Entergy®

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10 CFR 50.90

0CAN091801

September 17, 2018

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: Response to Request for Additional Information Related to the Application for Adoption of Emergency Action Level Schemes Pursuant to NEI 99-01, Revision 6
Arkansas Nuclear One, Units 1 and 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6

Dear Sir or Madam:

By letter dated March 29, 2018 (Reference 1), Entergy Operations, Inc. (Entergy), requested NRC approval of a proposed change to the Arkansas Nuclear One, Units 1 and 2 (collectively referred to as ANO) licenses. The proposed change involved revising the Emergency Plan for ANO to adopt the Nuclear Energy Institute's (NEI's) revised Emergency Action Level (EAL) scheme described in NEI 99-01, Revision 6, "Development of Emergency Action Levels for Non-Passive Reactors."

By email dated August 2, 2018 (Reference 2), the NRC informed Entergy that additional information is needed to support the Staff's continued review of the application. A clarification call between the NRC and the licensee was previously held on August 1, 2018. Reference 2 requires a response no later than September 17, 2018. Enclosure 1 of this letter includes a summary of the request for additional information (RAI) and Entergy's response to each question.

The Entergy response requires changes to certain enclosures included in the original Reference 1 application. For completeness and ease of NRC review, the following Reference 1 enclosures are being resubmitted in full as part of Entergy's response to the NRC's RAI:

2. Proposed EAL Technical Basis Document (Markup)
3. Proposed EAL Technical Basis Document (Clean)
4. NEI 99-01, Rev. 6, Deviations and Differences, ANO Units 1 and 2
5. Proposed EAL Matrix Chart and Review Table (for information only)
6. Supporting Referenced Document Pages (EP-CALC-ANO-1701 only)

No new regulatory commitments are included in this letter.

In accordance with 10 CFR 50.91, Entergy is notifying the State of Arkansas of this amendment request by transmitting a copy of this letter and enclosure to the designated State Official.

If there are any questions or if additional information is needed, please contact Stephenie Pyle at 479-858-4704.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on September 17, 2018.

Sincerely,

ORIGINAL SIGNED BY RICHARD L. ANDERSON

RLA/dbb

Enclosures:

1. Response to Request for Additional Information – ANO EAL Revisions
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3. Proposed EAL Technical Basis Document (Clean)
4. NEI 99-01, Rev. 6, Deviations and Differences, ANO Units 1 and 2
5. Proposed EAL Matrix Chart and Review Table (for information only)
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REFERENCES:

1. Entergy letter dated March 29, 2018, License Amendment Request – Adoption of Emergency Action Level Schemes Pursuant to NEI 99-01, Revision 6, Arkansas Nuclear One, Units 1 and 2, 0CAN031801 (ML18088B412)

2. NRC email dated August 2, 2018, *ANO-1 and 2 Final RAI RE: License Amendment Request to Adopt EAL Scheme Change Per NEI 99-01 Revision 6*, (EPID L-2018-LLA-0082) (0CNA081801) (ML18218A221)

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Enclosure 1 to

0CAN091801

Response to Request for Additional Information
ANO EAL Revisions

Response to Request for Additional Information

ANO EAL Revisions

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By email dated August 2, 2018 (Reference 2), the NRC informed Entergy that additional information is needed to support the Staff's continued review of the application. A clarification call between the NRC and the licensee was previously held on August 1, 2018. Reference 2 requires a response no later than September 17, 2018. The following includes a summary of the request for additional information (RAI) and Entergy's response to each question.

The Entergy response to several questions contained herein requires changes to certain enclosures included in the original Reference 1 application. For completeness and ease of NRC review, the following Reference 1 enclosures are being resubmitted in full as part of Entergy's response to the NRC's RAI:

2. Proposed EAL Technical Basis Document (Markup)
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5. Proposed EAL Matrix Chart and Review Table (for information only)
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ANO RAI 1

Concerning plant or procedure changes that could impact the ANO EAL scheme, please address the following:

a. Section 4.7, "EAL/Threshold References to AOP *[Abnormal Operating Procedure]* and EOP *[Emergency Operating Procedure]* Setpoints/Criteria," of NEI 99-01, Revision 6, states:

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

   Please explain what controls are in place at ANO to ensure that a subsequent change to an AOP or EOP is screened to determine if an evaluation pursuant to 10 CFR 50.54(q) is required.

