## 1.1 CATEGORY 'A' – ABNORMAL RADIATION LEVELS/RADIOLOGICAL EFFLUENT

Refer to Table 3-1, Recognition Category "A" Initiating Condition Matrix, for an overview.

### 1.1.1 IC Set AU1/AA1/AS1/AG1

This IC set is based upon indications of a gaseous or liquid release of radioactivity to the environment, regardless of the initiating event. In recognition of the lower possible radioactivity concentrations, the assessment of liquid releases is limited to the UE and Alert emergency classification levels. The set provides for accident assessments using pre-calculated values based on assumed conditions, real-time parameters and field monitoring results.

The progression from UE to GE is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1.

> **UE** - This IC addresses a potential decrease in the level of safety of the plant as indicated by a low-level radiological release that exceeds regulatory commitments for an extended period of time (e.g., an uncontrolled release).
> **Alert** - This IC addresses a release of gaseous or liquid radioactivity that results in projected or actual offsite doses greater than or equal to 1% of the EPA Protective Action Guides (PAGs).
> **SAE** - This IC addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to 10% of the EPA PAGs.
> **GE** - This IC addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to the EPA PAGs.

The threshold criteria specified in the EALs of this IC set are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

### 1.1.2 IC Set AU2/AA2/AS2/AG2

This IC set is based upon indications of potential or actual damage to an irradiated fuel assembly or multiple assemblies. It addresses a lowering of water level over irradiated fuel or fuel uncovery, and a spectrum of fuel handling accidents that result in mechanical damage to irradiated fuel (e.g., a dropped fuel assembly).

NEI 99-01, Revision 6, contains 3 EALs that reflect the future availability of the enhanced spent fuel pool level instrumentation associated with NRC Order EA-12-051. These EALs are included within existing IC AA2, and new ICs AS2 and AG2. Implementation of these EALs is recommended when the enhanced spent fuel pool level instrumentation is available for use.

The progression from UE to Alert is appropriate and consistent with guidance provided in

NUREG 0654/FEMA-REP-1.

> **UE -** This IC addresses a decrease in water level above irradiated fuel sufficient to cause elevated radiation levels.
> **Alert** - This IC addresses events that have caused imminent or actual damage to an irradiated fuel assembly, or a significant lowering of water level within the spent fuel pool (**EAL for enhanced SFP instrumentation included within this IC**).
> **SAE (IC and EAL for enhanced SFP instrumentation)** - This IC addresses a significant loss of spent fuel pool inventory control and makeup capability leading to imminent fuel damage.
> **GE (IC and EAL for enhanced SFP instrumentation)** - This IC addresses a significant loss of spent fuel pool inventory control and makeup capability leading to a prolonged uncovery of spent fuel.

The SAE and GE emergency classification levels for this specific accident progression are bounded by indications available in the BWR and PWR fission product barrier tables, as well as ICs AS1 and AG1. With the availability of new spent fuel pool level instrumentation, the enhanced EALs will provide a redundant escalation path by including specific SAE and GE ICs.

The threshold criteria specified in the EALs of this IC set are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.1.3 IC AA3

This IC addresses elevated radiation levels in certain plant rooms/areas sufficient to preclude or impede personnel from performing actions necessary to maintain normal plant operation, or to perform a normal plant cooldown and shutdown. This includes equipment in the Control Room (CR) and Central Alarm Station (CAS), and other plant-specific areas/rooms requiring continuous occupancy.

This stand-alone IC is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1, and does not require an IC set within the overall emergency classification scheme. This IC is primarily intended to ensure that the plant emergency response organization (ERO) is activated to support the CR in removing the impediment to normal access to the CR, CAS or other required area/room. Indications of further increases in radiation levels in the plant are bounded by indications available in the BWR and PWR fission product barrier tables, as well as ICs AS1 and AG1.

The threshold criteria specified in the EALs of this IC are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

## Table 3-1: Recognition Category "A" Initiating Condition Matrix

| UNUSUAL EVENT | ALERT | SITE AREA EMERGENCY | GENERAL EMERGENCY |
|---|---|---|---|
| **AU1** Release of gaseous or liquid radioactivity greater than 2 times the (site-specific effluent release controlling document) limits for 60 minutes or longer.<br>*Op. Modes: All* | **AA1** Release of gaseous or liquid radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE.<br>*Op. Modes: All* | **AS1** Release of gaseous radioactivity resulting in offsite dose greater than 100 mrem TEDE or 500 mrem thyroid CDE.<br>*Op. Modes: All* | **AG1** Release of gaseous radioactivity resulting in offsite dose greater than 1,000 mrem TEDE or 5,000 mrem thyroid CDE.<br>*Op. Modes: All* |
| **AU2** UNPLANNED loss of water level above irradiated fuel.<br>*Op. Modes: All* | **AA2** Significant lowering of water level above, or damage to, irradiated fuel.<br>*Op. Modes: All* | **AS2** Spent fuel pool level at (site-specific Level 3 description).<br>*Op. Modes: All* | **AG2** Spent fuel pool level cannot be restored to at least (site-specific Level 3 description) for 60 minutes or longer.<br>*Op. Modes: All* |
| | **AA3** Radiation levels that impede access to equipment necessary for normal plant operations, cooldown or shutdown.<br>*Op. Modes: All* | | |

