in determining whether the fuel clad barrier is lost or potentially lost. In addition, the inability to monitor the barrier should also be incorporated in this EAL as a factor in the SM/TSC Director/EOF Director judgment that the barrier may be considered lost or potentially lost. *(See also IC SG1, "Prolonged Loss or All Offsite Power and Prolonged Loss of All Onsite AC Power", for additional information.)*

RCS BARRIER EALs: RCB1 OR RCB2 OR RCB3 OR RCB4

The RCS barrier is the reactor coolant system pressure boundary and includes the reactor vessel and all reactor coolant system piping up to the isolation valves.

1. RCS Leak Rate (RCB1)

Loss:

RCS leakage > available makeup capacity as indicated by:

Unit 1: Loss of adequate subcooling margin

Unit 2: RCS subcooling (MTS) can NOT be maintained at least 30°F

Potential Loss:

- Unit 1: RCS leakage exceeding Normal Makeup Capacity (50 gpm)
- **Unit 2:** RCS leakage exceeding the capacity of one charging pump in the normal charging mode (44 gpm)

Basis:

The loss EAL addresses conditions where leakage from the RCS is greater than available inventory control capacity such that a loss of subcooling has occurred. The loss of subcooling is the fundamental indication that the inventory control systems are inadequate in maintaining RCS pressure and inventory against the mass loss through the leak.

The potential loss EAL is based on the inability to maintain normal liquid inventory within the reactor coolant system (RCS) by normal operation of the Makeup and Purification System (Unit 1) or the Chemical and Volume Control System (Unit 2).

For Unit 1 this is based on indications that leakage is greater than normal makeup capacity. The operator could not batch in water and boric acid to the makeup system fast enough to maintain the makeup tank level during a 50 gpm RCS leak. It is not necessary to perform a detailed assessment of the RCS leakrate to implement this EAL. Any event or condition which, in the judgment of the SM/TSC Director/EOF Director, could result in RCS leakage in excess of Unit 1 normal makeup capacity would meet the intent of this EAL; for example:

- Need to open the BWST suction for the operating makeup pump due to decreasing makeup tank level
- Full or partial HPI is needed to maintain the RCS pressure or pressurizer level
- Two out of three seal stages failed on any RCP
- RCS pressure decreasing due to failure of a primary relief valve to reseat

For Unit 2, this is considered as the capacity of one charging pump discharging to the charging header (44 gpm). Any event or condition which, in the judgment of the SM/TSC Director/EOF Director, could result in RCS leakage in excess of Unit 2 normal makeup capacity would meet the intent of this EAL; for example:

- A second charging pump being required is indicative of a substantial RCS leak
- Three out of four seal stages failed on any RCP
- RCS pressure decreasing due to failure of a primary relief valve to reseat

- 1. Unit 1 EOP 1202.013, Figure 1, Saturation and Adequate SCM
- 2. Unit 1 EOP Setpoint Document, Calculation 90-E-0016-07, Setpoint B.19
- 3. Unit 2 EOP 2202.009, "Functional Recovery"
- 4. Unit 2 EOP Setpoint Document, Calculation 90-E-0116-01
- 5. Unit 2 SAR Table 9.3-14, Charging Pumps Design Data

RCS BARRIER EALs: RCB1 OR RCB2 OR RCB3 OR RCB4

The RCS barrier is the reactor coolant system pressure boundary and includes the reactor vessel and all reactor coolant system piping up to the isolation valves.

2. SG Tube Rupture (RCB2)

Loss:

SGTR that results in an ECCS (SI) actuation

Potential Loss:

None

Basis:

This EAL is intended to address the full spectrum of steam generator (SG) tube rupture events in conjunction with containment barrier loss EAL **CNB3** and fuel clad barrier EALs. The loss EAL addresses RUPTURED SG(s) for which the leakage is large enough to cause actuation of ECCS safety injection. This is consistent to the RCS barrier potential loss EAL **RCB1**. By itself, this EAL will result in the declaration of an Alert. However, if the SG is also FAULTED (i.e., two barriers failed), the declaration escalates to a Site Area Emergency per containment barrier loss EAL **CNB3**.

There is no potential loss EAL.

RCS BARRIER EALs: RCB1 OR RCB2 OR RCB3 OR RCB4

The RCS barrier is the reactor coolant system pressure boundary and includes the reactor vessel and all reactor coolant system piping up to the isolation valves.

3. Containment Radiation Monitoring (RCB3)

Loss:

Containment radiation monitor reading > 100 R/hr

Potential Loss:

None

Basis:

The 100 R/hr reading on the containment high range radiation monitors (RE-8060 or RE-8061 for Unit 1, 2RE-8925-1 or 2RE-8925-2 for Unit 2) is a value which indicates the release of reactor coolant to the containment. This reading was derived assuming the instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory associated with an RCS concentration of 60 μ Ci/gm dose equivalent I-131 into the containment atmosphere. This reading is an order of magnitude lower than that specified for fuel clad barrier EAL **FCB4**. Thus, this EAL would be indicative of an RCS leak only. If the radiation monitor reading increased to that specified by fuel clad barrier EAL **FCB4**, fuel damage would also be indicated.

During the initial fifteen minutes after a thermal event inside containment, the high range radiation monitor readings are considered invalid due to possibility of a transient thermally-induced current.

There is no potential loss EAL associated with this item.

Reference Documents

 ANO Calculation 03-E-0002-01, Radiation Monitor EAL Setpoints for Fission Product Barrier Degradation

RCS BARRIER EALs: RCB1 OR RCB2 OR RCB3 OR RCB4

The RCS barrier is the reactor coolant system pressure boundary and includes the reactor vessel and all reactor coolant system piping up to the isolation valves.

4. SM/TSC Director/EOF Director Judgment (RCB4)

Any condition in the opinion of the SM/TSC Director/EOF Director that indicates loss or potential loss of the RCS barrier based on:

- Imminent barrier degradation (within 2 hours) due to degraded safety system performance
- Degraded ability to monitor barrier

Basis:

This EAL addresses any other factors that are to be used by the SM/TSC Director/EOF Director in determining whether the RCS barrier is lost or potentially lost. In addition, the inability to monitor the barrier should also be incorporated in this EAL as a factor in SM/TSC Director/EOF Director judgment that the barrier may be considered lost or potentially lost. (See also IC SG1, "Prolonged Loss of All Offsite Power and Prolonged Loss of All Onsite AC Power", for additional information.)

CONTAINMENT BARRIER EALs: CNB1 OR CNB2 OR CNB3 OR CNB4 OR CNB5 OR CNB6 OR CNB7

The containment barrier includes the containment building, its connections up to and including the outermost containment isolation valves. This barrier also includes the main steam, feedwater, and blowdown line extensions outside the containment building up to and including the outermost secondary side isolation valve.

1. Containment Pressure (CNB1)

Loss:

Rapid unexplained containment pressure loss following initial rise

<u>OR</u>

Containment pressure or sump level not consistent with LOCA conditions

Potential Loss:

Unit 1: 73.7 PSIA (59 PSIG) and rising

Unit 2: 73.7 PSIA and rising

An explosive mixture exists in Containment

<u>OR</u>

Containment Pressure > containment spray actuation setpoint with less than one full train of spray operating

Unit 1: 44.7 PSIA (30 PSIG)

Unit 2: 23.3 PSIA

Basis:

Rapid unexplained loss of pressure (i.e., not attributable to containment spray or condensation effects) following an initial pressure rise indicates a loss of containment integrity. Containment pressure and sump levels should rise as a result of the mass and energy release into containment from a LOCA. Thus, sump level or pressure or humidity (Unit 2) not rising indicates containment bypass and a loss of containment integrity. The containment pressure setpoint for potential loss of containment is based on the containment design pressure. The hydrogen concentration of 4% has been recognized by the NRC staff as a well-established lower flammability limit in air or steam-air atmospheres that is adequately conservative for protecting against an H₂ explosion. Hydrogen control systems at ANO are designed and operated as to maintain the containment hydrogen concentration below this level, so that indications of hydrogen concentrations above this are considered a potential challenge to the containment integrity. Conditions leading to these indications result from RCS barrier and/or fuel clad barrier loss. Thus, this EAL is primarily a discriminator between Site Area Emergency and General Emergency representing a potential loss of the third barrier.

