

## APPENDIX A – ACRONYMS AND ABBREVIATIONS

AC .....	Alternating Current
AOP .....	Abnormal Operating Procedure
<hr/>	
PRM .....	Average Power Range Meter
ATWS .....	Anticipated Transient Without Scram
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&W .....	Babcock and Wilcox
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HT .....	Boron Injection Initiation Temperature
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WR .....	Boiling Water Reactor
<hr/>	
AS .....	Central Alarm Station
CC .....	Cubic Centimeter
CDE .....	Committed Dose Equivalent
CFR .....	Code of Federal Regulations
CHM .....	Chemistry
CPM .....	Counts Per Minute
CTMT/CNMT .....	Containment
CSF .....	Critical Safety Function
<hr/>	
SFST .....	Critical Safety Function Status Tree
<hr/>	
BA .....	Design Basis Accident
DC .....	Direct Current
EAL .....	Emergency Action Level
ECCS .....	Emergency Core Cooling System
ECL .....	Emergency Classification Level
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OF .....	Emergency Operations Facility
ENN .....	Emergency Notification Network
ENS .....	Emergency Notification System
EOP .....	Emergency Operating Procedure
EPA .....	Environmental Protection Agency
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PG .....	Emergency Procedure Guideline
<hr/>	
PIP .....	Emergency Plan Implementing Procedure
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PR .....	Evolutionary Power Reactor
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PRI .....	Electric Power Research Institute
ERG .....	Emergency Response
Guideline ESF .....	Engineered Safety Feature
FAA .....	Federal Aviation Administration
FBI .....	Federal Bureau of Investigation
FEMA .....	Federal Emergency Management Agency



SAR	Final Safety Analysis Report	F
FNP	Farley Nuclear Plant	
FTS	Federal Telecommunications System	
GE	General Emergency	
CTL	Heat Capacity Temperature Limit	H
PCI	High Pressure Coolant Injection	H
SI	Human System Interface	H
HOO	Headquarters Operations Officer (NRC)	
Hx	Heat Exchanger	
IC	Initiating Condition	
ID	Inside Diameter	
PEEE	Individual Plant Examination of External Events (Generic Letter 88-20)	I
ISFSI	Independent Spent Fuel Storage Installation	
K <sub>eff</sub>	Effective Neutron Multiplication Factor	
CO	Limiting Condition of Operation	L
LOCA	Loss of Coolant	
Accident MCB	Main Control Board	
MCC	Motor Control Center	
CR	Main Control Room	M
SIV	Main Steam Isolation Valve	M
SL	Main Steam Line	M
μCi	micro-Curie	
mR, mRem, mrem, mREM	milli-Roentgen Equivalent Man	
W	Megawatt	M
NEI	Nuclear Energy Institute	
NPP	Nuclear Power Plant	
NRC	Nuclear Regulatory Commission	
SSS	Nuclear Steam Supply System	N
NORAD	North American Aerospace Defense Command	
NOUE	(Notification Of) Unusual Event	
NUMARC <sup>9</sup>	Nuclear Management and Resources Council	N
OBE	Operating Basis Earthquake	
OCA	Owner Controlled Area	
ODCM/ODAM	Offsite Dose Calculation (Assessment) Manual	
ORO	Off-site Response Organization	
PA	Protected Area	

<sup>9</sup> NUMARC was a predecessor organization of the Nuclear Energy Institute (NEI).