## 1.2 CATEGORY 'C' – COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

Refer to Table 3-2, Recognition Category "C" Initiating Condition Matrix, for an overview.

### 1.2.1 IC Set CU1/CA1/CS1/CG1

This IC set is based upon a loss of reactor vessel inventory or a loss of the ability to monitor reactor vessel level. The IC and associated EALs are independent of the initiating event (e.g., component failure, loss of configuration control, etc.).

The progression from UE to GE is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1.

> **UE** - This IC addresses the inability to restore and maintain water level to a required minimum level (or the lower limit of a level band), or a loss of the ability to monitor (reactor vessel/RCS [*PWR*] or RPV [*BWR*]) level concurrent with indications of coolant leakage.
> **Alert** - This IC addresses conditions that are precursors to a loss of the ability to adequately cool irradiated fuel (i.e., a precursor to a challenge to the fuel clad barrier).
> **SAE** - This IC addresses a significant and prolonged loss of (reactor vessel/RCS [*PWR*] or RPV [*BWR*]) inventory control and makeup capability leading to imminent fuel damage.
> **GE** - This IC addresses the inability to restore and maintain reactor vessel level above the top of active fuel with containment challenged.

The threshold criteria specified in the EALs of this IC set are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

### 1.2.2 IC Set CU2/CA2

This IC set is based upon a loss of power sources to AC emergency buses.

The progression from UE to Alert is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1.

> **UE** - This IC describes a significant degradation of offsite and onsite AC power sources such that any additional single failure would result in a loss of all AC power to safety systems.
> **Alert** - This IC addresses a total loss of AC power that compromises the performance of all safety systems requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink.

The SAE and GE emergency classification levels for this specific accident progression are bounded by indications available in ICs CS1, CG1, AS1 and AG1.

The threshold criteria specified in the EALs of this IC set are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.2.3 IC Set CU3/CA3

This IC set is based upon an inability to maintain control of reactor core/coolant heat removal. The IC and associated EALs are independent of the initiating event (e.g., equipment failures, addition of heat, etc.).

The progression from UE to Alert is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1.

> **UE** - This IC addresses an unplanned increase in RCS temperature above the Technical Specification cold shutdown temperature limit, or the inability to determine RCS temperature and level.
> **Alert** - This IC addresses conditions involving a loss of decay heat removal capability or an addition of heat to the RCS in excess of that which can currently be removed.

The SAE and GE emergency classification levels for this specific accident progression are bounded by indications available in ICs CS1, CG1, AS1 and AG1.

The threshold criteria specified in the EALs of this IC set are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.2.4 IC CU4

This IC addresses a loss of Vital DC power which compromises the ability to monitor and control operable safety systems when the plant is in the cold shutdown or refueling mode.

This stand-alone IC is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1, and does not require an IC set within the overall emergency classification scheme. It is primarily intended to ensure that key ERO members and offsite response organizations are aware of the event, resources necessary to respond to the event are mobilized and any necessary compensatory measures are promptly implemented. The Alert, SAE and GE emergency classification levels for a protracted loss of Vital DC power are bounded by indications available in ICs CA1, CA3, CS1, CG1, AA1, AS1 and AG1.

The threshold criteria specified in the EALs of this IC are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.2.5 IC CU5

This IC addresses a significant loss of on-site or offsite communications capabilities, including those to offsite response organization and NRC contact points.

This stand-alone IC is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1, and does not require an IC set within the overall emergency classification scheme. It is primarily intended to ensure that key ERO members and offsite response organizations are aware of the loss of communications capabilities, the resources necessary to restore communications are mobilized and compensatory measures are promptly implemented. There is no escalation IC for this this event.

The threshold criteria specified in the EALs of this IC are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.2.6 IC CA6

This IC addresses an unplanned or hazardous event that causes damage to safety systems of sufficient magnitude to significantly challenge the ability to maintain cooling of irradiated fuel. The hazardous events of interest include, but are not limited to, an earthquake, flooding, explosion or fire.

