Enclosure C

{Callaway Plant Unit 2}

EAL Technical Bases Manual

Emergency Classification Levels (ECLs)

Nuclear power plant emergencies are separated into four Emergency Classification Levels (ECLs): Unusual Event, Alert, Site Area Emergency, and General Emergency. The ECLs are escalated from least severe to most severe according to relative threat to the health and safety of the public and emergency workers. An ECL is determined to be met by identifying abnormal conditions and then comparing them to Initiating Conditions (ICs) through Emergency Action Levels (EAL) and Fission Product Barrier (FPB) threshold values as discussed below. When multiple EALs are met, event declaration is based in the highest ECL reached.

<u>UNUSUAL EVENT:</u> Events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.

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

<u>SITE AREA EMERGENCY:</u> Events are in progress or have occurred which involve an actual or likely major failures of plant functions needed for protection of the public or HOSTILE ACTION that results in intentional damage or malicious acts; 1) toward site personnel or equipment that could lead to the likely failure of or; 2) that prevent effective access to equipment needed for the protection of the public. Any releases are not expected to result in exposure levels that exceed EPA Protective Action Guideline exposure levels beyond the site boundary.

<u>GENERAL EMERGENCY:</u> Events are in progress or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.

A state or phase called RECOVERY may be entered prior to returning to a normal organization and operation. Recovery provides dedicated resources and organizational structure in support of restoration and communication activities following the termination of the emergency event.

Initiating Conditions (ICs)

The ICs provide a general description emergency conditions that are organized beneath the broader categories of the ECLs. The IC can be a continuous, measurable condition that is outside Technical Specifications, or it can encompass events such as fires or system/equipment failures.

Each IC is given a unique identification code consisting of two letters and one number. The first letter identifies the recognition category, the second letter identifies the ECL, and the number identifies the sequence of the IC within the recognition category. The EAL identification codes are developed as follows:

Recognition Categories

- "F" FISSION PRODUCT BARRIER DEGRADATION
- "R" RADIOLOGICAL EFFLUENT / ABNORMAL RADIATION LEVELS
- "H" HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY
- "S" SYSTEM MALFUNCTIONS - HOT
- "C" SYSTEM MALFUNCTIONS - COLD

Emergency Classification Levels

- “U” UNUSUAL EVENT
- “A” ALERT
- “S” SITE AREA EMERGENCY
- “G” GENERAL EMERGENCY

Emergency Action Levels (EALs) and Fission Product Barriers (FPBs)

EALs are predetermined, site specific, observable conditions below the ICs that place the state of the plant in a given ECL.

EALs are individually identified by the IC identification code followed by the EAL number, such as RG1.1 for a major effluent release or HA3.2 for high winds.

Fission Product Barriers (FPBs) are given unique three character identification codes and are further subdivided into loss and potential loss categories. Since meeting or exceeding a FPB does not necessarily result in an ECL, the first two letters simply identify the particular barrier by abbreviation. The number in the FPB identification code associates it with a particular FPB recognition category. The FPB identification codes are developed as follows:

<u>Barrier Abbreviation</u>

- “FC” FUEL CLAD
- “RC” REACTOR COOLANT
- “CT” CONTAINMENT

<u>FPB Recognition Categories</u>

- "1" CRITICAL SAFETY FUNCTION STATUS
- “2” CONTAINMENT RADIATION MONITORING
- “3” CORE TEMPERATURE
- “4” RPV LEVEL
- “5” RCS LEAK RATE
- “6” SG TUBE LEAKAGE / RUPTURE
- “7” RCS ACTIVITY
- “8” CONTAINMENT CONDITIONS
- “9” CONTAINMENT ISOLATION FAILURE
- “10” ED JUDGMENT

FPBs are treated the same as EALs in that they are applicable only as long as the condition(s) that meet or exceed their thresholds exist. This is in contrast to ECLs which once declared, remain in place until termination or recovery.

For EALs that contain time imbedded criterion, the {Emergency Coordinator} should not wait until the applicable time period has elapsed, but should declare the event as soon as it is determined that the condition will likely exceed the applicable time.

Equipment used for monitoring and evaluating plant conditions include routine instrumentation, backup or redundant instrumentation, and the use of other parameter instrumentation that can provide indirect indication.

- When an EAL or FPB refers to a specific instrument or indication that is unavailable prior to an event, alternate indication must be identified to compensate for the loss until the primary indication is restored for the applicable operating mode. Instrumentation used to classify events cannot be removed from service without also implementing adequate compensatory measures.

- When an EAL or FPB refers to a specific instrument or indication that is known to be inaccurate or becomes unavailable during an event (such as off scale high or low), other direct or indirect instrumentation must be used whenever possible. If there are no other direct or indirect means available, then the EAL or FPB can be assumed to have been exceeded consistent with its previous valid trend.

EALs and FPBs are predicated on unplanned events. A planned evolution involves actions to address limitations imposed by the evolution, performance of surveillance testing, and implementation of controls prior to knowingly exceeding a threshold. Planned evolutions to test, manipulate, repair, perform maintenance or modifications to systems and equipment that will knowingly result in an EAL or FPB being met or exceeded are not subject to event declaration as long as the planned actions or compensatory measures do not meet an ECL with regard to level of safety and the evolution proceeds as planned.

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

Operating Mode Applicability

For purposes of event classification, the following operating mode applicability definitions establish the conditions when the EAL or FPB thresholds represent a threat:

Mode	Reactivity Condition, K_{eff}	% Rated Thermal Power*	Average Reactor Coolant Temperature
1) Power Operation	≥ 0.99	> 5%	N/A
2) Startup	≥ 0.99	≤ 5%	N/A
3) Hot Standby	< 0.99	N/A	≥ 350° F
4) Hot Shutdown	< 0.99	N/A	350° F > T_{AVG} > 200° F
5) Cold Shutdown	< 0.99	N/A	≤ 200° F
6) Refueling	One or more vessel head closure bolts less than fully tensioned.		
D) Defueled	All reactor fuel removed from reactor pressure vessel (full core off load during refueling or extended outage).		

* Excluding decay heat.

ICs are based on the operating mode that exists at the time the event occurred, prior to any protective system or operator action initiated in response.

For events that occur in Cold Shutdown or Refueling, escalation is via EALs that have Cold Shutdown or Refueling for mode applicability, even if Hot Shutdown (or a higher mode) is entered during any subsequent heat-up. In particular, the FPB threshold values are applicable only to events that initiate in Hot Shutdown or higher. If there is a change in operating mode following an event declaration, any subsequent events involving EALs outside of the current declaration escalation path will be evaluated on the mode of the plant at the time the subsequent events occur.

EAL Technical Basis Manual Content

<u>Definitions</u>

A list of definitions is provided for terms having specific meaning to the EALs. EAL terminology definitions are provided with the intent to be used for a particular IC or EAL/FPB threshold value and may not be applicable to other uses of that term in other procedures outside the Emergency Preparedness Program.

<u>EAL Matrix Table</u>

The EAL Technical Basis Manual contains five EAL matrix tables based on the different EAL recognition categories

The EAL matrix is designed as an evaluation tool that organizes the ECLs from the highest (General Emergency) on the left to the lowest (Unusual Event) on the right. Evaluating the EALs for each ECL from highest to lowest reduces the possibility that an event will be under classified. All recognition categories are to be reviewed for applicability prior to event declaration.

Other user aids such as wallboards may be developed from the matrix table to support evaluation of abnormal conditions in other human factored formats.

<u>EAL Documentation Format</u>

Each EAL within the technical bases manual is documented in the following manner:

- IC Identification Number
- Initiating Condition
- Operating Mode Applicability
- EALs or FPB Threshold Value(s)
- Basis
    - Generic
    - Site (or U.S. EPR) Specific
- Basis Reference(s)

Definitions

AFFECTING SAFE SHUTDOWN: Event in progress has adversely affected functions that are necessary to bring the plant to and maintain it in the applicable hot or cold shutdown condition. Plant condition applicability is determined by Technical Specification LCOs in effect.

> Example 1: Event causes damage that results in entry into an LCO that requires the plant to be placed in hot shutdown. Hot shutdown is achievable, but cold shutdown is not. This event is not “affecting safe shutdown.”
>
> Example 2: Event causes damage that results in entry into an LCO that requires the plant to be placed in cold shutdown. Hot shutdown is achievable, but cold shutdown is not. This event is “affecting safe shutdown.”

BOMB: An explosive device suspected of having sufficient force to damage plant systems or structures.

CIVIL DISTURBANCE: A group of persons violently protesting station operations or activities at the site.

CONFINEMENT BOUNDARY: The barrier(s) between areas containing radioactive substances and the environment.

CONTAINMENT CLOSURE: The procedurally defined actions taken to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

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

FAULTED: In a steam generator, the existence of secondary side leakage that results in an uncontrolled drop in steam generator pressure or the steam generator being completely depressurized.

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

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

HOSTILE ACTION: An act toward a nuclear power plant or its personnel that includes the use of violent force to destroy equipment, take hostages, and/or intimidates the licensee to achieve an end. This includes attack by air, land, or water using guns, explosives, projectiles, vehicles, or other devices used to deliver destructive force. Other acts that satisfy the overall intent may be included. Hostile action should not be construed to include acts of civil disobedience or felonious acts that are not part of a concerted attack on the nuclear power plant. Non-terrorism-based EALs should be used to address such activities, (e.g., violent acts between individuals in the owner controlled area).

HOSTILE FORCE: One or more individuals who are engaged in a determined assault, overtly or by stealth and deception, equipped with suitable weapons capable of killing, maiming, or causing destruction.

IMMINENT: Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur. Where IMMINENT timeframes are specified, they shall apply.

INTRUSION / INTRUDER: A person(s) present in a specified area without authorization. Discovery of a bomb in a specified area is indication of intrusion into that area by a hostile force.

LARGE AIRCRAFT: Aircraft as large as or larger than passenger airliners or air cargo / freight planes (for example; 737, DC9, MD80, MD90, 717 or C-130). Examples of aircraft that would not be considered large are general aviation Cessna, Piper and Lear type private planes as well as police, medical and media helicopters.

NORMAL LEVELS: The highest reading in the past twenty-four hours excluding the current peak value.

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

OWNER CONTROLLED AREA: The property associated with the plant and owned by the company. Access is normally limited to persons entering for official business.

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

PROTECTED AREA: An area that normally encompasses all controlled areas within the security protected area fence.

RUPTURED: In a steam generator, existence of primary-to-secondary leakage of a magnitude sufficient to require or cause a reactor trip and safety injection.

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

SIGNIFICANT TRANSIENT: An unplanned event involving one or more of the following: (1) automatic runback >50% thermal reactor power, (2) electrical load rejection >50% full electrical load, (3) reactor trip, or (4) MHSI actuation.

STRIKE ACTION: A work stoppage within the PROTECTED AREA by a body of workers to enforce compliance with demands made on management. The strike action must threaten to interrupt normal plant operations.

UNISOLABLE: A breach or leak that cannot be isolated from the Control Room.

UNPLANNED: A parameter change or an event, the reasons for which may be known or unknown, that is not the result of an intended evolution and requires corrective or mitigative actions.

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

VITAL AREA: Any area, normally within the Protected Area that contains equipment, systems, components, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

Abbreviations

AC .... Alternating Current
BWR .... Boiling Water Reaction
CDE .... Committed Dose Equivalent
CFR .... Code of Federal Regulations
CSFST .... Critical Safety Function Status Tree
DC .... Direct Current
EAL .... Emergency Action Level
ECCS .... Emergency Core Cooling System
ECL .... Emergency Classification Level
EPA .... Environmental Protection Agency
EPRI .... Electric Power Research Institute
ESW .... Emergency Service Water
FAA .... Federal Aviation Administration
FBI .... Federal Bureau of Investigation
FSAR .... Final Safety Analysis Report
GE .... General Emergency
IC .... Initiating Condition
Keff .... Effective Neutron Multiplication Factor
LCO .... Limiting Condition of Operation
LOCA .... Loss of Coolant Accident
MHSI .... Medium Head Safety Injection
MSIV .... Main Steam Isolation Valve
mR .... milliRoentgen
NEI .... Nuclear Energy Institute
NRC .... Nuclear Regulatory Commission
NORAD .... North American Aerospace Defense Command
NUMARC .... Nuclear Management and Resources Council
OBE .... Operating Basis Earthquake
OCA .... Owner Controlled Area
ODCM .... Offsite Dose Calculation Manual
ORO .... Offsite Response Organization
PRA .... Probabilistic Risk Assessment
PWR .... Pressurized Water Reactor
PSIG .... Pounds per Square Inch Gauge
R .... Roentgen
RCS .... Reactor Coolant System
REM .... Roentgen Equivalent Man
RPV .... Reactor Pressure Vessel
SCBA .... Self-Contained Breathing Apparatus
SG .... Steam Generator
SI .... Safety Injection
SPDS .... Safety Parameter Display System
TEDE .... Total Effective Dose Equivalent
TOAF .... Top of Active Fuel
UE .... Unusual Event
U.S. EPR .... U.S Evolutionary Power Reactor

FISSION PRODUCT BARRIER DEGRADATION

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
FG1 1 2 3 4	**FS1** 1 2 3 4	**FA1** 1 2 3 4	**FU1** 1 2 3 4
1. Loss of any two barriers and loss or potential loss of the third barrier.	1. Loss or potential loss of any two barriers.	1. Any loss or any potential loss of either fuel clad or RCS.	1. Any loss or any potential loss of containment.

{Add FC2 containment rad graph here (damage curve based on 300 μCi/gm DEI-131)}

{Add CT2 containment rad graph here (damage curve based on 20% fuel clad)}

	FC – Fuel Clad		RC – Reactor Coolant System		CT - Containment	
Sub-Category	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**
2. Containment Radiation Monitoring	1. Containment radiation monitor ({JYK15 CR101}) **> {Graph FC2(L)1}**.	None	1. Containment radiation monitor ({JYK15 CR101}) **> {RC2(L)1} R/hr**.	None	None	1. Containment radiation monitor ({JYK15 CR101}) **> {Graph CT2(PL)1}**.
3. Core Temperature	1. **{**Calculated Clad Temperature in **Region 3 or higher}**.	1. **{**Calculated Clad Temperature in **Region 2}**.	None	None	None	1. a. **{**Calculated Clad Temperature in **Region 4}**. **AND** b. Restoration procedures not effective within **15 minutes**. **OR** 2. a. **{**Calculated Clad Temperature in **Region 3}**. **AND** b. RCS level ({JEF10 CL081}) **< {CT3(PL)2.b}**. **AND** c. Restoration procedures not effective within **15 minutes**.

FISSION PRODUCT BARRIER DEGRADATION

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
FG1 1 2 3 4 Loss of any two barriers and Loss or Potential Loss of the third barrier.	**FS1** 1 2 3 4 Loss or Potential Loss of any two barriers.	**FA1** 1 2 3 4 Any Loss or any Potential Loss of either Fuel Clad or RCS.	**FU1** 1 2 3 4 Any Loss or any Potential Loss of Containment.

	FC – Fuel Clad		RC – Reactor Coolant System		CT - Containment	
Sub-Category	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**
4. RPV Level	None	1. a. RCS level ({JEF10 CL081}) **< {FC4(PL)1.a}**. **AND** b. **{**Calculated Clad Temperature in **Region 2 or higher}**.	None	None	None	None
5. RCS Leak Rate	None	None	1. RCS leak rate greater than available makeup capacity as indicated by **{**Calculated Clad Temperature in **Region 2 or higher}**.	1. RCS leak rate requires operation of second charging pump to maintain pressurizer level.	None	None
6. SG Tube Leakage / Rupture	None	None	1. RUPTURED SG results in an MHSI actuation.	None	1. RUPTURED SG is also FAULTED outside of containment. **OR** 2. a. Primary-to-Secondary leak rate **> 10 gpm**. **AND** b. UNISOLABLE steam release from affected SG to the environment.	None
7. RCS Activity	1. Coolant activity **> 300 µCi/gm** Dose Equivalent I-131.	None	None	None	None	None
8. Containment Pressure	None	None	None	None	1. A containment pressure rise followed by a rapid UNPLANNED drop in containment pressure. **OR** 2. Containment pressure or IRWST level response not consistent with LOCA conditions.	1. Containment pressure **> 62 psig** and rising. **OR** 2. Containment Hydrogen **> 4%.**
9. Containment Isolation Failure	None	None	None	None	1. a. Failure of **ALL** isolation valves in any one line to close. **AND** b. Direct downstream pathway to the environment exists after containment isolation signal.	None
10. E*C* Judgment	1. Any condition in the opinion of the {Emergency Coordinator} that indicates loss of the fuel clad barrier.	1. Any condition in the opinion of the {Emergency Coordinator} that indicates potential loss of the fuel clad barrier.	1. Any condition in the opinion of the {Emergency Coordinator} that indicates loss of the RCS barrier.	1. Any condition in the opinion of the {Emergency Coordinator} that indicates potential loss of the RCS barrier.	1. Any condition in the opinion of the {Emergency Coordinator} that indicates loss of the containment barrier.	1. Any condition in the opinion of the {Emergency Coordinator} that indicates potential loss of the containment barrier.