ACS	Priority Actuation and Control System	P
PAG	Protective Action Guideline	
ICS	Process Information and Control System	P
RA/PSA	Probabilistic Risk Assessment / Probabilistic Safety Assessment	P
PBX	Private Branch Exchange	
PWR	Pressurized Water Reactor	
S	Protection System	P
PSIG	Pounds per Square Inch Gauge	
R	Roentgen	
CC	Reactor Control Console	R
CIC	Reactor Core Isolation Cooling	R
RCDT	Reactor Coolant Drain Tank	
RCS	Reactor Coolant System	
Rem, rem, REM	Roentgen Equivalent Man	
ETS	Radiological Effluent Technical Specifications	R
RHR	Residual Heat Removal	
RPS	Reactor Protection System	
RPV	Reactor Pressure Vessel	
RVLIS	Reactor Vessel Level Instrumentation System	
WCU	Reactor Water Cleanup	R
AR	Safety Analysis Report	S
AS	Safety Automation System	S
BO	Station Blackout	S
SAE	Site Area Emergency	
SCBA	Self-Contained Breathing Apparatus	
SFP	Spent Fuel Pool	
SG	Steam Generator	
SI	Safety Injection	
ICS	Safety Information and Control System	S
SNC	Southern Nuclear Company	
SPDS	Safety Parameter Display System	
RO	Senior Reactor Operator	S
TEDE	Total Effective Dose Equivalent	
TOAF	Top of Active Fuel	
TSC	Technical Support	
CenterTV	Threshold Value	



VDC ..... Volts Direct Current  
VOIP ..... Voice Over Internet Protocol  
WHT ..... Waste Holdup Tank  
~~OG ..... Westinghouse Owners Group~~



## **APPENDIX B – DEFINITIONS**

The following definitions are taken from Title 10, Code of Federal Regulations, and related regulatory guidance documents.

**General Emergency:** 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.

**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.

**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.

**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.

The following are key terms necessary for overall understanding the NEI 99-01 emergency classification scheme.

**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.

**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~~-~~descending~~ order of severity, are:

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

**Fission Product Barrier Threshold:** A pre-determined, site-specific, observable threshold indicating the loss or potential loss of a fission product barrier.

**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.



Selected terms used in Initiating Condition and Emergency Action Level statements are set in all capital letters (e.g., ALL CAPS). These words are defined terms that have specific meanings as used in this document. The definitions of these terms are provided below.

**CONFINEMENT BOUNDARY:** The barrier(s) between areas containing radioactive substances and the environment. ~~(Insert a site specific definition for this term.)~~ ~~Developer Note—The barrier(s) between spent fuel and the environment once the spent fuel is processed for dry storage.~~

**CONTAINMENT CLOSURE:** Per FNP-1(2)-STP-18.4, "Containment Integrity Verification and Closure". ~~Developer Note—The procedurally defined conditions or actions taken to secure containment (primary or secondary for BWR) and its associated structures, systems, and components as a functional barrier to fission product release under shutdown conditions.~~

**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.

**FAULTED:** The term applied to a steam generator that has a steam leak on the secondary side of sufficient size to cause an uncontrolled drop in steam generator pressure or the steam generator to become completely depressurized. ~~Developer Note—This term is applicable to PWRs only.~~

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

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

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

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

**IMMINENT:** The trajectory of events or conditions is such that an EAL will be met within a relatively short period of time regardless of mitigation or corrective actions.

**INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI):** A complex that is designed and constructed for the interim storage of spent nuclear fuel and other radioactive materials associated with spent fuel storage.



~~—— NORMAL LEVELS: As applied to radiological IC/EALs, the highest reading in the past twenty-four hours excluding the current peak value.~~

**OWNER CONTROLLED AREA (OCA):** The area that encompasses all controlled areas within the FNP site boundary but outside the security protected area fence. ~~(Insert a site-specific definition for this term.)~~ **Developer Note**—This term is typically taken to mean the site property owned by, or otherwise under the control of, the licensee. In some cases, it may be appropriate for a licensee to define a smaller area with a perimeter closer to the plant Protected Area perimeter (e.g., a site with a large OCA where some portions of the boundary may be a significant distance from the Protected Area). In these cases, developers should consider using the boundary defined by the Restricted or Secured Owner Controlled Area (ROCA/SOCA). The area and boundary selected for scheme use must be consistent with the description of the same area and boundary contained in the Security Plan.