This stand-alone IC is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1, and does not require an IC set within the overall emergency classification scheme. It is primarily intended to ensure that the plant emergency response organization (ERO) is activated to support the Control Room in understanding the event impacts and restoring affected safety system equipment to service. The SAE and GE classification levels for this event are bounded by indications available in ICs CS1, CG1, AS1 and AG1.

The threshold criteria specified in the EALs of this IC are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

## Table 3-2: Recognition Category "C" Initiating Condition Matrix

| UNUSUAL EVENT | ALERT | SITE AREA EMERGENCY | GENERAL EMERGENCY |
|---|---|---|---|
| **CU1** UNPLANNED loss of (reactor vessel/RCS [*PWR*] or RPV [*BWR*]) inventory for 15 minutes or longer.<br>*Op. Modes: Cold Shutdown, Refueling* | **CA1** Loss of (reactor vessel/RCS [*PWR*] or RPV [*BWR*]) inventory.<br>*Op. Modes: Cold Shutdown, Refueling* | **CS1** Loss of (reactor vessel/RCS [*PWR*] or RPV [*BWR*]) inventory affecting core decay heat removal capability.<br>*Op. Modes: Cold Shutdown, Refueling* | **CG1** Loss of (reactor vessel/RCS [*PWR*] or RPV [*BWR*]) inventory affecting fuel clad integrity with containment challenged.<br>*Op. Modes: Cold Shutdown, Refueling* |
| **CU2** Loss of all but one AC power source to emergency buses for 15 minutes or longer.<br>*Op. Modes: Cold Shutdown, Refueling, Defueled* | **CA2** Loss of all offsite and all onsite AC power to emergency buses for 15 minutes or longer.<br>*Op. Modes: Cold Shutdown, Refueling, Defueled* | | |
| **CU3** UNPLANNED increase in RCS temperature.<br>*Op. Modes: Cold Shutdown, Refueling* | **CA3** Inability to maintain the plant in cold shutdown.<br>*Op. Modes: Cold Shutdown, Refueling* | | |
| **CU4** Loss of Vital DC power for 15 minutes or longer.<br>*Op. Modes: Cold Shutdown, Refueling* | | | |
| **CU5** Loss of all onsite or offsite communications capabilities.<br>*Op. Modes: Cold* Shutdown*, Refueling, Defueled* | | | |

| UNUSUAL EVENT | ALERT | SITE AREA EMERGENCY | GENERAL EMERGENCY |
|---|---|---|---|
| | **CA6** UNPLANNED or hazardous event affecting SAFETY SYSTEMS.<br>*Op. Modes: Cold Shutdown, Refueling, Defueled* | | |

## 1.3 CATEGORY 'E' – INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI)

Refer to Table 3-3, Recognition Category "E" Initiating Condition Matrix, for an overview

### 1.3.1 IC E-HU1

This IC addresses an event that results in damage to the confinement boundary of a storage cask containing spent fuel. The IC and associated EAL are independent of the initiating event (e.g., component failure, natural event, etc.).

This stand-alone IC is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1, and does not require an IC set within the overall emergency classification scheme. It is primarily intended to ensure that key ERO members and offsite response organizations are aware of the cask damage, resources necessary to respond to the event are mobilized and protective measures are promptly implemented. Security-related events of concern to an ISFSI are bounded by IC HA1.

The threshold criterion specified in the EAL of this IC is consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

**Table 3-3: Recognition Category "E" Initiating Condition Matrix**

| **UNUSUAL EVENT** |
|---|
| **E-HU1** Damage to a loaded cask CONFINEMENT BOUNDARY.<br>*Op. Modes: All* |

## 1.4 CATEGORY 'F' – BWR AND PWR FISSION PRODUCT BARRIER TABLES

This IC set includes three ICs (FA1/FS1/FG1) which rely upon numerous thresholds as logic inputs to determine the appropriate emergency classification based upon the number of lost and/or potentially lost fission product barriers. Nuclear Steam Supply System (NSSS) designs include three fission product barriers: fuel cladding, the RCS, and the containment. The thresholds specified within this set define when each fission product barrier has been potentially lost or lost as appropriate for a BWR and a PWR.

The progression from Alert to GE is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1.

> **Alert** - Any Loss or any Potential Loss of either the Fuel Clad or RCS barrier.
> **SAE** - Loss or Potential Loss of any two barriers.
> **GE** - Loss of any two barriers and Loss or Potential Loss of the third barrier.

By design, the ICs and thresholds within this set are, in many cases, redundant with indications described in the Recognition Category 'A' and Recognition Category 'S' IC sets. This is because it is important for licensees to recognize events affecting one or more fission product barriers in as timely a manner as possible using the best available indicators from several different perspectives.

The barrier loss and potential loss threshold criteria specified in the BWR and PWR tables are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

## 1.5 CATEGORY 'H' – HAZARDS

Refer to Table 3-5, Recognition Category "H" Initiating Condition Matrix, for an overview.

