

## RS2

*[See Developer Notes]*

ECL: Site Area Emergency

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

Operating Mode Applicability: All

Emergency Action Levels:

(1) Lowering of spent fuel pool level to ~~(site-specific Level 3 value)~~ Level 3.

Basis:

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

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

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

### 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: 3.1.3.B

# RA1

ECL: Alert

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

**Operating Mode Applicability:** All

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

**Notes:**

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monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.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

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

Reactor Building Vent Accident Range Monitor: ID11-P601 (feeding ID11-R631, Rx Bldg Vent Wide Range) 2D11-P601 (feeding 2D11-R631, Rx Bldg Vent Wide Range)	$2.6 \times 10^{-2} \mu\text{Ci/cc}$ $2.6 \times 10^{-2} \mu\text{Ci/cc}$
Main Stack Accident Range Monitor: ID11-P007 (feeding ID11-R631, Main Stack Wide Range)	$8.1 \times 10^1 \mu\text{Ci/cc}$

(site specific monitor list and threshold values)

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

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

- (4) 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 10 mR/hr expected to continue for 60 minutes or longer.
- Analyses of field survey samples indicate thyroid CDE greater than 50 mrem for one hour of inhalation.

**Basis:**

This IC addresses a release of gaseous or liquid radioactivity that results in projected or actual offsite doses greater than or equal to 1% percent of the EPA Protective Action Guides (PAGs). It includes both monitored and un-monitored releases. Releases of this magnitude represent an

Commented [ 8]: V2 Rad Monitor Calculation

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actual or potential substantial degradation of the level of plant safety ~~of the plant~~ as indicated by a radiological release that significantly exceeds regulatory limits (e.g., a significant uncontrolled release).

Radiological effluent EALs are ~~also~~ included to provide a basis for classifying events and conditions that cannot be readily or appropriately classified on the basis of plant conditions alone. The inclusion of both plant condition and radiological effluent EALs more fully addresses the spectrum of possible accident events and conditions. ~~The 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 RS1. 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 that the threshold values are based on a site boundary (or beyond) dose of 10 mR/hour whole body or 50 mR/hour thyroid, whichever is more limiting.~~

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

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

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

#### **Developer Notes:**

~~While this IC may not be met absent challenges to one or more 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 and liquid effluent monitors.~~

- The effluent monitor readings should correspond to a dose of 10 mrem TEDE or 50 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 RS1 and RG1. 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 RS1 and RG1. 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: 3.12.C~~

## RA2

ECL: Alert

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

**Operating Mode Applicability:** All

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

- (1) Uncovery of irradiated fuel in the REFUELING PATHWAY.
- (2) Damage to irradiated fuel resulting in a release of radioactivity from the fuel as indicated by alarms on **ANY** of the following Table R1 radiation monitors:

Commented [ 11]: V4 Alarm Response Procedure Reference

Table R1	
Refuel Floor Area Radiation Monitors	
Unit 1	Unit 2
ID21-K601 A - Rx Head Laydown Area	2D21-K601 A - Rx Head Laydown Area
ID21-K601 B - Refueling Floor Stairway	2D21-K601 M - Spent Fuel/Fuel Pool Areas
ID21-K601 D - Refuel Floor	2D21-K601 E - Dryer/Separator Pool
ID21-K601 E - Drywell Shield Plug	2D21-K611 K - RPV Refuel Floor 228'
ID21-K601 M - Spent Fuel Pool and New Fuel Storage area	2D21-K611 L - RPV Refuel Floor 228'
Refuel Floor Ventilation Monitors	
Unit 1	Unit 2
ID11-K609 A-D - Rx Bldg. Potential Contaminated Area Vent Exhaust Rad Monitor	2D11-K609 A-D - Rx Bldg. Potential Contaminated Area Vent Exhaust Rad Monitor
ID11-K611 A-D - Refuel Floor Vent Exhaust	2D11-K611 A-D - Refuel Floor Vent Exhaust
	2D11-K634 A-D - Refuel Floor Rx Well Vent. Exhaust
	2D11-K635 A-D - Refuel Floor DW/Sep. Vent. Exhaust

Commented [ 12]: V4 Alarm Response Procedure Reference

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

- (3) Lowering of spent fuel pool level to (site-specific Level 2 value) Level 2. [See Developer Notes]

**Basis:**

REFUELING PATHWAY: This includes the reactor cavity, the transfer canal, and the spent fuel pool.

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

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

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

#### EAL #1

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

While an area radiation monitor could detect an increase in a dose rate due to a lowering of water level in some portion of the REFUELING PATHWAY, the reading may not be a reliable indication of whether or not the fuel is actually uncovered. To the degree possible, readings ~~should will~~ be considered in combination with other available indications of inventory loss.

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

#### EAL #2

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

#### EAL #3

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

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

#### ~~Developer Notes:~~

~~For EAL #1~~

~~Depending upon the availability and range of instrumentation, this EAL may include specific readings indicative of fuel uncover; consider water and radiation level readings. Specify the mode applicability of a particular indication if it is not available in all modes.~~

~~For EAL #2~~

— The “site-specific listing of radiation monitors, and the associated readings, setpoints and/or alarms” should contain those radiation monitors that could be used to identify damage to an irradiated fuel assembly (e.g., confirmatory of a release of fission product gases from irradiated fuel).

— For EALs #1 and #2

— 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 radiation value beyond the operating or display range of the installed radiation 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.

— To further promote accurate classification, developers should consider if some combination of monitors could be specified in the EAL to build in an appropriate level of corroboration between monitor readings into the classification assessment.

— Development of the EALs should also consider the availability and limitations of mode-dependent, or other controlled but temporary, radiation monitors. Specify the mode applicability of a particular monitor if it is not available in all modes.

— For EAL #3

— In accordance with the discussion in Section 1.4, NRC Order EA-12-051, it is recommended that this EAL be implemented when the enhanced spent fuel pool level instrumentation is available for use. The “site-specific Level 2 value” is usually the spent fuel pool level that is adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck. 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 2 value.