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

**PROTECTED AREA (PA):** The area that encompasses all controlled areas within the security protected area fence. ~~(Insert a site-specific definition for this term.)~~ **Developer Note**—This term is typically taken to mean the area under continuous access monitoring and control, and armed protection as described in the site Security Plan.

**REFUELING PATHWAY:** This includes the reactor refuel cavity, the fuel transfer canal, and the spent fuel pool, canals and pools through which irradiated fuel may be moved, but not including the reactor vessel. ~~(Insert a site-specific definition for this term.)~~ **Developer Note**—This description should include all the cavities, tubes, canals and pools through which irradiated fuel may be moved, but not including the reactor vessel.

**RUPTURE(D):** The condition of a steam generator in which primary-to-secondary leakage is of sufficient magnitude to require a safety injection. **Developer Note**—This term is applicable to PWRs only.

**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. These are typically systems classified as safety-related. **Developer Note**—This term may be modified to include the attributes of "safety-related" in accordance with 10 CFR 50.2 or other site-specific terminology, if desired.

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

**UNISOLABLE:** An open or breached system line that cannot be isolated, remotely or locally.

**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.



**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.



**Southern Nuclear Operating Company  
Edwin I. Hatch Nuclear Plant Units 1 and 2**

**License Amendment Request for Changes to  
Emergency Action Level Schemes to Adopt NEI 99-01 Rev. 6  
and to Modify Radiation Monitors at Farley Nuclear Plant**

**Enclosure 5**

**Hatch Marked-Up EAL Schemes**



**HATCH NUCLEAR PLANT**

**EMERGENCY ACTION LEVELS**

**INITIATING CONDITIONS,  
THRESHOLD VALUES,  
AND BASIS**



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## **DEVELOPMENT 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~~ The relevant sections of this document are:

- 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~~ These regulations are supplemented by various regulatory guidance documents. ~~Three of~~ Documents of particular relevance to NEI 99-01 are include:

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~~ This list is not all-inclusive. ~~and it~~ It is strongly recommended that scheme developers consult with licensing<sup>4</sup> and 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~~ contained 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 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~~ Additionally, appropriate aspects of IC HU1 and IC HA1 ~~should~~ will 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~~ 2011, 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~~ leading to core damage in three reactors. ~~While~~ Although the loss of power also impaired the spent fuel pool cooling function, sufficient water inventory was maintained in the pools to ~~preclude~~ prevent 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~~ One such measure was that each spent fuel pool ~~be~~ provided with reliable level instrumentation to significantly enhance the ability of key decision-makers to ~~effectively~~ 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 ~~therefore~~ 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 ~~plan’s effectiveness of the plan. As a result of the licensee’s~~ ~~Based on this~~ 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)	Emergency Action Level (1)	Emergency Action Level (1)	Emergency Action Level (1)
<ul style="list-style-type: none"> <li>Operating Mode Applicability</li> <li>Notes</li> <li>Basis</li> </ul>	<ul style="list-style-type: none"> <li>Operating Mode Applicability</li> <li>Notes</li> <li>Basis</li> </ul>	<ul style="list-style-type: none"> <li>Operating Mode Applicability</li> <li>Notes</li> <li>Basis</li> </ul>	<ul style="list-style-type: none"> <li>Operating Mode Applicability</li> <li>Notes</li> <li>Basis</li> </ul>
<p>(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.</p>			

### 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)<sup>†</sup>

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.

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<sup>†</sup>This term is sometimes shortened to Unusual Event (UE) or other similar site-specific terminology. The terms Notification of Unusual Event, NOUE and Unusual Event are used interchangeably throughout this document



**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<sup>2</sup>.

<sup>2</sup>The use of ECL attributes is at the discretion of a licensee and is not a requirement of the NRC. If a licensee chooses to incorporate the ECL attributes into their scheme basis document, it must be very clear that the NRC staff has not endorsed their acceptability or application for any purpose. In particular, the staff does not consider the



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.