The second potential loss EAL based on containment pressure represents a potential loss of containment in that the containment heat removal/depressurization system (containment sprays, but not including containment venting strategies) are either lost or performing in a degraded manner, as indicated by containment pressure greater than the setpoint at which the equipment was supposed to have actuated.

- 1. Unit 1 OP-1105.003, "Engineering Safeguards Actuation System"
- 2. Unit 1 SAR Sections 1.4.43, 5.2.1.2.1, 14.2.2.5.5.1 (reactor building design pressure)
- 3. Unit 1 SAR Section 6.6 Post-Loss of Coolant Accident Hydrogen Control
- 4. Unit 1 TS Table 3.3.5-1
- 5. Unit 2 SAR Section 6.2.5 Combustible Gas Control In Containment
- 6. Unit 2 SAR Section 3.8.1.3.1.D (Containment Design Pressure)
- 7. Unit 2 TS Table 3.3-4
- 8. Regulatory Guide 1.7, Control of Combustible Gas Concentrations in Containment Following a Loss-of-Coolant Accident, Rev. 2 1978

CONTAINMENT BARRIER EALS: CNB1 OR CNB2 OR CNB3 OR CNB4 OR CNB5 OR CNB6 OR CNB7

The Containment Barrier includes the containment building, its connections up to and including the outermost containment isolation valves. This barrier also includes the main steam, feedwater, and blowdown line extensions outside the containment building up to and including the outermost secondary side isolation valve.

2. Core Exit Thermocouples (CNB2)

Loss:

None

Potential Loss:

1. a. CETs indicate > 1200°F

AND

b. Restoration procedures not effective within 15 minutes

<u>OR</u>

2. a. CETs indicate > 700°F

<u>AND</u>

b. RVLMS indicates: Unit 1: Levels 1 through 9 DRY Unit 2: Levels 1 through 7 DRY

AND

c. Restoration procedures not effective within 15 minutes

Basis:

In this EAL, the function restoration procedures are those emergency operating procedures that address the recovery of the core cooling critical safety functions. The procedure is considered effective if the temperature is dropping.

Severe accident analyses (e.g., NUREG-1150) have concluded that function restoration procedures can arrest core degradation within the reactor vessel in a significant fraction of the core damage scenarios, and that the likelihood of containment failure is very small in these events. Given this, it is appropriate to provide a reasonable period to allow function restoration procedures to arrest the core melt sequence. Whether or not the procedures will be effective should be apparent within 15 minutes. The SM/TSC Director/EOF Director should make the declaration as soon as it is determined that the procedures have been, or will be ineffective.

The conditions in this potential loss EAL represent an imminent core melt sequence which, if not corrected, could lead to vessel failure and a higher potential for containment failure. In conjunction with the core cooling and heat sink criteria in the fuel and RCS barrier columns, this EAL would result in the declaration of a General Emergency (loss of two barriers and the potential loss of a third). If the function restoration procedures are ineffective, there is no success path.

CONTAINMENT BARRIER EALs: CNB1 OR CNB2 OR CNB3 OR CNB4 OR CNB5 OR CNB6 OR CNB7

The containment barrier includes the containment building, its connections up to and including the outermost containment isolation valves. This barrier also includes the main steam, feedwater, and blowdown line extensions outside the containment building up to and including the outermost secondary side isolation valve.

3. SG Secondary Side Release With Primary to Secondary Leakage (CNB3)

Loss:

1. RUPTURED steam generator is also FAULTED outside Containment

<u>OR</u>

2. Primary-to-secondary leakrate > 10 gpm with nonisolable steam release from affected steam generator to the environment

Potential Loss:

None

Basis:

This loss EAL recognizes that SG tube leakage can represent a bypass of the containment barrier as well as a loss of the RCS barrier. Secondary side release paths to environment include atmospheric relief valves and main steam line safety valves, as well as discharges direct to the environment from an unisolable secondary or steam line break. The threshold for establishing the nonisolable secondary side release is intended to be a prolonged release of radioactivity from the RUPTURED steam generator directly to the environment. This could be expected to occur when the main condenser is unavailable to accept the contaminated steam (i.e., SGTR with concurrent loss of offsite power and the RUPTURED steam generator is required for plant cooldown or has a stuck open relief valve). If the main condenser is available, there may be releases via air ejectors, gland seal exhausters, and other similar controlled, and often monitored, pathways. These pathways do not meet the intent of a nonisolable release path to the environment. These minor releases are assessed using Abnormal Rad Levels/Radiological Effluent ICs. For smaller breaks, not exceeding the Normal Makeup Capacity for Unit 1 or the capacity of one charging pump in the normal charging lineup for Unit 2, but exceeding 10 gpm, this EAL results in an Unusual Event.

For breaks that exceed the Normal Makeup Capacity for Unit 1 or the capacity of one charging pump in the normal charging lineup for Unit 2 or result in ECCS actuation, RCS barrier EALs **RCB1** or **RCB2** would result in an Alert if the ruptured SG is isolated. If the SG remains unisolated, this EAL will be a discriminator for Site Area Emergencies. Escalation to General Emergency would be based on Loss or Potential Loss of the fuel clad barrier.

There is no equivalent potential loss EAL for this item.

CONTAINMENT BARRIER EALs: CNB1 OR CNB2 OR CNB3 OR CNB4 OR CNB5 OR CNB6 OR CNB7

The containment barrier includes the containment building, its connections up to and including the outermost containment isolation valves. This barrier also includes the main steam, feedwater, and blowdown line extensions outside the containment building up to and including the outermost secondary side isolation valve.

4. Containment Isolation Valve Status after Containment Isolation (CNB4)

Loss:

Unisolable breach of containment with a direct release path to the environment following containment isolation actuation

Potential Loss:

None

Basis:

This EAL is intended to address incomplete containment isolation that allows direct release to the environment. It represents a loss of the containment barrier. A breach of containment has also occurred if an inboard and outboard pair of isolation valves fails to close on an automatic actuation signal or from a manual action in the control room and opens a release path to the environment.

The breach is not isolable from the Control Room if an attempt for isolation from the Control Room has been made and was unsuccessful. An attempt for isolation should be made prior to the accident classification. If isolable upon identification then this Initiating Condition is not applicable.

The use of the modifier "direct" in defining the release path discriminates against release paths through interfacing liquid systems. The existence of an in-line charcoal filter does not make a release path indirect since the filter is not effective at removing fission noble gases. Typical filters have an efficiency of 95-99% removal of iodine. Given the magnitude of the core inventory of iodine, significant releases could still occur. In addition, since the fission product release would be driven by boiling in the reactor vessel, the high humidity in the release stream can be expected to render the filters ineffective in a short period.

There is no potential loss EAL associated with this item.
FISSION PRODUCT BARRIER DEGRADATION

CONTAINMENT BARRIER EALS: CNB1 OR CNB2 OR CNB3 OR CNB4 OR CNB5 OR CNB6 OR CNB7

The containment barrier includes the containment building, its connections up to and including the outermost containment isolation valves. This barrier also includes the main steam, feedwater, and blowdown line extensions outside the containment building up to and including the outermost secondary side isolation valve.

5. Significant Radioactive Inventory in Containment (CNB5)

Loss:

None

Potential Loss:

Containment high range Rad Monitor reading > 4000 R/hr

Basis:

The 4000 R/hr reading on the containment high range radiation monitors (RE-8060 or RE-8061 for Unit 1, 2RE-8925-1 or 2RE-8925-2 for Unit 2) is a value which indicates significant fuel damage (~20%) well in excess of the EALs associated with both loss of fuel clad and loss of RCS barriers. A major release of radioactivity requiring offsite protective actions from core damage is not possible unless a major failure of fuel cladding allows radioactive material to be released from the core into the reactor coolant.

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%.

There is no loss EAL associated with this item.