RADIOLOGICAL EFFLUENT / ABNORMAL RADIATION LEVELS

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Radiological Effluents	**RG1** 1 2 3 4 5 6 D Offsite dose resulting from an actual or IMMINENT release of gaseous radioactivity greater than 1000 mRem (10mSv) TEDE or 5000 mRem (50 mSv) Thyroid CDE for the actual or projected duration of the release using actual meteorology. **EALs:** **Note:** If dose assessment results are available, declaration should be based on dose assessment instead of radiation monitor values. Do not delay declaration awaiting dose assessment results. 1. Vent Stack Noble Gas ({KLK90 FR001}) **> {RG1.1} μCi/hr** for **15 minutes** or longer. **OR** 2. Dose assessment using actual meteorology indicates doses at or beyond the site boundary of **EITHER** of the following: • **> 1000 mRem** TEDE • **> 5000 mRem** CDE Thyroid **OR** 3. Field survey results at or beyond the site boundary indicate **EITHER** of the following: • Gamma (closed window) dose rate **> 1000 mR/hr** for **60 minutes** or longer. • Air sample analysis **> 5000 mRem** CDE Thyroid for one hour of inhalation.	**RS1** 1 2 3 4 5 6 D Offsite dose resulting from an actual or IMMINENT release of gaseous radioactivity greater than 100 mRem (1 mSv) TEDE or 500 mRem (5 mSv) Thyroid CDE for the actual or projected duration of the release using actual meteorology. **EALs:** **Note:** If dose assessment results are available, declaration should be based on dose assessment instead of radiation monitor values. Do not delay declaration awaiting dose assessment results. 1. Vent Stack Noble Gas ((KLK90 FR001}) **> {RS1.1} μCi/hr** for **15 minutes** or longer. **OR** 2. Dose assessment using actual meteorology indicates doses at or beyond the site boundary of **EITHER** of the following: • **> 100 mRem** TEDE • **> 500 mRem** CDE Thyroid **OR** 3. Field survey results at or beyond the site boundary indicate **EITHER** of the following: • Gamma (closed window) dose rate **> 100 mR/hr** for **60 minutes** or longer. • Air sample analysis **> 500 mRem** CDE Thyroid for one hour of inhalation.	**RA1** 1 2 3 4 5 6 D Any release of gaseous or liquid radioactivity to the environment greater than 200 times the ODCM limit for 15 minutes or longer. **EALs:** **Note:** In the absence of data to the contrary, assume that the release duration has exceeded the applicable time if an ongoing release is detected and the release start time is unknown. 1. Vent Stack Noble Gas ({KLK90 FR001}) **> {RA1.1} μCi/hr** for **15 minutes** or longer. **OR** 2. **ANY** of the following effluent monitors **> 200 times the ODCM limit** established by a current radioactivity discharge permit for **15 minutes** or longer: • Rad Waste Building Transfer Tank Discharge Line Activity Monitor ({KPK29 CR001/002}) • Discharge permit specified monitor **OR** 3. Confirmed sample analysis for gaseous or liquid releases **> 200 times the ODCM limit** for **15 minutes** or longer.	**RU1** 1 2 3 4 5 6 D Any release of gaseous or liquid radioactivity to the environment greater than 2 times the ODCM limit for 60 minutes or longer. **EALs:** **Note:** In the absence of data to the contrary, assume that the release duration has exceeded the applicable time if an ongoing release is detected and the release start time is unknown. 1. Vent Stack Noble Gas ({KLK90 FR001}) **> {RU1.1} μCi/hr** for **60 minutes** or longer. **OR** 2. **ANY** of the following effluent monitors **> 2 times the ODCM limit** established by a current radioactivity discharge permit for **60 minutes** or longer: • Rad Waste Building Transfer Tank Discharge Line Activity Monitor ({KPK29 CR001/002}) • Discharge permit specified monitor **OR** 3. Confirmed sample analysis for gaseous or liquid releases **> 2 times the ODCM limit** for **60 minutes** or longer.

RADIOLOGICAL EFFLUENT / ABNORMAL RADIATION LEVELS Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Abnormal Radiation Levels			**RA2** 1 2 3 4 5 6 D Damage to irradiated fuel or loss of water level that has resulted or will result in the uncovering of irradiated fuel outside the reactor vessel. **EALs:** 1. A water level drop in the reactor refueling cavity, spent fuel pool or fuel transfer canal that will result in irradiated fuel becoming uncovered. **OR** 2. **>1000 mR/hr** on **ANY** of the following due to damage to irradiated fuel or loss of water level: • Reactor Building Refueling Bridge Area Dose Rate Monitor ({JYK15 CR003}) • Fuel Building Spent Fuel Mast Bridge Dose Rate Monitor ({JYK28 CR002}) • Fuel Building Fuel Pool Dose Rate Monitor ({JYK28 CR001}) • Transfer Pit Dose Rate Monitor ({JYK23 CR001})	**RU2** 1 2 3 4 5 6 D UNPLANNED rise in plant radiation levels. **EALs:** 1. a. UNPLANNED water level drop in the reactor refueling cavity, spent fuel pool or fuel transfer canal as indicated by **ANY** of the following: • Reactor refueling cavity level ({FAK31 CL003 or CL004}) **< {RU2.1.a(b1)} feet**. • Spent fuel pool level ({FAL18 CL001}) **< {RU2.1.a(b2)} feet**. • Fuel transfer canal level ({FAL18 CL004 or CL005}) **< {RU2.1.a(b3)} feet**. • Report of visual observation. **AND** b. Area radiation monitor rise on **ANY** of the following: • Reactor Building Refueling Bridge Area Dose Rate Monitor ({JYK15 CR003}) • Fuel Building Spent Fuel Mast Bridge Dose Rate Monitor ({JYK28 CR002}) • Fuel Building Fuel Pool Dose Rate Monitor ({JYK28 CR001}) • Transfer Pit Dose Rate Monitor ({JYK23 CR001}) **OR** 2. UNPLANNED area radiation monitor or radiation survey > **1000 times NORMAL LEVELS**.
			RA3 1 2 3 4 5 6 D Rise in radiation levels within the facility that impedes operation of systems required to maintain plant safety functions. **EALs:** 1. Dose rate **> 15 mR/hr** in **ANY** of the following areas requiring continuous occupancy to maintain plant safety functions: • Control Room • Central Alarm Station	

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Security	**HG1** 1 2 3 4 5 6 D HOSTILE ACTION resulting in loss of physical control of the facility. **EALs:** 1. A HOSTILE ACTION has occurred such that plant personnel are unable to operate equipment required to maintain safety functions. **OR** 2. A HOSTILE ACTION has caused failure of spent fuel cooling systems and IMMINENT fuel damage is likely.	**HS1** 1 2 3 4 5 6 D HOSTILE ACTION within the PROTECTED AREA. **EALs:** 1. A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by the Security Shift Supervisor.	**HA1** 1 2 3 4 5 6 D HOSTILE ACTION within the OWNER CONTROLLED AREA or airborne attack threat. **EALs:** 1. A HOSTILE ACTION is occurring or has occurred within the OWNER CONTROLLED AREA as reported by the Security Shift Supervisor. **OR** 2. A validated notification from the NRC of a LARGE AIRCRAFT attack threat within **30 minutes** of the site.	**HU1** 1 2 3 4 5 6 D Confirmed SECURITY CONDITION or threat which indicates a potential degradation in the level of safety of the plant. **EALs:** 1. A SECURITY CONDITION that does not involve a HOSTILE ACTION as reported by the Security Shift Supervisor. **OR** 2. A credible site-specific security threat notification. **OR** 3. A validated notification from the NRC providing information of an aircraft threat.
CR Evacuation		**HS2** 1 2 3 4 5 6 D Control Room evacuation has been initiated and plant control cannot be established. **EALs:** 1. a. Control Room evacuation has been initiated. **AND** b. Control of the plant cannot be established within **15 minutes**.	**HA2** 1 2 3 4 5 6 D Control Room evacuation has been initiated. **EALs:** 1. Control Room evacuation has been initiated.	

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Natural or Destructive Phenomena		**Table H-1: Safe Shutdown Vital Areas** • Control Room • Safeguards Buildings • Containment • Nuclear Auxiliary Building • Emergency Power Generating Buildings • ESW Cooling Towers	**HA3** 1 2 3 4 5 6 D Natural or destructive phenomena affecting VITAL AREAS. **EALs:** 1. a. Seismic event **> OBE** as indicated by PICS seismic monitoring system. **AND** b. Earthquake confirmed by **ANY** of the following: • Earthquake felt in plant • National Earthquake Center • Control Room indication of degraded performance of systems required for the safe shutdown of the plant. **OR** 2. Tornado or high winds **> {45 m/sec (100 mph)}** resulting in **EITHER** of the following: • VISIBLE DAMAGE to **ANY** structures in **Table H-1** areas containing safety systems or components. • Control Room indication of degraded performance of those safety systems. **OR** 3. Internal flooding in **Table H-1** areas resulting in **EITHER** of the following: • Electrical shock hazard that precludes access to operate or monitor safety equipment. • Control Room indication of degraded performance of those safety systems. **OR** 4. { } 5. Turbine failure-generated PROJECTILES resulting in **EITHER** of the following: • VISIBLE DAMAGE to or penetration of **ANY** structures in **Table H-1** areas containing safety systems or components. • Control Room indication of degraded performance of those safety systems. **OR** 6. Vehicle crash resulting in **EITHER** of the following: • VISIBLE DAMAGE to **ANY** structures in **Table H-1** areas containing safety systems or components. • Control Room indication of degraded performance of those safety systems.	**HU3** 1 2 3 4 5 6 D Natural or destructive phenomena affecting the PROTECTED AREA. **EALs:** 1. a. Seismic event trigger as indicated by PICS seismic monitoring system. **AND** b. Earthquake confirmed by **EITHER** of the following: • Earthquake felt in plant • National Earthquake Center **OR** 2. a. Tornado within the PROTECTED AREA. **OR** b. High winds **> {45 m/sec (100 mph)}**. **OR** 3. Internal flooding in **Table H-1** areas that has the potential to affect safety related equipment required by Technical Specifications for the current operating mode. **OR** 4. { } 5. Turbine failure resulting in casing penetration or damage to turbine or generator seals.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Fire / Explosion		**Table H-1: Safe Shutdown Vital Areas** • Control Room • Safeguards Buildings • Containment • Nuclear Auxiliary Building • Emergency Power Generating Buildings • ESW Cooling Towers	**HA4** 1 2 3 4 5 6 D FIRE or EXPLOSION affecting the operability of plant safety systems required to establish or maintain safe shutdown. **EALs:** 1. FIRE or EXPLOSION resulting in **EITHER** of the following: • VISIBLE DAMAGE to **ANY** structures in **Table H-1** areas containing safety systems or components. • Control Room indication of degraded performance of those safety systems.	**HU4** 1 2 3 4 5 6 D FIRE within the PROTECTED AREA not extinguished within 15 minutes of detection or EXPLOSION within the PROTECTED AREA. **EALs:** 1. FIRE not extinguished within **15 minutes** of Control Room notification or verification of a Control Room FIRE alarm in actual contact with or immediately adjacent to **ANY** of the **Table H-1** areas. **OR** 2. EXPLOSION within the PROTECTED AREA.
Toxic Gas			**HA5** 1 2 3 4 5 6 D Access to a VITAL AREA is prohibited due to toxic, corrosive, asphyxiant or flammable gases, which jeopardize the ability to safely operate or shutdown the reactor. **Note:** If the equipment in the VITAL AREA was inoperable or out of service before the event occurred, then this EAL should not be declared as it will have no adverse impact on the ability to safely operate or shutdown the plant beyond that allowed by Technical Specifications at the time of the event. **EALs:** 1. Access to a VITAL AREA is prohibited due to toxic, corrosive, asphyxiant or flammable gases, which jeopardize the ability to safely operate or shutdown the reactor.	**HU5** 1 2 3 4 5 6 D Release of toxic, corrosive, asphyxiant or flammable gases deemed detrimental to NORMAL PLANT OPERATIONS. **EALs:** 1. Toxic, corrosive, asphyxiant or flammable gases in amounts that have or could adversely affect NORMAL PLANT OPERATIONS. **OR** 2. Report by local, county or state officials for evacuation or sheltering of site personnel based on an offsite event.
Judgment	**HG6** 1 2 3 4 5 6 D Other conditions exist which in the judgment of the {Emergency Coordinator} warrant declaration of General Emergency. **EALs:** 1. Other conditions exist which in the judgment of the {Emergency Coordinator} indicate that events are in progress or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.	**HS6** 1 2 3 4 5 6 D Other conditions exist which in the judgment of the {Emergency Coordinator} warrant declaration of Site Area Emergency. **EALs:** 1. Other conditions exist which in the judgment of the {Emergency Coordinator} indicate that events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or HOSTILE ACTION that results in intentional damage or malicious acts; (1) toward site personnel or equipment that could lead to the likely failure of or, (2) that prevent effective access to equipment needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels beyond the site boundary.	**HA6** 1 2 3 4 5 6 D Other conditions exist which in the judgment of the {Emergency Coordinator} warrant declaration of an Alert. **EALs:** 1. Other conditions exist which in the judgment of the {Emergency Coordinator} indicate that events are in progress or have occurred which involve actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. Any releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.	**HU6** 1 2 3 4 5 6 D Other conditions exist which in the judgment of the {Emergency Coordinator} warrant declaration of an Unusual Event. **EALs:** 1. Other conditions exist which in the judgment of the {Emergency Coordinator} indicate that events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.

SYSTEM MALFUNCTIONS - HOT

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Loss of AC	**SG1** 1 2 3 4 Prolonged loss of all offsite and all onsite AC power to emergency busses. **EALs:** 1. a. Loss of **ALL** offsite and **ALL** onsite AC power to 31, 32, 33 and 34 BDA busses. **AND** b. **EITHER** of the following: • Restoration of at least one emergency bus within **2 hours** is not likely. • **{**Calculated Clad Temperature in **Region 4}**.	**SS1** 1 2 3 4 Loss of all offsite and all onsite AC power to emergency busses for 15 minutes or longer. **EALs:** 1. Loss of **ALL** offsite and **ALL** onsite AC power to 31, 32, 33 and 34 BDA busses for **15 minutes** or longer.	**SA1** 1 2 3 4 AC power capability to emergency busses reduced to a single source for 15 minutes or longer such that any additional single failure would result in a loss of all AC power to the emergency busses. **EALs:** 1. a. AC power to 31, 32, 33 and 34 BDA busses is reduced to a single source for **15 minutes** or longer. **AND** b. Any additional single failure will result in a loss of all AC power to 31, 32, 33 and 34 BDA busses.	**SU1** 1 2 3 4 Loss of all offsite AC power to emergency busses for 15 minutes or longer. **EALs:** 1. Loss of **ALL** offsite AC power to 31, 32, 33 and 34 BDA busses for **15 minutes** or longer.
Loss of DC		**SS2** 1 2 3 4 Loss of vital DC power for 15 minutes or longer. **EALs:** 1. **< 210 VDC** on the vital 31, 32, 33 and 34 BUC busses for **15 minutes** or longer.		
Failure of Protection Systems	**SG3** 1 2 Automatic trip and all manual actions failed to shutdown the reactor and indication of an extreme challenge to the ability to cool the core exists. **EALs:** 1. a. An automatic reactor trip failed to shutdown the reactor as indicated by reactor power **> 5%**. **AND** b. All manual actions failed to shutdown the reactor as indicated by reactor power **> 5%**. **AND** c. **EITHER** of the following have occurred: • **{**Calculated Clad Temperature **in Region 3 or higher}**. • Loss of all four trains of Emergency Feedwater.	**SS3** 1 2 Automatic trip failed to shutdown the reactor and manual actions taken from the reactor control console failed to shutdown the reactor. **EALs:** 1. a. An automatic reactor trip failed to shutdown the reactor as indicated by reactor power **> 5%**. **AND** b. Manual actions taken at the reactor control console failed to shutdown the reactor as indicated by reactor power **> 5%**.	**SA3** 1 2 Automatic trip failed to shutdown the reactor and the manual actions taken from the reactor control console are successful in shutting down the reactor. **EALs:** 1. a. An automatic reactor trip failed to shutdown the reactor as indicated by reactor power **> 5%**. **AND** b. Manual actions taken at the reactor control console successfully shutdown the reactor as indicated by reactor power **< 5%**.	**SU3** 3 4 Inadvertent criticality. **EALs:** 1. UNPLANNED sustained positive startup rate observed on nuclear instrumentation.

