ATTACHMENT 2

Markup of Seabrook Station Emergency Action Levels – Initiating Conditions, Threshold Values and Basis

SEABROOK STATION
EMERGENCY ACTION LEVELS

INITIATING CONDITIONS, THRESHOLD VALUES AND BASIS

TABLE OF CONTENTS

~~DEVELOMENT OF~~ EMERGENCY ACTION LEVELS ~~FOR NON-PASSIVE REACTORS~~

1 REGULATORY BACKGROUND

1.1 OPERATING REACTORS

Title 10, Code of Federal Regulations (CFR), Energy, contains the U.S. Nuclear Regulatory Commission (NRC) regulations that apply to nuclear power facilities. Several of these regulations govern various aspects of an emergency classification scheme. A review of the relevant sections listed below will aid the reader in understanding the key terminology provided in Section 3.0 of this document.

- 10 CFR § 50.47(a)(1)(i)
- 10 CFR § 50.47(b)(4)
- 10 CFR § 50.54(q)
- 10 CFR § 50.72(a)
- 10 CFR § 50, Appendix E, IV.B, Assessment Actions
- 10 CFR § 50, Appendix E, IV.C, Activation of Emergency Organization

The above regulations are supplemented by various regulatory guidance documents. Three documents of particular relevance to NEI 99-01 are:

- NUREG-0654/FEMA-REP-1, *Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants*, October 1980. [Refer to Appendix 1, *Emergency Action Level Guidelines for Nuclear Power Plants*]
- NUREG-1022, *Event Reporting Guidelines 10 CFR § 50.72 and § 50.73*
- Regulatory Guide 1.101, *Emergency Response Planning and Preparedness for Nuclear Power Reactors*

~~The above list is not all-inclusive and it is strongly recommended that scheme developers consult with licensing/regulatory compliance personnel to identify and understand all applicable requirements and guidance. Questions may also be directed to the NEI Emergency Preparedness staff.~~

1.2 INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI)

Selected guidance in NEI 99-01 is applicable to licensees electing to use their 10 CFR 50 emergency plan to fulfill the requirements of 10 CFR 72.32 for a stand-alone ISFSI. The emergency classification levels applicable to an ISFSI are consistent with the requirements of 10 CFR § 50 and the guidance in NUREG 0654/FEMA-REP-1. The initiating conditions germane to a 10 CFR § 72.32 emergency plan (as described in NUREG-1567) are subsumed within the classification scheme for a 10 CFR § 50.47 emergency plan.

The generic ICs and EALs for an ISFSI are presented in Section ~~8~~5, ISFSI ICs/EALs. IC ~~E-HU1~~EU1 covers the spectrum of credible natural and man-made events included within the scope of an ISFSI design. ~~This IC is not applicable to installations or facilities that may process and/or repackage spent fuel (e.g., a Monitored Retrievable Storage~~

~~Facility or an ISFSI at a spent fuel processing facility). In addition, appropriate aspects of IC HU1 and IC HA1 should also be included to address a HOSTILE ACTION directed against an ISFSI.~~

The analysis of potential onsite and offsite consequences of accidental releases associated with the operation of an ISFSI is contained in NUREG-1140, *A Regulatory Analysis on Emergency Preparedness for Fuel Cycle and Other Radioactive Material Licensees.* NUREG-1140 concluded that the postulated worst-case accident involving an ISFSI has insignificant consequences to public health and safety. This evaluation shows that the maximum offsite dose to a member of the public due to an accidental release of radioactive materials would not exceed 1 rem Effective Dose Equivalent.

~~Regarding the above information, the expectations for an offsite response to an Alert classified under a 10 CFR § 72.32 emergency plan are generally consistent with those for a Notification of Unusual Event in a 10 CFR § 50.47 emergency plan (e.g., to provide assistance if requested). Also, the licensee's Emergency Response Organization (ERO) required for 10 CFR § 72.32 emergency plan is different than that prescribed for a 10 CFR § 50.47 emergency plan (e.g., no emergency technical support function).~~

1.3 NRC ORDER EA-12-051

The Fukushima Daiichi accident of March 11, 2012, was the result of a tsunami that exceeded the plant's design basis and flooded the site's emergency electrical power supplies and distribution systems. This caused an extended loss of power that severely compromised the key safety functions of core cooling and containment integrity, and ultimately led to core damage in three reactors. While the loss of power also impaired the spent fuel pool cooling function, sufficient water inventory was maintained in the pools to preclude fuel damage from the loss of cooling.

Following a review of the Fukushima Daiichi accident, the NRC concluded that several measures were necessary to ensure adequate protection of public health and safety under the provisions of the backfit rule, 10 CFR 50.109(a)(4)(ii). Among them was to provide each spent fuel pool with reliable level instrumentation to significantly enhance the ability of key decision-makers to allocate resources effectively following a beyond design basis event. To this end, the NRC issued Order EA-12-051, *Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation*, on March 12, 2012, to all US nuclear plants with an operating license, construction permit, or combined construction and operating license.

NRC Order EA-12-051 states, in part, "All licensees … shall have a reliable indication of the water level in associated spent fuel storage pools capable of supporting identification of the following pool water level conditions by trained personnel: (1) level that is adequate to support operation of the normal fuel pool cooling system, (2) level that is adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck, and (3) level where fuel remains covered and actions to implement make-up water addition should no longer be deferred." To this end, all licensees must provide:

- A primary and back-up level instrument that will monitor water level from the normal level to the top of the used fuel rack in the pool;

- A display in an area accessible following a severe event; and
- Independent electrical power to each instrument channel and provide an alternate remote power connection capability.

NEI 12-02, *Industry Guidance for Compliance with NRC Order EA-12-051, "To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation"*, provides guidance for complying with NRC Order EA-12-051.

NEI 99-01, Revision 6, includes three EALs that reflect the availability of the enhanced spent fuel pool level instrumentation associated with NRC Order EA-12-051. These EALs are included within existing IC RA2, and new ICs RS2 and RG2. Associated EAL notes, bases and developer notes are also provided.

It is recommended that these EALs be implemented when the enhanced spent fuel pool level instrumentation is available for use.

The regulatory process that licensees follow to make changes to their emergency plan, including non-scheme changes to EALs, is 10 CFR 50.54(q). In accordance with this regulation, licensees are responsible for evaluating a proposed change and determining whether or not it results in a reduction in the effectiveness of the plan. As a result of the licensee's determination, the licensee will either make the change or submit it to the NRC for prior review and approval in accordance with 10 CFR 50.90.

2 KEY TERMINOLOGY USED IN NEI 99-01

There are several key terms that appear throughout the NEI 99-01 methodology. These terms are introduced in this section to support understanding of subsequent material. As an aid to the reader, the following table is provided as an overview to illustrate the relationship of the terms to each other.

Emergency Classification Level			
Unusual Event	Alert	SAE	GE
↓	↓	↓	↓
Initiating Condition	Initiating Condition	Initiating Condition	Initiating Condition
↓	↓	↓	↓
Emergency Action Level (1) • Operating Mode Applicability • Notes • Basis	Emergency Action Level (1) • Operating Mode Applicability • Notes • Basis	Emergency Action Level (1) • Operating Mode Applicability • Notes • Basis	Emergency Action Level (1) • Operating Mode Applicability • Notes • Basis
(1) When making an emergency classification, the Emergency Director must consider all information having a bearing on the proper assessment of an Initiating Condition. This includes the Emergency Action Level (EAL) plus the associated Operating Mode Applicability, Notes and the informing Basis information. In the Recognition Category F matrices, EALs are referred to as Fission Product Barrier Thresholds; the thresholds serve the same function as an EAL.			

2.1 EMERGENCY CLASSIFICATION LEVEL (ECL)

One of a set of names or titles established by the US Nuclear Regulatory Commission (NRC) for grouping off-normal events or conditions according to (1) potential or actual effects or consequences, and (2) resulting onsite and offsite response actions. The emergency classification levels, in ascending order of severity, are:

- Notification of Unusual Event (NOUE)
- Alert
- Site Area Emergency (SAE)
- General Emergency (GE)

2.1.1 Notification of Unusual Event (NOUE)

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.

Purpose: The purpose of this classification is to assure that the first step in future response has been carried out, to bring the operations staff to a state of readiness, and to provide systematic handling of unusual event information and decision-making.

2.1.2 Alert

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

Purpose: The purpose of this classification is to assure that emergency personnel are readily available to respond if the situation becomes more serious or to perform confirmatory radiation monitoring if required, and provide offsite authorities current information on plant status and parameters.

2.1.3 Site Area Emergency

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

Purpose: The purpose of the Site Area Emergency declaration is to assure that emergency response centers are staffed, to assure that monitoring teams are dispatched, to assure that personnel required for evacuation of near-site areas are at duty stations if the situation becomes more serious, to provide consultation with offsite authorities, and to provide updates to the public through government authorities.

2.1.4 General Emergency (GE)

Events are in progress or have occurred which involve actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA PAG exposure levels offsite for more than the immediate site area.

Purpose: The purpose of the General Emergency declaration is to initiate predetermined protective actions for the public, to provide continuous assessment of information from the licensee and offsite organizational measurements, to initiate additional measures as indicated by actual or potential releases, to provide consultation with offsite authorities, and to provide updates for the public through government authorities.

2.2 Initiating Condition (IC)

An event or condition that aligns with the definition of one of the four emergency classification levels by virtue of the potential or actual effects or consequences.

Discussion: An IC describes an event or condition, the severity or consequences of which meets the definition of an emergency classification level. An IC can be expressed as a continuous, measurable parameter (e.g., RCS leakage), an event (e.g., an earthquake) or the status of one or more fission product barriers (e.g., loss of the RCS barrier).

Appendix 1 of NUREG-0654 does not contain example Emergency Action Levels (EALs) for each ECL, but rather Initiating Conditions (i.e., plant conditions that indicate that a radiological emergency, or events that could lead to a radiological emergency, has occurred). NUREG-0654 states that the Initiating Conditions form the basis for establishment by a licensee of the specific plant instrumentation readings (as applicable) which, if exceeded, would initiate the emergency classification. Thus, it is the specific instrument readings that would be the EALs.

Considerations for the assignment of a particular Initiating Condition to an emergency classification level are discussed in Section 3.

2.3 Emergency Action Level (EAL)

A pre-determined, site-specific , observable threshold for an Initiating Condition that, when met or exceeded, places the plant in a given emergency classification level.

Discussion: EAL statements may utilize a variety of criteria including instrument readings and status indications; observable events; results of calculations and analyses; entry into particular procedures; and the occurrence of natural phenomena.

2.4 Fission Product Barrier Threshold

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

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

- Fuel Clad
- Reactor Coolant System (RCS)
- Containment

Upon determination that one or more fission product barrier thresholds have been exceeded, the combination of barrier loss and/or potential loss thresholds is compared to the fission product barrier IC/EAL criteria to determine the appropriate ECL.