### 1.5.1 IC Set HU1/HA1/HS1/HG1

This IC set is based upon the security-related events discussed in NRC Bulletin 2005-02 and RIS 2006-12. Licensees were to implement this guidance regardless of the specific version of the generic emergency classification scheme development guidance used, or if an emergency classification scheme was developed using an alternative approach. Based upon lessons learned from implementation and use of this IC set, particularly from combined security and emergency preparedness drills conducted by licensees, the NRC staff and the industry worked to enhance the language within the IC set. The changes eliminated potential points of confusion but maintained the intent of the IC set as provided in NRC Bulletin 2005-02 and RIS 2006-12. The NRC staff generated EAL Frequently Asked Question (EALFAQ) 2009-48 to address the changes made to the generic emergency classification scheme development guidance document.

The progression from UE to GE is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1.

> **UE** - This IC addresses events that pose a threat to plant personnel or safety system equipment
> **Alert** - This IC addresses the occurrence of a hostile action within the Owner Controlled Area or notification of an aircraft attack threat.
> **SAE** - This IC addresses the occurrence of a hostile action within the Protected Area.
> **GE** - This IC addresses an event in which a hostile force has taken physical control of the facility to the extent that the plant staff can no longer operate equipment necessary to maintain key safety functions. It also addresses a hostile action leading to a loss of physical control that results in actual or imminent damage to spent fuel due to 1) damage to a spent fuel pool cooling system (e.g., pumps, heat exchangers, controls, etc.) or, 2) loss of spent fuel pool integrity such that sufficient water level cannot be maintained

The threshold criteria specified in the EALs of this IC set are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

### 1.5.2 IC HU2

This IC addresses a seismic event that results in accelerations at the plant site equal to or greater than those specified for an Operating Basis Earthquake (OBE).

This stand-alone IC is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1, and does not require an IC set within the overall emergency classification scheme. This IC is primarily intended to ensure that key ERO members and offsite response

organizations are aware of the earthquake magnitude at the plant site, and post-event damage assessments are promptly implemented. Indications of earthquake-induced damage to safety systems are bounded by indications available in ICs SA10 or CA6. Indications of earthquake-induced damage to components containing radioactive materials are bounded by indications available in ICs AA1 or AA3.

The threshold criteria specified in the EAL of this IC are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.5.3 IC HU3

This IC addresses a variety of natural or technological hazard events that are considered to be precursors to a more significant event or condition, or have potential impacts that warrant emergency notification to local, State and Federal authorities. Specific hazards addressed include:

- Explosion
- Tornado strike
- Main turbine rotating component failure
- An external event that prohibits the plant staff from accessing the site
- Offsite release of hazardous materials affecting the Protected Area

This stand-alone IC is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1, and does not require an IC set within the overall emergency classification scheme. This IC is primarily intended to ensure that key ERO members and offsite response organizations are aware of the hazardous event affecting the plant site, and post-event damage assessments are promptly implemented. Indications of hazard-induced damage to safety systems are bounded by indications available in ICs SA10 or CA6. Indications of hazard-induced damage to components containing radioactive materials are bounded by indications available in ICs AA1 or AA3.

The threshold criteria specified in the EALs of this IC are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.5.4 IC HU4

This IC addresses the magnitude and extent of fires that may be indicative of a potential degradation of the level of safety of the plant.

This stand-alone IC is appropriate and consistent with guidance provided in NUREG

0654/FEMA-REP-1, and does not require an IC set within the overall emergency classification scheme. This IC is primarily intended to ensure that key ERO members and offsite response organizations are aware of the fire, and post-event damage assessments are promptly implemented. Indications of a protracted fire causing damage to safety systems are bounded by indications available in ICs SA10 or CA6. Indications of a protracted fire involving radioactive materials are bounded by indications available in ICs AA1 or AA3.

The threshold criteria specified in the EALs of this IC are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.5.5 IC HA5

This IC addresses an event involving a release of a hazardous gas that precludes or impedes access to equipment necessary to maintain normal plant operation, or required for a normal plant cooldown and shutdown.

This stand-alone IC is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1, and does not require an IC set within the overall emergency classification scheme. This IC is primarily intended to ensure that the plant emergency response organization (ERO) is activated to support the Control Room in removing the impediment to normal access to the affected area/room. Indications of a protracted loss of access to equipment necessary for normal plant operations, cooldown or shutdown are bounded by indications available in the BWR and PWR fission product barrier tables, as well as ICs AS1 and AG1.

The threshold criteria specified in the EAL of this IC are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.5.6 IC Set HA6/HS6

This IC set addresses an evacuation of the Control Room that results in transfer of plant control to locations outside the Control Room.