SYSTEM MALFUNCTIONS - HOT

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Plant Monitoring		**SS4** 1 2 3 4 Loss of all monitoring functions for 15 minutes or longer with a SIGNIFICANT TRANSIENT in progress. **EALs:** 1. a. Loss of SICS for **15 minutes** or longer. **AND** b. Loss of PICS for **15 minutes** or longer. **AND** c. **ANY** of the following SIGNIFICANT TRANSIENTS are in progress: • Automatic runback **> 50%** thermal power • Electrical load reject **> 50%** full load • Reactor trip • MHSI actuation	**SA4** 1 2 3 4 Loss of all monitoring functions for 15 minutes or longer. **EALs:** 1. a. Loss of SICS for **15 minutes** or longer. **AND** b. Loss of PICS for **15 minutes** or longer.	**SU4** 1 2 3 4 Degradation of monitoring functions for 15 minutes or longer. **EALs:** 1. Loss of SICS for **15 minutes** or longer. **OR** 2. Loss of PICS for **15 minutes** or longer.
T.S. Limits				**SU5** 1 2 3 4 Inability to reach required operating mode within Technical Specification limits. **EALs:** 1. Plant is not brought to required operating mode within Technical Specifications LCO action completion time.
Communications				**SU6** 1 2 3 4 Loss of all onsite or offsite communications capabilities. **EALs:** 1. Loss of **ALL** of the following onsite communication methods affecting the ability to perform routine operations: • {Radios} • {Plant Page} • {Internal Telephone Systems} **OR** 2. Loss of **ALL** of the following offsite communications methods affecting the ability to perform offsite notifications: • {SENTRY System } • NRC Emergency Notification System - ENS • NRC Health Physics Network - HPN • {External Telephone Systems}

SYSTEM MALFUNCTIONS - HOT

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
RCS Leakage				**SU7** 1 2 3 4 RCS leakage. __EALs:__ 1. Unidentified or pressure boundary leakage **> 10 gpm**. **OR** 2. Identified leakage **> 25 gpm**.
Fuel Clad Degradation				**SU9** 1 2 3 4 Fuel clad degradation. __EALs:__ 1. Gross Failed Fuel Monitor ({KUA66 CR001}) **> {SU9.1} cpm**. **OR** 2. Coolant sample activity **> 1.0 µCi/gm** dose equivalent I-131.

SYSTEM MALFUNCTIONS - COLD

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
Loss of AC			**CA1** 5 6 D Loss of all offsite and all onsite AC power to emergency busses for 15 minutes or longer. **EALs:** 1. Loss of **ALL** offsite and **ALL** onsite AC power to 31, 32, 33 and 34 BDA busses for **15 minutes** or longer.	**CU1** 5 6 AC power capability to emergency busses reduced to a single source for 15 minutes or longer such that any additional single failure would result in a loss of all AC power to the emergency busses. **EALs:** 1. a. AC power to 31, 32, 33 and 34 BDA busses is reduced to a single source for **15 minutes** or longer. **AND** b. Any additional single failure will result in a loss of all AC power to 31, 32, 33 and 34 BDA busses.
Loss of DC				**CU2** 5 6 Loss of required DC power for 15 minutes or longer. **EALs:** 1. **< 210 VDC** on the required 31, 32, 33 and 34 BUC busses for **15 minutes** or longer.
Failure of Protection System				**CU3** 5 6 Inadvertent criticality. **EALs:** 1. UNPLANNED sustained positive startup rate observed on nuclear instrumentation.
Communications				**CU6** 5 6 D Loss of all onsite or offsite communications capabilities. **EALs:** 1. Loss of **ALL** of the following onsite communication methods affecting the ability to perform routine operations: • {Radios} • {Plant Page} • {Internal Telephone Systems} **OR** 2. Loss of **ALL** of the following offsite communications methods affecting the ability to perform offsite notifications: • {SENTRY System} • NRC Emergency Notification System - ENS • NRC Health Physics Network - HPN • {External Telephone Systems}

SYSTEM MALFUNCTIONS - COLD

Modes: 1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 – Refueling, D – Defueled

RCS Leakage

GENERAL EMERGENCY

CG7 5 6

Loss of RPV inventory affecting fuel clad integrity with containment challenged.

EALs:

1. a. RPV level **< {96.0 feet (29.3 meters)}** (top of active fuel) for **30 minutes** or longer.

   AND

   b. **ANY Table C-1** containment challenge indications.

OR

2. a. RPV level cannot be monitored with core uncovery indicated by **ANY** of the following for **30 minutes** or longer:
   - Reactor Building Refueling Bridge Area Dose Rate Monitor ({JYK15 CR003}) **> {CG7.2.a(b1)} mR/hr**.
   - Erratic source range monitor indication.
   - UNPLANNED level rise in IRWST.

   AND

   b. **ANY Table C-1** containment challenge indications.

Table C-1: Containment Challenge Indications
• CONTAINMENT CLOSURE not established.
• Hydrogen concentration > 4% inside containment.
• UNPLANNED rise in containment pressure.

SITE AREA EMERGENCY

CS7 5 6

Loss of RPV inventory affecting core decay heat removal capability.

EALs:

1. a. CONTAINMENT CLOSURE not established.

   AND

   b. Loss of RPV inventory as indicated by RCS level ({JEF10 CL081}) **< {CS7.1.b}**.

OR

2. a. CONTAINMENT CLOSURE established.

   AND

   b. RPV level **< {96.0 feet (29.3 meters)}** (top of active fuel).

OR

3. a. RCS level cannot be monitored for **30 minutes** or longer.

   AND

   b. Loss of RPV inventory as indicated by **ANY** of the following:
   - Reactor Building Refueling Bridge Area Dose Rate Monitor ({JYK15 CR003}) **> {CS7.3.b(b1)} mR/hr**.
   - Erratic source range monitor indication.
   - UNPLANNED level rise in IRWST.

ALERT

CA7 5 6

Loss of RPV inventory.

EALs:

1. Loss of RPV inventory as indicated by RCS level ({JEF10 CL081}) **< {CA7.1}**.

OR

2. a. RCS level cannot be monitored for **15 minutes** or longer.

   AND

   b. Loss of RPV inventory as indicated by UNPLANNED level rise in IRWST.

UNUSUAL EVENT

CU7 5

RCS leakage.

EALs:

1. RCS leakage results in the inability to maintain or restore RCS level **> Procedure Established Minimum Level** for **15 minutes** or longer.

CU8 6

UNPLANNED loss of RCS inventory.

EALs:

1. a. UNPLANNED RCS level drop below the RPV flange for **15 minutes** or longer when the RCS level band is established above the RPV flange.

   OR

   b. UNPLANNED RCS level drop **< Procedure Established Minimum Level** for **15 minutes** or longer when the RCS level band is established below the RPV flange.

OR

2. a. RCS level cannot be monitored.

   AND

   b. Loss of RPV inventory as indicated by UNPLANNED level rise in IRWST.

Heat Sink

SITE AREA EMERGENCY

Table C-2: RCS Reheat Duration Thresholds

RCS	Cont Closure	Duration
Intact with Full Inventory	N/A	> 60 min*
Not Intact OR Reduced RCS Inventory	Established	> 20 min*
	Not Established	0 min

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

ALERT

CA10 5 6

Inability to maintain plant in cold shutdown.

EALs:

1. RCS temperature **> 200° F** for the specified duration on **Table C-2**.

OR

2. RCS pressure rise **> 10 psig** due to a loss of RCS cooling (this EAL does not apply in solid plant conditions).

UNUSUAL EVENT

CU10 5 6

UNPLANNED loss of decay heat removal capability.

EALs:

1. RCS temperature **> 200° F** due to an UNPLANNED loss of decay heat removal capability.

OR

2. Loss of **ALL** RCS temperature and RCS level indication for **15 minutes** or longer.

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

FG1

Initiating Condition:

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

Operating Mode Applicability:

1, 2, 3, 4

EALs:

Refer to fission product barrier loss and potential loss threshold values to determine barrier status.

Basis:

Generic

Fuel cladding, RCS and containment comprise the fission product barriers.

At the General Emergency classification level each barrier is weighted equally.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, Tables 5-F-1 and 5-F-3

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

FS1

Initiating Condition:

Loss or potential loss of any two barriers.

Operating Mode Applicability:

1, 2, 3, 4

EALs:

Refer to fission product barrier loss and potential loss threshold values to determine barrier status.

Basis:

Generic

Fuel cladding, RCS and containment comprise the fission product barriers.

At the Site Area Emergency classification level, each barrier is weighted equally.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, Tables 5-F-1 and 5-F-3

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

FA1

Initiating Condition:

Any loss or any potential loss of either fuel clad or RCS.

Operating Mode Applicability:

1, 2, 3, 4

EALs:

Refer to fission product barrier loss and potential loss threshold values to determine barrier status.

Basis:

Generic

Fuel cladding, RCS and containment comprise the fission product barriers.

The fuel cladding and RCS barriers are weighted more heavily than the containment barrier. Unlike the containment barrier, loss or potential loss of either the fuel cladding or RCS barrier may result in the relocation of radioactive materials or degradation of core cooling capability. Note that the loss or potential loss of containment barrier in combination with loss or potential loss of either fuel cladding or RCS barrier results in declaration of a Site Area Emergency under FS1.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, Tables 5-F-1 and 5-F-3

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

FU1

Initiating Condition:

Any loss or any potential loss of containment.

Operating Mode Applicability:

1, 2, 3, 4

EALs:

Refer to fission product barrier loss and potential loss threshold values to determine barrier status.

Basis:

Generic

Fuel cladding, RCS and containment comprise the fission product barriers.

Unlike the Fuel cladding and RCS barriers, the loss of either of which results in an Alert under FA1, loss of the containment barrier in and of itself does not result in the relocation of radioactive materials or the potential for degradation of core cooling capability. However, loss or potential loss of the containment barrier in combination with the loss or potential loss of either the Fuel cladding or RCS barrier results in declaration of a Site Area Emergency under FS1.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, Tables 5-F-1 and 5-F-3

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

Containment Radiation Monitoring **FC2**

Loss:

1. Containment radiation monitor ({JYK15 CR101}) **> {Graph FC2(L)1}**.

{Add FC2 containment rad graph here (damage curve based on 300 μCi/gm DEI-131)}

Potential Loss:

None

Basis:

Generic

The site (U.S. EPR) specific reading is a value which indicates the release of reactor coolant, with elevated activity indicative of fuel damage, into the containment.

The reading should be calculated assuming the instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory associated with a concentration of 300 μCi/gm dose equivalent I-131 into the containment atmosphere.

Reactor coolant concentrations of this magnitude are several times larger than the maximum concentrations (including iodine spiking) allowed within technical specifications and are therefore indicative of fuel damage.

This value is higher than that specified for RCS barrier Loss threshold #1.

There is no Potential Loss threshold associated with this item.

Site (U.S. EPR) Specific

{To be added to support EAL value/wording}

Basis Reference(s):

1. NEI 99-01 Rev 5, Table 5-F-3
2. {TS, CALC, procedure or drawing references}

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

Core Temperature **FC3**

Loss:

1. **{**Calculated Clad Temperature in **Region 3 or higher}**.

Potential Loss:

1. **{**Calculated Clad Temperature in **Region 2}**.

Basis:

Generic

Loss Threshold #1

The site (U.S. EPR) specific reading should correspond to significant superheating of the coolant.

This value typically corresponds to the temperature reading that indicates core cooling - RED for plants with CSFST, which is usually about 1200º F.

Potential Loss Threshold #1

The site (U.S. EPR) specific reading should correspond to loss of subcooling.

This value typically corresponds to the temperature reading that indicates core cooling - ORANGE for plants with CSFST, which is usually about 700º to 900º F.

Site (U.S. EPR) Specific

Loss Threshold #1

{To be added to support EAL value/wording}

Potential Loss Threshold #1

{To be added to support EAL value/wording}

Basis Reference(s):

1. NEI 99-01 Rev 5, Table 5-F-3
2. {TS, CALC, procedure or drawing references}

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

RPV Level **FC4**

Loss:

None

Potential Loss:

1. a. RCS level ({JEF10 CL081}) **< {FC4(PL)1.a}**.

   AND

   b. **{**Calculated Clad Temperature in **Region 2 or higher}**.

Basis:

Generic

There is no Loss threshold associated with this item.

The site (U.S. EPR) specific value for the Potential Loss threshold corresponds to the top of the active fuel.

Site (U.S. EPR) Specific

For the U.S. EPR, TOAF cannot be read by installed level instrumentation in Modes 1-4. The lowest indicated reactor water level is the bottom of the reactor coolant hot legs (Plant Elevation {+ 101.9 feet (31.1 meters)}).

Basis Reference(s):

1. NEI 99-01 Rev 5, Table 5-F-3
2. 02-DCD-JAA-1200A0-001
3. 02-DCD-PPY-JE-4001-000

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

RCS Activity **FC7**

Loss:

1. Coolant activity **> 300 μCi/gm** Dose Equivalent **I**-131.

Potential Loss:

None

Basis:

Generic

The site (U.S. EPR) specific value corresponds to 300 μCi/gm **I**-131 equivalent. Assessment by the EAL Task Force indicates that this amount of coolant activity is well above that expected for iodine spikes and corresponds to less than 5% fuel clad damage. This amount of radioactivity indicates significant clad damage and thus the Fuel Clad Barrier is considered lost.

There is no Potential Loss threshold associated with this item.

Site (U.S. EPR) Specific

{To be added to support EAL value/wording}

Basis Reference(s):

1. NEI 99-01 Rev 5, Table 5-F-3
2. {TS, CALC, procedure or drawing references}

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

Emergency Coordinator Judgment **FC10**

Loss:

1. Any condition in the opinion of the {Emergency Coordinator} that indicates loss of the fuel clad barrier.

Potential Loss:

1. Any condition in the opinion of the {Emergency Coordinator} that indicates potential loss of the fuel clad barrier.

Basis:

Generic

These thresholds address any other factors that are to be used by the {Emergency Coordinator} 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 {Emergency Coordinator} judgment that the barrier may be considered lost or potentially lost.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, Table 5-F-3

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

Containment Radiation Monitoring **RC2**

Loss:

1. Containment radiation monitor ({JYK15 CR101}) **> {RC2(L)1} R/hr**.

Potential Loss:

None

Basis:

Generic

The site (U.S. EPR) specific reading is a value, which indicates the release of reactor coolant to the containment.

The reading should be calculated assuming the instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory associated with normal operating concentrations (i.e., within T/S) into the containment atmosphere.

This reading will be less than that specified for FC2(L)1. Thus, this threshold would be indicative of a RCS leak only.

There is no Potential Loss threshold associated with this item.

Site (U.S. EPR) Specific

{To be added to support EAL value/wording}

Basis Reference(s):

1. NEI 99-01 Rev 5, Table 5-F-3
2. {TS, CALC, procedure or drawing references}

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

RCS Leak Rate **RC5**

Loss:

1. RCS leak rate greater than available makeup capacity as indicated by **{**Calculated Clad Temperature in **Region 2 or higher}**.

Potential Loss:

1. RCS leak rate requires operation of second charging pump to maintain pressurizer level.

Basis:

Generic

Loss Threshold #1

This threshold 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.