In some accident sequences, the ICs and EALs presented in the Abnormal

~~Radiation Levels/ Radiological Effluent (A) Recognition Category will be exceeded at the same time, or shortly after, the loss of one or more fission product barriers. This redundancy is intentional as the former ICs address radioactivity releases that result in certain offsite doses from whatever cause, including events that might not be fully encompassed by fission product barriers (e.g., spent fuel pool accidents, design containment leakage following a LOCA, etc.).~~

3 DESIGN OF THE NEI 99-01 EMERGENCY CLASSIFICATION SCHEME

3.1 ASSIGNMENT OF EMERGENCY CLASSIFICATION LEVELS (ECLS)

An effective emergency classification scheme must incorporate a realistic and accurate assessment of risk, both to plant workers and the public. There are obvious health and safety risks in underestimating the potential or actual threat from an event or condition; however, there are also risks in overestimating the threat as well (e.g., harm that may occur during an evacuation). The NEI 99-01 emergency classification scheme attempts to strike an appropriate balance between reasonably anticipated event or condition consequences, potential accident trajectories, and risk avoidance or minimization.

There are a range of "non-emergency events" reported to the US Nuclear Regulatory Commission (NRC) staff in accordance with the requirements of 10 CFR § 50.72. Guidance concerning these reporting requirements, and example events, are provided in NUREG-1022. Certain events reportable under the provisions of 10 CFR § 50.72 may also require the declaration of an emergency.

In order to align each Initiating Conditions (IC) with the appropriate ECL, it was necessary to determine the attributes of each ECL. The goal of this process is to answer the question, "What events or conditions should be placed under each ECL?" The following sources provided information and context for the development of ECL attributes.

- Assessments of the effects and consequences of different types of events and conditions
- Typical abnormal and emergency operating procedure setpoints and transition criteria
- Typical Technical Specification limits and controls
- Radiological Effluent Technical Specifications (RETS)/Offsite Dose Calculation Manual (ODCM) radiological release limits
- Review of selected Updated Final Safety Analysis Report (UFSAR) accident analyses
- Environmental Protection Agency (EPA) Protective Action Guidelines (PAGs)
- NUREG 0654, Appendix 1, *Emergency Action Level Guidelines for Nuclear Power Plants*
- Industry Operating Experience
- Input from industry subject matter experts and NRC staff members

The following ECL attributes were created by the Revision 6 Preparation Team to aid in the development of ICs and Emergency Action Levels (EALs). The team decided to include the attributes in this revision since they may be useful in briefing and training settings (e.g., helping an Emergency Director understand why a particular condition is classified as an Alert). It should be stressed that developers not attempt to redefine these attributes or apply them in any fashion that would change the generic guidance contained in this document.

The attributes of each ECL are presented below.

3.1.1 Notification of Unusual Event (NOUE)

A Notification of Unusual Event, as defined in section 2.1.1, includes but is not limited to an event or condition that involves:

(A) A precursor to a more significant event or condition.

(B) A minor loss of control of radioactive materials or the ability to control radiation levels within the plant.

(C) A consequence otherwise significant enough to warrant notification to local, State and Federal authorities.

3.1.2 Alert

An Alert, as defined in section 2.1.2, includes but is not limited to an event or condition that involves:

(A) A loss or potential loss of either the fuel clad or Reactor Coolant System (RCS) fission product barrier.

(B) An event or condition that significantly reduces the margin to a loss or potential loss of the fuel clad or RCS fission product barrier.

(C) A significant loss of control of radioactive materials resulting in an inability to control radiation levels within the plant, or a release of radioactive materials to the environment that could result in doses greater than 1% of an EPA PAG at or beyond the site boundary.

(D) A HOSTILE ACTION occurring within the OWNER CONTROLLED AREA, including those directed at an Independent Spent Fuel Storage Installation (ISFSI).

3.1.3 Site Area Emergency

A Site Area Emergency, as defined in section 2.1.3, includes but is not limited to an event or condition that involves:

(A) A loss or potential loss of any two fission product barriers – fuel clad, RCS and/or containment.

(B) A precursor event or condition that may lead to the loss or potential loss of multiple fission product barriers within a relatively short period of time. Precursor events and conditions of this type include those that challenge the monitoring and/or control of multiple safety systems.

(C) A release of radioactive materials to the environment that could result in doses greater than 10% of an EPA PAG at or beyond the site boundary.

(D) A HOSTILE ACTION occurring within the plant PROTECTED AREA.

~~3.1.4 General Emergency~~

~~A General Emergency, as defined in section 2.1.4, includes but is not limited to an event or condition that involves:~~

~~(A) Loss of any two fission product barriers AND loss or potential loss of the third barrier - fuel clad, RCS and/or containment.~~

~~(B) A precursor event or condition that, unmitigated, may lead to a loss of all three fission product barriers. Precursor events and conditions of this type include those that lead directly to core damage and loss of containment integrity.~~

~~(C) A release of radioactive materials to the environment that could result in doses greater than an EPA PAG at or beyond the site boundary.~~

~~(D) A HOSTILE ACTION resulting in the loss of key safety functions (reactivity control, core cooling/RPV water level or RCS heat removal) or damage to spent fuel.~~

~~3.1.5 Risk-Informed Insights~~

~~Emergency preparedness is a defense-in-depth measure that is independent of the assessed risk from any particular accident sequence; however, the development of an effective emergency classification scheme can benefit from a review of risk-based assessment results. To that end, the development and assignment of certain ICs and EALs also considered insights from several site-specific probabilistic safety assessments (PSA - also known as probabilistic risk assessment, PRA). Some generic insights from this review included:~~

~~1. Accident sequences involving a prolonged loss of all AC power are significant contributors to core damage frequency at many Pressurized Water Reactors (PWRs) and Boiling Water Reactors (BWRs). For this reason, a loss of all AC power for greater than 15 minutes, with the plant at or above Hot Shutdown, was assigned an ECL of Site Area Emergency. Precursor events to a loss of all AC power were also included as an Unusual Event and an Alert.~~

~~A station blackout coping analyses performed in response to 10 CFR § 50.63 and Regulatory Guide 1.155, *Station Blackout*, may be used to determine a time-based criterion to demarcate between a Site Area Emergency and a General Emergency. The time dimension is critical to a properly anticipatory emergency declaration since the goal is to maximize the time available for State and local officials to develop and implement offsite protective actions.~~

~~2. For severe core damage events, uncertainties exist in phenomena important to accident progressions leading to containment failure. Because of these uncertainties, predicting the status of containment integrity may be difficult under severe accident conditions. This is why maintaining containment integrity alone following sequences leading to severe core damage is an insufficient basis for not escalating to a General Emergency.~~

~~3. PSAs indicated that leading contributors to latent fatalities were sequences involving a containment bypass, a large Loss of Coolant Accident (LOCA) with early~~

containment failure, a Station Blackout lasting longer than the site-specific coping period, and a reactor coolant pump seal failure. The generic EAL methodology needs to be sufficiently rigorous to address these sequences in a timely fashion.

3.2 Types of Initiating Conditions and Emergency Action Levels

The NEI 99-01 methodology makes use of symptom-based, barrier-based and event-based ICs and EALs. Each type is discussed below.

Symptom-based ICs and EALs are parameters or conditions that are measurable over some range using plant instrumentation (e.g., core temperature, reactor coolant level, radiological effluent, etc.). When one or more of these parameters or conditions are off-normal, reactor operators will implement procedures to identify the probable cause(s) and take corrective action.

Fission product barrier-based ICs and EALs are the subset of symptom-based EALs that refer specifically to the level of challenge to the principal barriers against the release of radioactive material from the reactor core to the environment. These barriers are the fuel cladding, the reactor coolant system pressure boundary, and the containment. The barrier-based ICs and EALs consider the level of challenge to each individual barrier - potentially lost and lost - and the total number of barriers under challenge.

Event-based ICs and EALs define a variety of specific occurrences that have potential or actual safety significance. These include the failure of an automatic reactor scram/trip to shut down the reactor, natural phenomena (e.g., an earthquake), or man-made hazards such as a toxic gas release.

3.3 NSSS Design Differences

The NEI 99-01 emergency classification scheme accounts for the design differences between PWRs and BWRs by specifying EALs unique to each type of Nuclear Steam Supply System (NSSS). There are also significant design differences among PWR NSSSs; therefore, guidance is provided to aid in the development of EALs appropriate to different PWR NSSS types.

Developers will need to consider the relevant aspects of their plant's design and operating characteristics when converting the generic guidance of this document into a site-specific classification scheme. The goal is to maintain as much fidelity as possible to the intent of generic ICs and EALs within the constraints imposed by the plant design and operating characteristics. To this end, developers of a scheme for an advanced non-passive reactor may need to add, modify or delete some information contained in this document; these changes will be reviewed for acceptability by the NRC as part of the scheme approval process.

The guidance in NEI 99-01 is not applicable to advanced passive light water reactor designs. An Emergency Classification Scheme for this type of plant should be developed in accordance with NEI 07-01, *Methodology for Development of Emergency Action Levels, Advanced Passive Light Water Reactors*.

3.41.4 ORGANIZATION AND PRESENTATION OF GENERIC INFORMATION

The scheme's generic information is organized by Recognition Category in the following order.

- R - Abnormal Radiation Levels / Radiological Effluent – Section 6
- C - Cold Shutdown / Refueling System Malfunction – Section 7
- E - Independent Spent Fuel Storage Installation (ISFSI) – Section 8
- F - Fission Product Barrier – Section 9
- H - Hazards and Other Conditions Affecting Plant Safety – Section 10
- S-M - System Malfunction – Section 11

The following information and guidance is provided for each IC:

ECL – the assigned emergency classification level for the IC.

Initiating Condition – provides a summary description of the emergency event or condition.

Operating Mode Applicability – Lists the modes during which the IC and associated EAL(s) are applicable (i.e., are to be used to classify events or conditions).

Emergency Action Level(s) – Provides reports and indications that are considered to meet the intent of the IC. Developers should address each example EAL. If the generic approach to the development of an example EAL cannot be used (e.g., an assumed instrumentation range is not available at the plant), the developer should attempt to specify an alternate means for identifying entry into the IC.

For Recognition Category F, the fission product barrier thresholds are presented in tables applicable to BWRs and PWRs, and arranged by fission product barrier and the degree of barrier challenge (i.e., potential loss or loss). This presentation method shows the synergism among the thresholds, and supports accurate assessments.

Basis – Provides background information that explains the intent and application of the IC and EALs. In some cases, the basis also includes relevant source information and references.

- **Developer Notes** – Information that supports the development of the site-specific ICs and EALs. This may include clarifications, references, examples, instructions for calculations, etc. Developer notes should not be included in the site's emergency classification scheme basis document. Developers may elect to include information resulting from a developer note action in a basis section.

- **ECL Assignment Attributes** – Located within the Developer Notes section, specifies the attribute used for assigning the IC to a given ECL.

~~3.5~~1.5 IC AND EAL MODE APPLICABILITY

~~The NEI 99-01 emergency classification scheme was developed recognizing that the applicability of ICs and EALs will vary with plant mode. For example, some symptom-based ICs and EALs can be assessed only during the power operations, startup, or hot standby/shutdown modes of operation when all fission product barriers are in place, and plant instrumentation and safety systems are fully operational. In the cold shutdown and refueling modes, different symptom-based ICs and EALs will come into play to reflect the opening of systems for routine maintenance, the unavailability of some safety system components and the use of alternate instrumentation.~~

The following table shows which Recognition Categories are applicable in each plant mode. The ICs and EALs for a given Recognition Category are applicable in the indicated modes.