ECL Assignment Attributes: 3.1.2.B and 3.1.2.C

## RA3

**ECL:** Alert

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

**Operating Mode Applicability:** All

**Emergency Action Levels:** (1 or 2)

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

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

Control Room area radiation monitor ID21-K600 B or C
Central Alarm Station (by survey)

- ~~Control Room~~
- ~~Central Alarm Station~~
- ~~(other site specific areas/rooms)~~

- (2) An UNPLANNED event results in radiation levels that prohibit or impede access to any of the following Table H1 plant rooms or areas:

Table H1		
Building	Rooms	Applicable Modes
Diesel generator building	All	All
	Unit 1/2 130'	All
Reactor building	Unit 1/2 SE Diagonals (RHR)	All
	Unit 1/2 NE Diagonals (RHR)	All

~~(site specific list of plant rooms or areas with entry related mode applicability identified)~~

**Basis:**

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

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

For EAL #2, an Alert declaration is warranted if entry into the affected room/area is, or may be, procedurally required during the plant operating mode in effect at the time of the elevated radiation levels. The emergency classification is not contingent upon whether entry is actually necessary at the time of the increased radiation levels. Access should be considered as impeded if extraordinary measures are necessary to facilitate entry of personnel into the affected

**Commented [ 13]:** V5 Alarm Response Procedure Reference - Control Room Rad Monitor

room/area (e.g., installing temporary shielding, requiring use of non-routine protective equipment, requesting an extension in dose limits beyond normal administrative limits).

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

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

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

**Developer Notes:**

~~———— EAL #1~~

~~———— The value of 15mR/hr is derived from the GDC 19 value of 5 rem in 30 days with adjustment for expected occupancy times.~~

~~———— The "other site specific areas/rooms" should include any areas or rooms requiring continuous occupancy to maintain normal plant operation, or to perform a normal cooldown and shutdown.~~

~~———— EAL #2~~

~~The "site specific list of plant rooms or areas with entry-related mode applicability identified" should specify those rooms or areas that contain equipment which require a manual/local action as specified in operating procedures used for normal plant operation, cooldown and shutdown. Do not include rooms or areas in which actions of a contingent or emergency nature would be performed. (e.g., an action to address an off-normal or emergency condition such as emergency repairs, corrective measures or emergency operations). In addition, the list should specify the plant mode(s) during which entry would be required for each room or area.~~

~~The list should not include rooms or areas for which entry is required solely to perform actions of an administrative or record keeping nature (e.g., normal rounds or routine inspections).~~

~~———— If the equipment in the listed room or area was already inoperable, or out of service, before the event occurred, then no emergency should be declared since the event will have no adverse impact beyond that already allowed by Technical Specifications at the time of the event.~~

~~———— Rooms and areas listed in EAL #1 do not need to be included in EAL #2, including the Control Room.~~

~~ECL Assignment Attributes: 3.1.2.C~~

## RU1

**ECL:** Notification of Unusual Event

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

**Operating Mode Applicability:** All

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

**Notes:**

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

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

Reactor Building Vent Normal Range Monitor: 1D11-K619 A(B) 2D11-K636 A(B)
Main Stack Normal Range Monitor: 1D11-K600 A(B)
Liquid Radwaste Effluent Line Monitor: 1D11-K604 2D11-K604
Service Water System Effluent Line Monitor: 1D11-K605 2D11-K605

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

- (2) Reading on ANY effluent radiation monitor greater than 2 times the alarm setpoint established by a current radioactivity discharge permit for 60 minutes or longer.
- (3) Sample analysis for a gaseous or liquid release indicates a concentration or release rate greater than 2 times the ODCM ~~(site-specific effluent release controlling document)~~ limits for 60 minutes or longer.

**Basis:**

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

Commented [ 14]: V2 Rad Monitor Calculation

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

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

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

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

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

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

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

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

#### **Developer Notes:**

~~The "site-specific effluent release controlling document" is the Radiological Effluent Technical Specifications (RETS) or, for plants that have implemented Generic Letter 89-01<sup>4</sup>, the Offsite Dose Calculation Manual (ODCM). These documents implement regulations related to effluent controls (e.g., 10 CFR Part 20 and 10 CFR Part 50, Appendix I). As appropriate, the RETS or ODCM methodology should be used for establishing the monitor thresholds for this IC.~~

~~Listed monitors should include the effluent monitors described in the RETS or ODCM.~~

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<sup>4</sup> Implementation of Programmatic Controls for Radiological Effluent Technical Specifications in the Administrative Controls Section of the Technical Specifications and the Relocation of Procedural Details of RETS to the Offsite Dose Calculation Manual or to the Process Control Program

Developers may also consider including installed monitors associated with other potential effluent pathways that are not described in the RETS or ODCM<sup>56</sup>. If included, EAL values for these monitors should be determined using the most applicable dose/release limits presented in the RETS or ODCM. It is recognized that a calculated EAL value may be below what the monitor can read; in that case, the monitor does not need to be included in the list. Also, some monitors may not be governed by Technical Specifications or other license-related requirements; therefore, it is important that the associated EAL and basis section clearly identify any limitations on the use or availability of these monitors.

Some sites may find it advantageous to address gaseous and liquid releases with separate EALs.

Radiation monitor readings should reflect values that correspond to a radiological release exceeding 2 times a release control limit. The controlling document typically describes methodologies for determining effluent radiation monitor setpoints; these methodologies should be used to determine EAL values. In cases where a methodology is not adequately defined, developers should determine values consistent with effluent control regulations (e.g., 10 CFR Part 20 and 10 CFR Part 50 Appendix I) and related guidance.

For EAL #2 Values in this EAL should be 2 times the setpoint established by the radioactivity discharge permit to warn of a release that is not in compliance with the specified limits. Indexing the value in this manner ensures consistency between the EAL and the setpoint established by a specific discharge permit.

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.