Potential Loss Threshold #1

This threshold is based on the apparent inability to maintain normal liquid inventory within the Reactor Coolant System (RCS) by normal operation of the Chemical and Volume Control System which is considered to be the flow rate equivalent to one charging pump discharging to the charging header. Isolating letdown is a standard abnormal operating procedure action and may prevent unnecessary classifications when a non-RCS leakage path such as a CVCS leak exists. The intent of this condition is met if attempts to isolate letdown are NOT successful. Additional charging pumps being required is indicative of a substantial RCS leak.

Site (U.S. EPR) Specific

Loss Threshold #1

{To be added to support EAL value/wording}

Basis Reference(s):

1. NEI 99-01 Rev 5, Table 5-F-3
2. {TS, CALC, procedure or drawing references}

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

SG Tube Leakage / Rupture **RC6**

Loss:

1. RUPTURED SG results in an MHSI actuation.

Potential Loss:

None

Basis:

Generic

This threshold addresses the full spectrum of Steam Generator (SG) tube rupture events in conjunction with Containment barrier Loss thresholds. It addresses RUPTURED SG(s) for which the leakage is large enough to cause actuation of ECCS (SI). This is consistent to the RCS leak rate barrier Potential Loss threshold.

There is no Potential Loss threshold associated with this item.

Site (U.S. EPR) Specific

U.S. EPR Medium Head Safety Injection (MHSI) is the equivalent to the NEI standard Safety Injection (SI).

Basis Reference(s):

1. NEI 99-01 Rev 5, Table 5-F-3

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

Emergency Coordinator Judgment RC10

Loss:

1. Any condition in the opinion of the {Emergency Coordinator} that indicates loss of the RCS barrier.

Potential Loss:

1. Any condition in the opinion of the {Emergency Coordinator} that indicates potential loss of the RCS barrier.

Basis:

Generic

These thresholds address any other factors that are to be used by the {Emergency Coordinator} 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 {Emergency Coordinator} judgment that the barrier may be considered lost or potentially lost.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, Table 5-F-3

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

Containment Radiation Monitoring **CT2**

Loss:

None

Potential Loss:

1. Containment radiation monitor ({JYK15 CR101}) **> {Graph CT2(PL)1}**.

{Add CT2 containment rad graph here (damage curve based on 20% fuel clad)}

Basis:

Generic

There is no Loss threshold associated with this item.

The site (U.S. EPR) specific reading is a value which indicates significant fuel damage well in excess of the thresholds associated with both loss of Fuel Clad and loss of RCS barriers. As stated in Section 3.8 of NEI 99-01 Rev 5, a major release of radioactivity requiring off-site 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%.

Site (U.S. EPR) Specific

{To be added to support EAL value/wording}

Basis Reference(s):

1. NEI 99-01 Rev 5, Table 5-F-3
2. {TS, CALC, procedure or drawing references}

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

Core Temperature **CT3**

Loss:

None

Potential Loss:

1. a. **{**Calculated Clad Temperature in **Region 4}**.

   AND

   b. Restoration procedures not effective within **15 minutes**.

   OR

2. a. **{**Calculated Clad Temperature in **Region 3}**.

   AND

   b. RCS level ({JEF10 CL081}) **< {CT3(PL)2.b}**.

   AND

   c. Restoration procedures not effective within **15 minutes**.

Basis:

Generic

There is no Loss threshold associated with this item.

The conditions in these thresholds represent an IMMINENT core melt sequence which, if not corrected, could lead to vessel failure and an increased potential for containment failure. In conjunction with the Core Cooling and RCS Leakage criteria in the Fuel and RCS barrier columns, this threshold 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.

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 decreasing or if the vessel water level is increasing.

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 {Emergency Coordinator} should make the declaration as soon as it is determined that the procedures have been, or will be ineffective.

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

CT3 (continued)

Site (U.S. EPR) Specific

Potential Loss Threshold #1

{To be added to support EAL value/wording}

Potential Loss Threshold #2

For the U.S. EPR, TOAF cannot be read by installed level instrumentation in Modes 1-4. The lowest indicated reactor water level is the bottom of the reactor coolant hot legs (Plant Elevation {+ 101.9 feet (31.1 m)}).

Basis Reference(s):

1. NEI 99-01 Rev 5, Table 5-F-3
2. 02-DCD-JAA-1200A0-001
3. 02-DCD-PPY-JE-4001-000

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

SG Tube Leakage / Rupture **CT6**

Loss:

1. RUPTURED SG is also FAULTED outside of containment.

   OR

2. a. Primary-to-Secondary leak rate **> 10 gpm**.

   AND

   b. UNISOLABLE steam release from affected SG to the environment.

Potential Loss:

None

Basis:

Generic

The loss threshold recognizes that SG tube leakage can represent a bypass of the Containment barrier as well as a loss of the RCS barrier.

Users should realize that the two loss thresholds could be considered redundant. This was recognized during the development process. The inclusion of a threshold that uses Emergency Procedure commonly used terms like “RUPTURED and FAULTED” adds to the ease of the classification process and has been included based on this human factor concern.

This threshold results in an Unusual Event for smaller breaks that; (1) do not exceed the normal charging capacity threshold in RCS leak rate barrier Potential Loss threshold, or (2) do not result in ECCS actuation in RCS SG tube rupture barrier Loss threshold. For larger breaks, RCS barrier threshold criteria would result in an Alert. For SG tube ruptures which may involve multiple steam generators or unisolable secondary line breaks, this threshold would exist in conjunction with RCS barrier thresholds and would result in a Site Area Emergency.

Loss Threshold #1

This threshold addresses the condition in which a RUPTURED steam generator is also FAULTED. This condition represents a bypass of the RCS and containment barriers and is a subset of the second threshold. In conjunction with RCS leak rate barrier loss threshold, this would always result in the declaration of a Site Area Emergency.

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

CT6 (continued)

Loss Threshold #2

This threshold addresses SG tube leaks that exceed 10 gpm in conjunction with a UNISOLABLE release path to the environment from the affected steam generator. The threshold for establishing the UNISOLABLE 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., SG tube rupture with concurrent loss of off-site power and the RUPTURED steam generator is required for plant cooldown or 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 an UNISOLABLE release path to the environment. These minor releases are assessed using Abnormal Rad Levels / Radiological Effluent ICs.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, Table 5-F-3

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

Containment Pressure **CT8**

Loss:

1. A containment pressure rise followed by a rapid UNPLANNED drop in containment pressure.

   OR

2. Containment pressure or IRWST level response not consistent with LOCA conditions.

Potential Loss:

1. Containment pressure **> 62 psig** and rising.

   OR

2. Containment Hydrogen **> 4%**.

Basis:

Generic

Loss Thresholds #1 and #2

Rapid UNPLANNED loss of pressure (i.e., not attributable to containment spray or condensation effects) following an initial pressure increase from a primary or secondary high energy line break indicates a loss of containment integrity. Containment pressure and sump levels should increase as a result of mass and energy release into containment from a LOCA. Thus, sump level or pressure not increasing indicates containment bypass and a loss of containment integrity.

This indicator relies on operator recognition of an UNPLANNED response for the condition and therefore does not have a specific value associated with it. The UNPLANNED response is important because it is the indicator for a containment bypass condition.

Potential Loss Threshold #1

The site (U.S. EPR) specific pressure is based on the containment design pressure.

Potential Loss Threshold #2

Existence of an explosive mixture means a hydrogen and oxygen concentration of at least the lower deflagration limit curve exists.

Potential Loss Threshold #3

This threshold represents a potential loss of containment in that the containment heat removal/depressurization system (e.g., containment sprays, ice condenser fans, etc., 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.

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

CT8 (continued)

<u>Site (U.S. EPR) Specific</u>

<u>Potential Loss Threshold #3</u>

The U.S. EPR containment volume, condensation surface area, and heat capacities are such that the containment design pressure is not exceeded during design basis Loss of Coolant Accident (LOCA) and Main Steam Line Break (MSLB) events, In addition, the containment pressure decreases to less than 50% of the accident analysis values in less than 24 hours thus ensuring that radiological dose consequences are acceptable. Mass and energy releases to the containment during LOCA and MSLB events were calculated using RELAP5/MOD2 (B&W), which is an NRC approved methodology. Containment pressure responses were calculated using the GOTHIC code, also an NRC approved methodology. An automatically actuated containment spray system is therefore not required to mitigate the consequences of a Design Basis Accident, so no automatic actuation setpoint exists for this EAL threshold to be based on.

Basis Reference(s):

1. NEI 99-01 Rev 5, Table 5-F-3
2. U.S. EPR FSAR – Section 6.2.1
3. U.S. EPR FSAR – Section 6.2.2
4. U.S. EPR FSAR – Section 6.5.2
5. U.S. EPR FSAR – Section 15.0.3
6. U.S. EPR FSAR – Section 19.2.3.3

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

Containment Isolation Failure or Bypass CT9

Loss:

1. a. Failure of **ALL** isolation valves in any one line to close.

   AND

   b. Direct downstream pathway to the environment exists after containment isolation signal.

Potential Loss:

None

Basis:

Generic

This threshold addresses incomplete containment isolation that allows direct release to the environment.

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

There is no Potential Loss threshold associated with this item.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 4, Table 5-F-4

RECOGNITION CATEGORY
FISSION PRODUCT BARRIER DEGRADATION

Emergency Coordinator Judgment **CT10**

Loss:

1. Any condition in the opinion of the {Emergency Coordinator} that indicates loss of the containment barrier.

Potential Loss:

1. Any condition in the opinion of the {Emergency Coordinator} that indicates potential loss of the containment barrier.

Basis:

Generic

These thresholds address any other factors that are to be used by the {Emergency Coordinator} 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 threshold as a factor in {Emergency Coordinator} judgment that the barrier may be considered lost or potentially lost.

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

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, Table 5-F-3

RECOGNITION CATEGORY

RADIOLOGICAL EFFLUENTS / ABNORMAL RADIATION LEVELS

RG1

Initiating Condition:

Offsite dose resulting from an actual or IMMINENT release of gaseous radioactivity greater than 1000 mRem TEDE or 5000 mRem Thyroid CDE for the actual or projected duration of the release using actual meteorology.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

<u>**Note:**</u> If dose assessment results are available, declaration should be based on dose assessment instead of radiation monitor values. Do not delay declaration awaiting dose assessment results.

1. Vent Stack Noble Gas ({KLK90 FR001}) **> {RG1.1} µCi/hr** for **15 minutes** or longer.

   OR

2. Dose assessment using actual meteorology indicates doses at or beyond the site boundary of **EITHER** of the following:

   - **> 1000 mRem** TEDE
   - **> 5000 mRem** CDE Thyroid

   OR

3. Field survey results at or beyond the site boundary indicate **EITHER** of the following:

   - Gamma (closed window) dose rate **> 1000 mR/hr** for **60 minutes** or longer.
   - Air sample analysis **> 5000 mRem** CDE Thyroid for one hour of inhalation.

Basis:

<u>**Generic**</u>

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

The 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 thyroid committed dose equivalent (CDE). For the purpose of these IC/EALs, 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 TEDE dose is set at the EPA PAG, while the 5000 mrem thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

RECOGNITION CATEGORY

RADIOLOGICAL EFFLUENTS / ABNORMAL RADIATION LEVELS

RG1 (continued)

EAL #1

The site (U.S. EPR) specific monitor list in EAL #1 should include effluent monitors on all potential release pathways.

The monitor reading EALs should be determined using a dose assessment method that back calculates from the dose values specified in the IC. Since doses are generally not monitored in real-time, it is suggested that a release duration of one hour be assumed, and that the EALs be based on a site boundary (or beyond) dose of 1000 mrem whole body or 5000 mrem thyroid in one hour, whichever is more limiting (as was done for EALs #2 and #3). If individual site analyses indicate a longer or shorter duration for the period in which the substantial portion of the activity is released, the longer duration should be used.

The meteorology used should be the same as those used for determining RU1 and RA1 monitor reading EALs. The same source term (noble gases, particulates, and halogens) may also be used as long as it maintains a realistic and near linear escalation between the EALs for the four classifications. If proper escalations do not result from the use of the same source term, if the calculated values are unrealistically high, or if correlation between the values and dose assessment values does not exist, then consider using an accident source term for RS1 and RG1 calculations.

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

Site (U.S. EPR) Specific

EAL #1

{To be added to support EAL value/wording}

Basis Reference(s):

1. NEI 99-01 Rev 5, AG1
2. {TS, CALC, procedure or drawing references}

RECOGNITION CATEGORY
RADIOLOGICAL EFFLUENTS / ABNORMAL RADIATION LEVELS

RS1

Initiating Condition:

Offsite dose resulting from an actual or IMMINENT release of gaseous radioactivity greater than 100 mRem TEDE or 500 mRem Thyroid CDE for the actual or projected duration of the release using actual meteorology.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

Note: If dose assessment results are available, declaration should be based on dose assessment instead of radiation monitor values. Do not delay declaration awaiting dose assessment results.

1. Vent Stack Noble Gas ({KLK90 FR001}) **> {RS1.1} µCi/hr** for **15 minutes** or longer.

   OR

2. Dose assessment using actual meteorology indicates doses at or beyond the site boundary of **EITHER** of the following:

   - **> 100 mRem** TEDE
   - **> 500 mRem** CDE Thyroid

   OR

3. Field survey results at or beyond the site boundary indicate **EITHER** of the following:

   - Gamma (closed window) dose rate **> 100 mR/hr** for **60 minutes** or longer.
   - Air sample analysis **> 500 mRem** CDE Thyroid for one hour of inhalation.

Basis:

Generic

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

The 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 thyroid committed dose equivalent (CDE). For the purpose of these IC/EALs, 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 TEDE dose is set at 10% of the EPA PAG, while the 500 mrem thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE.

RECOGNITION CATEGORY

RADIOLOGICAL EFFLUENTS / ABNORMAL RADIATION LEVELS

RS1 (continued)

EAL #1

The site (U.S. EPR) specific monitor list in EAL #1 should include effluent monitors on all potential release pathways.

The monitor reading EALs should be determined using a dose assessment method that back calculates from the dose values specified in the IC. Since doses are generally not monitored in real-time, it is suggested that a release duration of one hour be assumed, and that the EALs be based on a site boundary (or beyond) dose of 100 mrem whole body or 500 mrem thyroid in one hour, whichever is more limiting (as was done for EALs #2 and #3). If individual site analyses indicate a longer or shorter duration for the period in which the substantial portion of the activity is released, the longer duration should be used.

The meteorology used should be the same as those used for determining RU1 and RA1 monitor reading EALs. The same source term (noble gases, particulates, and halogens) may also be used as long as it maintains a realistic and near linear escalation between the EALs for the four classifications. If proper escalations do not result from the use of the same source term, if the calculated values are unrealistically high, or if correlation between the values and dose assessment values does not exist, then consider using an accident source term for RS1 and RG1 calculations.

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

Site (U.S. EPR) Specific

EAL #1

{To be added to support EAL value/wording}

Basis Reference(s):

1. NEI 99-01 Rev 5, AS1
2. {TS, CALC, procedure or drawing references}

RECOGNITION CATEGORY

RADIOLOGICAL EFFLUENTS / ABNORMAL RADIATION LEVELS

RA1

Initiating Condition:

Any release of gaseous or liquid radioactivity to the environment greater than 200 times the ODCM limit for 15 minutes or longer.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

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

1. Vent Stack Noble Gas ({KLK90 FR001}) **> {RA1.1} µCi/hr** for **15 minutes** or longer.

   OR

2. **ANY** of the following effluent monitors **> 200 times the ODCM limit** established by a current radioactivity discharge permit for **15 minutes** or longer:
   - Rad Waste Building Transfer Tank Discharge Line Activity Monitor (KPK29 CR001/002})
   - Discharge permit specified monitor

   OR

3. Confirmed sample analysis for gaseous or liquid releases **> 200 times the ODCM limit** for **15 minutes** or longer.

Basis:

Generic

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

Nuclear power plants incorporate features intended to control the release of radioactive effluents to the environment. 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 a degradation in these features and/or controls.

The ODCM multiples are specified in RU1 and RA1 only to distinguish between non-emergency conditions, and from each other. While these multiples obviously correspond to an off-site 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.

RECOGNITION CATEGORY

RADIOLOGICAL EFFLUENTS / ABNORMAL RADIATION LEVELS

RA1 (continued)

Releases should not be prorated or averaged. For example, a release exceeding 600x ODCM for 5 minutes does not meet the threshold.