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attribute statements to supersede the established ECL definitions. As a result, the use of the attributes as a basis for justifying EAL changes is unacceptable.



(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. Where necessary, development guidance also addresses unique considerations for advanced non-passive reactor designs such as the Advanced Boiling Water Reactor (ABWR), the Advanced Pressurized Water Reactor (APWR) and the Evolutionary Power Reactor (EPR).

—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 - System Malfunction —Section 11

Each Recognition Category section contains a matrix showing the ICs and their associated emergency classification levels.

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**

Mode	Category					
	R	C	E	F	H	S
Power Operations	X		X	X	X	X
Startup	X		X	X	X	X
<del>Hot Standby</del>	<del>X</del>		<del>X</del>	<del>X</del>	<del>X</del>	<del>X</del>
Hot Shutdown	X		X	X	X	X
Cold Shutdown	X	X	X		X	
Refueling	X	X	X		X	
Defueled	X	X	X		X	
<del>Permanently Defueled</del>			<del>X</del>			



Hatch Units 1 and 2 Technical Specifications Table 1.1-1 provides the following mode definitions:

Commented [ 1]: VI TS Table 1.1-1 Modes

Mode	Title	Reactor Mode Switch Position	Average Reactor Coolant Temperature (°F)
1	Power Operation	Run	NA
2	Startup	Refuel <sup>(a)</sup> or Startup/Hot Standby	NA
3	Hot Shutdown <sup>(a)</sup>	Shutdown	> 212
4	Cold Shutdown <sup>(b)</sup>	Shutdown	≤ 212
5	Refueling <sup>(b)</sup>	Shutdown or Refuel	NA

- (a) All reactor vessel head closure bolts fully tensioned.  
(b) One or more reactor vessel head closure bolts less than fully tensioned.

In addition to these defined modes, "Defueled" is also applicable to the Hatch EAL scheme, consistent with NEI 99-01. Defueled is a 'No Mode' condition where all of the fuel has been removed from the reactor vessel (i.e., full core offload during refueling or extended outages).

These modes are used throughout the Hatch EALs with no modifications from NEI 99-01. When a unit is defueled, the Initiating Conditions designated as Mode Condition "ALL" or "Defueled" are applicable.

- Power Operations (1): Mode Switch in Run
- Startup (2): Mode Switch in Startup/Hot Standby or Refuel (with all vessel head bolts fully tensioned)
- Hot Shutdown (3): Mode Switch in Shutdown; Average Reactor Coolant Temperature >212 °F
- Cold Shutdown (4): Mode Switch in Shutdown; Average Reactor Coolant Temperature ≤ 212 °F
- Refueling (5): Mode Switch in Shutdown or Refuel, and one or more vessel head bolts less than fully tensioned.
- Developers will need to incorporate the mode criteria from unit-specific Technical Specifications into their emergency classification scheme. In addition, the scheme must also include the following mode designation specific to NEI 99-01:
- Defueled (None): All fuel removed from the reactor vessel (i.e., full core offload during refueling or extended outage).



## 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<sup>3</sup>. 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.

<sup>3</sup>Where appropriate, the Notes shown in the generic guidance typically include the event/condition ECL and the duration time specified in the EAL. If developers prefer to have several ICs reference a common NOTE on a wallboard display, it is acceptable to remove the ECL and time criterion and use a generic statement. For example, a common NOTE could read "The Emergency Director should declare the emergency promptly upon determining that the applicable EAL time has been exceeded, or will likely be exceeded."



#### 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.



## 52 GUIDANCE ON MAKING EMERGENCY CLASSIFICATIONS

### 5.1.2.1 GENERAL CONSIDERATIONS

~~When making an~~For any emergency classification, the emergency director 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 will~~ be based ~~up~~on valid indications, reports or conditions. A valid indication, report, or condition, ~~is one that~~ has been verified ~~through using~~ appropriate means, ~~such that there is~~leaving 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 will~~ be ~~completed~~validated 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 ~~should will~~ not wait until the applicable time has elapsed, but ~~should will~~ 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 will~~ 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~~resulting 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 such~~ cases, the controls associated with the planning, preparation and execution of the work will ensure ~~that~~ compliance with the operating license 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 are~~ assessed 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~~ Although 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 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 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) ~~evaluation~~ 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~~ In the event of multiple ~~emergency-emergencies~~ ~~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~~ will 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~~ will 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*.