MODE APPLICABILITY MATRIX

	Category					
Mode	**R**	**C**	**E**	**F**	**H**	**~~S~~M**
Power Operations	X		X	X	X	X
Startup	X		X	X	X	X
Hot Standby	X		X	X	X	X
Hot Shutdown	X		X	X	X	X
Cold Shutdown	X	X	X		X	
Refueling	X	X	X		X	
Defueled	X	X	X		X	

Operating Modes

Technical Specifications

Commented [DWS1]: V1 TS Table 1.2 Mode Definition

TABLE 1.2

MODE		Reactivity Condition, Keff	% Rated Thermal Power*	Average Coolant Temperature
1.	Power Operation	≥ 0.99	> 5%	≥ 350°F
2.	Startup	≥ 0.99	≤ 5%	≥ 350°F
3.	Hot Standby	< 0.99	0	≥ 350°F
4.	Hot Shutdown	< 0.99	0	350 °F > Tavg >200 °F
5.	Cold Shutdown	< 0.99	0	< 200 °F
6.	Refueling**	NA	0	< 140 °F
NA	Defueled	All fuel removed from the reactor vessel (full core offload during refueling or extended outage)		

*Excluding decay heat.

**Fuel in the reactor vessel with the vessel head closure bolts less than fully tensioned or with the head removed.

~~Power Operations (1): Reactor Power > 5%, Keff ≥ 0.99~~

~~Startup (2): Reactor Power ≤ 5%, Keff ≥ 0.99~~

~~Hot Standby (3): RCS ≥ 350 °F, Keff < 0.99~~

~~Hot Shutdown (4): 200 °F < RCS < 350 °F, Keff < 0.99~~

~~Cold Shutdown (5): RCS < 200 °F, Keff < 0.99~~

~~Refueling (6): One or more vessel head closure bolts less than fully tensioned~~

~~Defueled (None): All fuel removed from the reactor vessel (i.e., full core offload during refueling or extended outage).~~

1.6 BASIS DOCUMENT

The basis document is an integral part of an emergency classification scheme. The material in this document supports proper emergency classification decision-making by providing informing background and development information in a readily accessible format. It can be referred to in training situations and when making an actual emergency classification, if necessary. The document is also useful for establishing configuration management controls for EP-related equipment and explaining an emergency classification to offsite authorities. The content of the basis document includes:

- A site-specific Mode Applicability Matrix and description of operating modes (see Section 1.5).

- A discussion of the emergency classification and declaration process (see Section 2).
- Each Initiating Condition along with the associated EALs or fission product barrier thresholds, Operating Mode Applicability, Notes and Basis information (see Sections 3-8).
- A listing of acronyms and defined terms (see Appendices A and B, respectively).

A basis section should not contain information that could modify the meaning or intent of the associated IC or EAL. Such information should be incorporated within the IC or EAL statements, or as an EAL Note. Information in the Basis should only clarify and inform decision-making for an emergency classification.

Basis information should be readily available to be referenced, if necessary, by the Short Term Emergency Director/Site Emergency Director (STED/SED). For example, a copy of the basis document could be maintained in the appropriate emergency response facilities.

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

1.7 EAL/THRESHOLD REFERENCES TO AOP AND EOP SETPOINTS/CRITERIA

The criteria/values used in several EALs and fission product barrier thresholds may be drawn from AOPs and EOPs. This approach is intended to maintain good alignment between operational diagnoses and emergency classification assessments. Appropriate administrative controls are in place to ensure that a subsequent change to an AOP or EOP is screened to determine if an evaluation pursuant to 10 CFR 50.54(q) is required.

4 SITE-SPECIFIC SCHEME DEVELOPMENT GUIDANCE

This section provides detailed guidance for developing a site-specific emergency classification scheme. Conceptually, the approach discussed here mirrors the approach used to prepare emergency operating procedures – generic material prepared by reactor vendor owners groups is converted by each nuclear power plant into site-specific emergency operating procedures. Likewise, the emergency classification scheme developer will use the generic guidance in NEI 99-01 to prepare a site-specific emergency classification scheme and the associated basis document.

It is important that the NEI 99-01 emergency classification scheme be implemented as an integrated package. Selected use of portions of this guidance is strongly discouraged as it will lead to an inconsistent or incomplete emergency classification scheme that will likely not receive the necessary regulatory approval.

4.1 GENERAL IMPLEMENTATION GUIDANCE

The guidance in NEI 99-01 is not intended to be applied to plants "as-is"; however, developers should attempt to keep their site-specific schemes as close to the generic guidance as possible. The goal is to meet the intent of the generic Initiating Conditions (ICs) and Emergency Action Levels (EALs) within the context of site-specific characteristics – locale, plant design, operating features, terminology, etc. Meeting this goal will result in a shorter and less cumbersome NRC review and approval process, closer alignment with the schemes of other nuclear power plant sites and better positioning to adopt future industry-wide scheme enhancements.

When properly developed, the ICs and EALs should be unambiguous and readily assessable.

As discussed in Section 3, the generic guidance includes ICs and example EALs. It is the intent of this guidance that both be included in site-specific documents as each serves a specific purpose. The IC is the fundamental event or condition requiring a declaration. The EAL(s) is the pre-determined threshold that defines when the IC is met. If some feature of the plant location or design is not compatible with a generic IC or EAL, efforts should be made to identify an alternate IC or EAL.

If an IC or EAL includes an explicit reference to a mode dependent technical specification limit that is not applicable to the plant, then that IC and/or EAL need not be included in the site-specific scheme. In these cases, developers must provide adequate documentation to justify why the IC and/or EAL were not incorporated (i.e., sufficient detail to allow a third party to understand the decision not to incorporate the generic guidance).

Useful acronyms and abbreviations associated with the NEI 99-01 emergency classification scheme are presented in Appendix A, Acronyms and Abbreviations. Site-specific entries may be added if necessary.

Many words or terms used in the NEI 99-01 emergency classification scheme have scheme-specific definitions. These words and terms are identified by being set in all capital letters (i.e., ALL CAPS). The definitions are presented in Appendix B,

Definitions.

Below are examples of acceptable modifications to the generic guidance. These may be incorporated depending upon site developer and user preferences.

- The ICs within a Recognition Category may be placed in reverse order for presentation purposes (e.g., start with a General Emergency at the left/top of a user aid, followed by Site Area Emergency, Alert and NOUE).
- The Initiating Condition numbering may be changed.
- The first letter of a Recognition Category designation may be changed, as follows, provided the change is carried through for all of the associated IC identifiers.

  - R may be used in lieu of A
  - M may be used in lieu of S

For example, the Abnormal Radiation Levels / Radiological Effluent category designator "A" (for Abnormal) may be changed to "R" (for Radiation). This means that the associated ICs would be changed to RU1, RU2, RA1, etc.

- The ICs and EALs from Recognition Categories S and C may be incorporated into a common presentation method (e.g., one table) provided that all related notes and mode applicability requirements are maintained.
- The ICs and EALs for Emergency Director judgment and security-related events may be placed under separate Recognition Categories.
- The terms EAL and threshold may be used interchangeably.

The material in the Developer Notes section is included to assist developers with crafting correct IC and EAL statements. This material is not required to be in the final emergency classification scheme basis document.

4.2 Critical Characteristics

As discussed above, developers are encouraged to keep their site-specific schemes as close to the generic guidance as possible. When crafting the scheme, developers should satisfy themselves that certain critical characteristics have been met. These critical characteristics are listed below.

- The ICs, EALs, Operating Mode Applicability criteria, Notes and Basis information are consistent with industry guidance; while the actual wording may be different, the classification intent is maintained. With respect to Recognition Category F, a site-specific scheme must include some type of user aid to facilitate timely and accurate classification of fission product barrier losses and/or potential losses. The user aid logic must be consistent with the classification logic presented in Section 9.
- The ICs, EALs, Operating Mode Applicability criteria, Notes and Basis information are technically complete and accurate (i.e., they contain the information necessary to make a correct classification).
- EAL statements use objective criteria and observable values.
- ICs, EALs, Operating Mode Applicability and Note statements and formatting consider human factors and are user-friendly.

- The scheme facilitates upgrading and downgrading of the emergency classification where necessary.
- The scheme facilitates classification of multiple concurrent events or conditions.

4.3 Instrumentation Used for EALs

Instrumentation referenced in EAL statements should include that described in the emergency plan section which addresses 10 CFR 50.47(b)(8) and (9) and/or Chapter 7 of the FSAR. Instrumentation used for EALs need not be safety-related, addressed by a Technical Specification or ODCM/RETS control requirement, nor powered from an emergency power source; however, EAL developers should strive to incorporate instrumentation that is reliable and routinely maintained in accordance with site programs and procedures. Alarms referenced in EAL statements should be those that are the most operationally significant for the described event or condition.

Scheme developers should ensure that specified values used as EAL setpoints are within the calibrated range of the referenced instrumentation, and consider any automatic instrumentation functions that may impact accurate EAL assessment. In addition, EAL setpoint values should not use terms such as "off-scale low" or "off-scale high" since that type of reading may not be readily differentiated from an instrument failure. Findings and violations related to EAL instrumentation issues may be located on the NRC website.

4.4 Presentation of Scheme Information to Users

The US Nuclear Regulatory Commission (NRC) expects licensees to establish and maintain the capability to assess, classify and declare an emergency condition promptly within 15 minutes after the availability of indications to plant operators that an emergency action level has been, or may be, exceeded. When writing an emergency classification procedure and creating related user aids, the developer must determine the presentation method(s) that best supports the end users by facilitating accurate and timely emergency classification. To this end, developers should consider the following points.

- The first users of an emergency classification procedure are the operators in the Control Room. During the allowable classification time period, they may have responsibility to perform other critical tasks, and will likely have minimal assistance in making a classification assessment.
- As an emergency situation evolves, members of the Control Room staff are likely to be the first personnel to notice a change in plant conditions. They can assess the changed conditions and, when warranted, recommend a different emergency classification level to the Technical Support Center (TSC) and/or Emergency Operations Facility (EOF).
- Emergency Directors in the TSC and/or EOF will have more opportunity to focus on making an emergency classification, and will probably have advisors from Operations available to help them.

Emergency classification scheme information for end users should be presented in a manner with which licensed operators are most comfortable. Developers will need to work closely with representatives from the Operations and Operations Training Departments to develop readily usable and easily understood classification tools (e.g., a procedure and related user aids). If necessary, an alternate method for presenting

emergency classification scheme information may be developed for use by Emergency Directors and/or Offsite Response Organization personnel.

A wallboard is an acceptable presentation method provided that it contains all the information necessary to make a correct emergency classification. This information includes the ICs, Operating Mode Applicability criteria, EALs and Notes. Notes may be kept with each applicable EAL or moved to a common area and referenced; a reference to a Note is acceptable as long as the information is adequately captured on the wallboard and pointed to by each applicable EAL. Basis information need not be included on a wallboard but it should be readily available to emergency classification decision-makers.

In some cases, it may be advantageous to develop two wallboards - one for use during power operations, startup and hot conditions, and another for cold shutdown and refueling conditions.