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

<sup>5</sup>This includes consideration of the effluent monitors described in the site emergency plan section(s) which address the requirements of 10 CFR 50.47(b)(8) and (9).

<sup>6</sup>Developers should keep in mind the requirements of 10 CFR 50.54(q) and the guidance provided by INPO related to emergency response equipment when considering the addition of other effluent monitors.

~~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: 3.1.1.B~~

## RU2

**ECL:** Notification of Unusual Event

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

**Operating Mode Applicability:** All

**Emergency Action Levels:**

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

Personnel report of low water level
SFP low level alarm annunciator - Spent Fuel Storage Pool Level Low 654-022-1/2

(site-specific level indications).

Commented [ 15]: V6 SFP Level Low Annunciator

**AND**

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

ID21-K601 A - Rx Head Laydown Area
ID21-K601 D - Refuel Floor
ID21-K601 E - Drywell Shield Plug
ID21-K601 M - Spent Fuel Pool and New Fuel Storage area
2D21-K601 A - Rx Head Laydown Area
2D21-K601 M - Spent Fuel/Fuel Pool Areas
2D21-K601 E - Dryer/Separator Pool
2D21-K611 K - RPV Refuel Floor 228'
2D21-K611 L - RPV Refuel Floor 228'

(site-specific list of area radiation monitors)

Commented [ 16]: V2 Rad Monitor Calculation

**Basis:**

**REFUELING PATHWAY:** This includes the reactor cavity, the transfer canal, and the spent fuel pool

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

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

A water level decrease will be primarily determined by indications from available level instrumentation. Other sources of level indications may include reports from plant personnel

(e.g., from a refueling crew) or video camera observations (if available). A significant drop in the water level may also cause an increase in the radiation levels of adjacent areas that can be detected by monitors in those locations.

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

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

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

**Developer Notes:**

~~———— The “site-specific level indications” are those indications that may be used to monitor water level in the various portions of the REFUELING PATHWAY. Specify the mode applicability of a particular indication if it is not available in all modes.~~

~~———— The “site-specific list of area radiation monitors” should contain those area radiation monitors that would be expected to have increased readings following a decrease in water level in the site-specific REFUELING PATHWAY. In cases where a radiation monitor(s) is not available or would not provide a useful indication, consideration should be given to including alternate indications such as UNPLANNED changes in tank and/or sump levels.~~

~~———— Development of the EALs should consider the availability and limitations of mode-dependent, or other controlled but temporary, radiation monitors. Specify the mode applicability of a particular monitor if it is not available in all modes.~~

~~———— ECL Assignment Attributes: 3.1.1.A and 3.1.1.B~~

**74 COLD SHUTDOWN / REFUELING SYSTEM MALFUNCTION ICS/EALS**

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

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

# CG1

ECL: General Emergency

**Initiating Condition:** Loss of RPV inventory affecting fuel clad integrity with containment challenged.

**Operating Mode Applicability:** Cold Shutdown, Refueling

**Emergency Action Levels:** (1 or 2)

**Note:** The emergency director ~~should~~ will declare the General Emergency promptly upon determining that 30 minutes has been exceeded, or will likely be exceeded.

- (1) a. RPV level less than ~~-155"~~ (TAF) ~~(site-specific level)~~ for 30 minutes or longer.  
AND
- b. ANY indication from the Containment Challenge Table ~~(see below)~~ C1.
- (2) a. RPV level cannot be monitored for 30 minutes or longer.  
AND
- b. Core uncover is indicated by ANY of the following:

- (Site-specific radiation monitor) reading greater than (site-specific value)
- UNPLANNED level increase in (site-specific sump and/or tank) any of the following levels of sufficient magnitude to indicate core uncover:

Drywell Floor Drain Sumps	Reactor Building Floor Drain Sumps
Drywell Equipment Drain Sumps	Turbine Building Floor Drain Sumps
Torus	Rad Waste Tanks
Torus Room Sumps	

- (Other site-specific indications)

AND

- c. ANY indication from the Containment Challenge Table ~~(see below)~~ C1.

Containment Challenge Table C1
<del>■ CONTAINMENT CLOSURE not established*</del>
<del>■ (Explosive mixture) exists inside containment</del>
<del>■ UNPLANNED increase in containment pressure</del>
<del>■ Secondary containment radiation monitor reading above (site-specific value) [BWR]</del>
Containment H <sub>2</sub> greater than or equal to 6% AND O <sub>2</sub> greater than or equal to 5%
Primary Containment Pressure greater than 56 psig
Secondary CONTAINMENT INTEGRITY NOT established*
Secondary Containment radiation monitors greater than Max Safe values (SC EOP - Table 6)

Commented [ 17]: V7 RPV Level Indications/Display (-155")

Commented [ 18]: V9 Component/System References

Commented [ 19]: V10 H<sub>2</sub> and O<sub>2</sub> Concentration

Commented [ 20]: V11 Primary Containment Pressure Reference (> 56 psig)

Commented [ 21]: V12 Secondary Containment Rad Monitors

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

**Basis:**

CONTAINMENT INTEGRITY: Primary Containment OPERABLE per Technical Specification 3.6.1.1. Secondary Containment OPERABLE per Technical Specification 3.6.4.1

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

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

Water level for top of active fuel is calculated at -158.44". Although slightly more conservative, the -155" EOP value for top of active fuel is provided for this EAL to aid in operator recognition of the event.

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

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

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

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

In EAL 2.b, the 30-minute criterion is tied to a readily recognizable event start time (i.e., the total loss of ability to monitor level), and allows sufficient time to monitor, assess and correlate reactor and plant conditions to determine if core uncover has actually occurred (i.e., to account for various accident progression and instrumentation uncertainties). It also allows sufficient time

for ~~performance of~~ actions to terminate leakage, recover inventory control/ or makeup equipment, and/or restore level monitoring.

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

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

**Developer Notes:**

Accident analyses suggest that fuel damage may occur within one hour of uncovering depending upon the amount of time since shutdown; refer to Generic Letter 88-17, SECY 91-283, NUREG-1449 and NUMARC 91-06.