Entergy Response:

Entergy fleet-wide procedure EN-LI-100, "Process Applicability Determination," provides a method to determine impacts to licensing basis documents (LBDs) and processes when changes are proposed to activities/procedures, including changes to AOPs and EOPs. The Process Applicability Determination (PAD) form specifically questions the effect of a proposed change on the Emergency Plan and the associated EALs, along with all other LBDs. When impacts are identified, the procedure requires review and approval by Emergency Planning department personnel via a 10 CFR 50.54(q) review. Personnel can then determine whether a change to the applicable EAL is required.

b. Proposed EALs AA3.2 and HA5.1 are applicable only during Modes 3 and 4, based on current site operational requirements. Please explain what process is in place to ensure that plant equipment or procedural changes would be adequately screened to ensure that the EAL would be appropriately modified if needed.

Entergy Response:

In general, changes to procedures and plant modifications fall under the PAD process as described in response to Part 'a' above. Plant modifications are also governed by the Entergy Engineering Change (EC) process. This process not only assesses impacts to LBDs, regulation, commitments, etc., but a PAD is required for all commercial and nuclear plant modifications. Engineering equivalencies may not require a PAD, but reviews similar to those required by the PAD form are performed and documented for equivalencies within the EC package. Since a PAD (and if necessary, a 10 CFR 50.59 evaluation) must be performed for nearly all modifications, any impact to the Emergency Plan and EALs would be readily identified, as discussed in Part 'a' above.

ANO RAI 2

Section 4.4, "Presentation of Scheme Information to Users," of NEI 99-01, Revision 6, provides that an alternative method for presenting EAL scheme information may be developed for use, provided that it contains all the information needed to make a correct emergency classification. This information includes the Initiating Conditions (ICs), Operating Mode Applicability criteria, EALs, and Notes. The licensee provided an EAL Matrix Chart and Review Table (EAL Matrix) as an alternative presentation method. However, the EAL Matrix is not consistent with the proposed EAL Technical Basis document. This could lead to inaccurate or delayed emergency classifications. A partial list of examples of inconsistencies follows:

a. The proposed EAL basis document Table 1A-1, "Unit 1 Effluent Monitor Classification Thresholds," provides that radiation monitor "RX-9830" is the fuel handling area release point monitor, while the EAL Matrix provides that radiation monitor "RX-9820" is the fuel handling area release point monitor.

b. The proposed EAL basis document Table 2A-1, "Unit 2 Effluent Monitor Classification Thresholds," provides that radiation monitor "RX-9830" is the fuel handling area release point monitor, while the EAL Matrix provides that radiation monitor "RX-9820" is the fuel handling area release point monitor. Additionally, monitors 2RE-2330 (BMS Liquid Discharge), 2RE-4423 (Regenerative Waste Discharge), and 2RX-9820 (Containment Purge) are not consistent with the ANO EAL Basis document values.

c. The proposed EAL basis document Table 2A-2, “Unit 1[2] Fuel Damage Radiation Monitors,” provides radiation monitor 2RE-8915 (Spent Fuel Area). However, there is no corresponding monitor on the EAL Matrix. Additionally, the EAL Matrix shows 2RE-9825 as the instrument numbers for both the radwaste area monitors, as well as the containment high range monitor.

d. The EAL Matrix Fission Product Barriers threshold value for an Alert has FS1.1 as an EAL identifier vice FA1.1.

e. The proposed EAL Matrix shows that HS6.1 is only applicable when defueled vice in all modes. The ANO EAL Basis document shows all modes.

Please explain how the apparent differences between the EAL Matrix and the EAL basis document would not present human factors issues that could impact timely and accurate EAL assessments, or revise accordingly to address. (Note: the above items are intended to highlight NRC staff concerns and should not be considered as a complete list of potential issues.)

Entergy Response:

Entergy concurs that any differences between the EAL Matrix and the EAL basis document can present human factors issues which could impact timely and accurate EAL assessments. Entergy has revised the associated Reference 1 attachments to address all of the items identified in ANO RAI 2 above and in addition, has performed two independent verifications of the attachments to ensure consistency throughout.

ANO RAI 3

The proposed EAL AU1.1 threshold values for an Unusual Event classification have substantially changed from the currently-approved EAL threshold values for ANO based on NEI 99-01, Revision 5 guidance. Considering that the guidance for AU1.1 is similar between Revision 5 and Revision 6 to NEI 99-01, the proposed changes in values do not appear to be reasonable. NRC staff could not determine a valid reason for the setpoint changes based on the information provided in the proposed EAL scheme change. Although it appeared that ANO used a similar methodology to determine RU1.1 threshold values as the Offsite Dose Calculation Manual (ODCM), the proposed values for several monitors are approximately 2 orders of magnitude lower than expected. (Note: this assumes that the General Emergency, Site Area Emergency, and Alert threshold values for ANO were properly calculated.)