#### 5.42.4 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.~~

#### 5.52.5 CLASSIFICATION OF IMMINENT CONDITIONS

Although EALs provide specific thresholds, the emergency director 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, meeting an EAL is IMMINENT, the emergency classification ~~should~~ will 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.

#### 5.62.6 EMERGENCY CLASSIFICATION LEVEL UPGRADING AND DOWNGRADING

SNC policy is that once an emergency classification is made, it cannot be downgraded to a lower classification. Termination criteria contained in procedure NMP-EP-110, Emergency Classification and Initial Actions shall be completed for an event to be terminated. At termination, on an event specific basis, the site can either enter normal operating conditions or enter a recovery condition with a recovery organization established for turnover from the ERO. ~~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	Downgrade or terminate the emergency in



long-term plant damage	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, guidance 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, 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, end 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 for example, an earthquake, 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 that 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 will be applied to the classification of these conditions.

EAL momentarily met during expected plant response - In instances where When 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. This example presents an illustration:

An ATWS occurs and the auxiliary feedwater system RCIC fails to automatically start. Steam generator RPV levels rapidly decreases and the plant enters an inadequate RCS heat removal condition RPV Water Level condition (a potential loss of both the fuel clad barrier and a loss of the RCS barriers). If an operator manually starts the auxiliary feedwater system RCIC in accordance with an EOP step and clears the inadequate RCS heat removal RPV Water Level condition prior



to an emergency declaration, then the classification should be based on the ATWS only.

It is important to ~~stress-note~~ that the 15-minute emergency classification assessment period is not a "grace period" ~~during which to delay~~ a classification ~~may be delayed to allow the~~ in order to perform ~~ance 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 before to the emergency director completing-completes the review and necessary steps necessary to make the emergency declaration. This provision is included to ensures that any public protective actions resulting from the emergency classification are truly warranted by the plant conditions.~~

#### **5.92.9 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~~ Personnel could 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-~~It may be ~~due to~~ the event or condition ~~was not being~~ recognized at the time, or ~~there was~~ an error ~~that was made~~ in the emergency classification process.

In these cases, no emergency declaration is warranted; ~~however,~~ but the guidance contained in NUREG-1022 is applicable. Specifically, the event ~~should will~~ 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 will~~ 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

Table A-1: Recognition Category "A" Initiating Condition Matrix

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



## 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 emergency director ~~should~~ will 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:

Reactor Building Vent Accident Range Monitor: 1D11-P601 (feeding 1D11-R631, Rx Bldg Vent Wide Range) 2D11-P601 (feeding 2D11-R631, Rx Bldg Vent Wide Range)	2.6 $\mu\text{Ci/cc}$ 2.6 $\mu\text{Ci/cc}$
Main Stack Accident Range Monitor: 1D11-P007 (feeding 1D11-R631, Main Stack Wide Range)	8.1 x 10 <sup>3</sup> $\mu\text{Ci/cc}$

(site specific monitor list and threshold values)

- (2) Dose assessment using actual meteorology indicates doses greater than 1,000 mrem TEDE or 5,000 mrem thyroid CDE at or beyond the site boundary (site specific dose receptor point).
- (3) Field survey results indicate **EITHER** of the following at or beyond the site boundary (site specific dose receptor point):
- Closed window dose rates greater than 1,000 mR/hr expected to continue for 60 minutes or longer.
  - Analyses of field survey samples indicate thyroid CDE greater than 5,000 mrem for one hour of inhalation.