The type and range of RCS level instrumentation may vary during an outage as the plant moves through various operating modes and refueling evolutions, particularly for a PWR. As appropriate to the plant design, alternate means of determining RCS level are installed to assure that the ability to monitor level within the range required by operating procedures will not be interrupted. The instrumentation range necessary to support implementation of operating procedures in the Cold Shutdown and Refueling modes may be different (e.g., narrower) than that required during modes higher than Cold Shutdown.

For EAL #1.a —The “site-specific level” should be approximately the top of active fuel. If the availability of on-scale level indication is such that this level value can be determined during some shutdown modes or conditions, but not others, then specify the mode-dependent and/or configuration states during which the level indication is applicable. If the design and operation of water level instrumentation is such that this level value cannot be determined at any time during Cold Shutdown or Refueling modes, then do not include EAL #1 (classification will be accomplished in accordance with EAL #2).

For EAL #2.b —first bullet —As water level in the reactor vessel lowers, the dose rate above the core will increase. Enter a “site-specific radiation monitor” that could be used to detect core uncover and the associated “site-specific value” indicative of core uncover. It is recognized that the condition described by this IC may result in a radiation value beyond the operating or display range of the installed radiation 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.

———To further promote accurate classification, developers should consider if some combination of monitors could be specified in the EAL to build in an appropriate level of corroboration between monitor readings into the classification assessment.

For BWRs that do not have installed radiation monitors capable of indicating core uncover, alternate site specific level indications of core uncover should be used if available.

For EAL #2.b—second bullet—Post TMI accident studies indicated that the installed PWR nuclear instrumentation will operate erratically when the core is uncovered and that this should be used as a tool for making such determinations. Because BWR Source Range Monitor (SRM) nuclear instrumentation detectors are typically located below core mid-plane, this may not be a viable indicator of core uncover for BWRs.

For EAL #2.b—third bullet—Enter any “site specific sump and/or tank” levels that could be expected to change if there were a loss of inventory of sufficient magnitude to indicate core uncover. Specific level values may be included if desired.

For EAL #2.b—fourth bullet—Developers should determine if other reliable indicators exist to identify fuel uncover (e.g., remote viewing using cameras). The goal is to identify any unique or site specific indications, not already used elsewhere, that will promote timely and accurate emergency classification.

For the Containment Challenge Table:

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

For “Explosive mixture”, developers may enter the minimum containment atmospheric hydrogen concentration necessary to support a hydrogen burn (i.e., the lower deflagration limit). A concurrent containment oxygen concentration may be included if the plant has this indication available in the Control Room.

For BWRs, the use of secondary containment radiation monitors should provide indication of increased release that may be indicative of a challenge to secondary containment. The “site specific value” should be based on the EOP maximum safe values because these values are easily recognizable and have a defined basis.

ECL Assignment Attributes: 3.1.4.B

# CS1

ECL: Site Area Emergency

**Initiating Condition:** Loss of RPV inventory affecting core decay heat removal capability.

**Operating Mode Applicability:** Cold Shutdown, Refueling

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

**Note:** The emergency director ~~should~~ will declare the Site Area Emergency promptly upon determining that 30 minutes has been exceeded, or will likely be exceeded.

- (1) a. ~~CONTAINMENT CLOSURE~~ Secondary CONTAINMENT INTEGRITY not established.

AND

- b. RPV level less than ~~-41"~~ (6" below the Level 2 actuation setpoint) (site-specific level).

Commented [ 22]: V8 Level 2 Actuation Setpoint Information

- (2) a. ~~CONTAINMENT CLOSURE~~ Secondary CONTAINMENT INTEGRITY established.

AND

- b. RPV level less than ~~-155"~~ (TAF) (site-specific level).

Commented [ 23]: V7 RPV Level Indications/Display

- (3) a. RPV level cannot be monitored for 30 minutes or longer.

AND

- b. Core uncover is indicated by ANY of the following:

- UNPLANNED level increase in any of the following of sufficient magnitude to indicate core uncover:

Drywell Floor Drain Sumps	Reactor Building Floor Drain Sumps
Drywell Equipment Drain Sumps	Turbine Building Floor Drain Sumps
Torus	Rad Waste Tanks
Torus Room Sumps	

Commented [ 24]: V9 Component/System Reference

- ~~(Site-specific radiation monitor) reading greater than (site-specific value)~~
- ~~Erratic source range monitor indication [PWR]~~
- ~~UNPLANNED increase in (site-specific sump and/or tank) levels of sufficient magnitude to indicate core uncover~~
- ~~(Other site-specific indications)~~

## Basis:

CONTAINMENT INTEGRITY: Primary Containment OPERABLE per Technical Specification 3.6.1.1. Secondary Containment OPERABLE per Technical Specification 3.6.4.1.

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

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

Water level for top of active fuel is calculated at -158.44". Although slightly more conservative, the -155" EOP value for top of active fuel is provided for this EAL to aid in operator recognition of the event.

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

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

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

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

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

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

**Developer Notes:**

— Accident analyses suggest that fuel damage may occur within one hour of uncover depending upon the amount of time since shutdown; refer to Generic Letter 88-17, SECY 91-283, NUREG-1449 and NUMARC 91-06.

— The type and range of RCS level instrumentation may vary during an outage as the plant moves through various operating modes and refueling evolutions, particularly for a PWR. As appropriate to the plant design, alternate means of determining RCS level are installed to assure that the ability to monitor level within the range required by operating procedures will not be interrupted. The instrumentation range necessary to support implementation of operating procedures in the Cold Shutdown and Refueling modes may be different (e.g., narrower) than that required during modes higher than Cold Shutdown.

— PWR

— For EAL #1.b — the “site-specific level” is 6” below the bottom ID of the RCS loop. This is the level at 6” below the bottom ID of the reactor vessel penetration and not the low point of the loop. If the availability of on-scale level indication is such that this level value can be determined during some shutdown modes or conditions, but not others, then specify the mode-dependent and/or configuration states during which the level indication is applicable. If the design and operation of water level instrumentation is such that this level value cannot be determined at any time during Cold Shutdown or Refueling modes, then do not include EAL #1 (classification will be accomplished in accordance with EAL #3).