- 1. ANO Calculation 03-E-0002-01, Radiation Monitor EAL Setpoints for Fission Product Barrier Degradation
- 2. NUREG 1228, Source Term Estimation During Incident Response to Severe Nuclear Power Plant Accidents

FISSION PRODUCT BARRIER DEGRADATION

CONTAINMENT BARRIER EALS: CNB1 OR CNB2 OR CNB3 OR CNB4 OR CNB5 OR CNB6 OR CNB7

The containment barrier includes the containment building, its connections up to and including the outermost containment isolation valves. This barrier also includes the main steam, feedwater, and blowdown line extensions outside the containment building up to and including the outermost secondary side isolation valve.

6. Other Indications (CNB6)

Elevated readings on the following radiation monitors that indicate loss or potential loss of the Containment barrier:

MONITORS - UNIT 1		
RX-9820	Containment Purge	
RX-9825	Radwaste Area	
RX-9830	Fuel Handling Area	
RX-9835	Emergency Penetration Room	
MONITORS - UNIT 2		
2RX-9820	Containment Purge	
2RX-9825	Radwaste Area	
2RX-9830	Fuel Handling Area	
2RX-9835	Emergency Penetration Room	
2RX-9840	Post Accident Sampling Building	
2RX-9845	Aux. Building Extension	

Basis:

This EAL covers other indications that may unambiguously indicate the loss or potential loss of the containment barrier.

FISSION PRODUCT BARRIER DEGRADATION

CONTAINMENT BARRIER EALs: CNB1 <u>OR</u> CNB2 <u>OR</u> CNB3 <u>OR</u> CNB4 <u>OR</u> CNB5 <u>OR</u> CNB6 <u>OR</u> CNB7

The containment barrier includes the containment building, its connections up to and including the outermost containment isolation valves. This barrier also includes the main steam, feedwater, and blowdown line extensions outside the containment building up to and including the outermost secondary side isolation valve.

7. Emergency Director Judgment (CNB7)

Any condition in the opinion of the SM/TSC Director/EOF Director that indicates loss or potential loss of the containment barrier based on:

- Imminent barrier degradation (within 2 hours) due to degraded safety system performance
- Degraded ability to monitor barrier

Basis:

This EAL addresses any other factors that are to be used by the SM/TSC Director/EOF Director in determining whether the containment barrier is lost or potentially lost. In addition, the inability to monitor the barrier should also be incorporated in this EAL as a factor in SM/TSC Director/EOF Director judgment that the barrier may be considered lost or potentially lost. *(See also IC SG1, "Prolonged Loss of All Offsite Power and Prolonged Loss of All Onsite AC Power", for additional information.)*

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Confirmed security event which indicates a potential degradation in the level of safety of the plant

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2)

1. Security events as determined from the ANO Safeguards Contingency Plan and reported by ANO Security shift supervision.

<u>OR</u>

2. A credible site-specific security threat notification.

Basis:

Security shift supervision are the designated personnel on-site qualified and trained to confirm that a security event is occurring or has occurred. Training on security event classification confirmation is closely controlled due to the strict secrecy controls placed on the plant Safeguards Contingency Plan.

EAL #1 is based on the Site Security Plan. Security events which do not represent a potential degradation in the level of safety of the plant, are reported under 10 CFR 73.71 or in some cases under 10 CFR 50.72. Examples of security events that indicate potential degradation in the level of safety of the plant are provided below for consideration.

Consideration should be given to the following types of events when evaluating an event against the criteria of the Security Contingency Plan: SABOTAGE, HOSTAGE/EXTORTION, CIVIL DISTURBANCE, and STRIKE ACTION.

INTRUSION into the plant PROTECTED AREA by a HOSTILE FORCE would result in EAL escalation to an ALERT.

The intent of EAL #2 is to ensure that appropriate notifications for the security threat are made in a timely manner. Only the plant to which the specific threat is made need declare the Notification of Unusual Event.

The determination of "credible" is made through use of information found in the Safeguards Contingency Plan.

A higher initial classification could be made based upon the nature and timing of the threat and potential consequences. Consideration shall be given to upgrading the emergency response status and emergency classification in accordance with the Safeguards Contingency Plan and Emergency Plans.

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Other conditions exist which in the judgment of the SM/TSC Director/EOF Director warrant declaration of an NUE

Operating Mode Applicability:

All

Emergency Action Level(s):

 Other conditions exist which in the judgment of the SM/TSC Director/EOF Director 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 is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the SM/TSC Director/EOF Director to fall under the NUE emergency class.

From a broad perspective, one area that may warrant SM/TSC Director/EOF Director 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.

HU4

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

FIRE within PROTECTED AREA Boundary not extinguished within 15 minutes of detection

Operating Mode Applicability:

All

Emergency Action Level(s):

1. FIRE in Table H-1 buildings or areas contiguous to any Table H-1 areas not extinguished within 15 minutes of Control Room notification or verification of a Control Room alarm:

Table H1				
Unit 1	Unit 2			
CA-1 & HP Office Area Condensate Demineralizer Room Corridor 98 Fire Area C LNEPR LSEER/ Air Compressor Room LSEPR LSPPR MSIV Room North ES Switchgear Room (A-4) South ES Switchgear Room Turbine Building • A1, A2, H1, H2 Swgr area • 354' Bowling Alley north end west of BA comp room • 368' West Heater Deck from LSEER (orange door) along east wall of ES Swgr Rooms to Corridor 98 door. UNEPR/Hot Tool Room/Decon Room USEPR USPPR	2A-3 Room 2A-4, 2D-02, & East Battery Room 2B-53 Room 2B9/2B10 Room 2Y11/13 Equipment Room Aux Bldg 317' General Access Aux Bldg 355' Aux Bldg 354' B ESF Room Corridor Behind Door 340 Turbine Bldg • 2A1, 2A2, 2H1, 2H2 Area • 354' West wall of Demineralizer area • 368' West Heater Deck north of north SWGR Room (2A3) and East of LNEPR Intake Structure 354' or 366' LNEPR LSEPR MG Set Room Steam Pipe Area Hot Machine Shop UNEPR UNPPR, LNPPR USPPR			

Basis:

The purpose of this IC 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 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 this 15 minute duration is to size the FIRE and to discriminate against small FIREs that are readily extinguished (e.g., smoldering waste paper basket). Table H1 applies to buildings and areas adjacent (in actual contact with or immediately adjacent) to plant VITAL AREAs or other significant buildings or areas. The intent of this EAL is not to include buildings (i.e., warehouses) or areas that are not adjacent (in actual contact with or immediately adjacent) to plant VITAL AREAs. This IC excludes FIREs within administration buildings, waste-basket FIREs, and other small FIREs of no safety consequence. Escalation to a higher emergency dass is by **HA4**.

HU5

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Release of toxic or flammable gases deemed detrimental to normal operation of the plant

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2)

1. Report or detection of toxic or fiammable gases that has or could enter the site area boundary in amounts that can affect NORMAL PLANT OPERATIONS.

<u>OR</u>

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

Basis:

This IC is based on the existence of uncontrolled releases of toxic or flammable gas that 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 such gases is such that normal plant operations would be affected. This would exclude small or incidental releases, or releases that do not impact structures needed for plant operation. The EALs are intended to not require significant assessment or quantification. The EALs assume an uncontrolled process that has the potential to affect plant operations, or personnel safety.

Escalation of this EAL is via **HA5**, which involves a quantified release of toxic or flammable gas affecting VITAL AREAs.

HU6

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Natural and destructive phenomena affecting the PROTECTED AREA

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8)

1. An earthquake is felt and the 0.01g acceleration alarm annunciates indicating an earthquake has occurred.

<u>OR</u>

2. Report by plant personnel of tornado or high winds > 67 mph striking within PROTECTED AREA boundary.

<u>OR</u>

3. Vehicle crash into plant structures or systems within PROTECTED AREA boundary.

<u>OR</u>

4. Report by plant personnel of an unanticipated EXPLOSION within PROTECTED AREA boundary resulting in VISIBLE DAMAGE to permanent structure or equipment.