Alternative presentation methods for the Recognition Category F ICs and fission product barrier thresholds are acceptable and include flow charts, block diagrams, and checklist-type tables. Developers must ensure that the site-specific method addresses all possible threshold combinations and classification outcomes shown in the BWR or PWR EAL fission product barrier tables. The NRC staff considers the presentation method of the Recognition Category F information to be an important user aid and may request a change to a particular proposed method if, among other reasons, the change is necessary to promote consistency across the industry.

4.5 Integration of ICs/EALs with Plant Procedures

A rigorous integration of IC and EAL references into plant operating procedures is not recommended. This approach would greatly increase the administrative controls and workload for maintaining procedures. On the other hand, performance challenges may occur if recognition of meeting an IC or EAL is based solely on the memory of a licensed operator or an Emergency Director, especially during periods of high stress.

Developers should consider placing appropriate visual cues (e.g., a step, note, caution, etc.) in plant procedures alerting the reader/user to consult the site emergency classification procedure. Visual cues could be placed in emergency operating procedures, abnormal operating procedures, alarm response procedures, and normal operating procedures that apply to cold shutdown and refueling modes. As an example, a step, note or caution could be placed at the beginning of an RCS leak abnormal operating procedure that reminds the reader that an emergency classification assessment should be performed.

4.6 Basis Document

A basis document is an integral part of an emergency classification scheme. The material in this document supports proper emergency classification decision-making by providing informing background and development information in a readily accessible format. It can be referred to in training situations and when making an actual emergency classification, if necessary. The document is also useful for establishing configuration management controls for EP-related equipment and explaining an emergency classification to offsite authorities. The content of the basis document should include, at

a minimum, the following:

- A site-specific Mode Applicability Matrix and description of operating modes, similar to that presented in section 3.5.
- A discussion of the emergency classification and declaration process reflecting the material presented in Section 5. This material may be edited as needed to align with site-specific emergency plan and implementing procedure requirements.
- Each Initiating Condition along with the associated EALs or fission product barrier thresholds, Operating Mode Applicability, Notes and Basis information.
- A listing of acronyms and defined terms, similar to that presented in Appendices A and B, respectively. This material may be edited as needed to align with site-specific characteristics.
- Any site-specific background or technical appendices that the developers believe would be useful in explaining or using elements of the emergency classification scheme.

A Basis section should not contain information that could modify the meaning or intent of the associated IC or EAL. Such information should be incorporated within the IC or EAL statements, or as an EAL Note. Information in the Basis should only clarify and inform decision-making for an emergency classification.

Basis information should be readily available to be referenced, if necessary, by the Emergency Director. For example, a copy of the basis document could be maintained in the appropriate emergency response facilities.

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

4.7 EAL/Threshold References to AOP and EOP Setpoints/Criteria

As reflected in the generic guidance, the criteria/values used in several EALs and fission product barrier thresholds may be drawn from a plant's AOPs and EOPs. This approach is intended to maintain good alignment between operational diagnoses and emergency classification assessments. Developers should verify that appropriate administrative controls are in place to ensure that a subsequent change to an AOP or EOP is screened to determine if an evaluation pursuant to 10 CFR 50.54(q) is required.

4.8 Developer and User Feedback

Questions or comments concerning the material in this document may be directed to the NEI Emergency Preparedness staff, NEI EAL task force members or submitted to the Emergency Preparedness Frequently Asked Questions process.

~~5~~2 GUIDANCE ON MAKING EMERGENCY CLASSIFICATIONS

~~5.1~~2.1 GENERAL CONSIDERATIONS

When making an emergency classification, the ~~Emergency Director~~STED/SED must consider all information having a bearing on the proper assessment of an Initiating Condition (IC). This includes the Emergency Action Level (EAL) plus the associated Operating Mode Applicability, Notes and the informing Basis information. In the Recognition Category F matrices, EALs are referred to as Fission Product Barrier Thresholds; the thresholds serve the same function as an EAL.

NRC regulations require the licensee to establish and maintain the capability to assess, classify, and declare an emergency condition within 15 minutes after the availability of indications to plant operators that an emergency action level has been exceeded and to promptly declare the emergency condition as soon as possible following identification of the appropriate emergency classification level. The NRC staff has provided guidance on implementing this requirement in NSIR/DPR-ISG-01, Interim Staff Guidance, *Emergency Planning for Nuclear Power Plants.*

All emergency classification assessments should be based upon valid indications, reports or conditions. A valid indication, report, or condition, is one that has been verified through appropriate means such that there is no doubt regarding the indicator's operability, the condition's existence, or the report's accuracy. For example, validation could be accomplished through an instrument channel check, response on related or redundant indicators, or direct observation by plant personnel. The validation of indications should be completed in a manner that supports timely emergency declaration.

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

A planned work activity that results in an expected event or condition which meets or exceeds an EAL does not warrant an emergency declaration provided that 1) the activity proceeds as planned and 2) the plant remains within the limits imposed by the operating license. Such activities include planned work to test, manipulate, repair, maintain or modify a system or component. In these cases, the controls associated with the planning, preparation and execution of the work will ensure that compliance is maintained with all aspects of the operating license provided that the activity proceeds and concludes as expected. Events or conditions of this type may be subject to the reporting requirements of 10 § CFR 50.72.

The assessment of some EALs is based on the results of analyses that are necessary to ascertain whether a specific EAL threshold has been exceeded ~~(e.g., dose assessments, chemistry sampling, RCS leak rate calculation, etc.)~~; the EAL and/or the associated basis discussion will identify the necessary analysis. In these cases, the 15-minute declaration period starts with the availability of the analysis results that show the threshold to be exceeded (i.e., this is the time that the EAL information is first available). The NRC

expects licensees to establish the capability to initiate and complete EAL-related analyses within a reasonable period of time ~~(e.g., maintain the necessary expertise on-shift)~~.

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

~~5.2~~2.2 Classification Methodology

To make an emergency classification, the user will compare an event or condition (i.e., the relevant plant indications and reports) to an EAL(s) and determine if the EAL has been met or exceeded. The evaluation of an EAL(s) must be consistent with the related Operating Mode Applicability and Notes. If an EAL has been met or exceeded, then the IC is considered met and the associated ECL is declared in accordance with plant procedures.

When assessing an EAL that specifies a time duration for the off-normal condition, the "clock" for the EAL time duration runs concurrently with the emergency classification process "clock." For a full discussion of this timing requirement, refer to NSIR/DPR-ISG-01.

~~5.3~~2.3 Classification of Multiple Events and Conditions

When multiple emergency events or conditions are present, the user will identify all met or exceeded EALs. The highest applicable ECL identified during this review is declared. For example:

- If an Alert EAL and a Site Area Emergency EAL are met, ~~whether at one unit or at two different units,~~ a Site Area Emergency should be declared.

There is no "additive" effect from multiple EALs meeting the same ECL. For example:

- If two Alert EALs are met, ~~whether at one unit or at two different units,~~ an Alert should be declared.

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

~~5.4~~2.4 Consideration of Mode Changes During Classification

The mode in effect at the time that an event or condition occurred, and prior to any plant or operator response, is the mode that determines whether or not an IC is applicable. If an event or condition occurs, and results in a mode change before the emergency is

declared, the emergency classification level is still based on the mode that existed at the time that the event or condition was initiated (and not when it was declared).

Once a different mode is reached, any new event or condition, not related to the original event or condition, requiring emergency classification should be evaluated against the ICs and EALs applicable to the operating mode at the time of the new event or condition.

For events that occur in Cold Shutdown or Refueling, escalation is via EALs that are applicable in the Cold Shutdown or Refueling modes, even if Hot Shutdown (or a higher mode) is entered during the subsequent plant response. In particular, the fission product barrier EALs are applicable only to events that initiate in the Hot Shutdown mode or higher.

~~Once a different mode is reached, any new event or condition, not related to the original event or condition, requiring emergency classification should be evaluated against the ICs and EALs applicable to the operating mode at the time of the new event or condition. For events that occur in Cold Shutdown or Refueling, escalation is via EALs that are applicable in the Cold Shutdown or Refueling modes, even if Hot Shutdown (or a higher mode) is entered during the subsequent plant response. In particular, the fission product barrier EALs are applicable only to events that initiate in the Hot Shutdown mode or higher.~~

~~5.5~~2.5 CLASSIFICATION OF IMMINENT CONDITIONS

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

~~5.6~~2.6 EMERGENCY CLASSIFICATION LEVEL UPGRADING AND DOWNGRADING

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

The following approach to downgrading or terminating an ECL is recommended.

ECL	Action When Condition No Longer Exists
Unusual Event	Terminate the emergency in accordance with plant procedures.
Alert	Downgrade or terminate the emergency in accordance with plant procedures.
Site Area Emergency with no long-term plant damage	Downgrade or terminate the emergency in accordance with plant procedures.

Site Area Emergency with long-term plant damage	Terminate the emergency and enter recovery in accordance with plant procedures.
General Emergency	Terminate the emergency and enter recovery in accordance with plant procedures.

~~As noted above, gGuidance concerning classification of rapidly escalating events or conditions is provided in RIS 2007-02.~~

~~5.7~~2.7 CLASSIFICATION OF SHORT-LIVED EVENTS

~~As discussed in Section 3.2, e~~Event-based ICs and EALs define a variety of specific occurrences that have potential or actual safety significance. By their nature, some of these events may be short-lived and, thus, over before the emergency classification assessment can be completed. ~~If an event occurs that meets or exceeds an EAL, the associated ECL must be declared regardless of its continued presence at the time of declaration.~~ Examples of such events include a failure of the reactor protection system to automatically scram/trip the reactor followed by a successful manual scram/trip or an earthquake.

~~5.8~~2.8 CLASSIFICATION OF TRANSIENT CONDITIONS

Many of the ICs and/or EALs contained in this document employ time-based criteria. These criteria will require that the IC/EAL conditions be present for a defined period of time before an emergency declaration is warranted. In cases where no time-based criterion is specified, it is recognized that some transient conditions may cause an EAL to be met for a brief period of time ~~(e.g., a few seconds to a few minutes)~~. The following guidance should be applied to the classification of these conditions.

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

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

> An ATWS occurs and the auxiliary feedwater system fails to automatically start. Steam generator levels rapidly decrease and the plant enters an inadequate RCS heat removal condition (a potential loss of both the fuel clad and RCS barriers). If an operator manually starts the auxiliary feedwater system in accordance with an EOP step and clears the inadequate RCS heat removal condition prior to an emergency declaration, then the classification should be based on the ATWS only.

It is important to stress that the 15-minute emergency classification assessment period is not a "grace period" during which a classification may be delayed to allow the performance of a corrective action that would obviate the need to classify the event; emergency classification assessments must be deliberate and timely, with no undue

delays. The provision discussed above addresses only those rapidly evolving situations where an operator is able to take a successful corrective action prior to the ~~Emergency Director~~STED/SED completing the review and steps necessary to make the emergency declaration. This provision is included to ensure that any public protective actions resulting from the emergency classification are truly warranted by the plant conditions.

~~5.9~~2.9 After-the-Fact Discovery of an Emergency Event or Condition

In some cases, an EAL may be met but the emergency classification was not made at the time of the event or condition. This situation can occur when personnel discover that an event or condition existed which met an EAL, but no emergency was declared, and the event or condition no longer exists at the time of discovery. This may be due to the event or condition not being recognized at the time or an error that was made in the emergency classification process.