For EAL #2.b — The “site-specific level” should be approximately the top of active fuel. If the availability of on-scale level indication is such that this level value can be determined during some shutdown modes or conditions, but not others, then specify the mode-dependent and/or configuration states during which the level indication is applicable. If the design and operation of water level instrumentation is such that this level value cannot be determined at any time during Cold Shutdown or Refueling modes, then do not include EAL #2 (classification will be accomplished in accordance with EAL #3).

For EAL #3.b — first bullet — As water level in the reactor vessel lowers, the dose rate above the core will increase. Enter a “site-specific radiation monitor” that could be used to detect core uncover and the associated “site-specific value” indicative of core uncover. It is recognized that the condition described by this IC may result in a radiation value beyond the operating or display range of the installed radiation 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.

To further promote accurate classification, developers should consider if some combination of monitors could be specified in the EAL to build in an appropriate level of corroboration between monitor readings into the classification assessment.

For EAL #3.b — second bullet — Post-TMI accident studies indicated that the installed PWR nuclear instrumentation will operate erratically when the core is uncovered and that this should be used as a tool for making such determinations.

For EAL #3.b — third bullet — Enter any “site-specific sump and/or tank” levels that could be expected to change if there were a loss of RCS/reactor vessel inventory of sufficient magnitude to indicate core uncover. Specific level values may be included if desired.

For EAL #3.b—fourth bullet—Developers should determine if other reliable indicators exist to identify fuel uncover (e.g., remote viewing using cameras). The goal is to identify any unique or site-specific indications, not already used elsewhere, that will promote timely and accurate emergency classification.

———BWR

——— For EAL #1.b “site-specific level” is the Low-Low-Low ECCS actuation setpoint / Level 1. The BWR Low-Low-Low ECCS actuation setpoint / Level 1 was chosen because it is a standard operationally significant setpoint at which some (typically low pressure ECCS) injection systems would automatically start and attempt to restore RPV level. This is a RPV water level value that is observable below the Low-Low/Level 2 value specified in IC-CA1, but significantly above the Top of Active Fuel (TOAF) threshold specified in EAL #2.

For EAL #2.b—The “site-specific level” should be for the top of active fuel.

For EAL #3.b—first bullet—As water level in the reactor vessel lowers, the dose rate above the core will increase. Enter a “site-specific radiation monitor” that could be used to detect core uncover and the associated “site-specific value” indicative of core uncover. It is recognized that the condition described by this IC may result in a radiation value beyond the operating or display range of the installed radiation 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.

——— To further promote accurate classification, developers should consider if some combination of monitors could be specified in the EAL to build in an appropriate level of corroboration between monitor readings into the classification assessment.

——— For BWRs that do not have installed radiation monitors capable of indicating core uncover, alternate site-specific level indications of core uncover should be used if available.

For EAL #3.b—second bullet—Because BWR source range monitor (SRM) nuclear instrumentation detectors are typically located below core mid-plane, this may not be a viable indicator of core uncover for BWRs.

For EAL #3.b—third bullet—Enter any “site-specific sump and/or tank” levels that could be expected to change if there were a loss of RPV inventory of sufficient magnitude to indicate core uncover. Specific level values may be included if desired.

For EAL #3.b—fourth bullet—Developers should determine if other reliable indicators exist to identify fuel uncover (e.g., remote viewing using cameras). The goal is to identify any unique or site-specific indications, not already used elsewhere, that will promote timely and accurate emergency classification.

ECL Assignment Attributes: 3.1.3.B

# CA1

ECL: Alert

**Initiating Condition:** Loss of RPV inventory.

**Operating Mode Applicability:** Cold Shutdown, Refueling

**Emergency Action Levels:** (1 or 2)

**Note:** The emergency director ~~should~~ will declare the Alert promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.

(1) Loss of RPV inventory as indicated by level less than ~~(site-specific level)~~ -35" (Level 2 actuation setpoint) ~~(site-specific level)~~.

Commented [ 25]: V8 Level 2 Actuation Setpoint Information

(2) a. RPV level cannot be monitored for 15 minutes or longer

**AND**

b. UNPLANNED level increase in ~~(site-specific sump and/or tank)~~ any of the following ~~levels~~ due to a loss of RPV inventory:

Drywell Floor Drain Sumps	Reactor Building Floor Drain Sumps
Drywell Equipment Drain Sumps	Turbine Building Floor Drain Sumps
Torus	Rad Waste Tanks
Torus Room Sumps	

Commented [ 26]: V9 Component/System Reference

## Basis:

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

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

For EAL #1, a lowering of water level below ~~(site-specific level)~~-35" (Level 2 actuation setpoint) indicates that operator actions have not been successful in restoring and maintaining RPV water level. The heat-up rate of the coolant will increase as the available water inventory is reduced. A continuing decrease in water level will lead to core uncover.

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

For EAL #2, the inability to monitor RPV level may be caused by instrumentation and/or power failures, or water level dropping below the range of available instrumentation. If water level cannot be monitored, operators may determine that an inventory loss is occurring by observing

changes in sump and/or tank levels. Sump and/or tank level changes must be evaluated against other potential sources of water flow to ensure they are indicative of leakage from the RPV.

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

If the RPV inventory level continues to lower, then escalation to Site Area Emergency ~~would be via~~uses IC CS1.