<u>OR</u>

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

<u>OR</u>

(CONTINUED ON NEXT PAGE)

6. Uncontrolled flooding in Table H-1 areas that has the potential to affect safety related equipment needed for the current operating mode.

Table	H1
Table Unit 1 CA-1 & HP Office Area Condensate Demineralizer Room Corridor 98 Fire Area C LNEPR LSEER/ Air Compressor Room LSEPR LSPPR MSIV Room North ES Switchgear Room (A-4) South ES Switchgear Room Turbine Building • A1, A2, H1, H2 Swgr area • 354' Bowling Alley north end west of BA comp room • 368' West Heater Deck from LSEER (orange door) along east wall of ES Swgr Rooms to Corridor 98 door. UNEPR/Hot Tool Room/Decon Room USEPR USPPR USPPR	H1 Unit 2 2A-3 Room 2A-4, 2D-02, & East Battery Room 2B-53 Room 2B-63 Room 2B9/2B10 Room 2Y11/13 Equipment Room Aux Bldg 317' General Access Aux Bldg 335' Aux Bldg 354' B ESF Room Corridor Behind Door 340 Turbine Bldg • 2A1, 2A2, 2H1, 2H2 Area • 354' West wall of Demineralizer area • 368' West Heater Deck north of north SWGR Room (2A3) and East of LNEPR Intake Structure 354' or 366' LNEPR LSEPR MG Set Room Steam Pipe Area Hot Machine Shop UNEPR UNPPR, LNPPR

<u>OR</u>

7. Lake Dardanelle level > 345 feet.

<u>OR</u>

8. Lake Dardanelle level < 335 feet.

Basis:

An NUE would be declared on the basis of the occurrence of an event of sufficient magnitude to be of concern to plant operators. Areas identified in the EALs define the location of the event based on the potential for damage to equipment contained therein. Escalation of the event to an Alert occurs when the magnitude of the event is sufficient to result in damage to equipment contained in the specified location.

EAL #1 is based on damage that may be caused to some portions of the site, but should not affect ability of safety functions to operate. The method of detection is based on instrumentation, validated by a reliable source, or operator assessment. As defined in the EPRI sponsored "Guidelines for Nuclear Plant Response to an Earthquake", dated October 1989, a *"felt earthquake"* is:

An earthquake of sufficient intensity such that: (a) the vibratory ground motion is felt at the nuclear plant site and recognized as an earthquake based on a consensus of control room operators on duty at the time, and (b) for plants with operable seismic instrumentation, the seismic switches of the plant are activated.

EAL #2 is based on the assumption that a tornado striking (touching down) or high winds within the PROTECTED AREA may have potentially damaged plant structures containing functions or systems required for safe shutdown of the plant. The high wind value in EAL #2 is conservatively based on the SAR design basis for Unit 1 of 67 mph. Unit 2 Design basis is 80 mph. If damage is confirmed visually or by other plant indications, the event may be escalated to Alert.

EAL #3 is intended to address crashes of vehicle types large enough to cause significant damage to plant structures containing functions and systems required for safe shutdown of the plant. If the crash is confirmed to affect a plant VITAL AREA, the event may be escalated to Alert.

For EAL #4 only those EXPLOSIONs of sufficient force to damage permanent structures or equipment within the PROTECTED AREA should be considered. 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 SM/TSC Director/EOF Director also needs to consider any security aspects of the EXPLOSION, if applicable.

EAL #5 is based on 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 (lubricating oils) and gases (hydrogen cooling) to the plant environs. Actual FIREs and flammable gas build up are appropriately classified via **HU4** and **HU5**. Generator seal damage observed after generator purge does not meet the intent of this EAL because it did not impact normal operation of the plant. This EAL is consistent with the definition of a NUE while maintaining the anticipatory nature desired and recognizing the risk to non-safety related equipment. Escalation of the emergency classification is based on potential damage done by missiles generated by the failure or in conjunction with a steam generator tube rupture. The latter event would be classified by the radiological EALs or fission product barrier EALs.

EAL #6 addresses the effect of flooding caused by internal events such as component failures, equipment misalignment, or outage activity mishaps. The site-specific areas include those areas that contain systems required for safe shutdown of the plant and that are not designed to be wetted or submerged. Escalation of the emergency classification is based on the damage caused or by access restrictions that prevent necessary plant operations or systems monitoring.

.

EAL #7 and #8 are based on the levels of Lake Dardanelle at which the site will take specific action to reduce the impact of the lake level on plant safety by initiating plant shutdown.

- 1. OP-1203.025 "Natural Emergencies"
- 2. OP-2203.008 "Natural Emergencies"
- 3. Unit 1 FSAR
- 4. Unit 2 FSAR

HA1

ALERT

Initiating Condition:

Confirmed security event within a plant PROTECTED AREA

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2)

1. INTRUSION into the plant PROTECTED AREA by a HOSTILE FORCE.

<u>OR</u>

2. Other security events as determined from the ANO Safeguards Contingency Plan and reported by ANO Security shift supervision.

Basis:

This class of security events represents an escalated threat to plant safety above that contained in the NUE. A confirmed INTRUSION report is satisfied if physical evidence indicates the presence of a HOSTILE FORCE within the PROTECTED AREA.

Consideration should be given to the following types of events when evaluating an event against the criteria of the Security Contingency Plan: SABOTAGE, HOSTAGE/EXTORTION, and STRIKE ACTION. The Safeguards Contingency Plan identifies numerous events/conditions that constitute a threat/compromise to a Station's security. Only those events that involve actual or potential substantial degradation to the level of safety of the plant need to be considered. The following events would not normally meet this requirement; (e.g., Failure by a Member of the Security Force to carry out an assigned/required duty, internal disturbances, loss/compromise of safeguards materials or strike actions).

INTRUSION into a VITAL AREA by a HOSTILE FORCE will escalate this event to a Site Area Emergency.

Security shift supervision are the designated personnel on-site qualified and trained to confirm that a security event is occurring or has occurred. Training on security event classification confirmation is closely controlled due to the strict secrecy controls placed on the plant Security Plan.

HA2

ALERT

Initiating Condition:

Other conditions exist which in the judgment of the SM/TSC Director/EOF Director warrant declaration of an Alert

Operating Mode Applicability:

All

Emergency Action Level(s):

1. Other conditions exist which in the judgment of the SM/TSC Director/EOF Director 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. Any releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.

Basis:

This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the SM/TSC Director/EOF Director to fall under the Alert emergency class.

HA3

ALERT

Initiating Condition:

Control Room evacuation has been initiated

Operating Mode Applicability:

All

Emergency Action Level(s):

Entry into Alternate Shutdown procedure for Control Room evacuation:

Unit 1: 1203.002, "Alternate Shutdown" Unit 2: 2203.014, "Alternate Shutdown"

Basis:

With the Control Room evacuated, additional support, monitoring and direction through the Technical Support Center and/or other emergency response facilities is necessary. Inability to establish plant control from outside the Control Room within 15 minutes will escalate this event to a Site Area Emergency.

HA4

ALERT

Initiating Condition:

FIRE or EXPLOSION affecting the operability of plant safety systems required to establish or maintain safe shutdown

Operating Mode Applicability:

All

Emergency Action Level(s):

1. FIRE or EXPLOSION in any Table H1 areas.

Table H1			
Unit 1 CA-1 & HP Office Area Condensate Demineralizer Room Corridor 98 Fire Area C LNEPR	Unit 2 2A-3 Room 2A-4, 2D-02, & East Battery Room 2B-53 Room 2B-63 Room 2B9/2B10 Room		
LSEER/ Air Compressor Room LSEPR LSPPR MSIV Room North ES Switchgear Room (A-4) South ES Switchgear Room Turbine Building • A1, A2, H1, H2 Swgr area • 354' Bowling Alley north end west of BA comp room • 368' West Heater Deck from LSEER (orange door) along east wall of ES Swgr	2Y11/13 Equipment Room Aux Bldg 317' General Access Aux Bldg 335' Aux Bldg 354' B ESF Room Corridor Behind Door 340 Turbine Bldg • 2A1, 2A2, 2H1, 2H2 Area • 354' West wall of Demineralizer area • 368' West Heater Deck north of north SWGR Room (2A3) and East of LNEPR		
Rooms to Corridor 98 door. UNEPR/Hot Tool Room/Decon Room USEPR USPPR	Intake Structure 354' or 366' LNEPR LSEPR MG Set Room Steam Pipe Area Hot Machine Shop UNEPR UNPPR, LNPPR USPPR		

<u>AND</u>

Affected system parameter indications show degraded performance or plant personnel report VISIBLE DAMAGE to permanent structures or equipment within the specified area.