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

EAL #1

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

To ensure a realistic near-linear escalation path, a value should be selected roughly half-way between the RU1 EAL #1 value and the value calculated for RS1 EAL #1 value. The value will be based on radiation monitor readings to exceed 200 times the Technical Specification limit and releases are not terminated within 60 minutes. The ODCM establishes a methodology for determining effluent radiation monitor setpoints. The ODCM specifies default source terms and, for gaseous releases, prescribes the use of pre-determined annual average meteorology in the most limiting downwind sector for showing compliance with the regulatory commitments. This EAL can be determined using this methodology if appropriate.

EAL #2

This EAL addresses radioactivity releases, that for whatever reason, cause effluent radiation monitor readings to exceed the threshold identified in the IC established by the radioactivity discharge permit. This value may be associated with a planned batch release, or a continuous release path.

In either case, the value is established by the ODCM to warn of a release that is not in compliance. Indexing the EAL to the ODCM setpoints in this manner insures that the EAL will never be less than the setpoint established by a specific discharge permit.

EAL #3

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

Site (U.S. EPR) Specific

The U.S. EPR Radiological Effluent Controls Program (RECP) limits either are the same or less restrictive than the ODCM.

EAL #1

{To be added to support EAL value/wording}

EAL #2

An elevated monitor reading while the effluent flow path is isolated is not considered a VALID reading.

RECOGNITION CATEGORY

RADIOLOGICAL EFFLUENTS / ABNORMAL RADIATION LEVELS

RA1 (continued)

The effluent monitors listed are those normally used for planned discharges. If a discharge is performed using a different flow path or effluent monitor (e.g., a portable or temporary effluent monitor), then the declaration criteria will be based on the monitor specified in the Discharge Permit.

Should 200 times the high alarm setpoint result in an offscale high meter reading, then the EAL would be considered met when the meter goes offscale high for 15 minutes or longer, provided there are no other direct or indirect means available to determine actual value.

<u>EAL #3</u>

Grab samples are used to; determine release concentrations or release rates, confirm meter readings, or indicate the need for sampling when the effluent monitors are not in service or other alarms occur. The maximum instantaneous release rate limits are calculated in accordance with the ODCM. These are indicated on approved discharge permit release packages.

Basis Reference(s):

1. NEI 99-01 Rev 5, AA1
2. {TS, CALC, procedure or drawing references}

RECOGNITION CATEGORY
RADIOLOGICAL EFFLUENTS / ABNORMAL RADIATION LEVELS

RU1

Initiating Condition:

Any release of gaseous or liquid radioactivity to the environment greater than 2 times the ODCM limit for 60 minutes or longer.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

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

1. Vent Stack Noble Gas ({KLK90 FR001}) **> {RU1.1} µCi/hr** for **60 minutes** or longer.

   OR

2. **ANY** of the following effluent monitors **> 2 times the ODCM limit** established by a current radioactivity discharge permit for **60 minutes** or longer:
   - Rad Waste Building Transfer Tank Discharge Line Activity Monitor ({KPK29 CR001/002})
   - Discharge permit specified monitor

   OR

3. Confirmed sample analysis for gaseous or liquid releases **> 2 times the ODCM limit** for **60 minutes** or longer.

Basis:

Generic

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

Nuclear power plants incorporate features intended to control the release of radioactive effluents to the environment. 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 a degradation in these features and/or controls.

The ODCM multiples are specified in RU1 and RA1 only to distinguish between non-emergency conditions, and from each other. While these multiples obviously correspond to an off-site 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.

RECOGNITION CATEGORY

RADIOLOGICAL EFFLUENTS / ABNORMAL RADIATION LEVELS

RU1 (continued)

Releases should not be prorated or averaged. For example, a release exceeding 4x ODCM for 30 minutes does not meet the threshold.

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

EAL #1

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

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

The ODCM establishes a methodology for determining effluent radiation monitor setpoints. The ODCM specifies default source terms and, for gaseous releases, prescribes the use of pre-determined annual average meteorology in the most limiting downwind sector for showing compliance with the regulatory commitments. This EAL is determined using this methodology.

EAL #2

This EAL addresses radioactivity releases, that for whatever reason, cause effluent radiation monitor readings to exceed the threshold identified in the IC established by the radioactivity discharge permit. This value may be associated with a planned batch release, or a continuous release path.

In either case, the value is established by the ODCM to warn of a release that is not in compliance. Indexing the EAL to the ODCM setpoints in this manner insures that the EAL will never be less than the setpoint established by a specific discharge permit.

EAL #3

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

Site (U.S. EPR) Specific

The U.S. EPR Radiological Effluent Controls Program (RECP) limits either are the same or less restrictive than the ODCM.

EAL #1

{To be added to support EAL value/wording}

EAL #2

An elevated monitor reading while the effluent flow path is isolated is not considered a VALID reading.

RECOGNITION CATEGORY

RADIOLOGICAL EFFLUENTS / ABNORMAL RADIATION LEVELS

RU1 (continued)

The effluent monitors listed are those normally used for planned discharges. If a discharge is performed using a different flow path or effluent monitor (e.g., a portable or temporary effluent monitor), then the declaration criteria will be based on the monitor specified in the Discharge Permit.

EAL #3

Grab samples are used to; determine release concentrations or release rates, confirm meter readings, or indicate the need for sampling when the effluent monitors are not in service or other alarms occur. The maximum instantaneous release rate limits are calculated in accordance with the ODCM. These are indicated on approved discharge permit release packages.

Basis Reference(s):

1. NEI 99-01 Rev 5, AU1
2. {TS, CALC, procedure or drawing references}

RECOGNITION CATEGORY

RADIOLOGICAL EFFLUENTS / ABNORMAL RADIATION LEVELS

RA2

Initiating Condition:

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

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

1. A water level drop in the reactor refueling cavity, spent fuel pool or fuel transfer canal that will result in irradiated fuel becoming uncovered.

   OR

2. **>1000 mR/hr** on **ANY** of the following due to damage to irradiated fuel or loss of water level:

   - Reactor Building Refueling Bridge Area Dose Rate Monitor ({JYK15 CR003})
   - Fuel Building Spent Fuel Mast Bridge Dose Rate Monitor ({JYK28 CR002})
   - Fuel Building Fuel Pool Dose Rate Monitor ({JYK28 CR001})
   - Transfer Pit Dose Rate Monitor ({JYK23 CR001})

Basis:

Generic

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

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

EAL #1

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

RECOGNITION CATEGORY

RADIOLOGICAL EFFLUENTS / ABNORMAL RADIATION LEVELS

RA2 (continued)

EAL #2

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

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

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

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

Site (U.S. EPR) Specific

EAL #2

NUREG/CR-4982 indicates that even if corrective actions are not taken when spent fuel becomes uncovered, no prompt fatalities are predicted and the risk of injury is low. Therefore, a period of time will be available to take corrective actions prior to the actual onset of fuel damage.

Visual observation of spent fuel uncovery represents a major ALARA concern in that radiation levels could exceed 10,000 R/hr on the refuel bridge when fuel uncovery begins. The value of 1000 mR/hr was conservatively chosen for classification purposes.

Basis Reference(s):

1. NEI 99-01 Rev 5, AA2
2. Information Notice No. 90-08, KR-85 Hazards from Decayed Fuel
3. NUREG/CR-4982, Severe Accident in Spent Fuel Pools in Support of Generic Safety Issue 82, July 1987

RECOGNITION CATEGORY
RADIOLOGICAL EFFLUENTS / ABNORMAL RADIATION LEVELS

RU2

Initiating Condition:

UNPLANNED rise in plant radiation levels.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

1. a. UNPLANNED water level drop in the reactor refueling cavity, spent fuel pool or fuel transfer canal as indicated by **ANY** of the following:

   - Reactor refueling cavity level ({FAK31 CL003 or CL004}) **< {RU2.1.a(b1)} feet**.
   - Spent fuel pool level ({FAL18 CL001}) **< {RU2.1.a(b2)} feet**.
   - Fuel transfer canal level ({FAL18 CL004 or CL005}) **< {RU2.1.a(b3)} feet**.
   - Report of visual observation.

   AND

   b. Area radiation monitor rise on **ANY** of the following:

   - Reactor Building Refueling Bridge Area Dose Rate Monitor ({JYK15 CR003})
   - Fuel Building Spent Fuel Mast Bridge Dose Rate Monitor ({JYK28 CR002})
   - Fuel Building Fuel Pool Dose Rate Monitor ({JYK28 CR001})
   - Transfer Pit Dose Rate Monitor ({JYK23 CR001})

   OR

2. UNPLANNED area radiation monitor or radiation survey **> 1000 times NORMAL LEVELS**.

Basis:

Generic

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

RECOGNITION CATEGORY

RADIOLOGICAL EFFLUENTS / ABNORMAL RADIATION LEVELS

RU2 (continued)

EAL #1

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

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

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

For refueling events where the water level drops below the RPV flange classification would be via CU8.

EAL #2

This EAL addresses increases in plant radiation levels that represent a loss of control of radioactive material resulting in a potential degradation in the level of safety of the plant.

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

Site (U.S. EPR) Specific

EAL #1

{To be added to support EAL value/wording}

Basis Reference(s):

1. NEI 99-01 Rev 5, AU2
2. Information Notice No. 90-08, KR-85 Hazards from Decayed Fuel
3. {TS, CALC, procedure or drawing references}

RECOGNITION CATEGORY

RADIOLOGICAL EFFLUENTS / ABNORMAL RADIATION LEVELS

RA3

Initiating Condition:

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

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

1. Dose rate **> 15 mR/hr** in **ANY** of the following areas requiring continuous occupancy to maintain plant safety functions:
   - Control Room
   - Central Alarm Station

Basis:

Generic

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

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

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

Areas requiring continuous occupancy include the control room and, as appropriate to the site, any other control stations that are staffed continuously, such as a radwaste control room, or a security alarm station.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, AA3
2. {TS, CALC, procedure or drawing references}

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HG1

Initiating Condition:

HOSTILE ACTION resulting in loss of physical control of the facility.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

1. A HOSTILE ACTION has occurred such that plant personnel are unable to operate equipment required to maintain safety functions.

   OR

2. A HOSTILE ACTION has caused failure of spent fuel cooling systems and IMMINENT fuel damage is likely.

Basis:

<u>Generic</u>

<u>EAL #1</u>

This EAL encompasses conditions under which a HOSTILE ACTION has resulted in a loss of physical control of VITAL AREAS (containing vital equipment or controls of vital equipment) required to maintain safety functions and control of that equipment cannot be transferred to and operated from another location.

Typically, these safety functions are reactivity control (ability to shut down the reactor and keep it shutdown), RCS inventory (ability to cool the core), and secondary heat removal (ability to maintain a heat sink).

Loss of physical control of the control room or remote shutdown capability alone may not prevent the ability to maintain safety functions. Design of the remote shutdown capability and the location of the transfer switches should be taken into account. Primary emphasis should be placed on those components and instruments that supply protection for and information about safety functions.

If control of the plant equipment necessary to maintain safety functions can be transferred to another location, then the threshold is not met.

<u>EAL #2</u>

This EAL addresses failure of spent fuel cooling systems as a result of HOSTILE ACTION if IMMINENT fuel damage is likely, such as when a freshly off-loaded reactor core is in the spent fuel pool.

<u>Site (U.S. EPR) Specific</u>

None

Basis Reference(s):

1. NEI 99-01 Rev 5, HG1

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HS1

Initiating Condition:

HOSTILE ACTION within the PROTECTED AREA.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

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

Basis:

Generic

This condition represents an escalated threat to plant safety above that contained in the Alert in that a HOSTILE FORCE has progressed from the OWNER CONTROLLED AREA to the PROTECTED AREA.

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

The fact that the site is under serious attack with minimal time available for further preparation or additional assistance to arrive requires ORO readiness and preparation for the implementation of protective measures.

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

Although nuclear plant security officers are well trained and prepared to protect against HOSTILE ACTION, it is appropriate for OROs to be notified and encouraged to begin preparations for public protective actions (if they do not normally) to be better prepared should it be necessary to consider further actions.

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

Site (U.S. EPR) Specific

None

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY
HS1 (continued)

Basis Reference(s):

1. NEI 99-01 Rev 5, HS4

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA1

Initiating Condition:

HOSTILE ACTION within the OWNER CONTROLLED AREA or airborne attack threat.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

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

   OR

2. A validated notification from the NRC of a LARGE AIRCRAFT attack threat within **30 minutes** of the site.

Basis:

<u>Generic</u>

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

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

<u>EAL #1</u>

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

Note that this EAL is applicable for any HOSTILE ACTION occurring, or that has occurred, in the OWNER CONTROLLED AREA. This includes ISFSI's that may be outside the PROTECTED AREA but still within the OWNER CONTROLLED AREA.

Although nuclear plant security officers are well trained and prepared to protect against HOSTILE ACTION, it is appropriate for OROs to be notified and encouraged to begin activation (if they do not normally) to be better prepared should it be necessary to consider further actions.

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA1 (continued)

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

EAL #2

This EAL addresses the immediacy of an expected threat arrival or impact on the site within a relatively short time.

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

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

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

Site (U.S. EPR) Specific

EAL #2

LARGE AIRCRAFT is the U.S. EPR specific term used for airliner.

Basis Reference(s):

1. NEI 99-01 Rev 5, HA4

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU1

Initiating Condition:

Confirmed SECURITY CONDITION or threat which indicates a potential degradation in the level of safety of the plant.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

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

   OR

2. A credible site-specific security threat notification.

   OR

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

Basis:

Generic

Security events which do not represent a potential degradation in the level of safety of the plant are reported under 10 CFR 73.71 or in some cases under 10 CFR 50.72. Security events assessed as HOSTILE ACTIONS are classifiable under HA8, HS4 and HG1.

A higher initial classification could be made based upon the nature and timing of the security threat and potential consequences. The licensee shall consider upgrading the emergency response status and emergency classification level in accordance with the site's Safeguards Contingency Plan and Emergency Plan.

EAL #1

Reference is made to site (U.S. EPR) specific security shift supervision because these individuals are the designated personnel on-site qualified and trained to confirm that a security event is occurring or has occurred. Training on security event classification confirmation is closely controlled due to the strict secrecy controls placed on the plant Safeguards Contingency Plan.

This threshold is based on site-specific security plans. Site-specific Safeguards Contingency Plans are based on guidance provided by NEI 03-12.

EAL #2

This threshold is included to ensure that appropriate notifications for the security threat are made in a timely manner. This includes information of a credible threat. Only the plant to which the specific threat is made need declare the Unusual Event.

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU1 (continued)

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

EAL #3

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

This EAL is met when a plant receives information regarding an aircraft threat from the NRC. Validation is performed by calling the NRC or by other approved methods of authentication. Only the plant to which the specific threat is made need declare the Unusual Event.

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

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, HU4

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HS2

Initiating Condition:

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

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

1. a. Control Room evacuation has been initiated.

   AND

   b. Control of the plant cannot be established within **15 minutes**.

Basis:

Generic

The intent of this IC is to capture those events where control of the plant cannot be reestablished in a timely manner. In this case, expeditious transfer of control of safety systems has not occurred (although fission product barrier damage may not yet be indicated).

The intent of the EAL is to establish control of important plant equipment and knowledge of important plant parameters in a timely manner. Primary emphasis should be placed on those components and instruments that supply protection for and information about safety functions. Typically, these safety functions are 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).

The determination of whether or not control is established at the remote shutdown panel is based on {Emergency Coordinator} judgment. The {Emergency Coordinator} is expected to make a reasonable, informed judgment within the site-specific time for transfer that the licensee has control of the plant from the remote shutdown panel.

The site-specific time for transfer is based on analysis or assessments as to how quickly control must be reestablished without core uncovering and/or core damage. This time should not exceed 15 minutes without additional justification.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01, Rev 5 HS2

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA2

Initiating Condition:

Control Room evacuation has been initiated.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

1. Control Room evacuation has been initiated.

Basis:

Generic

With the control room evacuated, additional support, monitoring and direction through the Technical Support Center and/or other emergency response facilities may be necessary.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01, Rev 5 HA5

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA3

Initiating Condition:

Natural or destructive phenomena affecting VITAL AREAS.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

1. a. Seismic event **> OBE** as indicated by PICS seismic monitoring system.