In these cases, no emergency declaration is warranted; however, the guidance contained in NUREG-1022 is applicable. Specifically, the event should be reported to the NRC in accordance with 10 CFR § 50.72 within one hour of the discovery of the undeclared event or condition. The licensee should also notify appropriate State and local agencies in accordance with the agreed upon arrangements.

~~5.10 Retraction of an Emergency Declaration~~

~~Guidance on the retraction of an emergency declaration reported to the NRC is discussed in NUREG-1022.~~

63 ABNORMAL RAD LEVELS / RADIOLOGICAL EFFLUENT ICS/EALS

~~Recognition Category "A" Initiating Condition Matrix~~

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
RG1 Release of gaseous radioactivity resulting in offsite dose greater than 1,000 mrem TEDE or 5,000 mrem thyroid CDE. *Op. Modes: All*	**RS1** Release of gaseous radioactivity resulting in offsite dose greater than 100 mrem TEDE or 500 mrem thyroid CDE. *Op. Modes: All*	**RA1** Release of gaseous or liquid radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE. *Op. Modes: All*	**RU1** Release of gaseous or liquid radioactivity greater than 2 times the ~~(site-specific effluent release controlling document)~~ODCM limits for 60 minutes or longer. *Op. Modes: All*
RG2 Spent fuel pool level cannot be restored to at least ~~(site-specific Level 3 description)~~1.5 ft (Level 3) for 60 minutes or longer. *Op. Modes: All*	**RS2** Spent fuel pool level at ~~(site-specific Level 3 description)~~1.5 ft. (Level 3). *Op. Modes: All*	**RA2** Significant lowering of water level above, or damage to, irradiated fuel. *Op. Modes: All*	**RU2** UNPLANNED loss of water level above irradiated fuel. *Op. Modes: All*
		RA3 Radiation levels that IMPEDE access to equipment necessary for normal plant operations, shutdown or cooldown. *Op. Modes: All*	

Commented [DWS3]: V2 SFP Levels Drawing

Commented [DWS2]: V2 SFP Levels Drawing

RG1

ECL: General Emergency

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

Operating Mode Applicability: All

Emergency Action Levels: (1 or 2 or 3)

Notes:

- The STED/SED~~Emergency Director~~ should declare the General Emergency promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 15 minutes.
- If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.
- The pre-calculated effluent monitor values presented in EAL #1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

(1) Reading on ANY of the following radiation monitors greater than the reading shown for 15 minutes or longer:

Monitor	Reading	
RM-6528-4 (WRGM rate)	2.85E+8 uCi/sec	
	Time After Shutdown Reading	
	≤ 1 hr	> 1 hr to ≤ 2 hrs
RM-6481-1* (MSL A)	1310 mR/hr	1060 mR/hr
RM-6482-1* (MSL B)	1310 mR/hr	1060 mR/hr
RM-6482-2* (MSL C)	1310 mR/hr	1060 mR/hr
RM-6481-2* (MSL D)	1310 mR/hr	1060 mR/hr

* With release path to the environment from affected steam line, open ASDV or SRV, line is faulted, or open steam supply to 1-FW-P-37A. ~~(site-specific monitor list and threshold values)~~

Commented [DWS4]: V3 EPCALC-06-02 - Effluent Monitor Values for R EALs

Commented [DWS5]: V3 EPCALC-06-02 - Effluent Monitor Values for R EALs

OR

(2) Dose assessment using actual meteorology indicates doses greater than 1,000 mrem TEDE or 5,000 mrem thyroid CDE at or beyond ~~(site-specific dose receptor point)~~the site boundary.

Commented [DWS6]: V4 ODCM and TS Basis for Site Boundary Receptor Point

OR

(3) Field survey results indicate **EITHER** of the following at or beyond ~~(site-specific dose receptor point)~~the site boundary:

Closed window dose rates greater than 1000 mR/hr expected to continue for 60 minutes or longer.
Analyses of field survey samples indicate thyroid CDE greater than 5000 mrem for one hour of inhalation.

Commented [DWS7]: V4 ODCM and TS Basis for Site Boundary Receptor Point

Basis:

This IC addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to the EPA Protective Action Guides (PAGs). It includes both

monitored and un-monitored releases. Releases of this magnitude will require implementation of protective actions for the public.

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

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

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

RG2

~~[See Developer Notes]~~

ECL: General Emergency

Initiating Condition: Spent fuel pool level cannot be restored to at least ~~(site-specific Level 3~~ 1.5 ft. ~~description)~~ (Level 3) for 60 minutes or longer.

Operating Mode Applicability: All

Emergency Action Levels:

Note: The ~~Emergency Director~~STED/SED should declare the General Emergency promptly upon determining that 60 minutes has been exceeded, or will likely be exceeded.

(1) Spent fuel pool level cannot be restored to at least ~~(site-specific Level 3 value)~~1.5 ft. above the fuel racks~~.~~ for 60 minutes or longer as indicated by SF-LI-2616 (MPCS computer point A4172) or SF-LI-2617 (MPCS computer point A4220)~~.~~

Commented [DWS8]: V2 SFP Levels Drawing

Basis:

This IC addresses a significant loss of spent fuel pool inventory control and makeup capability leading to a prolonged uncovery of spent fuel. This condition will lead to fuel damage and a radiological release to the environment.

Post-Fukushima order EA-12-051 required the installation of reliable SFP level indication capable of identifying normal level (Level 1), SFP level 12 ft. 3 in. above the top of the fuel racks (Level 2) and SFP level 1.5 ft. above the top of the fuel racks (Level 3).

The Spent Fuel Pool Instrumentation System (SFPIS) consists of two new independent level instrument channels (SF-L-2616 and SF-L-2617) in the Spent Fuel system. The SFPIS channels will be used to monitor spent fuel pool level during and following beyond design basis events that could challenge the capability to ensure optimum protection for the stored fuel assemblies in the pool.

Each channel is capable of measuring SFP level over a span from just above the top of the spent fuel racks to the normal SFP operating water level. The SFPIS will be monitored in accordance with Beyond Design Basis guidelines contained in FSGs for Extended Loss of AC Power and Alternate SFP Makeup and Cooling.

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

RS1

ECL: Site Area Emergency

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

Operating Mode Applicability: All

Emergency Action Levels: (1 or 2 or 3)

Notes:

- The ~~Emergency Director~~STED/SED should declare the Site Area Emergency promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 15 minutes.
- If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.
- The pre-calculated effluent monitor values presented in EAL #1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

(1) Reading on ANY of the following radiation monitors greater than the reading shown for 15 minutes or longer:

Monitor	Reading	
RM-6528-4 (WRGM rate)	2.85E+7 uCi/sec	
	Time After Shutdown Reading	
	≤ 1 hr	> 1 hr to ≤ 2 hrs
RM-6481-1* (MSL A)	130 mR/hr	100 mR/hr
RM-6482-1* (MSL B)	130 mR/hr	100 mR/hr
RM-6482-2* (MSL C)	130 mR/hr	100 mR/hr
RM-6481-2* (MSL D)	130 mR/hr	100 mR/hr

* With release path to the environment from affected steam line, open ASDV or SRV, line is faulted, or open steam supply to 1-FW-P-37A.

OR ~~(site-specific monitor list and threshold values)~~

(2) Dose assessment using actual meteorology indicates doses greater than 100 mrem TEDE or 500 mrem thyroid CDE at or beyond ~~(site-specific dose receptor point)~~the site boundary.

OR

(3) Field survey results indicate **EITHER** of the following at or beyond ~~(site-specific dose receptor point)~~the site boundary:

Closed window dose rates greater than 100 mR/hr expected to continue for 60 minutes or longer.
Analyses of field survey samples indicate thyroid CDE greater than 500 mrem for one hour of inhalation.

Commented [DWS9]: V3 EPCALC-06-02 - Effluent Monitor Values for R EALs

Commented [DWS10]: V4 ODCM and TS Basis for Site Boundary Receptor Point

Commented [DWS11]: V4 ODCM and TS Basis for Site Boundary Receptor Point

Basis:

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

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

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

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

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

RS2

~~[See Developer Notes]~~

ECL: Site Area Emergency

Initiating Condition: Spent fuel pool level at ~~(site-specific Level 3 description)~~1.5 ft.(Level 3)

Commented [DWS12]: V2 SFP Levels Drawing

Operating Mode Applicability: All

Emergency Action Levels:

(1) Lowering of spent fuel pool level to ~~(site-specific Level 3 value~~1.5 ft above the fuel racks as indicated by SF-LI-2616 (MPCS computer point A4172) or SF-LI-2617 (MPCS computer point A4220)~~.)~~.

Commented [DWS13]: V2 SFP Levels Drawing

Basis:

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

Post-Fukushima order EA-12-051 required the installation of reliable SFP level indication capable of identifying normal level (Level 1), SFP level 12 ft. 3 in. above the top of the fuel racks (Level 2) and SFP level 1.5 ft. above the top of the fuel racks (Level 3).

The Spent Fuel Pool Instrumentation System (SFPIS) consists of two new independent level instrument channels (SF-L-2616 and SF-L-2617) in the Spent Fuel system. The SFPIS channels will be used to monitor spent fuel pool level during and following beyond design basis events that could challenge the capability to ensure optimum protection for the stored fuel assemblies in the pool.

Each channel is capable of measuring SFP level over a span from just above the top of the spent fuel racks to the normal SFP operating water level. The SFPIS will be monitored in accordance with Beyond Design Basis guidelines contained in FSGs for Extended Loss of AC Power and Alternate SFP Makeup and Cooling.

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

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

RA1

ECL: Alert

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

Operating Mode Applicability: All

Emergency Action Levels: (1 or 2 or 3 or 4)

Notes:

- The ~~Emergency Director~~STED/SED should declare the Alert promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.
- If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 15 minutes.
- If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.
- The pre-calculated effluent monitor values presented in EAL #1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

(1) Reading on ANY of the following radiation monitors greater than the reading shown for 15 minutes or longer:

Monitor	Reading
RM-6528-4 (WRGM rate)	2.85E+6 uCi/sec
RM-6481-1* (MSL A)	10 mR/hr
RM-6482-1* (MSL B)	10 mR/hr
RM-6482-2* (MSL C)	10 mR/hr
RM-6481-2* (MSL D)	10 mR/hr

* With release path to the environment from affected steam line, open ASDV or SRV, line is faulted, or open steam supply to 1-FW-P-37A. ~~(site-specific monitor list and threshold values)~~

Commented [DWS14]: V3 EPCALC-06-02 - Effluent Monitor Values for R EALs

OR

(2) Dose assessment using actual meteorology indicates doses greater than 10 mrem TEDE or 50 mrem thyroid CDE at or beyond ~~(site-specific dose receptor point)~~the site boundary.

Commented [DWS15]: V4 ODCM and TS Basis for Site Boundary Receptor Point

OR

(3) Analysis of a liquid effluent sample indicates a concentration or release rate that would result in doses greater than 10 mrem TEDE or 50 mrem thyroid CDE at or beyond ~~(site-specific dose receptor point)~~the site boundary for one hour of exposure.

Commented [DWS16]: V4 ODCM and TS Basis for Site Boundary Receptor Point

OR

(4) Field survey results indicate **EITHER** of the following at or beyond ~~(site-specific dose receptor point)~~the site boundary:

- Closed window dose rates greater than 10 mR/hr expected to continue for 60 minutes or longer.
- Analyses of field survey samples indicate thyroid CDE greater than 50 mrem for one hour of inhalation.