The progression from Alert to SAE is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1.

> **Alert** – This IC addresses an evacuation of the Control Room that results in transfer of plant control to alternate locations outside the Control Room.
> **SAE** - This IC addresses an evacuation of the Control Room that results in transfer of plant control to alternate locations, and the control of a key safety function cannot be reestablished in a timely manner.

The GE classification level for this specific accident progression is bounded by indications available in the BWR and PWR fission product barrier tables or IC AG1.

The threshold criteria specified in the EALs of this IC set are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.5.7 IC Set HU7/HA7/HS7/HG7

This IC set provides discretionary criteria to the decision-maker with which to make an emergency classification.

The progression from UE to GE is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1.

> **UE** – This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for a NOUE.
> **Alert** – This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for an Alert.
> **SAE** – This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for a Site Area Emergency.
> **GE** - This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for a General Emergency.

The threshold criteria specified in the EALs of this IC set are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

## Table 3-5: Recognition Category "H" Initiating Condition Matrix

| UNUSUAL EVENT | ALERT | SITE AREA EMERGENCY | GENERAL EMERGENCY |
|---|---|---|---|
| **HU1** Confirmed SECURITY CONDITION or threat.<br>*Op. Modes: All* | **HA1** HOSTILE ACTION within the OWNER CONTROLLED AREA or airborne attack threat within 30 minutes.<br>*Op. Modes: All* | **HS1** HOSTILE ACTION within the PROTECTED AREA.<br>*Op. Modes: All* | **HG1** HOSTILE ACTION resulting in loss of physical control of the facility.<br>*Op. Modes: All* |
| **HU2** Seismic event greater than OBE levels.<br>*Op. Modes: All* | | | |
| **HU3** A natural or technological hazard potentially affecting plant safety.<br>*Op. Modes: All* | | | |
| **HU4** FIRE potentially degrading the level of safety of the plant.<br>*Op. Modes: All* | | | |
| | **HA5** Gaseous release impeding access to equipment necessary for normal plant operations, cooldown or shutdown.<br>*Op. Modes: All* | | |
| | **HA6** Control Room evacuation resulting in transfer of plant control to alternate locations.<br>*Op. Modes: All* | **HS6** Inability to control a key safety function from outside the Control Room.<br>*Op. Modes: All* | |

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| UNUSUAL EVENT | ALERT | SITE AREA EMERGENCY | GENERAL EMERGENCY |
|---|---|---|---|
| **HU7** Other conditions exist which in the judgment of the Emergency Director warrant declaration of a (NO)UE.<br>*Op. Modes: All* | **HA7** Other conditions exist which in the judgment of the Emergency Director warrant declaration of an Alert.<br>*Op. Modes: All* | **HS7** Other conditions exist which in the judgment of the Emergency Director warrant declaration of a Site Area Emergency.<br>*Op. Modes: All* | **HG7** Other conditions exist which in the judgment of the Emergency Director warrant declaration of a General Emergency.<br>*Op. Modes: All* |

## 1.6 CATEGORY 'S' – SYSTEM MALFUNCTION

Refer to Table 3-6, Recognition Category "S" Initiating Condition Matrix, for an overview.

### 1.6.1 IC Set SU1/SA1/SS1/SG1

This IC set is based upon a loss of power sources to AC emergency buses.

The progression from UE to GE is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1.

> **UE** – This IC addresses a prolonged loss of offsite power.
> **Alert** – This IC describes a significant degradation of offsite and onsite AC power sources such that any additional single failure would result in a loss of all AC power to safety systems.
> **SAE** – This IC addresses a total loss of AC power that compromises the performance of all safety systems requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink
> **GE** - This IC addresses a prolonged loss of all power sources to AC emergency buses.

The threshold criteria specified in the EALs of this IC set are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

### 1.6.2 IC Set SU2/SA2

This IC set is based upon a loss of key plant safety indications.

The progression from Unusual Event to Alert is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1.

> **UE** – This IC addresses the difficulty associated with monitoring normal plant conditions without the ability to obtain safety system parameters from within the Control Room.
> **Alert** - This IC addresses the difficulty associated with monitoring rapidly changing plant conditions during a transient without the ability to obtain safety system parameters from within the Control Room.

The SAE and GE classification levels for this specific accident progression are bounded by indications available in the ICs of Recognition Categories F and S.

The threshold criteria specified in the EALs of this IC set are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.6.3 IC SU3

This IC addresses a degradation of fuel clad integrity sufficient to cause reactor coolant activity to exceed an allowable limit specified in Technical Specifications.