   AND

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

   - Earthquake felt in plant
   - National Earthquake Center
   - Control Room indication of degraded performance of systems required for the safe shutdown of the plant.

   OR

2. Tornado or high winds **> {45 m/sec (100 mph)}** resulting in **EITHER** of the following:

   - VISIBLE DAMAGE to **ANY** structures in **Table H-1** areas containing safety systems or components.
   - Control Room indication of degraded performance of those safety systems.

   OR

3. Internal flooding in **Table H-1** areas resulting in **EITHER** of the following:

   - Electrical shock hazard that precludes access to operate or monitor safety equipment.
   - Control Room indication of degraded performance of those safety systems.

   OR

4. { }

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

   - VISIBLE DAMAGE to or penetration of **ANY** structures in **Table H-1** areas containing safety systems or components.
   - Control Room indication of degraded performance of those safety systems.

   OR

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA3 (continued)

6. Vehicle crash resulting in **EITHER** of the following:
   - VISIBLE DAMAGE to **ANY** structures in **Table H-1** areas containing safety systems or components.
   - Control Room indication of degraded performance of those safety systems.

Table H-1: Safe Shutdown Vital Areas
• Control Room
• Safeguards Buildings
• Containment
• Nuclear Auxiliary Building
• Emergency Power Generating Buildings
• ESW Cooling Towers

Basis:

Generic

These EALs escalate from HU3 in that the occurrence of the event has resulted in VISIBLE DAMAGE to plant structures or areas containing equipment necessary for a safe shutdown, or has caused damage to the safety systems in those structures evidenced by control room indications of degraded system response or performance. The occurrence of VISIBLE DAMAGE and/or degraded system response is intended to discriminate against lesser events. The initial report should not be interpreted as mandating a lengthy damage assessment prior to classification. No attempt is made in this EAL to assess the actual magnitude of the damage. The significance here is not that a particular system or structure was damaged, but rather, that the event was of sufficient magnitude to cause this degradation.

EALs #2 - #6

These EALs should specify site (U.S. EPR) specific structures or areas that contain safety system, or component and functions required for safe shutdown of the plant. Site-specific Safe Shutdown Analysis should be consulted for equipment and plant areas required to establish or maintain safe shutdown.

EAL #1

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

This threshold should be based on site-specific FSAR design basis. See EPRI-sponsored "Guidelines for Nuclear Plant Response to an Earthquake", dated October 1989, for information on seismic event categories.

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

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA3 (continued)

EAL #2

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

The high wind value should be based on site (U. S. EPR) specific FSAR design basis as long as it is within the range of the instrumentation available for wind speed.

EAL #3

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

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

The site (U.S. EPR) specific areas include those areas that contain systems required for safe shutdown of the plant, which are not designed to be partially or fully submerged. The plant's IPEEE (PRA) may provide insight into areas to be considered when developing this EAL.

EAL #5

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

The site (U.S. EPR) specific list of areas should include all areas containing safety structure, system, or component, their controls, and their power supplies.

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA3 (continued)

EAL #6

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

Site (U.S. EPR) Specific

EAL #1

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 inventory ground motion is felt at the nuclear plant site and recognized as an earthquake based on a consensus of Control Room operators on duty at the time, and (b) for plants with operable seismic instrumentation, the seismic switches of the plant are activated.

The U.S. EPR Maximum Probable Earthquake is 0.30g.

EAL #2

The U.S. EPR maximum wind speed is 145 miles per hour, however the actual wind speed value to be used in the EAL is limited to the lower of (1) the maximum design wind speed of 145 miles per hour or (2) the maximum recordable wind speed based on the site-specific meteorological equipment.

Wind speed is obtained from meteorological data in the Control Room that is averaged over a 15 minute period to prevent instantaneous wind gusts or fluctuations from affecting the measurement.

{EAL #4

}

Basis Reference(s):

1. NEI 99-01, Rev 5 HA1
2. U.S. EPR FSAR Section 3.7.1.1.1
3. U.S. EPR FSAR Section 3.3
4. U.S. EPR FSAR Section 3.4.2

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU3

Initiating Condition:

Natural or destructive phenomena affecting the PROTECTED AREA.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

1. a. Seismic event trigger as indicated by PICS seismic monitoring system.

   AND

   b. Earthquake confirmed by **EITHER** of the following:

   - Earthquake felt in plant
   - National Earthquake Center

   OR

2. a. Tornado within the PROTECTED AREA.

   OR

   b. High winds **> {45 m/sec (100 mph)}**.

   OR

3. Internal flooding in **Table H-1** areas that has the potential to affect safety related equipment required by Technical Specifications for the current operating mode.

   OR

4. { }

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

Table H-1: Safe Shutdown Vital Areas
• Control Room
• Safeguards Buildings
• Containment
• Nuclear Auxiliary Building
• Emergency Power Generating Buildings
• ESW Cooling Towers

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU3 (continued)

Basis:

Generic

These EALs are categorized on the basis of the occurrence of an event of sufficient magnitude to be of concern to plant operators.

EAL #1

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

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

For most plants with seismic instrumentation, the seismic switches are set at an acceleration of about 0.01g. This EAL should be developed on site specific basis. The method of detection can be based on instrumentation, validated by a reliable source, or operator assessment.

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

EAL #2

This EAL is based on a tornado striking (touching down) or high winds within the PROTECTED AREA.

The high wind value should be based on site (U.S. EPR) specific FSAR design basis as long as it is within the range of the instrumentation available for wind speed.

EAL #3

This EAL addresses the effect of internal flooding caused by 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, which are not designed to be partially or fully submerged. The plant's IPEEE (PRA) may provide insight into areas to be considered when developing this EAL.

{EAL #4

}

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU3 (continued)

EAL #5

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

Of major concern is the potential for leakage of combustible fluids (lubricating oils) and gases (hydrogen cooling) to the plant environs. Actual FIRES and flammable gas build up are appropriately classified via HA4 and HU4.

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

Site (U.S. EPR) Specific

EAL #1

PICS indication of trigger actuation (minimal level of earthquake to initiate recorder) is appropriate as seismic system indication of detection of earthquake.

EAL #2

The U.S. EPR maximum wind speed is 145 miles per hour, however the actual wind speed value to be used in the EAL is limited to the lower of (1) the maximum design wind speed of 145 miles per hour or (2) the maximum recordable wind speed based on the site-specific meteorological equipment. Wind speed is obtained from meteorological data in the Control Room that is averaged over a 15 minute period to prevent instantaneous wind gusts or fluctuations from affecting the measurement.

{EAL #4

}

Basis Reference(s):

1. NEI 99-01, Rev 5 HU1
2. U.S. EPR FSAR Section 3.4.2

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA4

Initiating Condition:

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

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

1. FIRE or EXPLOSION resulting in **EITHER** of the following:
   - VISIBLE DAMAGE to **ANY** structures in **Table H-1** areas containing safety systems or components.
   - Control Room indication of degraded performance of those safety systems.

Table H-1: Safe Shutdown Vital Areas
• Control Room • Safeguards Buildings • Containment • Nuclear Auxiliary Building • Emergency Power Generating Buildings • ESW Cooling Towers

Basis:

Generic

VISIBLE DAMAGE is used to identify the magnitude of the FIRE or EXPLOSION and to discriminate against minor FIRES and EXPLOSIONS.

The reference to structures containing safety systems or components is included to discriminate against FIRES or 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 or EXPLOSION was large enough to cause damage to these systems.

The use of VISIBLE DAMAGE should not be interpreted as mandating a lengthy damage assessment prior to classification. The declaration of an Alert and the activation of the Technical Support Center will provide the {Emergency Coordinator} with the resources needed to perform detailed damage assessments.

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

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA4 (continued)

This EAL should specify site (U.S. EPR) specific structures or areas that contain safety system, or component and functions required for safe shutdown of the plant. Site-specific Safe Shutdown Analysis should be consulted for equipment and plant areas required to establish or maintain safe shutdown.

Site (U.S. EPR) Specific

A steam line break or steam explosion that damages permanent structures or equipment in one of these areas would be classified under this EAL.

Basis Reference(s):

1. NEI 99-01, Rev 5 HA2

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU4

Initiating Condition:

FIRE within the PROTECTED AREA not extinguished within 15 minutes of detection or EXPLOSION within the PROTECTED AREA.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

1. FIRE not extinguished within **15 minutes** of Control Room notification or verification of a Control Room FIRE alarm in actual contact with or immediately adjacent to **ANY** of the **Table H-1** areas.

   OR

2. EXPLOSION within the PROTECTED AREA.

Table H-1: Safe Shutdown Vital Areas
• Control Room • Safeguards Buildings • Containment • Nuclear Auxiliary Building • Emergency Power Generating Buildings • ESW Cooling Towers

Basis:

<u>Generic</u>

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

As used here, detection is visual observation and report by plant personnel or sensor alarm indication.

<u>EAL #1</u>

The 15 minute time period begins with a credible notification that a FIRE is occurring, or indication of a fire detection system alarm/actuation. Verification of a fire detection system alarm/actuation includes actions that can be taken within the control room or other nearby site-specific location to ensure that it is not spurious. An 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.

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU4 (continued)

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

The site-specific list should be limited and applies to buildings and areas in actual contact with or immediately adjacent to VITAL AREAS or other significant buildings or areas. The intent of this IC is not to include buildings (i.e., warehouses) or areas that are not in actual contact with or immediately adjacent to VITAL AREAS. This excludes FIRES within administration buildings, wastebasket FIRES, and other small FIRES of no safety consequence. Immediately adjacent implies that the area immediately adjacent contains or may contain equipment or cabling that could impact equipment located in VITAL AREAS or the fire could damage equipment inside VITAL AREAS or that precludes access to VITAL AREAS.

EAL #2

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

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

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

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01, Rev 5 HU2

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA5

Initiating Condition:

Access to a VITAL AREA is prohibited due to toxic, corrosive, asphyxiant or flammable gases which jeopardize the ability to safely operate or shutdown the reactor.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

1. Access to a VITAL AREA is prohibited due to toxic, corrosive, asphyxiant or flammable gases which jeopardize the ability to safely operate or shutdown the reactor.

Basis:

Generic

Gases in a VITAL AREA can affect the ability to safely operate or safely shutdown the reactor.

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

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

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

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

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

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01, Rev 5 HA3

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU5

Initiating Condition:

Release of toxic, corrosive, asphyxiant or flammable gases deemed detrimental to NORMAL PLANT OPERATIONS.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EALs:

1. Toxic, corrosive, asphyxiant or flammable gases in amounts that have or could adversely affect NORMAL PLANT OPERATIONS.

   OR

2. Report by local~~, *county*~~ or state officials for evacuation or sheltering of site personnel based on an offsite event.

Basis:

Generic

This EAL is based on the release of toxic, corrosive, asphyxiant or flammable gases of sufficient quantity to affect NORMAL PLANT OPERATIONS.

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

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

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

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01, Rev 5 HU3

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HG6

Initiating Condition:

Other conditions exist which in the judgment of the {Emergency Coordinator} warrant declaration of a General Emergency.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EAL Threshold Value:

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

Basis:

Generic

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

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01, Rev 5 HG2
2. EPA-400, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HS6

Initiating Condition:

Other conditions exist which in the judgment of the {Emergency Coordinator} warrant declaration of a Site Area Emergency.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EAL Threshold Value:

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

Basis:

Generic

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

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01, Rev 5 HS3
2. EPA-400, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HA6

Initiating Condition:

Other conditions exist which in the judgment of the {Emergency Coordinator} warrant declaration of an Alert.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EAL Threshold Value:

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

Basis:

Generic

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

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01, Rev 5 HA6
2. EPA-400, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

RECOGNITION CATEGORY
HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

HU6

Initiating Condition:

Other conditions exist which in the judgment of the {Emergency Coordinator} warrant declaration of an Unusual Event.

Operating Mode Applicability:

1, 2, 3, 4, 5, 6, D

EAL Threshold Value:

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

Basis:

Generic

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

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01, Rev 5 HU5

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SG1

Initiating Condition:

Prolonged loss of all offsite and all onsite AC power to emergency busses.

Operating Mode Applicability:

1, 2, 3, 4

EALs:

1. a. Loss of **ALL** offsite and **ALL** onsite AC power to 31, 32, 33 and 34 BDA busses.

   AND

   b. **EITHER** of the following:

   - Restoration of at least one emergency bus within **2 hours** is not likely.
   - **{**Calculated Clad Temperature in **Region 4}**.

Basis:

Generic

Loss of all AC power to emergency busses compromises all plant safety systems requiring electric power including RHR, ECCS, Containment Heat Removal and the Ultimate Heat Sink. Prolonged loss of all AC power to emergency busses will lead to loss of fuel clad, RCS, and containment, thus warranting declaration of a General Emergency.

The hours to restore AC power can be based on a site blackout coping analysis performed in conformance with 10 CFR 50.63 and Regulatory Guide 1.155, "Station Blackout," as available. Appropriate allowance for off-site emergency response including evacuation of surrounding areas should be considered. 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.

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.

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SG1 (continued)

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, SG1

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SS1

Initiating Condition:

Loss of all offsite and all onsite AC power to emergency busses for 15 minutes or longer.

Operating Mode Applicability:

1, 2, 3, 4

EALs:

1. Loss of **ALL** offsite and **ALL** onsite AC power to 31, 32, 33 and 34 BDA busses for **15 minutes** or longer.

Basis:

Generic

Loss of all AC power to emergency busses compromises all plant safety systems requiring electric power including RHR, ECCS, Containment Heat Removal and the Ultimate Heat Sink. Prolonged loss of all AC power to emergency busses will lead to loss of Fuel Clad, RCS, and Containment, thus this event can escalate to a General Emergency.

Fifteen minutes was selected as a threshold to exclude transient or momentary losses of off-site power.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, SS1

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SA1

Initiating Condition:

AC power capability to emergency busses reduced to a single source for 15 minutes or longer such that any additional single failure would result in a loss of all AC power to the emergency busses.

Operating Mode Applicability:

1, 2, 3, 4

EALs:

1. a. AC power to 31, 32, 33 and 34 BDA busses is reduced to a single source for **15 minutes** or longer.

   AND

   b. Any additional single failure will result in a loss of all AC power to 31, 32, 33 and 34 BDA busses.

Basis:

Generic

The condition indicated by this IC is the degradation of the off-site and on-site AC power systems such that any additional single failure would result in a station blackout. This condition could occur due to a loss of off-site power with a concurrent failure of all but one emergency generator to supply power to its emergency busses. Another related condition could be the loss of all off-site power and loss of on-site emergency generators with only one train of emergency busses being backfed from the unit main generator, or the loss of on-site emergency generators with only one train of emergency busses being backfed from off-site power.

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

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, SA5

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SU1

Initiating Condition:

Loss of all offsite AC power to emergency busses for 15 minutes or longer.

Operating Mode Applicability:

1, 2, 3, 4

EALs:

1. Loss of **ALL** offsite AC power to 31, 32, 33 and 34 BDA busses for **15 minutes** or longer.

Basis:

Generic

Prolonged loss of off-site AC power reduces required redundancy and potentially degrades the level of safety of the plant by rendering the plant more vulnerable to a complete loss of AC power to emergency busses.

Fifteen minutes was selected as a threshold to exclude transient or momentary losses of off-site power.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, SU1

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SS2

Initiating Condition:

Loss of vital DC power for 15 minutes or longer.

Operating Mode Applicability:

1, 2, 3, 4

EALs:

1. **< 210 VDC** on the vital 31, 32, 33 and 34 BUC busses for **15 minutes** or longer.

Basis:

Generic

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.

Site specific bus voltage should be based on the minimum bus voltage necessary for the operation of safety related equipment. This voltage value should incorporate a margin of at least 15 minutes of operation before the onset of inability to operate those loads. This voltage is usually near the minimum voltage selected when battery sizing is performed. Typically the value for the entire battery set is approximately 105 VDC. For a 60 cell string of batteries the cell voltage is typically 1.75 Volts per cell. For a 58 string battery set the minimum voltage is typically 1.81 Volts per cell.

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

Site (U.S. EPR) Specific

The U.S. EPR has a 250 VDC battery system, where the typical minimum voltage of 210 VDC (versus 105) is the appropriate threshold.