~~————~~ **Developer Notes:**

~~————~~ For EAL #1 the "site-specific level" should be based on either:

- ~~[BWR] Low-Low ECCS actuation setpoint/Level 2. This setpoint was chosen because it is a standard operationally significant setpoint at which some (typically high pressure ECCS) injection systems would automatically start and is a value significantly below the low RPV water level RPS actuation setpoint specified in IC CU1.~~
- ~~[PWR] The minimum allowable level that supports operation of normally used decay heat removal systems (e.g., Residual Heat Removal or Shutdown Cooling). If multiple levels exist, specify each along with the appropriate mode or configuration dependency criteria.~~

~~————~~ For EAL #2 The type and range of RCS level instrumentation may vary during an outage as the plant moves through various operating modes and refueling evolutions, particularly for a PWR. As appropriate to the plant design, alternate means of determining RCS level are installed to assure that the ability to monitor level within the range required by operating procedures will not be interrupted. The instrumentation range necessary to support implementation of operating procedures in the Cold Shutdown and Refueling modes may be different (e.g., narrower) than that required during modes higher than Cold Shutdown.

Enter any "site-specific sump and/or tank" levels that could be expected to increase if there were a loss of inventory (i.e., the lost inventory would enter the listed sump or tank).

~~————~~ ECL Assignment Attributes: 3.1.2.B

## CA2

ECL: Alert

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

**Operating Mode Applicability:** Cold Shutdown, Refueling, Defueled

**Emergency Action Levels:**

**Note:** The emergency director ~~should~~ will declare the Alert promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.

- (1) Loss of ALL offsite and ALL onsite AC Power to 4160 VAC Essential Buses 1/2E, 1/2F, AND 1/2G (site-specific emergency buses) for 15 minutes or longer.

Table S1	
Unit 1	Unit 2
Start-up Aux XFMR 1C	Start-up Aux XFMR 2C
Start-up Aux XFMR 1D	Start-up Aux XFMR 2D
Diesel Generator 1A	Diesel Generator 2A
Diesel Generator 1B	Diesel Generator 1B
Diesel Generator 1C	Diesel Generator 2C

Commented [ 27]: V13 4160 VAC Essential Buses Information

Commented [ 28]: V13 4160 VAC Essential Buses Information

**Basis:**

This IC addresses a total loss of AC power (see Table S1 above) that compromises the performance of all SAFETY SYSTEMS requiring electric power, including those necessary for emergency essential core cooling, containment heat removal/pressure control, spent fuel heat removal, and the ultimate heat sink.

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

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

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

**Developer Notes:**

For a power source that has multiple generators, the EAL and/or Basis section should reflect the minimum number of operating generators necessary for that source to provide adequate power to an AC emergency bus. For example, if a backup power source is comprised of two generators (i.e., two 50% capacity generators sized to feed 1 AC emergency bus), the EAL and Basis section must specify that both generators for that source are operating.

The "site specific emergency buses" are the buses fed by offsite or emergency AC power sources that supply power to the electrical distribution system that powers SAFETY SYSTEMS. There is typically 1 emergency bus per train of SAFETY SYSTEMS.

The EAL and/or Basis section may specify use of a non-safety-related power source provided that operation of this source is controlled in accordance with abnormal or emergency operating procedures, or beyond design basis accident response guidelines (e.g., FLEX support guidelines). Such power sources should generally meet the "Alternate ac source" definition provided in 10 CFR 50.2.

—— At multi-unit stations, the EALs may credit compensatory measures that are proceduralized and can be implemented within 15 minutes. Consider capabilities such as power source cross-ties, "swing" generators, other power sources described in abnormal or emergency operating procedures, etc. Plants that have a proceduralized capability to supply offsite AC power to an affected unit via a cross-tie to a companion unit may credit this power source in the EAL provided that the planned cross-tie strategy meets the requirements of 10 CFR 50.63.

—— ECL Assignment Attributes: 3.1.2.B

# CA3

ECL: Alert

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

**Operating Mode Applicability:** Cold Shutdown, Refueling

**Emergency Action Levels:** (1 or 2)

**Note:** The emergency director ~~should~~ will declare the Alert promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.

- (1) UNPLANNED increase in RCS temperature to greater than 212 °F (site-specific Technical Specification cold shutdown temperature limit) for greater than the duration specified in the following table Table C2.

Commented [ 29]: V1 TS Table 1.1-1 Modes

Table: RCS Heat-up Duration Thresholds		
RCS Status	Containment Closure Status	Heat-up Duration
Intact (but not at reduced inventory [PWR])	Not applicable	60 minutes*
Not intact (or at reduced inventory [PWR])	Established	20 minutes*
	Not Established	0 minutes
* If an RCS heat removal system is in operation within this time frame and RCS temperature is being reduced, the EAL is not applicable.		
Table C2: RCS Heat-up Duration Thresholds		
RCS Status	Secondary CONTAINMENT INTEGRITY Status	Heat-up Duration
Not Intact	Not Established	0 minutes*
	Established	20 minutes
Intact	Not applicable	60 minutes*
* If RHR is in operation within this time frame and RCS temperature is being reduced, the EAL is not applicable.		

- (2) UNPLANNED RCS pressure increase greater than (site-specific pressure reading) 10 psig. (This EAL does not apply during water-solid plant conditions. [PWR])

Commented [ 30]: V14 RCS Pressure Indications

**Basis:**

CONTAINMENT INTEGRITY: Primary Containment OPERABLE per Technical Specification 3.6.1.1. Secondary Containment OPERABLE per Technical Specification 3.6.4.1.

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

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

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

The RCS Heat-up Duration Thresholds table addresses the case where there is an increase in RCS temperature, the RCS is not intact, and Secondary CONTAINMENT INTEGRITY is not established. In this case, no heat-up duration is allowed (i.e., 0 minutes). This is because 1) the evaporated reactor coolant may be released directly into the containment atmosphere and subsequently to the environment, and 2) there is reduced reactor coolant inventory above the top of irradiated fuel.

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

Finally, the RCS Heat-up Duration Thresholds table also addresses an increase in RCS temperature with the RCS intact. The status of ~~CONTAINMENT CLOSURE~~Secondary CONTAINMENT INTEGRITY is not crucial in this condition since the intact RCS is providing a high pressure barrier to a fission product release. The 60-minute time frame should allow sufficient time to address the temperature increase without a substantial degradation in plant safety.