This stand-alone IC is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1, and does not require an IC set within the overall emergency classification scheme. This UE IC is primarily intended to ensure that key ERO members are aware of the fuel clad degradation and support the Control Room in implementation of appropriate response measures. Escalation of the emergency classification is bounded by BWR and PWR fission product barrier tables, as well as ICs AA1, AS1, and AG1.

The threshold criteria specified in the EALs of this IC are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.6.4 IC SU4

This IC addresses RCS leakage that may be a precursor to a more significant event.

This stand-alone IC is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1, and does not require an IC set within the overall emergency classification scheme. This UE IC is primarily intended to ensure that key ERO members are aware of the RCS leakage and support the Control Room in implementation of appropriate response measures. Escalation of the emergency classification is bounded by BWR and PWR fission product table indicators, as well as ICs AA1, AS1, and AG1.

The threshold criteria specified in the EALs of this IC are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.6.5 IC Set SU5/SA5/SS5

This IC set addresses a failure of the reactor protection system to automatically shutdown the reactor.

The progression from Unusual Event to SAE is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1.

**UE** - This IC addresses an event that causes an automatic reactor (trip [*PWR*] / scram [*BWR*]) and the Reactor Protection System subsequently fails to shutdown the reactor.
**Alert** – This IC addresses an event that causes an automatic reactor (trip [*PWR*] / scram [*BWR*]), the Reactor Protection System subsequently fails to shutdown the reactor, and operator actions taken at the reactor control consoles to manually shutdown the reactor are unsuccessful.
**SAE** - This IC addresses an event that causes an automatic reactor (trip [*PWR*] / scram [*BWR*]), the Reactor Protection System subsequently fails to shutdown the reactor, all operator actions to manually shutdown the reactor are unsuccessful, and continued power generation is challenging the capability to adequately remove heat from the core and/or the RCS.

The GE classification level for this specific accident progression is bounded by indications available in the BWR and PWR fission product table indications, and IC AG1.

The threshold criteria specified in the EALs of this IC set are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.6.6 IC SU6

This IC addresses a significant loss of on-site or offsite communications capabilities, including those to offsite response organization and NRC contact points.

This stand-alone IC is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1, and does not require an IC set within the overall emergency classification scheme. It is primarily intended to ensure that key ERO members and offsite response organizations are aware of the loss of communications capabilities, the resources necessary to restore communications are mobilized and compensatory measures are promptly implemented. There is no escalation IC for this this event.

The threshold criteria specified in the EALs of this IC are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.6.7 IC SU7

This IC addresses a failure of one or more containment penetrations to automatically isolate (close) when required by an actuation signal. It also addresses an event that results in high containment pressure with a concurrent failure of containment pressure control systems. This IC is applicable to a PWR plant.

This stand-alone IC is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1, and does not require an IC set within the overall emergency classification scheme. It is primarily intended to ensure that key ERO members and offsite response organizations are aware of significant challenges to containment integrity, and compensatory measures are promptly implemented. The escalation of the emergency classification level, if needed to address a subsequent loss or potential loss of the RCS, is bounded by the BWR and PWR fission product barrier tables.

The threshold criteria specified in the EALs of this IC are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.6.8 IC SU8

This IC addresses the inability or failure to place a unit in a required operating mode as required by Technical Specifications.

This stand-alone IC is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1, and does not require an IC set within the overall emergency classification scheme. It is primarily intended to ensure that key ERO members and offsite response organizations are aware of any issues inhibiting the timely completion of a required mode change. The escalation of the emergency classification level, if needed, is bounded by indications available in the ICs of Recognition Categories A, H, S and F.

The threshold criterion specified in the EAL of this IC is consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.6.9 IC Set SS9/SG9

This IC set addresses a loss of Vital DC power.

The progression from SAE to GE is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1.

> **SAE** - This IC addresses a loss of Vital DC power which compromises the ability to monitor and control safety systems.
> **GE** - This IC addresses a concurrent and prolonged loss of both AC and Vital DC power.

The threshold criteria specified in the EALs of this IC set are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.6.10 IC SA10

This IC addresses an unplanned or hazardous event that causes damage to safety systems of sufficient magnitude to significantly reduce the margin to a loss or potential loss of the fuel clad or RCS fission product barrier. The hazardous events of interest include, but are not limited to, an earthquake, flooding, explosion or fire.

This stand-alone IC is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1, and does not require an IC set within the overall emergency classification scheme. It is primarily intended to ensure that the plant emergency response organization (ERO) is activated to support the Control Room in understanding the event impacts and restoring affected safety system equipment to service. The SAE and GE classification levels for this event are bounded by indications available in the ICs of Recognition Categories A, S and F.