### 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.

Commented [ 2]: V2 Rad Monitor Calculation

Commented [ 3]: V3 ODCM Site Boundary Reference

Commented [ 4]: V3 ODCM Site Boundary Reference



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 monitor reading threshold values are determined using a dose assessment method that back calculates from the dose values specified in the IC. The meteorology and source term (noble gases, particulates, and halogens) used are the same as those used to determine the monitor reading threshold values in ICs RS1 and RA1. This protocol will maintain intervals between the threshold values for the three classifications. Since doses are generally not monitored in real-time, a release duration of one hour is assumed, and the threshold values are based on a site boundary (or beyond) dose of 1000 mR/hour whole body or 5000 mR/hour thyroid, whichever is more limiting.

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.

#### **Developer Notes:**

—— The effluent ICs/EALs are included to provide a basis for classifying events that cannot be readily classified on the basis of plant conditions alone. The inclusion of both types of ICs/EALs more fully addresses the spectrum of possible events and accidents.

—— While this IC may not be met absent challenges to multiple fission product barriers, it provides classification diversity and may be used to classify events that would not reach the same ECL based on plant status or the fission product matrix alone. For many of the DBAs analyzed in the Updated Final Safety Analysis Report, the discriminator will not be the number of fission product barriers challenged, but rather the amount of radioactivity released to the environment.

—— The EPA PAGs are expressed in terms of the sum of the effective dose equivalent (EDE) and the committed effective dose equivalent (CEDE), or as the thyroid committed dose equivalent (CDE). For the purpose of these IC/EALs, the dose quantity total effective dose equivalent (TEDE), as defined in 10 CFR § 20, is used in lieu of "...sum of EDE and CEDE...".

—— The EPA PAG guidance provides for the use of adult thyroid dose conversion factors; however, some states have decided to base protective actions on child thyroid CDE. Nuclear power plant ICs/EALs need to be consistent with the protective action methodologies employed by the States within their EPZs. The thyroid CDE dose used in the IC and EALs should be adjusted as necessary to align with State protective action decision making criteria.

—— The "site specific monitor list and threshold values" should be determined with consideration of the following:

- Selection of the appropriate installed gaseous effluent monitors.
- The effluent monitor readings should correspond to a dose of 1,000 mrem TEDE or 5,000 mrem thyroid CDE at the "site specific dose receptor point" (consistent with the calculation methodology employed) for one hour of exposure.



- Monitor readings will be calculated using a set of assumed meteorological data or atmospheric dispersion factors; the data or factors selected for use should be the same as those employed to calculate the monitor readings for ICs RA1 and RS1. Acceptable sources of this information include, but are not limited to, the RETS/ODCM and values used in the site's emergency dose assessment methodology.
- The calculation of monitor readings will also require use of an assumed release isotopic mix; the selected mix should be the same as that employed to calculate monitor readings for ICs RA1 and RS1. Acceptable sources of this information include, but are not limited to, the RETS/ODCM and values used in the site's emergency dose assessment methodology.
- Depending upon the methodology used to calculate the EAL values, there may be overlap of some values between different ICs. Developers will need to address this overlap by adjusting these values in a manner that ensures a logical escalation in the ECL.

The "site-specific dose receptor point" is the distance(s) and/or locations used by the licensee to distinguish between on-site and offsite doses. The selected distance(s) and/or locations should reflect the content of the emergency plan, and procedural methodology used to determine offsite doses and Protective Action Recommendations. The variation in selected dose receptor points means there may be some differences in the distance from the release point to the calculated dose point from site to site.

Developers should research radiation monitor design documents or other information sources to ensure that 1) the EAL value being considered is within the usable response and display range of the instrument, and 2) there are no automatic features that may render the monitor reading invalid (e.g., an auto-purge feature triggered at a particular indication level).