The threshold values for AU1.1 are intended to address a potential reduction, as indicated by a low-level radiological release that exceeds regulatory commitments for an extended period of time. Section A.4 to Appendix A of NEI 99-01, Revision 5, discusses the usage of ODCM values as threshold values for AU1. This attachment is still applicable to NEI 99-01, Revision 6.

Please explain why the ANO ODCM calculated values for effluent flow paths were not used as a basis for the ANO AU1.1 threshold values. This explanation should include a justification for using a shutdown source term, not apportioning the threshold values to account for multiple release stacks, and Notice of Unusual Event threshold values that differ from the proposed Alert values by a factor of approximately 100 to approximately 10,000.

Entergy Response:

ANO did not use similar methods in determining the Unusual Event (UE) effluent thresholds between the NEI 99-01, Revision 5, and Revision 6 EALs. For example, the Revision 5 thresholds were based on methods that considered allocation fractions used to maintain effluent monitor setpoints below the annual station limit. The Revision 6 thresholds do not use setpoint safety factors or allocation fractions in order to provide a value that approximates the 2x ODCM limit versus the 2x monitor set point limit. The Revision 6 method is more consistent with and supports the process of multi-unit/multi-release point dose assessment (MUDA) guidance, which was a consideration for the change in methods. Additional differences exist between the Revision 5 and Revision 6 methods. For example, the Revision 5 methods originated from 1981 calculations updated through EAL scheme changes. The Revision 6 method uses current industry and current ODCM methods and inputs for the UE threshold. As such, several other inputs are different between the Revision 5 and Revision 6 thresholds, which further contribute to the difference in values.

The Revision 6 UE gaseous source term is based upon the NUREG-1940, Table 1-6, noble gas activity fractions available at shutdown, which would represent the maximum possible equilibrium activity fractions. This is not a “shutdown source term” where activity is lost due to decay.

There is no direct association between the UE and the Alert thresholds in the Revision 6 EALs, as there was in the Revision 5 EALs. The Revision 6 Alert thresholds are 1/100 of the General Emergency (GE) thresholds and are based on a fuel clad accident source term, accident X/Qs, and EPA-400 dose conversion factors and protective action guideline (PAG) limits developed using the URI/RASCAL dose model. The Revision 5 Alert thresholds are 200x the ODCM limit and are based on annual release noble gas source term fractions, annual average X/Q, Regulatory Guide (RG) 1.109 dose conversion factors, and 10 CFR 20 limits. Revision 5 UE and Alert thresholds were factors of each other. Revision 6 UE and Alert thresholds are not factors of each other.

ANO RAI 4

ANO removed 2RX-9840 (Post Accident Sampling Building), 2RX-9845 (Auxiliary Building Extension), and 2RX-9850 (Low Level Radwaste Storage Building) from the proposed AU1.1. These are monitored effluent paths that are not accounted for in the proposed ANO scheme, but are in use in the current approved scheme.

Please provide a justification to explain why all continuous radioactivity releases from monitored gaseous effluent pathways were not included in the proposed ANO EAL scheme change, or revise accordingly. (Note: considering that ALL effluent flow path radiation monitor readings are typically significantly lower than two times the ODCM limit, simply providing that an effluent path had low values for some amount of time is not adequate justification for eliminating one or more monitored effluent flow paths.)

Entergy Response:

The Post Accident Sampling System (PASS) Building is an annex to the ANO-2 Auxiliary Building and was designed to accommodate the high activity associated with sampling the Reactor Coolant System (RCS) following an accident. The PASS is no longer used and has been abandoned in place (piping separated/capped from other plant systems). The building does not contain any other radiological systems or piping and is physically separated from Auxiliary Building ventilation systems. Therefore, the associated Super Particulate Iodine and Noble Gas (SPING) monitor (2RX-9840) associated with this annex has been abandoned. Should the PASS ever be restored, the plant modification process would identify any support systems necessary, including offsite radiological monitoring requirements and EAL impacts, for the PASS Building (see response to ANO RAI 1).