Basis:

The areas listed are those containing functions and systems required for the safe shutdown of the plant. The list of areas was developed from the AOPs, EOPs, and the Safe Shutdown Analysis. This makes it easier to determine if the FIRE or EXPLOSION is potentially affecting one or more redundant trains of safety systems. Escalation to a higher emergency dass, if appropriate, will be based on System Malfunction, Fission Product Barrier Degradation, Abnormal Rad Levels/Radiological Effluent, or SM/TSC Director/EOF Director Judgment EALs.

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 safety systems is included to discriminate against FIREs/EXPLOSIONs in areas having a low probability of affecting safe operation. 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.

This situation is not the same as removing equipment for maintenance that is covered by the 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. A FIRE/EXPLOSION is an UNPLANNED activity and, as such, does constitute a substantial degradation in the level of safety of the plant. In this situation, an Alert classification is warranted.

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 SM/TSC Director/EOF Director with the resources needed to perform these damage assessments. The SM/TSC Director/EOF Director also needs to consider any security aspects of the EXPLOSIONs, if applicable.

HA5

ALERT

Initiating Condition:

Release of toxic or flammable gases within or contiguous to a VITAL AREA which jeopardizes operation of systems required to establish or maintain safe shutdown

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2)

1. Report or detection of toxic gases within or contiguous to a VITAL AREA in concentrations that may result in an atmosphere IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH).

<u>OR</u>

2. Report or detection of gases in concentration > the LOWER FLAMMABILITY LIMIT within or contiguous to a VITAL AREA.

Basis:

This IC is based on gases that affect the safe operation of the plant. This IC applies to buildings and areas adjacent to plant VITAL AREAs or other significant buildings or areas (i.e., service water intake). The intent of this IC is not to include buildings (e.g., warehouses) or other areas that are not immediately adjacent to plant VITAL AREAs. It is appropriate that increased monitoring be done to ascertain whether consequential damage has occurred.

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 adjacent to a VITAL AREA. Exposure to an IDLH atmosphere will result in immediate harm to unprotected personnel, and would preclude access to any such affected areas.

EAL #2 is met when the flammable gas concentration in a VITAL AREA or any building or area adjacent to a VITAL AREA exceeds 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 SM/TSC Director/EOF Director Judgment EALs.

HA6

ALERT

Initiating Condition:

Natural and destructive phenomena affecting the plant VITAL AREA

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2 OR 3 OR 4 OR 5 OR 6)

1. An earthquake is felt and the 0.1g acceleration alarm annunciates indicating an Operating Basis Earthquake has occurred.

<u>OR</u>

- Tornado or high winds > 67 mph within PROTECTED AREA boundary resulting in VISIBLE DAMAGE to any of the following plant structures/equipment or Control Room indication of degraded performance of those systems:
 - Reactor Building
 - Intake Structure
 - Ultimate Heat Sink
 - BWST/RWT
 - Auxiliary Building
 - Turbine Building
 - QCST
 - Control Room
 - Startup Transformers
 - Diesel Fuel Vault

<u>OR</u>

- 3. Vehicle crash within PROTECTED AREA boundary and resulting in VISIBLE DAMAGE to any of the following plant structures or equipment therein <u>or</u> Control Room indication of degraded performance of those systems:
 - Reactor Building
 - Intake Structure
 - Ultimate Heat Sink
 - BWST/RWT
 - Auxiliary Building
 - Turbine Building
 - QCST
 - Control Room
 - Startup Transformers
 - Diesel Fuel Vault

<u>OR</u>

(CONTINUED ON NEXT PAGE)

- 4. Turbine failure-generated missiles resulting in VISIBLE DAMAGE to or penetration of any of the following plant areas:
 - Turbine Building
 - Auxiliary Building
 - Reactor Building
 - Diesel Fuel Vault
 - Startup Transformers

<u>OR</u>

5. Uncontrolled flooding in Table H1 areas that results in degraded safety system performance as indicated in the Control Room <u>or</u> that creates industrial safety hazards (e.g., electric shock) that precludes access necessary to operate or monitor safety equipment:

Table H1		
Unit 1	Unit 2	
 CA-1 & HP Office Area Condensate Demineralizer Room Corridor 98 Fire Area C LNEPR LSEER/ Air Compressor Room LSEPR LSPPR MSIV Room North ES Switchgear Room (A-4) South ES Switchgear Room Turbine Building A1, A2, H1, H2 Swgr area 354' Bowling Alley north end west of BA comp room 368' West Heater Deck from LSEER (orange door) along east wall of ES Swgr Rooms to Corridor 98 door. UNEPR/Hot Tool Room/Decon Room 	2A-3 Room 2A-4, 2D-02, & East Battery Room 2B-53 Room 2B-63 Room 2B9/2B10 Room 2Y11/13 Equipment Room Aux Bldg 317' General Access Aux Bldg 335' Aux Bldg 354' B ESF Room Corridor Behind Door 340 Turbine Bldg • 2A1, 2A2, 2H1, 2H2 Area • 354' West wall of Demineralizer area • 368' West Heater Deck north of north SWGR Room (2A3) and East of LNEPR	
USEPR USPPR	LNEPR LSEPR MG Set Room Steam Pipe Area Hot Machine Shop UNEPR UNPPR, LNPPR USPPR	

<u>OR</u>

6. Lake Dardanelle level < 335 feet and Emergency Cooling Pond inoperable

Basis:

These EALs escalate from the NUE EALs in HU6 in that the occurrence of the event has resulted in VISIBLE DAMAGE to plant structures or areas containing equipment necessary for a safe shutdown, or has caused damage to the safety systems in those structures evidenced by control indications of degraded system response or performance. The occurrence of VISIBLE DAMAGE and/or degraded system response is intended to discriminate against lesser events. The initial "report" should not be interpreted as mandating a lengthy damage assessment prior to classification. No attempt is made in this EAL to assess the actual magnitude of the damage. The significance here is not that a particular system or structure was damaged, but rather, that the event was of sufficient magnitude to cause this degradation. Escalation to higher classifications occurs on the basis of other EALs (e.g., System Malfunction).

EAL #1 is based on seismic events of a magnitude that can result in a plant VITAL AREA being subjected to forces beyond design limits, and thus damage may be assumed to have occurred to plant safety systems. See EPRI-sponsored "Guidelines for Nuclear Plant Response to an Earthquake", dated October 1989, for information on seismic event categories.

EAL #2 is based on the assumption that a tornado striking (touching down) or high winds within the PROTECTED AREA may have potentially damaged plant structures containing functions or systems required for safe shutdown of the plant. The high wind value in EAL #2 is conservatively based on the SAR design basis for Unit 1 of 67 mph. Unit 2 Design basis is 80 mph. If damage is confirmed visually or by other plant indications, escalation to Alert is appropriate.

EAL #3 is intended to address crashes of vehicle types large enough to cause significant damage to plant structures containing functions and systems required for safe shutdown of the plant.

EAL #4 is intended to address the threat to safety related equipment imposed by missiles generated by main turbine rotating component failures. The list of areas includes all areas containing safety-related equipment, their controls, and their power supplies that could be impacted by turbine failure-generated missiles. This EAL is, therefore, consistent with the definition of an ALERT in that if missiles have damaged or penetrated areas containing safety-related equipment the potential exists for substantial degradation of the level of safety of the plant.

EAL #5 addresses the effect of internal flooding that has resulted in degraded performance of systems affected by the flooding, or has created industrial safety hazards (e.g., electrical shock) 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. The areas include those areas that contain systems required for safe shutdown of the plant that are not designed to be wetted or submerged.