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

EAL #2 provides a pressure-based indication of RCS heat-up.

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

**Developer Notes:**

~~For EAL #1—Enter the “site-specific Technical Specification cold shutdown temperature limit” where indicated. The RCS should be considered intact or not intact in accordance with site-specific criteria.~~

~~For EAL #2—The “site-specific pressure reading” should be the lowest change in pressure that can be accurately determined using installed instrumentation, but not less than 10 psig.~~

For PWRs, this IC and its associated EALs address the concerns raised by Generic Letter 88-17, *Loss of Decay Heat Removal*. A number of phenomena such as pressurization, vortexing, steam generator U-tube draining, RCS level differences when operating at a mid-loop condition, decay heat removal system design, and level instrumentation problems can lead to conditions where decay heat removal is lost and core uncover can occur. NRC analyses show that there are sequences that can cause core uncover in 15 to 20 minutes, and severe core damage within an hour after decay heat removal is lost. The allowed time frames are consistent with the guidance provided by Generic Letter 88-17 and believed to be conservative given that a low pressure Containment barrier to fission product release is established.

ECL Assignment Attributes: 3.1.2.B

**ECL:** Alert

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

**Operating Mode Applicability:** Cold Shutdown, Refueling

**Emergency Action Levels:**

- (1) a. The occurrence of **ANY** of the following hazardous events:
- Seismic event (earthquake)
  - Internal or external flooding event
  - High winds or tornado strike
  - FIRE
  - EXPLOSION
  - ~~(site specific hazards)~~
  - Other events with similar hazard characteristics as determined by the Shift Manager
- AND**
- b. **EITHER** of the following:
- Event damage has caused indications of degraded performance in at least one train of a SAFETY SYSTEM needed for the current operating mode.
  - The event has caused **VISIBLE DAMAGE** to a SAFETY SYSTEM component or structure needed for the current operating mode.

**Basis:**

**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.

**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.

**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.

**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.

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

EAL 1.a identifies hazardous events that could result in damage to plant systems. A seismic event is indicated by entry into IC HU2. Flooding is indicated by a significant increase in water levels (external or internal). High winds are indicated by sustained winds at the site meteorological tower exceeding 35 mph.

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

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

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

**Developer Notes:**

~~For (site specific hazards), developers should consider including other significant, site specific hazards to the bulleted list contained in EAL 1.a (e.g., a seiche).~~

~~Nuclear power plant SAFETY SYSTEMS are comprised of two or more separate and redundant trains of equipment in accordance with site specific design criteria.~~

~~ECL Assignment Attributes: 3.1.2.B~~

## CU1

**ECL:** Notification of Unusual Event

**Initiating Condition:** UNPLANNED loss of RPV inventory for 15 minutes or longer.

**Operating Mode Applicability:** Cold Shutdown, Refueling

**Emergency Action Levels:** (1 or 2)

**Note:** The emergency director ~~should~~ will declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.

(1) UNPLANNED loss of reactor coolant results in RPV level less than ~~a required~~ the lower limit of the controlling level band for 15 minutes or longer.

(2) a. RPV level cannot be monitored.

**AND**

b. UNPLANNED level increase in ~~(site specific sump and/or tank) levels~~ any of the following:-

Drywell Floor Drain Sumps	Reactor Building Floor Drain Sumps
Drywell Equipment Drain Sumps	Turbine Building Floor Drain Sumps
Torus	Rad Waste Tanks
Torus Room Sumps	

Commented [ 31]: V9 Component/System Reference

### **Basis:**

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

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

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

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

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

EAL #2 addresses a condition where all means to determine RPV level have been lost. In this condition, operators may determine that an inventory loss is occurring by observing changes in sump and/or tank levels. Sump and/or tank level changes must be evaluated against other potential sources of water flow to ensure they are indicative of leakage from the RPV.

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

**Developer Notes:**

~~EAL #1—It is recognized that the minimum allowable reactor vessel/RCS/RPV level may have many values over the course of a refueling outage. Developers should solicit input from licensed operators concerning the optimum wording for this EAL statement. In particular, determine if the generic wording is adequate to ensure accurate and timely classification, or if specific setpoints can be included without making the EAL statement unwieldy or potentially inconsistent with actions that may be taken during an outage. If specific setpoints are included, these should be drawn from applicable operating procedures or other controlling documents.~~

~~EAL #2.b—Enter any “site specific sump and/or tank” levels that could be expected to increase if there were a loss of inventory (i.e., the lost inventory would enter the listed sump or tank).~~

~~—— ECL Assignment Attributes: 3.1.1.A~~

## CU2

**ECL:** Notification of Unusual Event

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

**Operating Mode Applicability:** Cold Shutdown, Refueling, Defueled

**Emergency Action Levels:**

**Note:** The emergency director ~~should~~ will declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.

- (1) a. AC power capability to 4160 VAC Essential Buses 1/2E, 1/2F, AND 1/2G (site-specific emergency buses) is reduced to a single power source for 15 minutes or longer.

**AND**

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

Unit 1	Unit 2
Start-up Aux XFMR 1C	Start-up Aux XFMR 2C
Start-up Aux XFMR 1D	Start-up Aux XFMR 2D
Diesel Generator 1A	Diesel Generator 2A
Diesel Generator 1B	Diesel Generator 1B
Diesel Generator 1C	Diesel Generator 2C

Commented [ 32]: V13 4160 VAC Essential Buses Information

Commented [ 33]: V13 4160 VAC Essential Buses Information

**Basis:**

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

This IC describes a significant degradation of offsite and onsite AC power sources such that any additional single failure would result in a loss of all AC power to SAFETY SYSTEMS. In this condition, the sole AC power source (see Table S1 above) may be powering one, or more than one, train of safety-related equipment.

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

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

- A loss of all offsite power with a concurrent failure of all but one **emergencyessential** power source (e.g., an onsite diesel generator).
- A loss of all offsite power and loss of all **emergencyessential** power sources (e.g., onsite diesel generators) with a single train of **emergencyessential** buses being back-fed from the unit main generator.
- A loss of **emergencyessential** power sources (e.g., onsite diesel generators) with a single train of **emergencyessential** buses being back-fed from an offsite power source.