Commented [DWS17]: V4 ODCM and TS Basis for Site Boundary Receptor Point

Basis:

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

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

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

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

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

RA2

ECL: Alert

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

Operating Mode Applicability: All

Emergency Action Levels: (1 or 2 or 3)

(1) Uncovery of irradiated fuel in the REFUELING PATHWAY.

OR

(2) Damage to irradiated fuel resulting in a release of radioactivity from the fuel as indicated by high-alarm, or reading in excess of the current high-alarm setpoint **on ANY** of the following radiation monitors:

RM-6518-1	FSB High Range
RM-6562-1	FSB Vent
RM-6535A-1	Manipulator Crane
RM-6535B-1	Manipulator Crane

~~(site-specific listing of radiation monitors, and the associated readings, setpoints and/or alarms)~~**OR**

(3) Lowering of spent fuel pool level to ~~(site-specific Level 2 value)~~12 ft. 3 in. above the fuel racks on SF-LI-2616 (MPCS computer point A4172) or SF-LI-2617 (MPCS computer point A4220). ~~[*See Developer Notes*]~~

Commented [DWS18]: V5 UFSAR Table 12.3-14 - CTMT Post-LOCA Range

Commented [DWS19]: V2 SFP Levels Drawing

Basis:

REFUELING PATHWAY: The reactor refueling cavity, spent fuel pool and fuel transfer canal.

Commented [DWS20]: V6 Refueling pathway RU2 RA2

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

This IC applies to irradiated fuel that is licensed for dry storage up to the point that the loaded storage cask is sealed. Once sealed, damage to a loaded cask causing loss of the CONFINEMENT BOUNDARY is classified in accordance with IC ~~E-HU1~~EU1.

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

EAL #1

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

While an area radiation monitor could detect an increase in a dose rate due to a lowering of water

level in some portion of the REFUELING PATHWAY, the reading may not be a reliable indication of whether or not the fuel is actually uncovered. To the degree possible, readings should be considered in combination with other available indications of inventory loss.

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

EAL #2

This EAL addresses a release of radioactive material caused by mechanical damage to irradiated fuel. Damaging events may include the dropping, bumping or binding of an assembly, or dropping a heavy load onto an assembly. A rise in readings on radiation monitors should be considered in conjunction with in-plant reports or observations of a potential fuel damaging event ~~(e.g., a fuel handling accident)~~.

EAL #3

Spent fuel pool water level at this value is within the lower end of the level range necessary to prevent significant dose consequences from direct gamma radiation to personnel performing operations in the vicinity of the spent fuel pool. This condition reflects a significant loss of spent fuel pool water inventory and thus it is also a precursor to a loss of the ability to adequately cool the irradiated fuel assembles stored in the pool.

Post-Fukushima order EA-12-051 required the installation of reliable SFP level indication capable of identifying normal level (Level 1), SFP level 12 ft. 3 in. above the top of the fuel racks (Level 2) and SFP level 1.5 ft. above the top of the fuel racks (Level 3).

The Spent Fuel Pool Instrumentation System (SFPIS) consists of two new independent level instrument channels (SF-L-2616 and SF-L-2617) in the Spent Fuel system. The SFPIS channels will be used to monitor spent fuel pool level during and following beyond design basis events that could challenge the capability to ensure optimum protection for the stored fuel assemblies in the pool.

Each channel is capable of measuring SFP level over a span from just above the top of the spent fuel racks to the normal SFP operating water level. The SFPIS will be monitored in accordance with Beyond Design Basis guidelines contained in FSGs for Extended Loss of AC Power and Alternate SFP Makeup and Cooling.

Escalation of the emergency classification level would be via ICs RS1 or RS2 ~~*(see RS2 Developer Notes)*~~.

RA3

ECL: Alert

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

Operating Mode Applicability: All

Emergency Action Levels: (1 or 2)

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

(1) Dose rate greater than 15 mR/hr in **ANY** of the following areas:

Control Room RM6550
Central Alarm Station (CAS) by survey
Secondary Alarm Station (SAS) by survey ~~(other site-specific areas/rooms)~~

OR

(2) An UNPLANNED event results in radiation levels that prohibit or IMPEDE access to any of the following plant rooms or areas:

~~(site-specific list of plant rooms or areas with entry-related mode applicability identified)~~Table H1	
Area	Mode
Primary Aux Building 25 ft elevation 7 ft elevation - 26 ft elevation	1, 2, 3, 4
Turbine Building	1, 2, 3
Switchgear Rooms Essential Non-essential	1, 2, 3, 4
Steam and Feedwater Pipe chases	1, 2, 3
Waste Process Building 25 ft elevation -3 ft elevation -31 ft elevation	1, 2, 3
Containment	3, 4
Equipment Vaults	3, 4

Commented [DWS21]: V7 Ops procedures

Basis:

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

IMPEDE: Entry into an area requires extraordinary measures to facilitate entry of personnel into the affected room/area by installing temporary shielding, requiring use of non-routine protective equipment, or requesting an extension in dose limits beyond normal administrative limits.

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

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

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

- The plant is in an operating mode different than the mode specified for the affected room/area (i.e., entry is not required during the operating mode in effect at the time of the elevated radiation levels). For example, the plant is in Mode 1 when the radiation increase occurs, and the procedures used for normal operation, cooldown and shutdown do not require entry into the affected room until Mode 4.
- The increased radiation levels are a result of a planned activity that includes compensatory measures which address the temporary inaccessibility of a room or area ~~(e.g., radiography, spent filter or resin transfer, etc.)~~.
- The action for which room/area entry is required is of an administrative or record keeping nature ~~(e.g., normal rounds or routine inspections)~~.
- The access control measures are of a conservative or precautionary nature, and would not actually prevent or impede a required action.

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

RU1

ECL: Notification of Unusual Event

Initiating Condition: Release of gaseous or liquid radioactivity greater than 2 times the ~~(site-specific effluent release controlling document)~~ODCM limits for 60 minutes or longer.

Operating Mode Applicability: All

Emergency Action Levels: (1 or 2 or 3)

Notes:

- The ~~Emergency Director~~STED/SED should declare the Unusual Event promptly upon determining that 60 minutes has been exceeded, or will likely be exceeded.
- If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 60 minutes.
- If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

(1) Reading on **ANY** non-isolated effluent path radiation monitor greater than 2 times the ~~(site-specific effluent release controlling document)~~ODCM limits for 60 minutes or longer:

RM-6509-1 (WTT Disch)
RM-6521-1 (TB Sump)
RM-6519-1 (SG Blowdown)
RM-6473-1 (WT LIQ EFF)
RM-6528-4 (WRGM rate)

Commented [DWS22]: V32 UFSAR Table 11.5-1

Commented [DWS23]: V8 012_Table 03-15 - UFSAR WRGM Ranges

OR

~~(site-specific monitor list and threshold values corresponding to 2 times the controlling document limits)~~

(2) Reading on **ANY** effluent radiation monitor greater than 2 times the alarm setpoint established by a current radioactivity discharge permit for 60 minutes or longer.

OR

(3) Sample analysis for a gaseous or liquid release indicates a concentration or release rate greater than 2 times the ~~(site-specific effluent release controlling document)~~ODCM limits for 60 minutes or longer.

Basis:

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

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

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

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

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

EAL #1 - This EAL addresses normally occurring continuous radioactivity releases from monitored gaseous or liquid effluent pathways.

EAL #2 - This EAL addresses radioactivity releases that cause effluent radiation monitor readings to exceed 2 times the limit established by a radioactivity discharge permit. This EAL ~~will typically be~~is associated with planned batch releases from non-continuous release pathways ~~(e.g., radwaste, waste gas)~~.

EAL #3 - This EAL addresses uncontrolled gaseous or liquid releases that are detected by sample analyses or environmental surveys, particularly on unmonitored pathways ~~(e.g., spills of radioactive liquids into storm drains, heat exchanger leakage in river water systems, etc.)~~.

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

RU2

ECL: Notification of Unusual Event

Initiating Condition: UNPLANNED loss of water level above irradiated fuel.

Operating Mode Applicability: All

Emergency Action Levels:

(1) a. UNPLANNED water level drop in the REFUELING PATHWAY as indicated by ANY of the following:

1-SF-LI-2607 (Spent Fuel Pool Level)
1-SF-LI-2629 or 1-SF-LIT-2629-1 (Reactor Refuel Cavity Level)~~(site-specific level indications).~~

Commented [DWS24]: V9 SFP Level

AND

b. UNPLANNED rise in area radiation levels as indicated by **ANY** of the following radiation monitors:~~.~~

RM-6535-A-1, Containment Manipulator Crane
RM-6535-B-1, Containment Manipulator Crane
RM-6549-1, FSB Spent Fuel Range Low
RM-6518-1, FSB Spent Fuel Range Hi

~~(site-specific list of area radiation monitors)~~

Commented [DWS25]: V10 UFSAR Table 12.3-14 - CTMT Post-LOCA Range

Basis:

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

REFUELING PATHWAY: The reactor refueling cavity, spent fuel pool and fuel transfer canal.

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

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

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

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

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

~~7~~4 COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTION ICS/EALS

Recognition Category "C" Initiating Condition Matrix

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
CG1 Loss of reactor vessel/RCS inventory affecting fuel clad integrity with containment challenged. *Op. Modes: 5, 6*	**CS1** Loss of reactor vessel/RCS inventory affecting core decay heat removal capability. *Op. Modes: 5, 6*	**CA1** Loss of reactor vessel/RCS inventory. *Op. Modes: 5, 6*	**CU1** UNPLANNED loss of reactor vessel/RCS inventory for 15 minutes or longer. *Op. Modes: 5, 6*
		CA2 Loss of all offsite and all onsite AC power to emergency buses for 15 minutes or longer. *Op. Modes: 5, 6, Defueled*	**CU2** Loss of all but one AC power source to emergency buses for 15 minutes or longer. *Op. Modes: 5, 6, Defueled*
		CA3 Inability to maintain the plant in cold shutdown. *Op. Modes: 5, 6*	**CU3** UNPLANNED increase in RCS temperature. *Op. Modes: 5, 6*
			CU4 Loss of Vital DC power for 15 minutes or longer. *Op. Modes: 5, 6*
			CU5 Loss of all onsite or offsite communications capabilities. *Op. Modes: 5, 6, Defueled*
		CA6 Hazardous event affecting a SAFETY SYSTEM needed for the current operating mode. *Op. Modes: 5, 6*	

CG1

ECL: General Emergency

Initiating Condition: Loss of reactor vessel/RCS inventory affecting fuel clad integrity with containment challenged.

Operating Mode Applicability: 5, 6

Emergency Action Levels: (1 or 2)

Note: The ~~Emergency Director~~STED/SED should declare the General Emergency promptly upon determining that 30 minutes has been exceeded, or will likely be exceeded.

(1) a. RVLIS Full Range < 55% (-141.5 in) ~~Reactor vessel/RCS level less than (site-specific level)~~ for 30 minutes or longer.

AND

b. **ANY** indication from the Containment Challenge Table C2. ~~(see below).~~

OR

(2) a. Reactor vessel/RCS level cannot be monitored for 30 minutes or longer.