EAL #6 addresses site specific phenomena which has the potential for the loss of primary and secondary heat sink.

- 1. OP-1203.025 "Natural Emergencies"
- 2. OP-2203.008 "Natural Emergencies"

HS1

SITE AREA EMERGENCY

Initiating Condition:

Confirmed security event in a plant VITAL AREA

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2)

1. INTRUSION into the plant VITAL AREA by a HOSTILE FORCE.

<u>OR</u>

2. Other security events as determined from the ANO Safeguards Contingency Plan and reported by ANO Security shift supervision.

Basis:

This class of security events represents an escalated threat to plant safety above that contained in the Alert ICs in that a HOSTILE FORCE has progressed from the PROTECTED AREA to a VITAL AREA.

Consideration should be given to the following types of events when evaluating an event against the criteria of the site specific Security Contingency Plan: SABOTAGE and HOSTAGE/EXTORTION. The Safeguards Contingency Plan identifies numerous events/conditions that constitute a threat/compromise the Station's security. Only those events that involve actual or likely major failures of plant functions needed for protection of the public need to be considered. The following events would **not** normally meet this requirement: failure by a member of the security force to carry out an assigned/required duty, internal disturbances, loss/compromise of safeguards materials or strike actions.

Loss of plant control would escalate this event to a GENERAL EMERGENCY.

Security shift supervision are the designated personnel on-site qualified and trained to confirm that a security event is occurring or has occurred. Training on security event classification confirmation is closely controlled due to the strict secrecy controls placed on the plant Security Plan.

HS2

SITE AREA EMERGENCY

Initiating Condition:

Other conditions exist which in the judgment of the SM/TSC Director/EOF Director warrant declaration of Site Area Emergency

Operating Mode Applicability:

All

Emergency Action Level(s):

1. Other conditions exist which in the judgment of the SM/TSC Director/EOF Director 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. Any releases are not expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels beyond the site boundary.

Basis:

This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the SM/TSC Director/EOF Director to fall under the emergency class description for Site Area Emergency.

HS3

SITE AREA EMERGENCY

Initiating Condition:

Control Room evacuation has been initiated and plant control cannot be established

Operating Mode Applicability:

All

Emergency Action Level(s):

1. a. Control room evacuation has been initiated.

<u>AND</u>

b. Control of the plant cannot be established per the following procedures within 15 minutes:

Unit 1: 1203.002, "Alternate Shutdown" Unit 2: 2203.014, "Alternate Shutdown"

Basis:

Expeditious transfer of safety systems has not occurred but fission product barrier damage may not yet be indicated. The intent of this IC is to capture those events where control of the plant cannot be reestablished in a timely manner. The determination of whether or not control is established outside of the Control Room is based on SM/TSC Director/EOF Director judgment. The SM/TSC Director/EOF Director is expected to make a reasonable, informed judgment within 15 minutes that control of the plant has or has not been established.

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 such as reactivity control (ability to shutdown the reactor and maintain it shutdown), RCS inventory (ability to cool the core), and secondary heat removal (ability to maintain a heat sink).

Escalation of this event, if appropriate, would be by Fission Product Barrier Degradation, Abnormal Rad Levels/Radiological Effluent, or SM/TSC Director/EOF Director Judgment EALs.

HG1

GENERAL EMERGENCY

Initiating Condition:

Security event resulting in loss of physical control of the facility

Operating Mode Applicability:

All

Emergency Action Level(s):

1. A HOSTILE FORCE has taken control of plant equipment such that plant personnel are unable to operate equipment required to maintain safety functions.

Basis:

This IC encompasses conditions under which a HOSTILE FORCE has taken physical control of VITAL AREAs (containing vital equipment or controls of vital equipment) required to maintain safety functions and control of that equipment cannot be transferred to and operated from another location. These safety functions are reactivity control (ability to shut down the reactor and keep it shutdown) RCS inventory (ability to cool the core), and secondary heat removal (ability to maintain a heat sink). If control of the plant equipment necessary to maintain safety functions can be transferred to another location, then the above initiating condition is not met.

This EAL should also address loss of physical control of spent fuel pool cooling systems if imminent fuel damage is likely (e.g., freshly off-loaded reactor core in pool).

Loss of physical control of the Control Room or remote shutdown/alternate shutdown capability alone may not prevent the ability to maintain safety functions. Design of the remote shutdown/alternate capability and the location of the transfer switches should be taken into account.

HG2

GENERAL EMERGENCY

Initiating Condition:

Other conditions exist which in the judgment of the SM/TSC Director/EOF Director warrant declaration of General Emergency

Operating Mode Applicability:

All

Emergency Action Level(s):

 Other conditions exist which in the judgment of the SM/TSC Director/EOF Director 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 EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.

Basis:

This EAL is intended to address unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the SM/TSC Director/EOF Director to fall under the General Emergency class.

SU1

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Loss of all offsite power to Vital 4.16 KV busses for > 15 minutes

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2) Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s):

1. Loss of power to all Startup Transformers for > 15 minutes.

<u>AND</u>

Each vital 4.16 KV bus is powered from an independent diesel generator.

Basis:

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.

The EAL allows credit for operation of installed design feature (Alternate AC Diesel Generator).

- 1. 1202.007, Degraded Power
- 2. 1202.008, Blackout
- 3. 2202.007, Loss of Off-Site Power
- 4. 2202.008, Station Blackout
- 5. 2104.037, Alternate AC Diesel Generator Operations

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

UNPLANNED loss of most or all safety system annunciation or indication in the Control Room for > 15 minutes

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2) Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s):

 UNPLANNED loss of most or all annunciators or indicators associated with safety systems for > 15 minutes.

Basis:

This IC and its associated EALs are intended to recognize the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment.

Recognition of the availability of computer based indication equipment is considered (e.g., SPDS, plant computer, etc.).

Quantification of "Most" is arbitrary, however, it is estimated that if approximately 75% of the safety system annunciators or indicators are lost, there is a higher 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.

SYSTEM MALFUNCTION (SU6)

It is further recognized that each plant design provides redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This will be addressed by the specific Technical Specification. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification action, the NUE is based on **SU11**.

Annunciators or indicators for this EAL must include those identified in the Abnormal Operating Procedures, in the Emergency Operating Procedures, and in other EALs (e.g., area, process, and/or effluent rad monitors, etc.). The loss of control room annunciators increases the difficulty to recognize changing plant conditions. It is estimated that if approximately 75% of the safety system annunciators or indications are lost, there is an increased risk that a degraded plant condition could go undetected.

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

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

This NUE will be escalated to an Alert if a transient is in progress during the loss of annunciation or indication (SA6).

Basis Documents:

- 1. 1203.043, Loss Control Room Annunciator
- 2. 2203.042, Loss of Control Room Annunciators

SU7

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

RCS leakage

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2) Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s): (1 OR 2)

1. Unidentified or pressure boundary leakage > 10 gpm.

<u>OR</u>

2. Identified leakage > 25 gpm.

Basis:

This IC is included as an NUE because the condition may be a precursor of more serious conditions and, as result, is considered to be a potential degradation of the level of safety of the plant. The 10 gpm value for the unidentified and pressure boundary leakage was selected as it is observable with normal Control Room indications. Lesser values must generally be determined through time-consuming surveillance tests (e.g., mass balances). The EAL for identified leakage is set at a higher value due to the lesser significance of identified leakage in comparison to unidentified or pressure boundary leakage. In either case, escalation of this IC to the Alert level is via **FA1**.

SU8

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

UNPLANNED loss of all onsite or offsite communications capabilities

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2) Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s): (1 OR 2)

 Loss of all onsite communications capability (Table M1) affecting the ability to perform routine operations.

Table M1 Onsite Communications Equipment		
Station radio system Plant paging system In-plant telephones Gaitronics		

<u>OR</u>

2. Loss of all offsite communications capability (Table M2)



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 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., individuals being sent to offsite locations, etc.) are being utilized to make communications possible.