Basis Reference(s):

1. NEI 99-01 Rev 5, SS3
2. Technical Specification 3.8.4, DC Sources

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SG3

Initiating Condition:

Automatic trip and all manual actions failed to shutdown the reactor and indication of an extreme challenge to the ability to cool the core exists.

Operating Mode Applicability:

1, 2

EALs:

1. a. An automatic reactor trip failed to shutdown the reactor as indicated by reactor power **> 5%**.

   AND

   b. All manual actions failed to shutdown the reactor as indicated by reactor power **> 5%**.

   AND

   c. **EITHER** of the following have occurred:

   - **{**Calculated Clad Temperature in **Region 3 or higher}**
   - Loss of all four trains of Emergency Feedwater.

Basis:

<u>Generic</u>

Under these conditions, the reactor is producing more heat than the maximum decay heat load for which the safety systems are designed and efforts to bring the reactor subcritical are unsuccessful.

The reactor should be considered shutdown when it producing less heat than the maximum decay heat load for which the safety systems are designed (typically 3 to 5% power).

For PWRs, the extreme challenge to the ability to cool the core is intended to mean that the core exit temperatures are at or approaching 1200º 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. For PWRs, 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.

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SG3 (continued)

In the event either of these challenges exists at a time that the reactor has not been brought below the power associated with the safety system design a core melt sequence exists. In this situation, core degradation can occur rapidly. For this reason, the General Emergency declaration is intended to be anticipatory of the fission product barrier table declaration to permit maximum off-site intervention time.

Site (U.S. EPR) Specific

5% power is based on the combined capacity of all four trains of the Emergency Feedwater systems.

Basis Reference(s):

1. NEI 99-01 Rev 5, SG2
2. {TS, CALC, procedure or drawing references}

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SS3

Initiating Condition:

Automatic trip failed to shutdown the reactor and manual actions taken from the reactor control console failed to shutdown the reactor.

Operating Mode Applicability:

1, 2

EALs:

1. a. An automatic reactor trip failed to shutdown the reactor as indicated by reactor power **> 5%**.

   AND

   b. Manual actions taken at the reactor control console failed to shutdown the reactor as indicated by reactor power **> 5%**.

Basis:

Generic

Under these conditions, the reactor is producing more heat than the maximum decay heat load for which the safety systems are designed and efforts to bring the reactor subcritical are unsuccessful. A Site Area Emergency is warranted because conditions exist that lead to IMMINENT loss or potential loss of both fuel clad and RCS.

The reactor should be considered shutdown when it producing less heat than the maximum decay heat load for which the safety systems are designed (typically 3 to 5% power).

Manual scram (trip) actions taken at the reactor control console are any set of actions by the reactor operator(s) at which causes or should cause control rods to be rapidly inserted into the core and shuts down the reactor.

Manual scram (trip) actions are not considered successful if action away from the reactor control console is required to scram (trip) the reactor. This EAL is still applicable even if actions taken away from the reactor control console are successful in shutting the reactor down because the design limits of the fuel may have been exceeded or because of the gross failure of the Reactor Protection System to shutdown the plant.

Site (U.S. EPR) Specific

5% power is based on the combined capacity of all four trains of the Emergency Feedwater systems.

Basis Reference(s):

1. NEI 99-01 Rev 5, SS2
2. {TS, CALC, procedure or drawing references}

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SA3

Initiating Condition:

Automatic trip failed to shutdown the reactor and the manual actions taken from the reactor control console are successful in shutting down the reactor.

Operating Mode Applicability:

1, 2

EALs:

1. a. An automatic reactor trip failed to shutdown the reactor as indicated by reactor power **> 5%**.

   AND

   b. Manual actions taken at the reactor control console successfully shutdown the reactor as indicated by reactor power **< 5%**.

Basis:

<u>Generic</u>

The reactor should be considered shutdown when it producing less heat than the maximum decay heat load for which the safety systems are designed (typically 3 to 5% power).

Manual scram (trip) actions taken at the reactor control console are any set of actions by the reactor operator(s) which causes or should cause control rods to be rapidly inserted into the core and shuts down the reactor.

If the manual scram (trip) switches/pushbuttons on the control room console panels are considered an automatic input into the Reactor Protection System, a failure to scram (trip) without any other automatic input would make this threshold applicable.

This condition indicates failure of the automatic protection system to scram (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. Thus the plant safety has been compromised because design limits of the fuel may have been exceeded. An Alert is indicated because conditions may exist that lead to potential loss of fuel clad or RCS and because of the failure of the Reactor Protection System to automatically shutdown the plant.

<u>Site (U.S. EPR) Specific</u>

5% power is based on the combined capacity of all four trains of the Emergency Feedwater systems.

Basis Reference(s):

1. NEI 99-01 Rev 5, SA2
2. {TS, CALC, procedure or drawing references}

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SU3

Initiating Condition:

Inadvertent criticality.

Operating Mode Applicability:

3, 4

EALs:

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

Basis:

Generic

This IC addresses inadvertent criticality events. This IC indicates a potential degradation of the level of safety of the plant, warranting an Unusual Event classification. This IC excludes inadvertent criticalities that occur during planned reactivity changes associated with reactor startups (e.g., criticality earlier than estimated).

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 increase in neutron population due to subcritical multiplication.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, SU8

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SS4

Initiating Condition:

Loss of all monitoring functions for 15 minutes or longer with a SIGNIFICANT TRANSIENT in progress.

Operating Mode Applicability:

1, 2, 3, 4

EALs:

1. a. Loss of SICS for **15 minutes** or longer.

   AND

   b. Loss of PICS for **15 minutes** or longer.

   AND

   c. **ANY** of the following SIGNIFICANT TRANSIENTS are in progress:

   - Automatic runback **> 50%** thermal power
   - Electrical load rejection **> 50%** full electrical load
   - Reactor trip
   - MHSI actuation

Basis:

Generic

This IC is intended to recognize the threat to plant safety associated with the complete loss of capability of the control room staff to monitor plant response to a SIGNIFICANT TRANSIENT.

A Site Area Emergency is considered to exist if the control room staff cannot monitor safety functions needed for protection of the public while a significant transient is in progress.

Site-specific indications needed to monitor safety functions necessary for protection of the public must include control room indications, computer generated indications and dedicated annunciation capability.

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, maintain the spent fuel cooled, and to maintain containment intact.

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

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SS4 (continued)

Site (U.S. EPR) Specific

The U.S. EPR is designed to survive a full offsite load rejection and maintain onsite house loads. Although actions will automatically occur, the inability of the operators to verify proper response increases risk and justifies escalation of emergency classification. A 50% change in power/electrical load was chosen as a reasonable value (less than the design criteria, which will still be considered a substantial challenge to the systems) as the threshold criteria.

Basis Reference(s):

1. NEI 99-01 Rev 5, SS6

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SA4

Initiating Condition:

Loss of all monitoring functions for 15 minutes or longer.

Operating Mode Applicability:

1, 2, 3, 4

EALs:

1. a. Loss of SICS for **15 minutes** or longer.

   AND

   b. Loss of PICS for **15 minutes** or longer.

Basis:

Generic

This IC is intended to recognize the difficulty associated with monitoring changing plant conditions without the use of the annunciation or indication equipment.

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

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, SA4

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SU4

Initiating Condition:

Degradation of monitoring functions for 15 minutes or longer.

Operating Mode Applicability:

1, 2, 3, 4

EALs:

1. Loss of SICS for **15 minutes** or longer.

   OR

2. Loss of PICS for **15 minutes** or longer.

Basis:

Generic

This IC and its associated EAL 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.).

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

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, SU3

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SU5

Initiating Condition:

Inability to reach required operating mode within Technical Specification limits.

Operating Mode Applicability:

1, 2, 3, 4

EALs:

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

Basis:

Generic

Limiting Conditions of Operation (LCOs) require the plant to be brought to a required operating 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 Unusual Event is required when the plant is not brought to the required operating mode within the allowable action statement time in the Technical Specifications. Declaration of an Unusual Event is based on the time at which the LCO-specified action statement time period elapses under the site Technical Specifications and is not related to how long a condition may have existed.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, SS2

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SU6

Initiating Condition:

Loss of all onsite or offsite communications capabilities.

Operating Mode Applicability:

1, 2, 3, 4

EALs:

1. Loss of **ALL** of the following onsite communication methods affecting the ability to perform routine operations:
   - {Radios}
   - {Plant Page}
   - {Internal Telephone Systems}

   OR

2. Loss of **ALL** of the following offsite communications methods affecting the ability to perform offsite notifications:
   - {SENTRY System}
   - NRC Emergency Notification System - ENS
   - NRC Health Physics Network - HPN
   - {External Telephone Systems}

Basis:

Generic

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

The loss of off-site communications ability is expected to be significantly more comprehensive than the condition addressed by 10 CFR 50.72.

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

Site-specific list for on-site communications loss must encompass the loss of all means of communications (e.g., commercial telephones, sound powered phone systems, page party system (Gaitronics) and radios / walkie talkies) routinely used for operations.

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SU6 (continued)

Site-specific list for off-site communications loss must encompass the loss of all means of communications with off-site authorities. This should include the {SENTRY System}, commercial telephone lines, telecopy transmissions, and dedicated phone systems that are routinely used for offsite emergency notifications.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, SU6

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SU7

Initiating Condition:

RCS leakage.

Operating Mode Applicability:

1, 2, 3, 4

EALs:

1. Unidentified or pressure boundary leakage **> 10 gpm**.

   OR

2. Identified leakage **> 25 gpm**.

Basis:

Generic

This IC is included as an Unusual Event because it may be a precursor of more serious conditions and, as result, is considered to be a potential degradation of the level of safety of the plant. The 10 gpm value for the unidentified or pressure boundary leakage was selected as it is observable with normal control room indications. Lesser values must generally be determined through time-consuming surveillance tests (e.g., mass balances).

Relief valve normal operation should be excluded from this IC. However, a relief valve that operates and fails to close per design should be considered applicable to this IC if the relief valve cannot be isolated.

The EAL for identified leakage is set at a higher value due to the lesser significance of identified leakage in comparison to unidentified or pressure boundary leakage.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, SU5

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - HOT

SU9

Initiating Condition:

Fuel clad degradation.

Operating Mode Applicability:

1, 2, 3, 4

EALs:

1. Gross Failed Fuel Monitor ({KUA66 CR001}) **> {SU9.1} cpm**.

   OR

2. Coolant sample activity **> 1.0 µCi/gm** dose equivalent I-131.

Basis:

Generic

This EAL is included because it is a precursor of more serious conditions and, as result, is considered to be a potential degradation of the level of safety of the plant.

EAL #1

This threshold addresses site-specific radiation monitor readings that provide indication of a degradation of fuel clad integrity.

EAL #2

This threshold addresses coolant samples exceeding coolant technical specifications for transient iodine spiking limits.

Site (U.S. EPR) Specific

EAL #1

{To be added to support EAL value/wording}

Basis Reference(s):

1. NEI 99-01 Rev 5, SU4
2. Technical Specifications 3.4.15, RCS Specific Activity

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CA1

Initiating Condition:

Loss of all offsite and all onsite AC power to emergency busses for 15 minutes or longer.

Operating Mode Applicability:

5, 6, D

EALs:

1. Loss of all offsite and all onsite AC power to 31, 32, 33 and 34 BDA busses for **15 minutes** or longer.

Basis:

Generic

Loss of all AC power compromises all plant safety systems requiring electric power including Residual Heat Removal, ECCS, Containment Heat Removal, Spent Fuel Heat Removal and the Ultimate Heat Sink.

The event can be classified as an Alert when in cold shutdown, refueling, or defueled mode because of the significantly reduced decay heat and lower temperature and pressure, increasing the time to restore one of the 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.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, CA3

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CU1

Initiating Condition:

AC power capability to emergency busses reduced to a single source for 15 minutes or longer such that any additional single failure would result in a loss of all AC power to the emergency busses.

Operating Mode Applicability:

5, 6

EALs:

1. a. AC power to 31, 32, 33 and 34 BDA busses is reduced to a single source for **15 minutes** or longer.

   AND

   b. Any additional single failure will result in a loss of all AC power to 31, 32, 33 and 34 BDA busses.

Basis:

Generic

The condition indicated by this IC is the degradation of the off-site and on-site AC power systems such that any additional single failure would result in a station blackout. This condition could occur due to a loss of off-site power with a concurrent failure of all but one emergency generator to supply power to its emergency busses.

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

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, CU3

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CU2

Initiating Condition:

Loss of required DC power for 15 minutes or longer.

Operating Mode Applicability:

5, 6

EALs:

1. **< 210 VDC** on the required 31, 32, 33 and 34 BUC busses for **15 minutes** or longer.

Basis:

Generic

The purpose of this IC and its associated EAL 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.

Plants will routinely 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.

Site specific bus voltage should be based on the minimum bus voltage necessary for the operation of safety related equipment. This voltage value should incorporate a margin of at least 15 minutes of operation before the onset of inability to operate those loads. This voltage is usually near the minimum voltage selected when battery sizing is performed. Typically the value for the entire battery set is approximately 105 VDC. For a 60 cell string of batteries the cell voltage is typically 1.75 Volts per cell. For a 58 string battery set the minimum voltage is typically 1.81 Volts per cell.

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

Site (U.S. EPR) Specific

The U.S. EPR has a 250 VDC battery system, where the typical minimum voltage of 210 VDC (versus 105) is the appropriate threshold.

Basis Reference(s):

1. NEI 99-01 Rev 5, CU7
2. Technical Specification 3.8.4, DC Sources

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CU3

Initiating Condition:

Inadvertent criticality.

Operating Mode Applicability:

5, 6

EALs:

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

Basis:

Generic

This IC addresses criticality events that occur in Cold Shutdown or Refueling modes (NUREG 1449, Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States) such as fuel mis-loading events and inadvertent dilution events. This IC indicates a potential degradation of the level of safety of the plant, warranting an Unusual Event emergency classification level.

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 increase in neutron population due to subcritical multiplication.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, CU8

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CU6

Initiating Condition:

Loss of all onsite or offsite communications capabilities.

Operating Mode Applicability:

5, 6, D

EALs:

1. Loss of **ALL** of the following onsite communication methods affecting the ability to perform routine operations:
   - {Radios}
   - {Plant Page}
   - {Internal Telephone Systems}

   OR

2. Loss of **ALL** of the following offsite communications methods affecting the ability to perform offsite notifications:
   - {SENTRY System}
   - NRC Emergency Notification System - ENS
   - NRC Health Physics Network - HPN
   - {External Telephone Systems}

Basis:

__Generic__

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

The loss of off-site communications ability is expected to be significantly more comprehensive than the condition addressed by 10 CFR 50.72.

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

Site-specific list for on-site communications loss must encompass the loss of all means of communications (e.g., commercial telephones, sound powered phone systems, page party system (Gaitronics) and radios / walkie talkies) routinely used for operations.

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CU6 (continued)

Site-specific list for off-site communications loss must encompass the loss of all means of communications with off-site authorities. This should include the {SENTRY System}, commercial telephone lines, telecopy transmissions, and dedicated phone systems that are routinely used for offsite emergency notifications.

<u>Site (U.S. EPR) Specific</u>

None

Basis Reference(s):

1. NEI 99-01 Rev 5, CU6

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CG7

Initiating Condition:

Loss of RPV inventory affecting fuel clad integrity with containment challenged.

Operating Mode Applicability:

5, 6

EALs:

1. a. RPV level **< {96.0 feet (29.3 meters)}** (top of active fuel) for **30 minutes** or longer.

   AND

   b. **ANY Table C-1** containment challenge indications.

   OR

2. a. RPV level cannot be monitored with core uncovery indicated by **ANY** of the following for **30 minutes** or longer:

   - Reactor Building Refueling Bridge Area Dose Rate Monitor ({JYK15 CR003}) **> {CG7.2.a(b1)} mR/hr**.
   - Erratic source range monitor indication.
   - UNPLANNED level rise in IRWST.

   AND

   b. **ANY Table C-1** containment challenge indications.

Table C-1: Containment Challenge Indications
• CONTAINMENT CLOSURE not established.
• Hydrogen concentration > 4% inside containment.
• UNPLANNED rise in containment pressure.