AND

b. Core uncovery is indicated by **ANY** of the following:

RM-6535A-1 (Manipulator Crane) reading greater than 9500 mR/hr
RM-6535B-1 (Manipulator Crane) reading greater than 9500 mR/hr~~(Site-specific radiation monitor) reading greater than (site-specific value)~~
Erratic source range monitor indication
UNPLANNED increase in Containment Sumps A or B~~(site-specific sump and/or tank)~~ levels of sufficient magnitude to indicate core uncovery.
~~(Other site-specific indications)~~Visual observation.

AND

c. **ANY** indication from the Containment Challenge Table C2.~~(see below).~~

Containment Challenge Table C2
CONTAINMENT INTEGRITY not established *
Containment H_2 concentration ≥ 6%~~(Explosive mixture) exists inside containment~~
UNPLANNED increase in containment pressure

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

Basis:

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

Commented [DWS26]: V11 EPCALC-06-04 - RVLIS Values

Commented [DWS27]: V10 UFSAR Table 12.3-14 – Manipulator Crane Monitor Range

Commented [DWS28]: V13 Containment Sumps

Commented [DWS29]: V14 H2 concentration in containment

CONTAINMENT INTEGRITY: The procedurally defined conditions or actions taken to secure containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions.

This IC addresses the inability to restore and maintain reactor vessel level above the top of active fuel with containment challenged. This condition represents actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity. Releases can be reasonably expected to exceed EPA PAG exposure levels offsite for more than the immediate site area.

Following an extended loss of core decay heat removal and inventory makeup, decay heat will cause reactor coolant boiling and a further reduction in reactor vessel level. If RCS/reactor vessel level cannot be restored, fuel damage is probable.

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

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

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

Manipulator Crane setpoint of 9500 mR/hr is 95% of the monitor range.

In EAL 2.b, the 30-minute criterion is tied to a readily recognizable event start time (i.e., the total loss of ability to monitor level), and allows sufficient time to monitor, assess and correlate reactor and plant conditions to determine if core uncovery has actually occurred (i.e., to account for various accident progression and instrumentation uncertainties). It also allows sufficient time for performance of actions to terminate leakage, recover inventory control/makeup equipment and/or restore level monitoring.

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

RVLIS LEVEL (%)	VESSEL LEVEL (inches from vessel flange)
~108	119.8
100	81.3
90	31.8
80	-17.7

70	-67.2	
63	-101.9	RC-LI-9405, RC-LIT-9467, and the Tygon Tube do not indicate reactor vessel level when actual level is less than -95" due to the weir on the RCP discharge.
60	-116.7	
55	-141.5	
50	-166.2	
40	-215.7	
30	-265.2	
20	-314.7	
10	-364.2	
0	-413.7	

These EALs address 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.*

Reference:
FSAR Table 12.3-14

CS1

ECL: Site Area Emergency

Initiating Condition: Loss of reactor vessel/RCS inventory affecting core decay heat removal capability.

Operating Mode Applicability: 5, 6

Emergency Action Levels: (1 or 2 or 3)

Note: The ~~Emergency Director~~STED/SED should declare the Site Area Emergency promptly upon determining that 30 minutes has been exceeded, or will likely be exceeded.

(1) a. CONTAINMENT INTEGRITY not established.

AND

b. ~~Reactor vessel/RCS level less than~~ RVLIS Full Range < 63% (-101.9 in) ~~(site-specific level)~~.

Commented [DWS30]: V11 EPCALC-06-04 - RVLIS Values

OR

(2) a. CONTAINMENT INTEGRITY established.

AND

b. RVLIS Full Range < 55% (-141.5 in) ~~Reactor vessel/RCS level less than (site-specific level)~~.

Commented [DWS31]: V11 EPCALC-06-04 - RVLIS Values

OR

(3) a. Reactor vessel/RCS level cannot be monitored for 30 minutes or longer.

AND

b. Core uncovery is indicated by **ANY** of the following:

RM-6535A-1 (Manipulator Crane) reading greater than 9500 mR/hr
RM-6535B-1 (Manipulator Crane) reading greater than 9500 mR/hr ~~(Site-specific radiation monitor) reading greater than (site-specific value)~~
Erratic source range monitor indication ~~*[PWR]*~~
UNPLANNED increase in Containment Sumps A or B ~~(site-specific sump and/or tank)~~ levels of sufficient magnitude to indicate core uncovery
~~(Other site-specific indications)~~Visual observation.

Commented [DWS32]: V12 UFSAR Table 12.3-14 - CTMT Post-LOCA Range

Commented [DWS33]: V13 Containment Sumps

Basis:

CONTAINMENT INTEGRITY: The procedurally defined conditions or actions taken to secure containment and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions.

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

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

Following an extended loss of core decay heat removal and inventory makeup, decay heat will cause reactor coolant boiling and a further reduction in reactor vessel level. If RCS/reactor vessel level cannot be restored, fuel damage is probable.

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

In EAL 3.a, the 30-minute criterion is tied to a readily recognizable event start time (i.e., the total loss of ability to monitor level), and allows sufficient time to monitor, assess and correlate reactor and plant conditions to determine if core uncovery has actually occurred (i.e., to account for various accident progression and instrumentation uncertainties). It also allows sufficient time for performance of actions to terminate leakage, recover inventory control/makeup equipment and/or restore level monitoring. Manipulator Crane setpoint of 9500 mR/hr is 95% of the monitor range.

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

RVLIS LEVEL (%)	VESSEL LEVEL (inches from vessel flange)	
~108	119.8	
100	81.3	
90	31.8	
80	-17.7	
70	-67.2	
63	-101.9	RC-LI-9405, RC-LIT-9467, and the Tygon Tube do not indicate reactor vessel level when actual level is less than -95" due to the weir on the RCP discharge.
60	-116.7	
55	-141.5	
50	-166.2	
40	-215.7	
30	-265.2	
20	-314.7	
10	-364.2	
0	-413.7	

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

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

CA1

ECL: Alert

Initiating Condition: Loss of reactor vessel/RCS inventory.

Operating Mode Applicability: 5, 6

Emergency Action Levels: (1 or 2)

Note: The ~~Emergency Director~~STED/SED should declare the Alert promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.

(1) Loss of reactor vessel/RCS inventory as indicated by RVLIS full range < 64% (-96.9") in).~~level less than (site-specific level)~~.

Commented [DWS34]: V11 EPCALC-06-04 - RVLIS Values

OR

(2) a. Reactor vessel/RCS level cannot be monitored for 15 minutes or longer.

AND

b. UNPLANNED increase in ~~(site-specific sump and/or tank)~~Containment Sumps A or B levels due to a loss of reactor vessel/RCS inventory.

Commented [DWS35]: V13 Containment Sumps

Basis:

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

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

For EAL #1, a lowering of water level below 64%~~(site-specific level)~~ indicates that operator actions have not been successful in restoring and maintaining reactor vessel/RCS water level. The heat-up rate of the coolant will increase as the available water inventory is reduced. A continuing decrease in water level will lead to core uncovery.

Although related, EAL #1 is concerned with the loss of RCS inventory and not the potential concurrent effects on systems needed for decay heat removal~~ (e.g., loss of a Residual Heat Removal suction point)~~. An increase in RCS temperature caused by a loss of decay heat removal capability is evaluated under IC CA3.

For EAL #2, the inability to monitor reactor vessel/RCS level may be caused by instrumentation and/or power failures, or water level dropping below the range of available instrumentation. If water level cannot be monitored, operators may determine that an inventory loss is occurring by observing changes in sump and/or tank levels. Sump and/or tank level changes must be evaluated against other potential sources of water flow to ensure they are indicative of leakage from the reactor vessel/RCS.

RVLIS LEVEL (%)	VESSEL LEVEL (inches from vessel flange)	
~108	119.8"	
100	81.3"	
90	31.8"	
80	-17.7"	
70	-67.2"	
64	-96.9"	
60	-116.7"	
50	-166.2"	RC-LI-9405, RC-LIT-9467, and the Tygon Tube do not indicate reactor vessel level when actual level is less than -95" due to the weir on the RCP discharge.
40	-215.7"	
30	-265.2"	
20	-314.7"	
10	-364.2"	
0	-413.7"	

The 15-minute duration for the loss of level indication was chosen because it is half of the EAL duration specified in IC CS1

If the reactor vessel/RCS inventory level continues to lower, then escalation to Site Area Emergency would be via IC CS1.

CA2

ECL: Alert

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

Operating Mode Applicability: 5, 6, Defueled

Emergency Action Levels:

Note:

- The ~~Emergency Director~~STED/SED should declare the Alert promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.
- For a bus to be considered energized from SEPS, both SEPS diesel generator sets must be functional.

(1) Loss of **ALL** offsite and **ALL** onsite AC Power to BOTH AC emergency buses E5 AND E6 ~~(site-specific emergency buses)~~for 15 minutes or longer.

Basis:

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

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

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

1-EDE-SWG-5 (E5) and 1-EDE-SWG-6 (E6) are the 4.16 kV emergency buses for Train A and Train B respectively. These buses supply all safety-related loads.

This Initiating Condition is not met if either Bus E5 or E6 is energized from the Supplemental Emergency Power System (SEPS).

The SEPS primary function is to supply power to one 4.16 kV emergency bus, EDE-SWG-5 (E5) or EDE-SWG-6 (E6), in the event of a loss-of-offsite-power (LOOP) and both EDGs fail to start and load. In addition (SEPS) provides back up power to the emergency buses when one of the emergency diesel generators (EDG) is out of service for up to fourteen days. SEPS can be used when it is anticipated that one of the EDGs will be inoperable for longer than the technical specification allowable outage time (AOT) of 72 hours.

The design of the SEPS is capable of providing the required safety-related loads in the event of a loss of offsite power if both emergency diesel generators fail to start and load. During these events it is assumed that there is no seismic event or an event that requires safeguards actuation (SI, CBS, CVI, CI, etc.). In addition to providing power to the required loads, the total combined output of the SEPS system can supply either the RHR pump or the SI pump and one set of pressurizer heaters. These design conditions are based on Probabilistic Risk Evaluation (PRA) EE-03-007.

The SEPS consists of two 4.16 kV generators which use diesel fuel engines as the prime mover. The generator sets (gensets) SEPS-DG-2-A and SEPS-DG-2-B are capable of automatically starting, synchronizing together and energizing the SEPS electrical bus. The SEPS design requires a "dead bus" transfer back to an offsite power source, i.e., the emergency bus powered by SEPS must be de-energized before restoring offsite power.

For power restoration from the SEPS, both SEPS diesel generator sets must be functional.

The use of the SEPS is recognized in the Emergency Operating Procedures.

Reference:
UFSAR Section 8.3.1, AC Power Systems

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

CA3

ECL: Alert

Initiating Condition: Inability to maintain the plant in cold shutdown.

Operating Mode Applicability: 5, 6

Emergency Action Levels: (1 or 2)

Note: The ~~Emergency Director~~STED/SED should declare the Alert promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

(1) UNPLANNED increase in RCS temperature to greater than 200° F ~~(site-specific Technical Specification cold shutdown temperature limit)~~ for greater than the duration specified in the following table.