Basis Documents:

1. 1903.062, "Communications System Operating Procedure"

SU9

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Fuel clad degradation

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2) Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s): (1 OR 2)

1. Failed Fuel Iodine radiation monitor reading indicates fuel clad degradation > Technical Specification allowable limits.

<u>Unit 1:</u> RI-1237S reads > 1.3×10^5 counts per minute.

<u>Unit 2:</u> 2RITS-4806B reads > 6.5×10^4 counts per minute.

2. RCS sample activity value indicating fuel clad degradation > Technical Specification allowable limits.

<u>Unit 1:</u> RCS Sample Analysis: > 3.50 µCi/gm IDE RCS Sample Analysis: > 72/Ē µCi/gm Gross Activity

<u>Unit 2:</u> RCS Sample Analysis: > 1.0 µCi/gm IDE RCS Sample Analysis: > 100/Ē µCi/gm Gross Activity

Basis:

This IC and its associated EALs are included as an NUE 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 addresses the Letdown Radiation Monitor reading that is indicative of RCS Iodine levels that may exceed the Technical Specification limit. EAL #2 addresses reactor coolant samples exceeding Technical Specification limits for iodine spikes that are indicative of a loss of fuel clad integrity. Escalation of this EAL to the Alert level is via the Fission Product Barrier Degradation Monitoring EALs. The companion EAL to **SU4** for the Cold Shutdown/Refueling modes is **CU4**.

•

SU10

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Inadvertent criticality

Operating Mode Applicability:

Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s):

1. An UNPLANNED sustained positive startup rate observed on nuclear instrumentation.

Basis:

This IC addresses inadvertent criticality events. While the primary concern 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), this 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 NUE 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 can be identified using the startup rate monitor. The term "sustained" is used in order to allow exclusion of expected short term positive startup rates from planned control rod movements such as shutdown bank withdrawal. These short term positive startup rates are the result of the rise in neutron population due to subcritical multiplication.

Escalation would be by the fission product barrier EALs, as appropriate to the operating mode at the time of the event, or by SM/TSC Director/EOF Director Judgment.

- 1.
- 1203.012G, "Annunciator K08 Corrective Action" 2203.012D, "Annunciator 2K04 Corrective Action" 2.

SU11

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Inability to reach required shutdown within Technical Specification limits

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2) Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s):

1. Plant is not brought to required operating mode within Technical Specifications LCO action statement time.

Basis:

Limiting Conditions for Operation (LCOs) require the plant to be brought to a required shutdown mode when the Technical Specification required configuration cannot be restored. Depending on the circumstances, this may or may not be an emergency or precursor to a more severe condition. In any case, the initiation of plant shutdown required by the site Technical Specifications requires a four hour report under 10 CFR 50.72 (b) Non-emergency events. The plant is within its safety envelope when being shut down within the allowable action statement time in the Technical Specifications. An immediate NUE is required when the plant is not brought to the required operating mode within the allowable action statement time in the Technical Specifications and is not related to how long a condition may have existed. Other required Technical Specification shutdowns that involve precursors to more serious events are addressed by other System Malfunction, Hazards, or Fission Product Barrier Degradation ICs.

- 1. ANO2 Technical Specifications
- 2. ANO1 Technical Specifications

ALERT

SA1

Initiating Condition:

AC power capability to Vital 4.16 KV busses reduced to a single power source for > 15 minutes such that any additional single failure would result in station blackout

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2) Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s):

1. AC power capability to Vital 4.16 KV busses reduced to a single power source for > 15 minutes.

AND

Any additional single failure will result in station blackout.

Basis:

This IC and its associated EAL is intended to provide an escalation from SU1. The condition indicated is the degradation of the offsite and onsite power systems such that any additional single failure would result in a station blackout. This condition could occur due to a loss of offsite power with a concurrent failure of one emergency generator to supply power to its emergency busses. Another related condition could be the loss of all offsite power and loss of onsite emergency diesels with only one train of emergency busses being backfed from the unit main generator, or the loss of onsite emergency diesels with only one train of emergency busses being backfed from offsite power. The subsequent loss of this single power source would escalate the event to a Site Area Emergency in accordance with **SS1**.

The EAL allows credit for operation of the Alternate AC Diesel Generator.

Even though a vital 4.16 KV bus may be energized, if necessary loads (i.e., loads that if lost would inhibit decay heat removal capability or reactor vessel makeup capability) are not operable on the energized bus then the bus should not be considered operable. If this bus was the only energized bus then a Site Area Emergency per **SS1** should be declared.

- 1. 1202.007, Degraded Power
- 2. 1202.008, Blackout
- 3. 2202.007, Loss of Off-Site Power
- 4. 2202.008, Station Blackout
- 5. 2104.037, Alternate AC Diesel Generator Operations

ALERT

Initiating Condition:

Failure of Reactor Protection System instrumentation to complete or initiate an automatic reactor trip once a Reactor Protection System setpoint has been exceeded and manual trip was successful

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2) Hot Standby (Mode 3)

Emergency Action Level(s):

1. Indication(s) exist that indicate that reactor protection system setpoint was exceeded and automatic trip did not occur, and a successful manual trip occurred.

Basis:

This condition indicates failure of the reactor protection system to trip the reactor. This condition is more than a potential degradation of a safety system in that a front line automatic protection system did not function in response to a plant transient and thus the plant safety has been compromised, and 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 barriers. Reactor protection system setpoint being exceeded, rather than limiting safety system setpoint being exceeded, is specified here because failure of the reactor protection system is the issue. A manual trip 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., manual reactor trip, diverse trip initiation). Any action taken to trip the reactor from any location other than panel C03 (Unit 1) or 2C03 (Unit 2) constitutes a failure of the manual trip function. Failure of manual trip would escalate the event to a Site Area Emergency (SS3).

The operator may not detect the RPS failure prior to performing the manual trip. The failure would be detected by reviewing the post trip sequence of events printout from the plant computer and the emergency class would be declared, at that time.
ALERT

Initiating Condition:

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

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2) Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s):

 UNPLANNED loss of most or all annunciators or indicators associated with safety systems for > 15 minutes.

<u>AND</u>

Either of the following:

a. A SIGNIFICANT TRANSIENT is in progress.

<u>OR</u>

b. Compensatory non-alarming indications are unavailable.

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. Recognition of the availability of computer based indication equipment is considered (e.g., SPDS, plant computer, etc.).

"Planned" loss of annunciators or indicators includes scheduled maintenance and testing activities.

Quantification of "Most" is arbitrary, however, it is estimated that if approximately 75% of the safety system annunciators or indicators are lost, there is higher 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 more monitoring of system operation.

SYSTEM MALFUNCTION (SA6)

It is further recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This will be addressed by the specific Technical Specification. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification action, the NUE is based on **SU11**.

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

This Alert will be escalated to a Site Area Emergency (SS6) if the operating crew cannot monitor the transient in progress.

- 1. 1015.037, Post Transient Review
- 2. 1203.043, Loss Control Room Annunciator
- 3. 2203.042, Loss of Control Room Annunciators

SITE AREA EMERGENCY

Initiating Condition:

Loss of all offsite power and loss of all onsite AC power to Vital 4.16 KV busses

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2) Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s):

1. Loss of power to all Startup transformers.

<u>AND</u>

Failure of all diesel generators to supply power to Vital 4.16 KV busses.

AND

Failure to restore power to at least one Vital 4.16 KV bus within 15 minutes from the loss of both offsite and onsite AC power.

Basis:

Loss of all AC power compromises all plant safety systems requiring electric power including DHR or SDC, ECCS, containment heat removal and the ultimate heat sink. Prolonged loss of all AC power will cause core uncovering and loss of containment integrity, thus this event can escalate to a General Emergency. The 15 minute duration is selected to exclude transient or momentary power losses.

Escalation to General Emergency is via fission product barrier degradation FG1 or SG1.