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

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

**Developer Notes:**

~~For a power source that has multiple generators, the EAL and/or Basis section should reflect the minimum number of operating generators necessary for that source to provide required power to an AC emergency bus. For example, if a backup power source is comprised of two generators (i.e., two 50% capacity generators sized to feed 1 AC emergency bus), the EAL and Basis section must specify that both generators for that source are operating.~~

~~The “site-specific emergency buses” are the buses fed by offsite or emergency AC power sources that supply power to the electrical distribution system that powers SAFETY SYSTEMS. There is typically 1 emergency bus per train of SAFETY SYSTEMS.~~

~~Developers should modify the bulleted examples provided in the basis section, above, as needed to reflect their site-specific plant designs and capabilities.~~

~~The EALs and Basis should reflect that each independent offsite power circuit constitutes a single power source. For example, three independent 345kV offsite power circuits (i.e., incoming power lines) comprise three separate power sources. Independence may be determined from a review of the site-specific UFSAR, SBO analysis or related loss of electrical power studies.~~

~~The EAL and/or Basis section may specify use of a non-safety-related power source provided that operation of this source is recognized in AOPs and EOPS, or beyond design-basis accident response guidelines (e.g., FLEX support guidelines). Such power sources should generally meet the “Alternate ac source” definition provided in 10 CFR 50.2.~~

~~At multi-unit stations, the EALs may credit compensatory measures that are proceduralized and can be implemented within 15 minutes. Consider capabilities such as power source cross-ties, “swing” generators, other power sources described in abnormal or emergency operating procedures, etc. Plants that have a proceduralized capability to supply offsite AC power to an affected unit via a cross-tie to a companion unit may credit this power source in the EAL provided that the planned cross-tie strategy meets the requirements of 10 CFR 50.63.~~

~~ECL Assignment Attributes: 3.1.1.A~~

## CU3

**ECL:** Notification of Unusual Event

**Initiating Condition:** UNPLANNED increase in RCS temperature.

**Operating Mode Applicability:** Cold Shutdown, Refueling

**Emergency Action Levels:** (1 or 2)

**Note:** The emergency director ~~should~~ will declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.

- (1) UNPLANNED increase in RCS temperature to greater than 212 °F (site-specific Technical Specification cold shutdown temperature limit).
- (2) Loss of ALL RCS temperature and RPV level indication for 15 minutes or longer.

**Basis:**

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

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

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

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

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

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

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

Commented [ 34]: V1 TS Table 1.1-1 Modes

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

**Developer Notes:**

For EAL #1, enter the "site-specific Technical Specification cold shutdown temperature limit" where indicated.

—— ECL Assignment Attributes: 3.1.1.A

## CU4

**ECL:** Notification of Unusual Event

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

**Operating Mode Applicability:** Cold Shutdown, Refueling

**Emergency Action Levels:**

**Note:** The emergency director ~~should~~ will declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.

- (1) Indicated voltage is less than 105/210 VDC (~~site specific bus voltage value~~) on Technical Specification required 125/250 VDC Vital DC buses 1/2R22-S016 AND 1/2R22-S017 for 15 minutes or longer.

Commented [ 35]: V15 DC System Information

Commented [ 36]: V15 DC System Information

**Basis:**

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

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

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

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

**Developer Notes:**

~~The "site specific bus voltage value" should be based on the minimum bus voltage necessary for adequate operation of SAFETY SYSTEM equipment. This voltage value should incorporate a margin of at least 15 minutes of operation before the onset of inability to operate those loads. This voltage is usually near the minimum voltage selected when battery sizing is performed.~~

~~The typical value for an entire battery set is approximately 105 VDC. For a 60 cell string of batteries, the cell voltage is approximately 1.75 Volts per cell. For a 58 string battery set, the minimum voltage is approximately 1.81 Volts per cell.~~

~~ECL Assignment Attributes: 3.1.1.A~~

## CU5

**ECL:** Notification of Unusual Event

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

**Operating Mode Applicability:** Cold Shutdown, Refueling, Defueled

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

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

Plant telephones (Includes hardwired and wireless)
Plant page
Plant radio systems

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

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

ENN (Emergency Notification Network)
Commercial phones

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

- (3) Loss of **ALL** of the following NRC communications methods:

ENS on Federal Telecommunications System (FTS)
Commercial phones

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

### **Basis:**

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

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

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

EAL #2 addresses a total loss of the communications methods used to notify all OROs of an emergency declaration. The OROs referred to here are the State of Georgia, Appling County, Jeff Davis County, Tattnall County and Toombs County. ~~(see Developer Notes).~~

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

**Developer Notes:**

—— EAL #1 — The “site-specific list of communications methods” should include all communications methods used for routine plant communications (e.g., commercial or site telephones, page-party systems, radios, etc.). This listing should include installed plant equipment and components, and not items owned and maintained by individuals.

EAL #2 — The “site-specific list of communications methods” should include all communications methods used to perform initial emergency notifications to OROs as described in the site Emergency Plan. The listing should include installed plant equipment and components, and not items owned and maintained by individuals. Example methods are ring-down/dedicated telephone lines, commercial telephone lines, radios, satellite telephones and internet-based communications technology.

In the Basis section, insert the site-specific listing of the OROs requiring notification of an emergency declaration from the Control Room in accordance with the site Emergency Plan, and typically within 15 minutes.

EAL #3 — The “site-specific list of communications methods” should include all communications methods used to perform initial emergency notifications to the NRC as described in the site Emergency Plan. The listing should include installed plant equipment and components, and not items owned and maintained by individuals. These methods are typically the dedicated Emergency Notification System (ENS) telephone line and commercial telephone lines.

—— ECL Assignment Attributes: 3.1.1.C

**85 INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI) ICS/EALS**

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

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