The threshold criteria specified in the EALs of this IC are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

**Table 3-6: Recognition Category "S" Initiating Condition Matrix**

| UNUSUAL EVENT | ALERT | SITE AREA EMERGENCY | GENERAL EMERGENCY |
|---|---|---|---|
| **SU1** Loss of all offsite AC power capability to emergency buses for 15 minutes or longer. *Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown* | **SA1** Loss of all but one AC power source to emergency buses for 15 minutes or longer. *Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown* | **SS1** Loss of all offsite and all onsite AC power to emergency buses for 15 minutes or longer. *Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown* | **SG1** Prolonged loss of all offsite and all onsite AC power to emergency buses. *Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown* |

| UNUSUAL EVENT | ALERT | SITE AREA EMERGENCY | GENERAL EMERGENCY |
|---|---|---|---|
| **SU2** UNPLANNED loss of Control Room indications for 15 minutes or longer.<br>*Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown* | **SA2** UNPLANNED loss of Control Room indications for 15 minutes or longer with a significant transient in progress.<br>*Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown* | | |
| **SU3** Fuel clad degradation.<br>*Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown* | | | |
| **SU4** RCS leakage for 15 minutes or longer.<br>*Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown* | | | |
| **SU5** Automatic (trip [*PWR*] / scram [*BWR*]) fails to shutdown the reactor and manual action taken at the reactor control consoles is successful in shutting down the reactor.<br>*Op. Modes: Power Operation* | **SA5** Automatic (trip [*PWR*] / scram [*BWR*]) fails to shutdown the reactor and manual action taken at the reactor control consoles is not successful in shutting down the reactor.<br>*Op. Modes: Power Operation* | **SS5** Inability to shutdown the reactor causing a challenge to (core cooling [*PWR*] / RPV water level [*BWR*]) or RCS heat removal.<br>*Op. Modes: Power Operation* | |
| **SU6** Loss of all onsite or offsite communications capabilities.<br>*Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown* | | | |

| UNUSUAL EVENT | ALERT | SITE AREA EMERGENCY | GENERAL EMERGENCY |
|---|---|---|---|
| **SU7** Failure to isolate containment or loss of containment pressure control. [*PWR*]<br>*Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown* | | | |
| **SU8** Inability to reach a required operating mode within Technical Specification limits.<br>*Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown* | | | |
| | | **SS9** Loss of all Vital DC power for 15 minutes or longer.<br>*Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown* | **SG9** Loss of all AC and Vital DC power sources for 15 minutes or longer.<br>*Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown* |
| | **SA10** UNPLANNED or hazardous event affecting SAFETY SYSTEMS.<br>*Op. Modes: Power Operation, Startup, Hot Standby, Hot Shutdown* | | |

## 1.7 CATEGORY 'PD' – PERMANENTLY DEFUELED

In order to relax the emergency plan requirements applicable to an operating station, the owner of a permanently defueled station must demonstrate that no credible event can result in a significant radiological release beyond the site boundary. It is expected that this verification will confirm that the source term and motive force available in the permanently defueled condition are insufficient to warrant classifications of a Site Area Emergency or General Emergency. Therefore, the ECLs for the ICs applicable to a permanently defueled station are limited to a Notification of Unusual Event (NOUE) or an Alert.

Refer to Table 3-7, Recognition Category "PD" Initiating Condition Matrix, for an overview.

### 1.7.1 IC Set PD-AU1/ PD-AA1

This IC set is based upon indications of a gaseous or liquid release of radioactivity to the environment, regardless of the initiating event. The set provides for accident assessments using pre-calculated values based on assumed conditions, real-time parameters and field monitoring results.

The progression from UE to Alert is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1.

> **UE** - This IC addresses a potential decrease in the level of safety of the plant as indicated by a low-level radiological release that exceeds regulatory commitments for an extended period of time (e.g., an uncontrolled release).
> **Alert** - This IC addresses a release of gaseous or liquid radioactivity that results in projected or actual offsite doses greater than or equal to 1% of the EPA Protective Action Guides (PAGs).

The threshold criteria specified in the EALs of this IC set are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

### 1.7.2 IC Set PD-AU2/ PD-AA2

This IC set is based upon indications of increased radiation levels within the facility.

The progression from UE to Alert is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1.

> **UE** - This IC addresses elevated plant radiation levels caused by a decrease in water level above irradiated (spent) fuel or other UNPLANNED events.
> **Alert** - This IC addresses increased radiation levels that impede necessary access to areas containing equipment that must be operated manually or that requires local monitoring, in

order to maintain systems needed to maintain spent fuel integrity.

The threshold criteria specified in the EALs of this IC set are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.7.3 IC PD-SU1

This IC addresses an unplanned increase in the temperature of water in the spent fuel pool.