Basis:

<u>Generic</u>

This IC represents the inability to restore and maintain RPV level to above the top of active fuel with containment challenged. Fuel damage is probable if RPV level cannot be restored, as available decay heat will cause boiling, further reducing the RPV level. With the CONTAINMENT breached or challenged then the potential for unmonitored fission product release to the environment is high. This represents a direct path for radioactive inventory to be released to the environment. This is consistent with the definition of a GE. The GE is declared on the occurrence of the loss or IMMINENT loss of function of <u>all three</u> barriers.

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CG7 (continued)

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.

<u>EAL #1</u>

A number of variables can have a significant impact on heat removal capability challenging the fuel clad barrier. Examples include; mid-loop, reduced level/flange level, head in place, cavity flooded, RCS venting strategy, decay heat removal system design, vortexing pre-disposition, steam generator U-tube draining.

Analysis indicates that core damage may occur within an hour following continued core uncovery therefore, 30 minutes was conservatively chosen.

If CONTAINMENT CLOSURE is re-established prior to exceeding the 30 minute core uncovery time limit then escalation to GE would not occur.

Site shutdown contingency plans typically provide for re-establishing CONTAINMENT CLOSURE following a loss of heat removal or RCS inventory functions.

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.

<u>EAL #2</u>

Sump and tank level increases must be evaluated against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of RCS leakage.

In the cold shutdown mode, normal RCS level and RPV level instrumentation systems will usually be available. In the refueling mode, normal means of RPV level indication may not be available. Redundant means of RPV level indication will usually be installed (including the ability to monitor level visually) to assure that the ability to monitor level will not be interrupted. However, if all level indication were to be lost during a loss of RCS inventory event, the operators would need to determine that RPV inventory loss was occurring by observing sump and tank level changes. Sump and tank level increases must be evaluated against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of RCS leakage.

As water level in the RPV lowers, the dose rate above the core will increase. The dose rate due to this core shine should result in site-specific monitor indication and possible alarm.

This EAL should conservatively estimate a site-specific dose rate setpoint indicative of core uncovery (i.e., level at TOAF).

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CG7 (continued)

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.

Site (U.S. EPR) Specific

EAL #1

Top of Active Fuel (TOAF) cannot be read by installed level instrumentation in cold modes. {TOAF corresponds to plant elevation 96.0 feet (29.3 meters)}

EAL #2

U.S. EPR design does not have a Containment Building Sump. The IRWST is the point of drainage.

{To be added to support EAL value/wording}

Basis Reference(s):

1. NEI 99-01 Rev 5, CG1
2. {TS, CALC, procedure or drawing references}

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CS7

Initiating Condition:

Loss of RPV inventory affecting core decay heat removal capability.

Operating Mode Applicability:

5, 6

EALs:

1. a. CONTAINMENT CLOSURE not established.

   AND

   b. Loss of RPV inventory as indicated by RCS level ({JEF10 CL081}) **< {CS7.1.b}**.

   OR

2. a. CONTAINMENT CLOSURE established.

   AND

   b. RPV level **< {96.0 feet (29.3 meters)}** (top of active fuel).

   OR

3. a. RCS level cannot be monitored for **30 minutes** or longer.

   AND

   b. Loss of RPV inventory as indicated by any of the following:

   - Reactor Building Refueling Bridge Area Dose Rate Monitor ({JYK15 CR003}) **> {CS7.3.b(b1)} mR/hr**.
   - Erratic source range monitor indication.
   - UNPLANNED level rise in IRWST.

Basis:

<u>Generic</u>

Under the conditions specified by this IC, continued decrease in RCS/RPV level is indicative of a loss of inventory control. Inventory loss may be due to an RCS breach, pressure boundary leakage, or continued boiling in the RPV. Thus, declaration of a Site Area Emergency is warranted.

<u>EAL #1</u>

6” below the bottom ID of the RCS Loop should be the level equal to 6” below the bottom of the RPV loop penetration (not the low point of the loop). PWRs unable to measure this level should choose the first observable point below the bottom ID of the loop as the EAL value. If a water level instrument is not available such that the PWR EAL value cannot be determined, then EAL 3 should be used to determine if the IC has been met.

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CS7 (continued)

EAL #3

In the cold shutdown mode, normal RCS level and RPV level instrumentation systems will usually be available. In the refueling mode, normal means of RPV level indication may not be available. Redundant means of RPV level indication will usually be installed (including the ability to monitor level visually) to assure that the ability to monitor level will not be interrupted. However, if all level indication were to be lost during a loss of RCS inventory event, the operators would need to determine that RPV inventory loss was occurring by observing sump and tank level changes. Sump and tank level increases must be evaluated against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of RCS leakage.

The 30-minute duration allows sufficient time for actions to be performed to recover inventory control equipment.

As water level in the RPV lowers, the dose rate above the core will increase. The dose rate due to this core shine should result in site-specific monitor indication and possible alarm.

This EAL should conservatively estimate a site-specific dose rate setpoint indicative of core uncovery (i.e., level at TOAF).

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.

Site (U.S. EPR) Specific

EAL #1

The lowest indicated reactor water level is the bottom of the reactor coolant hot legs {(Plant Elevation +101.9 feet (31.1 meters))}. A location 6” below the reactor coolant system hot legs would be {101.4 feet (30.9 meters)}.

EAL #2

Top of Active Fuel (TOAF) cannot be read by installed level instrumentation in cold modes. {TOAF corresponds to plant elevation 96.0 feet (29.3 meters)}

EAL #3

U.S. EPR design does not have a Containment Building Sump. The IRWST is the point of drainage.

{To be added to support EAL value/wording}

Basis Reference(s):

1. NEI 99-01 Rev 5, CS1
2. 02-DCD-JAA-1200A0-001
3. 02-DCD-PPY-JE-4001-000

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CA7

Initiating Condition:

Loss of RPV inventory.

Operating Mode Applicability:

5, 6

EALs:

1. Loss of RPV inventory as indicated by RCS level ({JEF10 CL081}) **< {CA7.1}**.

   OR

2. a. RCS level cannot be monitored for **15 minutes** or longer.

   AND

   b. Loss of RPV inventory as indicated by UNPLANNED level rise in IRWST.

Basis:

<u>Generic</u>

These EALs serve as precursors to a loss of ability to adequately cool the fuel. The magnitude of this loss of water indicates that makeup systems have not been effective and may not be capable of preventing further RPV level decrease and potential core uncovery. This condition will result in a minimum emergency classification level of an Alert.

<u>EAL #1</u>

The PWR Bottom ID of the RCS Loop setpoint was chosen because at this level remote RCS level indication may be lost and loss of suction to decay heat removal systems has occurred. The Bottom ID of the RCS Loop Setpoint should be the level equal to the bottom of the RPV loop penetration (not the low point of the loop).

The inability to restore and maintain level after reaching this setpoint would be indicative of a failure of the RCS barrier.

<u>EAL #2</u>

In the cold shutdown mode, normal RCS level and RPV level instrumentation systems will usually be available. In the refueling mode, normal means of RPV level indication may not be available. Redundant means of RPV level indication will usually be installed (including the ability to monitor level visually) to assure that the ability to monitor level will not be interrupted. However, if all level indication were to be lost during a loss of RCS inventory event, the operators would need to determine that RPV inventory loss was occurring by observing sump and tank level changes. Sump and tank level increases must be evaluated against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of RCS leakage.

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CA7 (continued)

The 15-minute duration for the loss of level indication was chosen because it is half of the CS1 Site Area Emergency EAL duration. Significant fuel damage is not expected to occur until the core has been uncovered for greater than 1 hour per the analysis referenced in the CG1 basis. Therefore this EAL meets the definition for an Alert.

Site (U.S. EPR) Specific

EAL #1

The lowest indicated reactor water level is the bottom of the reactor coolant hot legs {(Plant Elevation +101.9 feet (31.1 meters)}.

EAL #2

U.S. EPR design does not have a Containment Building Sump. The IRWST is the point of drainage.

Basis Reference(s):

1. NEI 99-01 Rev 5, CA1
2. 02-DCD-JAA-1200A0-001
3. 02-DCD-PPY-JE-4001-000

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CU7

Initiating Condition:

RCS leakage.

Operating Mode Applicability:

5

EALs:

1. RCS leakage results in the inability to maintain or restore RCS level **> Procedure Established Minimum Level** for **15 minutes** or longer.

Basis:

Generic

This IC is considered to be a potential degradation of the level of safety of the plant. The inability to maintain or restore level is indicative of loss of RCS inventory.

Relief valve normal operation should be excluded from this IC. However, a relief valve that operates and fails to close per design should be considered applicable to this IC if the relief valve cannot be isolated.

The difference between CU7 and CU8 deals with the RCS conditions that exist between cold shutdown and refueling modes. In the refueling mode the RCS is not intact and RPV level and inventory are monitored by different means. In cold shutdown the RCS will normally be intact and standard RCS inventory and level monitoring means are available.

Site (U.S. EPR) Specific

RCS level in the Cold Shutdown mode is controlled within limits that are established by procedures in effect for the present conditions. There are Cold Shutdown mode evolutions that are directed by procedures that require precise control and monitoring of RCS levels that include establishment of low level limits. Examples of such evolutions include draining down to vessel flange level to prepare for reactor head flange bolt de-tensioning, and draining to mid-loop for equipment maintenance. During these evolutions it is appropriate to use the low level limit established by the procedure in effect to determine if RCS leakage is occurring and emergency declaration is required.

Basis Reference(s):

1. NEI 99-01, Rev. 5 CU1

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CU8

Initiating Condition:

UNPLANNED loss of RCS inventory.

Operating Mode Applicability:

6

EALs:

1. a. UNPLANNED RCS level drop below the RPV flange for **15 minutes** or longer when the RCS level band is established above the RPV flange.

   OR

   b. UNPLANNED RCS level drop **< Procedure Established Minimum Level** for **15 minutes** or longer when the RCS level band is established below the RPV flange.

   OR

2. a. RCS level cannot be monitored.

   AND

   b. Loss of RPV inventory as indicated by UNPLANNED rise in IRWST.

Basis:

Generic

This IC is a precursor of more serious conditions and considered to be a potential degradation of the level of safety of the plant.

Refueling evolutions that decrease RCS water level below the RPV flange are carefully planned and procedurally controlled. An UNPLANNED event that results in water level decreasing below the RPV flange, or below the planned RCS water level for the given evolution (if the planned RCS water level is already below the RPV flange), warrants declaration of an Unusual Event due to the reduced RCS inventory that is available to keep the core covered.

The allowance of 15 minutes was chosen because it is reasonable to assume that level can be restored within this time frame using one or more of the redundant means of refill that should be available. If level cannot be restored in this time frame then it may indicate a more serious condition exists.

The difference between CU7 and CU8 deals with the RCS conditions that exist between cold shutdown and refueling modes. In cold shutdown the RCS will normally be intact and standard RCS inventory and level monitoring means are available. In the refueling mode the RCS is not intact and RPV level and inventory are monitored by different means.

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CU8 (continued)

EAL #1

This EAL involves a decrease in RCS level below the top of the RPV flange that continues for 15 minutes due to an UNPLANNED event. This EAL is not applicable to decreases in flooded reactor cavity level, which is addressed by RU2.1 until such time as the level decreases to the level of the vessel flange.

EAL #2

This EAL addresses conditions in the refueling mode when normal means of core temperature indication and RCS level indication may not be available. Redundant means of RPV level indication will normally be installed (including the ability to monitor level visually) to assure that the ability to monitor level will not be interrupted. However, if all level indication were to be lost during a loss of RCS inventory event, the operators would need to determine that RPV inventory loss was occurring by observing sump and tank level changes. Sump and tank level increases must be evaluated against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of RCS leakage.

Site (U.S. EPR) Specific

U.S. EPR design does not have a Containment Building Sump. The IRWST is the point of drainage.

Basis Reference(s):

1. NEI 99-01 Rev 5, CU2

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CA10

Initiating Condition:

Inability to maintain plant in cold shutdown.

Operating Mode Applicability:

5, 6

EALs:

1. RCS temperature **> 200° F** for the specified duration on **Table C-2**.

Table C-2: RCS Reheat Duration Thresholds		
RCS	**Containment Closure**	**Duration**
Intact with Full RCS Inventory	N/A	> 60 minutes*
Not Intact OR Reduced RCS Inventory	Established	> 20 minutes*
	Not Established	0 minutes

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

OR

2. RCS pressure rise **> 10 psig** due to a loss of RCS cooling (this EAL does not apply in solid plant conditions).

Basis:

Generic

For PWRs, 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, 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 there are sequences that 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 the Technical Specification cold shutdown temperature limit when the heat removal function is available.

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CA10 (continued)

EAL #1

The RCS Reheat Duration Threshold table 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. RCS should be considered intact when the RCS pressure boundary is established (e.g., no freeze seals, nozzle dams installed or SG manways removed). The status of CONTAINMENT CLOSURE in this condition is immaterial given that the RCS is providing a high pressure barrier to fission product release to the environment. The 60 minute time frame should allow sufficient time to restore cooling without they're being a substantial degradation in plant safety.

The RCS Reheat Duration Threshold table also 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 discussed above, RCS should be assumed to be intact when the RCS pressure boundary is established (e.g., no freeze seals, nozzle dams installed or SG manways removed). 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" (discussed later in this basis) and is believed to be conservative given that a low pressure Containment barrier to fission product release is established.

Finally, complete loss of functions required for core cooling during refueling and cold shutdown modes when neither CONTAINMENT CLOSURE is established nor RCS is intact. RCS is intact when the RCS pressure boundary is in its normal condition for the cold shutdown mode of operation (e.g., no freeze seals or nozzle dams). No delay time is allowed because the evaporated reactor coolant that may be released into the Containment during this heatup condition could also be directly released to the environment.

The note (*) indicates that this EAL is not applicable if actions are successful in restoring an RCS heat removal system to operation and RCS temperature is being reduced within the specified time frame.

EAL #2

The 10 psi pressure increase addresses situations where, due to high decay heat loads, the time provided to restore temperature control, should be less than 60 minutes. The RCS pressure setpoint chosen should be 10 psi or the lowest pressure that the site can read on installed Control Board instrumentation that is equal to or greater than 10 psi.

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, CA4
2. Technical Specifications Section 1.0 Table 1.1-1, Modes

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CU10

Initiating Condition:

UNPLANNED loss of decay heat removal capability.

Operating Mode Applicability:

5, 6

EALs:

1. RCS temperature **> 200°** F due to an UNPLANNED loss of decay heat removal capability.

   OR

2. Loss of **ALL** RCS temperature and RCS level indication for **15 minutes** or longer.

Basis:

Generic

This IC is be a precursor of more serious conditions and, as a result, is considered to be a potential degradation of the level of safety of the plant. In cold shutdown the ability to remove decay heat relies primarily on forced cooling flow. Operation of the systems that provide this forced cooling may be jeopardized due to the unlikely loss of electrical power or RCS inventory. Since the RCS usually remains intact in the cold shutdown mode a large inventory of water is available to keep the core covered.

Entry into cold shutdown conditions may be attained within hours of operating at power. Entry into the refueling mode procedurally may not occur for typically 100 hours (site specific) or longer after the reactor has been shutdown. Thus the heatup threat and therefore the threat to damaging the fuel clad may be lower for events that occur in the refueling mode with irradiated fuel in the RPV (note that the heatup threat could be lower for cold shutdown conditions if the entry into cold shutdown was following a refueling). In addition, the operators should be able to monitor RCS temperature and RPV level so that escalation to the alert level will occur if required.

During refueling the level in the RPV will normally be maintained above the RPV flange. Refueling evolutions that decrease water level below the RPV flange are carefully planned and procedurally controlled. Loss of forced decay heat removal at reduced inventory may result in more rapid increases in RCS/RPV temperatures depending on the time since shutdown.

Unlike the cold shutdown mode normal means of core temperature indication and RCS level indication may not be available in the refueling mode. Redundant means of RPV level indication are therefore procedurally installed to assure that the ability to monitor level will not be interrupted. However, if all level and temperature indication were to be lost in either the cold shutdown of refueling modes, EAL 2 would result in declaration of an Unusual Event if both temperature and level indication cannot be restored within 15 minutes from the loss of both means of indication.

RECOGNITION CATEGORY
SYSTEM MALFUNCTIONS - COLD

CU10 (continued)

Site (U.S. EPR) Specific

None

Basis Reference(s):

1. NEI 99-01 Rev 5, CU4
2. Technical Specifications Section 1.0 Table 1.1-1, Modes