Commented [DWS36]: V15 Cold SD Temp Limit TS

Table ~~1~~ C1 - RCS Heat-up Duration Thresholds

RCS Status	CONTAINMENT INTEGRITY Status	Heat-up Duration
INTACT ~~(but not at reduced inventory~~ and reactor vessel ≥ -36 inches ~~[*PWR*])~~	Not applicable	60 minutes*
Not INTACT ~~(~~or reactor vessel ≤ -36 inches ~~at reduced inventory [*PWR*])~~	Established	20 minutes*
	Not Established	0 minutes
* If ~~an RCS heat removal system~~RHR is in operation within this time frame and RCS temperature is being reduced, the EAL is not applicable.		

Commented [DWS37]: V16 Reduced Inventory

Commented [DWS38]: V16 Reduced Inventory

OR

(2) UNPLANNED RCS pressure increase greater than 25 psig ~~(site-specific pressure reading)~~. (This EAL does not apply during water-solid plant conditions.)

Commented [DWS39]: V17 RCS Pressure range

Basis:

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

INTACT: Capable of being pressurized.

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

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

The RCS Heat-up Duration Thresholds table addresses an increase in RCS temperature when CONTAINMENT INTEGRITY is established but the RCS is not intact, or RCS inventory is reduced ~~(e.g., mid-loop operation in PWRs)~~. The 20-minute criterion was included to allow time for operator action to address the temperature increase.

The RCS Heat-up Duration Thresholds table also addresses an increase in RCS temperature with the RCS intact. The status of CONTAINMENT INTEGRITY is not crucial in this condition since the intact RCS is providing a high pressure barrier to a fission product release. The 60-

minute time frame should allow sufficient time to address the temperature increase without a substantial degradation in plant safety.

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

EAL #2 provides a pressure-based indication of RCS heat-up. The wide-range RCS pressure transmitters have a range of 0 to 3,000 psig. The main control boards have two post-accident monitoring qualified meters, one for each wide-range RCS pressure transmitter. These meters have major divisions at 100 psig intervals and minor divisions at 50 psig intervals. Since it is possible to read the approximate mid-point between minor divisions, the value is set to 25 psig.

Reference: OS1000.09

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

CA6

ECL: Alert

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

Operating Mode Applicability: 5, 6

Emergency Action Levels:

(1) a. The occurrence of **ANY** of the following hazardous events:

Seismic event (earthquake)
Internal or external flooding event
High winds or tornado strike
FIRE
EXPLOSION
Other events with similar hazard characteristics as determined by the Shift Manager

AND

b. **EITHER** of the following:

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

OR

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

Basis:

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

EXPLOSION: A rapid, violent and catastrophic failure of a piece of equipment due to combustion, chemical reaction or overpressurization. A release of steam (from high energy lines or components) or an electrical component failure (caused by short circuits, grounding, arcing, etc.) should not automatically be considered an explosion. Such events may require a post-event inspection to determine if the attributes of an explosion are present.

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

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

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

EAL 1.b.1 addresses damage to a SAFETY SYSTEM train that is in service/operation since indications for it will be readily available. The indications of degraded performance should be significant enough to cause concern regarding the operability or reliability of the SAFETY SYSTEM train. –

EAL 1.b.2 addresses damage to a SAFETY SYSTEM component that is not in service/operation or readily apparent through indications alone, or to a structure containing SAFETY SYSTEM components. Operators will make this determination based on the totality of available event and damage report information. This is intended to be a brief assessment not requiring lengthy analysis or quantification of the damage.

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

CU1

ECL: Notification of Unusual Event

Initiating Condition: UNPLANNED loss of reactor vessel/RCS inventory for 15 minutes or longer.

Operating Mode Applicability: 5, 6

Emergency Action Levels: (1 or 2)

Note: The ~~Emergency Director~~STED/SED should declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.

(1) UNPLANNED loss of reactor coolant results in reactor vessel/RCS level less than a required lower limit of an operating band, specified by an operating procedure for 15 minutes or longer.

OR

~~(1)~~(2) a. Reactor vessel/RCS level cannot be monitored.

~~——~~**AND**

b. UNPLANNED increase in ~~(site-specific sump and/or tank)~~Containment Sump A or B levels.

Commented [DWS40]: V13 Containment Sumps

Basis:

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

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

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

EAL #1 recognizes that the minimum required reactor vessel/RCS level can change several times during the course of a refueling outage as different plant configurations and system lineups are implemented. This EAL is met if the minimum level, specified for the current plant conditions, cannot be maintained for 15 minutes or longer. The minimum level is typically specified in the applicable operating procedure but may be specified in another controlling document.

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

EAL #2 addresses a condition where all means to determine reactor vessel/RCS level have been lost. In this condition, operators may determine that an inventory loss is occurring by observing changes in sump and/or tank levels. Sump and/or tank level changes must be evaluated against

other potential sources of water flow to ensure they are indicative of leakage from the reactor vessel/RCS.

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

CU2

ECL: Notification of Unusual Event

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

Operating Mode Applicability: 5, 6, Defueled

Emergency Action Levels:

Notes:

- The ~~Emergency Director~~STED/SED should declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.
- For power restoration from the SEPS, both SEPS diesel generator sets must be functional.

(1) a. AC power capability to Both AC emergency buses E5 AND E6 ~~(site-specific emergency buses)~~ is reduced to a single power source for 15 minutes or longer.

AND

b. Any additional single power source failure will result in loss of all AC power to SAFETY SYSTEMS.

Basis:

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

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

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

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

~~A loss of all offsite power with a concurrent failure of all but one emergency power source (e.g., an onsite diesel generator).~~

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

~~A loss of emergency power sources (e.g., onsite diesel generators) with a single train of emergency buses being back-fed from an offsite power source.~~

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

1-EDE-SWG-5 (E5) and 1-EDE-SWG-6 (E6) are the 4.16 kV emergency buses for Train A and Train B respectively. These buses supply all safety-related loads.

This Initiating Condition is not met if either Bus E5 or E6 is energized from the Supplemental Emergency Power System (SEPS).

The SEPS primary function is to supply power to one 4.16 kV emergency bus, EDE-SWG-5 (E5) or EDE-SWG-6 (E6), in the event of a loss-of-offsite-power (LOOP) and both EDGs fail to start and load. In addition (SEPS) provides back up power to the emergency buses when one of the emergency diesel generators (EDG) is out of service for up to fourteen days. SEPS can be used when it is anticipated that one of the EDGs will be inoperable for longer than the technical specification allowable outage time (AOT) of 72 hours.

The design of the SEPS is capable of providing the required safety-related loads in the event of a loss of offsite power if both emergency diesel generators fail to start and load. During these events it is assumed that there is no seismic event or an event that requires safeguards actuation (SI, CBS, CVI, CI, etc.). In addition to providing power to the required loads, the total combined output of the SEPS system can supply either the RHR pump or the SI pump and one set of pressurizer heaters. These design conditions are based on Probabilistic Risk Evaluation (PRA) EE-03-007.

The SEPS consists of two 4.16 kV generators which use diesel fuel engines as the prime mover. The generator sets (gensets) SEPS-DG-2-A and SEPS-DG-2-B are capable of automatically starting, synchronizing together and energizing the SEPS electrical bus. The SEPS design requires a "dead bus" transfer back to an offsite power source, i.e., the emergency bus powered by SEPS must be de-energized before restoring offsite power.

For power restoration from the SEPS, both SEPS diesel generator sets must be functional.

The use of the SEPS is recognized in the Emergency Operating Procedures.

Reference: UFSAR Section 8.3.1, AC Power Systems

The subsequent loss of the remaining single power source would escalate the event to an Alert in accordance with IC CA2.

CU3

ECL: Notification of Unusual Event

Initiating Condition: UNPLANNED increase in RCS temperature.

Operating Mode Applicability: 5, 6

Emergency Action Levels: (1 or 2)

Note: The ~~Emergency Director~~STED/SED should declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.

(1) UNPLANNED increase in RCS temperature to greater than 200° F~~(site-specific Technical Specification cold shutdown temperature limit)~~.

Commented [DWS41]: V15 Cold SD Temp Limit TS

OR

(2) Loss of **ALL** RCS temperature and reactor vessel/RCS level indication for 15 minutes or longer.

Basis:

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

This IC addresses an UNPLANNED increase in RCS temperature above the Technical Specification cold shutdown temperature limit, or the inability to determine RCS temperature and level, represents a potential degradation of the level of safety of the plant. If the RCS is not intact and CONTAINMENT INTEGRITY is not established during this event, the ~~Emergency Director~~STED/SED should also refer to IC CA3.

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

EAL #1 involves a loss of decay heat removal capability, or an addition of heat to the RCS in excess of that which can currently be removed, such that reactor coolant temperature cannot be maintained below the cold shutdown temperature limit specified in Technical Specifications. During this condition, there is no immediate threat of fuel damage because the core decay heat load has been reduced since the cessation of power operation.

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

EAL #2 reflects a condition where there has been a significant loss of instrumentation capability necessary to monitor RCS conditions and operators would be unable to monitor key parameters necessary to assure core decay heat removal. During this condition, there is no immediate threat of fuel damage because the core decay heat load has been reduced since the cessation of power operation.

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

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

CU4

ECL: Notification of Unusual Event

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

Operating Mode Applicability: 5, 6

Emergency Action Levels:

Note: The ~~Emergency Director~~STED/SED should declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.

(1) Indicated voltage is less than 105V~~(site-specific bus voltage value)~~ on required Vital DC buses associated with the Protected Train for 15 minutes or longer.

Train A 11A and 11C
Train B 11B and 11D

Commented [DWS42]: V18 UFSAR 8.3.2 - DCV 105 limit

Basis:

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

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

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

Per DBD-ED-05, the DC bus voltage range within which the 125 Volt DC system is considered operable is 105 volts minimum to 140 volts maximum. The vital DC Buses (Switchgear) are SWG-11A and 11C for Train A and SWG-11B and 11D for Train B.

Reference: UFSAR Section 8.3.2, DC Power System
Procedure OS1248.01, Loss of a Vital 125 VDC Bus
Procedure VPRO F5278, Loss of All Vital DC Power
DBD-ED-05, 125 VDC System

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

CU5

ECL: Notification of Unusual Event

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

Operating Mode Applicability: 5, 6, Defueled

Emergency Action Levels: (1 or 2 or 3)

(1) Loss of **ALL** of the following onsite communication methods:

In-Plant (PBX) Telephones
Gai-Tronics
Plant Radio System

OR

~~(site-specific list of communications methods)~~

(2) Loss of **ALL** of the following ORO communications methods:

Nuclear Alert System (NAS)
Backup NAS
All plant telephones
Cellular telephones

OR

(3) ~~(site-specific list of communications methods)~~ Loss of **ALL** of the following NRC communications methods:

Emergency Notification System (ENS)
All plant telephones
FTS telephones in the TSC
Cellular telephones

~~(site-specific list of communications methods)~~

Basis:

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

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

EAL #1 addresses a total loss of the communications methods used in support of routine plant operations.

EAL #2 addresses a total loss of the communications methods used to notify all OROs of an emergency declaration. The OROs referred to here are Commonwealth of Massachusetts and State of New Hampshire.

EAL #3 addresses a total loss of the communications methods used to notify the NRC of an emergency declaration.