It is recognized that the condition described by this IC may result in a radiological effluent value beyond the operating or display range of the installed effluent monitor. In those cases, EAL values should be determined with a margin sufficient to ensure that an accurate monitor reading is available. For example, an EAL monitor reading might be set at 90% to 95% of the highest accurate monitor reading. This provision notwithstanding, if the estimated/calculated monitor reading is greater than approximately 110% of the highest accurate monitor reading, then developers may choose not to include the monitor as an indication and identify an alternate EAL threshold.

Although the IC references TEDE, field survey results are generally available only as a "whole body" dose rate. For this reason, the field survey EAL specifies a "closed window" survey reading.

— Indications from a real-time dose projection system are not included in the generic EALs. Many licensees do not have this capability. For those that do, the capability may not be within the scope of the plant Technical Specifications. A licensee may request to include an EAL using real-time dose projection system results; approval will be considered on a case-by-case basis.

— Indications from a perimeter monitoring system are not included in the generic EALs. Many licensees do not have this capability. For those that do, these monitors may not be controlled and maintained to the same level as plant equipment, or within the scope of the plant Technical Specifications. In addition, readings may be influenced by environmental or other factors. A licensee may request to include an EAL using a perimeter monitoring system; approval will be considered on a case-by-case basis.

— ECL Assignment Attributes: 3.1.4.C







## RG2

*{See Developer Notes}*

ECL: General Emergency

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

**Operating Mode Applicability:** All

**Emergency Action Levels:**

**Note:** The emergency director ~~should~~will 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)~~Level 3 for 60 minutes or longer.

**Basis:**

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

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.

**Developer Notes:**

~~In accordance with the discussion in Section 1.4, NRC Order EA-12-051, it is recommended that this IC and EAL be implemented when the enhanced spent fuel pool level instrumentation is available for use. The "site-specific Level 3 value" is usually that spent fuel pool level where fuel remains covered and actions to implement make-up water addition should no longer be deferred. This site-specific level is determined in accordance with NRC Order EA-12-051 and NEI 12-02, and applicable owner's group guidance.~~

~~Developers should modify the EAL and/or Basis section to reflect any site-specific constraints or limitations associated with the design or operation of instrumentation used to determine the Level 3 value.~~

~~ECL Assignment Attributes: 3.1.4.C~~



## 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 ~~should~~ will 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:

Reactor Building Vent Accident Range Monitor:	
1D11-P601 (feeding 1D11-R631, Rx Bldg Vent Wide Range)	$2.6 \times 10^{-1} \mu\text{Ci/cc}$
2D11-P601 (feeding 1D11-R631, Rx Bldg Vent Wide Range)	$2.6 \times 10^{-1} \mu\text{Ci/cc}$
Main Stack Accident Range Monitor:	
1D11-P007 (feeding 1D11-R631, Main Stack Wide Range)	$8.1 \times 10^{-2} \mu\text{Ci/cc}$

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

### Basis:

This IC addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to 10%—percent 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.

Commented [ 5]: V2 Rad Monitor Calculation

Commented [ 6]: V3 ODCM Site Boundary reference

Commented [ 7]: V3 ODCM Site Boundary reference



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 monitor reading threshold values are determined using a dose assessment method that back calculates from the dose values specified in the IC. The meteorology and source term (noble gases, particulates, and halogens) used is the same as those used to determine the monitor reading threshold values in ICs RG1 and RA1. This protocol maintains intervals between the threshold values for the three classifications. Since doses are generally not monitored in real-time, a release duration of one hour is assumed, and the threshold values are based on a site boundary (or beyond) dose of 100 mR/hour whole body or 500 mR/hour thyroid, whichever is more limiting.

The TEDE dose is set at 10% ~~percent~~ 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~~ uses IC RG1.