This stand-alone IC is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1, and does not require an IC set within the overall emergency classification scheme. It is primarily intended to ensure that key ERO members and offsite response organizations are aware of any issues inhibiting a restoration of spent fuel pool cooling capabilities. The escalation of the emergency classification level, if needed, is bounded by indications available in the ICs of Recognition Category A.

The threshold criterion specified in the EAL of this IC is consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.7.4 IC Set PD-HU1/ PD-HA1

This IC set is based upon the security-related events discussed in NRC Bulletin 2005-02 and RIS 2006-12. Licensees were to implement this guidance regardless of the specific version of the generic emergency classification scheme development guidance used, or if an emergency classification scheme was developed using an alternative approach. Based upon lessons learned from implementation and use of this IC set, particularly from combined security and emergency preparedness drills conducted by licensees, the NRC staff and the industry worked to enhance the language within the IC set. The changes eliminated potential points of confusion but maintained the intent of the IC set as provided in NRC Bulletin 2005-02 and RIS 2006-12. The NRC staff generated EAL Frequently Asked Question (EALFAQ) 2009-48 to address the changes made to the generic emergency classification scheme development guidance document.

The progression from UE to Alert is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1.

> **UE** - This IC addresses events that pose a threat to plant personnel or the equipment necessary to maintain cooling of spent fuel, and thus represent a potential degradation in the level of plant safety.
> **Alert** - This IC addresses the occurrence of a HOSTILE ACTION within the OWNER CONTROLLED AREA or notification of an aircraft attack threat.

The threshold criteria specified in the EALs of this IC set are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.7.5 IC PD-HU2

This IC addresses an unplanned or hazardous event that results in sufficient damage to cause a loss of more than one train of equipment needed to cool spent fuel.

This stand-alone IC is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1, and does not require an IC set within the overall emergency classification scheme. It is primarily intended to ensure that the plant emergency response organization (ERO) is activated to support the Control Room in understanding the event impacts and restoring affected equipment to service.. The escalation of the emergency classification level, if needed, is bounded by indications available in the ICs of Recognition Category A.

The threshold criterion specified in the EAL of this IC is consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

1.7.6 IC Set PD-HU3/ PD-HA3

This IC set provides discretionary criteria to the decision-maker with which to make an emergency classification.

The progression from UE to Alert is appropriate and consistent with guidance provided in NUREG 0654/FEMA-REP-1.

> **UE** – This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for a NOUE.
> **Alert** – This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for an Alert.

The threshold criteria specified in the EALs of this IC set are consistent with the expected Critical Characteristics of a standard emergency classification scheme.

Based on the above, the generic development guidance meets the requirements of Section IV of

Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.

**Table 3-7: Recognition Category "PD" Initiating Condition Matrix**

| UNUSUAL EVENT | ALERT |
|---|---|
| **PD-AU1** Release of gaseous or liquid radioactivity greater than 2 times the (site-specific effluent release controlling document) limits for 60 minutes or longer.<br>*Op. Modes: Not Applicable* | **PD-AA1** Release of gaseous or liquid radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE.<br>*Op. Modes: Not Applicable* |
| **PD-AU2** UNPLANNED rise in plant radiation levels.<br>*Op. Modes: Not Applicable* | **PD-AA2** UNPLANNED rise in plant radiation levels that impedes plant access required to maintain spent fuel integrity.<br>*Op. Modes: Not Applica*ble |
| **PD-SU1** UNPLANNED spent fuel pool temperature rise.<br>*Op. Modes: Not Applicable* | |
| **PD-HU1** Confirmed SECURITY CONDITION or threat.<br>*Op. Modes: Not Applicable* | **PD-HA1** HOSTILE ACTION within the OWNER CONTROLLED AREA or airborne attack threat within 30 minutes.<br>*Op. Modes: Not Applicable* |
| **PD-HU2** An UNPLANNED event affecting equipment necessary for spent fuel cooling.<br>*Op.* Modes*: Not Applicable* | |
| **PD-HU3** Other conditions exist which in the judgment of the Emergency Director warrant declaration of a (NO)UE.<br>*Op. Modes: Not Applicable* | **PD-HA3** Other conditions exist which in the judgment of the Emergency Director warrant declaration of an Alert.<br>*Op. Modes: Not Applicable* |

## 2.0 CONCLUSION

The NEI EAL Task Force has determined that the proposed emergency classification scheme uses objective and observable values, is worded in a manner that addresses human engineering and user friendliness concerns, follows logical progression for escalating events, and allows for event downgrading and upgrading based upon the potential risk to the public health and safety. Risk assessments were appropriately used to set the boundaries of the emergency classification levels and ensure that all ICs that trigger emergency classification are in the same range of relative risk.

Based on the above, the NEI EAL Task Force believes that Revision 6 of NEI 99-01 meets the requirements of Section IV of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(4), and is therefore acceptable.