Loss of the 6.9 KV busses and non-vital 4.16 KV busses puts the plant in a natural circulation mode with Decay Heat being removed by the EFW System. Maintaining the required components for Natural Circulation Cooling is of vital importance. Consideration should be given to operable loads necessary to remove decay heat or provide Reactor Vessel makeup capability when evaluating loss of AC power to vital 4.16 KV busses. Even though a vital bus may be energized, if necessary loads (i.e., loads that, if lost, would inhibit decay heat removal capability or Reactor Vessel makeup capability) are not operable on the energized bus, then the bus should not be considered operable for this IC. If this bus was the only energized bus, than a Site Area Emergency per **SS1** should be declared.

- 1. 1202.007, Degraded Power
- 2. 1202.008, Blackout
- 3. 2202.007, Loss of Off-Site Power
- 4. 2202.008, Station Blackout
- 5. 2104.037, Alternate AC Diesel Generator Operations

SITE AREA EMERGENCY

Initiating Condition:

Failure of Reactor Protection System instrumentation to complete or initiate an automatic reactor trip once a Reactor Protection System setpoint has been exceeded and manual trip was NOT successful

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2)

Emergency Action Level(s):

1. Indication(s) exist that automatic and manual trips were not successful.

Basis:

Automatic and manual trip are not considered successful if action away from the reactor control console was required to trip the reactor.

Under these conditions, the reactor is producing more heat than the maximum decay heat load for which the safety systems are designed. A Site Area Emergency is indicated because conditions exist that lead to imminent loss or potential loss of both fuel clad and RCS barriers. Although this IC may be viewed as redundant to the Fission Product Barrier Degradation IC, its inclusion is necessary to better assure timely recognition and emergency response. Escalation of this event to a General Emergency would be via **FG1** or **HG2**.

SITE AREA EMERGENCY

Initiating Condition:

Loss of all vital DC power

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2) Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s):

1. Loss of ALL Vital DC power based on bus voltage of < 105 volts for > 15 minutes.

Basis:

Battery bus voltage indicating less than 105 volts constitutes loss of DC associated busses. Loss of all DC power compromises ability to monitor and control plant safety functions. Prolonged loss of all DC power will cause core uncovering and loss of containment integrity when there is significant decay heat and sensible heat in the reactor system. Escalation to a General Emergency would occur via **AG1** or **FG1**. Fifteen minutes was selected as a threshold to exclude transient or momentary power losses.

SITE AREA EMERGENCY

Initiating Condition:

Complete loss of heat removal capability

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2) Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s):

1. Loss of core cooling and heat sink.

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.

Under these conditions, 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 **AG1** or **FG1**.

SS6

SITE AREA EMERGENCY

Initiating Condition:

Inability to monitor a SIGNIFICANT TRANSIENT in progress

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2) Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s):

1. a. Loss of \geq 75% of annunciators associated with safety systems.

<u>AND</u>

b. Compensatory non-alarming indications are unavailable.

<u>AND</u>

c. Indications needed to monitor safety functions (reactivity control, core cooling, RCS integrity, or containment integrity) are unavailable.

<u>AND</u>

d. A SIGNIFICANT TRANSIENT is in progress.

Basis:

This IC and it associated EAL is intended to recognize the inability of the Control Room staff to monitor the plant response to a transient. A Site Area Emergency is considered to exist if the control room staff cannot monitor safety functions needed for protection of the public.

SYSTEM MALFUNCTION (SS6)

Indications needed to monitor safety functions necessary for protection of the public must include Control Room indications, computer generated indications and dedicated annunciation capability. The specific indications should be those used to determine such functions as the ability to shut down the reactor, maintain the core cooled, to maintain the reactor coolant system intact, and to maintain containment intact (FS1, FG1).

"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.

Quantification of "Most" is arbitrary, however, it is estimated that if approximately 75% of the safety system annunciators or indicators are lost, there is a higher 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 more monitoring of system operation.

- 1. 1015.037, "Post Transient Review"
- 2. 1203.043, "Loss Control Room Annunciator"
 3. 2203.042, "Loss of Annunciators"

Initiating Condition:

Prolonged loss of all offsite power and prolonged loss of all onsite AC power to Vital 4.16 KV busses

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2) Hot Standby (Mode 3) Hot Shutdown (Mode 4)

Emergency Action Level(s):

1. Loss of power to all Startup transformers.

AND

Failure of all Diesel Generators to supply power to Vital 4.16 KV busses.

<u>AND</u>

Either of the following: (a <u>OR</u> b)

a. Restoration of at least one Vital 4.16 KV bus within four (4) hours is not likely

<u>OR</u>

b. **FA1** entry conditions met.

SYSTEM MALFUNCTION (SG1)

Basis:

Loss of all AC power compromises all plant safety systems requiring electric power including DHR, SDC, ECCS, containment heat removal and the ultimate heat sink. Prolonged loss of all AC power will lead to loss of fuel clad, RCS, and containment barriers. The 4 hours to restore AC power is based on the results of the calculations referenced below. Appropriate allowance for offsite emergency response including evacuation of surrounding areas should be considered. Although this IC may be viewed as redundant to the Fission Product Barrier Degradation ICs, its inclusion is necessary to better assure timely recognition and emergency response.

This IC is specified to assure that in the unlikely event of a prolonged station blackout, timely recognition of the seriousness of the event occurs and that declaration of a General Emergency occurs as early as is appropriate, based on a reasonable assessment of the event trajectory.

The likelihood of restoring at least one emergency bus should be based on a realistic appraisal of the situation since a delay in an upgrade decision based on only a chance of mitigating the event could result in a loss of valuable time in preparing and implementing public protective actions.

In addition, under these conditions, fission product barrier monitoring capability may be degraded. Although it may be difficult to predict when power can be restored, it is necessary to give the SM/TSC Director/EOF Director a reasonable idea of how quickly the need to declare a General Emergency may be 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 SM/TSC Director/EOF Director judgment as it relates to imminent Loss or Potential Loss of fission product barriers and degraded ability to monitor fission product barriers.

- 1. Unit 1 Calculation 85-E-0072-02, Time from Loss of All AC Power to Loss of Subcooling
- 2. Unit 2 Calculation 85-E-0072-01, *Time from Loss of All AC Power to Loss of Subcooling*

SG3

GENERAL EMERGENCY

Initiating Condition:

Failure of the Reactor Protection System to complete an automatic trip and manual trip was NOT successful and there is indication of an extreme challenge to the ability to cool the core

Operating Mode Applicability:

Power Operation (Mode 1) Startup (Mode 2)

Emergency Action Level(s):

1. Indications exist that automatic and manual trips were <u>NOT</u> successful.

<u>AND</u>

Either of the following: (a or b)

- a. Indication(s) exists that core cooling is extremely challenged:
 - CETs indicate ≥ 1200°F

<u>OR</u>

 RVLMS indicates: Unit 1: Levels 1 through 9 DRY Unit 2: Levels 1 through 7 DRY

<u>OR</u>

b. Indication(s) exist that heat removal is extremely challenged based on feedwater flow rate being less than:

Unit 1: 430 gpm **Unit 2:** 485 gpm

Basis:

Automatic and manual trips are not considered successful if action away from the reactor control console is required to trip the reactor.

Under the conditions of this IC and its associated EALs, the efforts to bring the reactor subcritical have been unsuccessful and, as a result, the reactor is producing more heat than the maximum decay heat load for which the safety systems were designed. Although there are capabilities away from the reactor control console, such as emergency boration, the continuing temperature rise indicates that these capabilities are not effective. This situation could be a precursor for a core melt sequence.

SYSTEM MALFUNCTION (SG3)

£2

The extreme challenge to the ability to cool the core is intended to mean that the core exit temperatures are at or approaching 1200°F or that the reactor vessel water level is below the top of active fuel.

Another consideration is the inability to initially remove heat during the early stages of this sequence. If emergency feedwater flow is insufficient to remove the amount of heat required by design from at least one steam generator, an extreme challenge should be considered to exist.

In the event either of these challenges exists at a time that the reactor has not been brought below the power associated with the safety system design (typically 3 to 5% power) a core melt sequence exists. In this situation, core degradation can occur rapidly. For this reason, the General Emergency declaration is intended to be anticipatory of the fission product barrier matrix declaration (**FG1**) to permit maximum offsite intervention time.