#### **Developer Notes:**

~~While this IC may not be met absent challenges to multiple fission product barriers, it provides classification diversity and may be used to classify events that would not reach the same ECL based on plant status or the fission product matrix alone. For many of the DBAs analyzed in the Updated Final Safety Analysis Report, the discriminator will not be the number of fission product barriers challenged, but rather the amount of radioactivity released to the environment.~~

~~The EPA PAGs are expressed in terms of the sum of the effective dose equivalent (EDE) and the committed effective dose equivalent (CEDE), or as the thyroid committed dose equivalent (CDE). For the purpose of these IC/EALs, the dose quantity total effective dose equivalent (TEDE), as defined in 10 CFR § 20, is used in lieu of "...sum of EDE and CEDE....".~~

~~The EPA PAG guidance provides for the use of adult thyroid dose conversion factors; however, some states have decided to base protective actions on child thyroid CDE. Nuclear power plant ICs/EALs need to be consistent with the protective action methodologies employed by the States within their EPZs. The thyroid CDE dose used in the IC and EALs should be adjusted as necessary to align with State protective action decision-making criteria.~~

~~The "site-specific monitor list and threshold values" should be determined with consideration of the following:~~

- ~~• Selection of the appropriate installed gaseous effluent monitors.~~
- ~~• The effluent monitor readings should correspond to a dose of 100 mrem TEDE or 500 mrem thyroid CDE at the "site-specific dose receptor point" (consistent with the calculation methodology employed) for one hour of exposure.~~



- Monitor readings will be calculated using a set of assumed meteorological data or atmospheric dispersion factors; the data or factors selected for use should be the same as those employed to calculate the monitor readings for ICs RAI and RGI. Acceptable sources of this information include, but are not limited to, the RETS/ODCM and values used in the site's emergency dose assessment methodology.
- The calculation of monitor readings will also require use of an assumed release isotopic mix; the selected mix should be the same as that employed to calculate monitor readings for ICs RAI and RGI. Acceptable sources of this information include, but are not limited to, the RETS/ODCM and values used in the site's emergency dose assessment methodology.
- Depending upon the methodology used to calculate the EAL values, there may be overlap of some values between different ICs. Developers will need to address this overlap by adjusting these values in a manner that ensures a logical escalation in the ECL.

—— The "site-specific dose receptor point" is the distance(s) and/or locations used by the licensee to distinguish between on-site and offsite doses. The selected distance(s) and/or locations should reflect the content of the emergency plan, and the procedural methodology used to determine offsite doses and Protective Action Recommendations. The variation in selected dose receptor points means there may be some differences in the distance from the release point to the calculated dose point from site to site.

—— Developers should research radiation monitor design documents or other information sources to ensure that 1) the EAL value being considered is within the usable response and display range of the instrument, and 2) there are no automatic features that may render the monitor reading invalid (e.g., an auto-purge feature triggered at a particular indication level).

—— It is recognized that the condition described by this IC may result in a radiological effluent value beyond the operating or display range of the installed effluent monitor. In those cases, EAL values should be determined with a margin sufficient to ensure that an accurate monitor reading is available. For example, an EAL monitor reading might be set at 90% to 95% of the highest accurate monitor reading. This provision notwithstanding, if the estimated/calculated monitor reading is greater than approximately 110% of the highest accurate monitor reading, then developers may choose not to include the monitor as an indication and identify an alternate EAL threshold.

—— Although the IC references TEDE, field survey results are generally available only as a "whole body" dose rate. For this reason, the field survey EAL specifies a "closed window" survey reading.

—— Indications from a real-time dose projection system are not included in the generic EALs. Many licensees do not have this capability. For those that do, the capability may not be within the scope of the plant Technical Specifications. A licensee may request to include an EAL using real-time dose projection system results; approval will be considered on a case-by-case basis.

—— Indications from a perimeter monitoring system are not included in the generic EALs. Many licensees do not have this capability. For those that do, these monitors may not be controlled and maintained to the same level as plant equipment, or within the scope of the plant Technical Specifications. In addition, readings may be influenced by environmental or other factors. A licensee may request to include an EAL using a perimeter monitoring system; approval will be considered on a case-by-case basis.



— ECL Assignment Attributes: 3.1.3.C

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