The Auxiliary Building Extension (ABE) is a clean area that was originally designed to process radioactive waste following a major Steam Generator (SG) tube rupture event assumed to grossly contaminate the secondary system. The original design, which included evaporator units, was abandoned not long after original plant startup. The lower level of the building is an open area with large compartments where low level radioactive equipment/material is sometimes stored. Other than a fire event, there is no potential of radioactive release from the ABE. Should a fire occur, it is unlikely that any release of the fixed contamination would pass through the SPING monitor. While the ventilation system is normally in service, it is not a "continuous release" from a radiological perspective. The NEI 99-01 basis for gaseous effluent thresholds specifies the release point be a normally occurring continuous radioactivity release or a planned batch release from non-continuous release pathways, neither of which applies to 2RX-9845 (SPING 10) for the ABE. Should the ABE ever be designated as a radiological area that would require consideration for offsite release potential, the plant modification process would identify any impacts to systems, operations, and regulatory requirements, including EAL impacts (see response to ANO RAI 1).

Per the ANO-2 Safety Analysis Report (SAR), Section 11.5.6.1, "Low Level Radioactive Waste Storage Building (LLRWSB)," the LLRWSB is designed to provide a controlled environment for receiving and shipping, inspection, equipment sorting, compaction, and decontamination activities associated with on-site storage and off-site shipment of LLRW. The only design release of radioactivity would occur during compacting operations; however, this process is not used at ANO. The LLRWSB is separate from the Reactor and Auxiliary Buildings; therefore, radioactivity cannot pass through those buildings into the LLRWSB to the environment. The radioactivity contained in the LLRWSB, primarily particulate isotopes, is not sufficient to exceed the UE threshold of 2x ODCM limit for 60 minutes for any credible event.

The potential for an accident level release via the LLRWSB pathway is extremely remote. The normal radio-isotopic makeup of the building contents mainly consists of particulate isotopes which would not be released to the atmosphere in sufficient quantities that would require a declaration of an emergency class. The most probable event for a significant release would be fire in the building which would most likely bypass the monitoring system. Note that the LLRWSB contains a fire detection and suppression system. The NEI 99-01 basis for gaseous effluent thresholds specifies the release point be a normally occurring continuous radioactivity release or a planned batch release from non-continuous release pathways, neither of which applies to 2RX-9850 (SPING 11) for the LLRWSB.

ANO RAI 5

ANO calculation EP-CALC-ANO 1701 states that AU1.3 will still be valid. However, AU1.3 was not provided in the ANO EAL scheme change.

If monitors 2RX-9840, 2RX-9845 and 2RX-9850 were intended to be assessed by AU1.2 vice AU 1.3, please explain how a timely and accurate classification can be made for effluent flow paths that may not have an active discharge permit.

Entergy Response:

Entergy has revised EP-CALC-ANO-1701 to address RAI #4. The calculation no longer refers to AU1.3 for monitors 2RX-9845 and 2RX-9850. As discussed in response to RAI #4, 2RX-9840 has been abandoned. The revised calculation is provided with the revised Reference 1 enclosures, as applicable.

ANO RAI 6

The proposed EAL CU3.1, contains the condition, "…due to the loss of RCS cooling," which is not consistent with NEI 99-01, Revision 6. This could result in potential misclassification for an event that causes RCS temperature to rise above 200 degrees Fahrenheit (°F) when decay heat removal capability has not been lost.

Please provide justification, in greater detail, for adding the condition, "…due to the loss of RCS cooling," to the EAL CU3.1 threshold value, or revise accordingly.

Entergy Response:

Entergy agrees with the noted concern and, subsequently, the subject phrase has been removed from EAL CU3.1. The EAL will now state:

UNPLANNED rise in RCS temperature to > 200 °F

Affected pages of the applicable Reference 1 enclosures have been updated accordingly and included in this letter.

ANO RAI 7

The proposed EAL CA1.1 threshold values equate to levels that are approximately at the bottom of the hot leg. The guidance provided by NEI 99-01, Revision 6, states "… [t]he minimum level that supports operation of normally used heat removal systems (e.g., Residual Heat Removal or Shutdown Cooling)."

Please explain what unique ANO design features support a CA1.1 threshold value that is substantially lower than the value at which the heat removal systems can operate, or revise accordingly.

Entergy Response:

For ANO-1, the minimum level for Decay Heat Removal (DHR) operation is elevation 370' 3", in accordance with OP-1104.004, "Decay Heat Removal Operating Procedure," Attachment B, "Minimum Height of Water to Avoid Vortex Formation vs. Decay Heat Flow." The value selected was based on 1000 gpm DHR flow which is the flow rate at which the low flow alarm is received. For consistency with NEI 99-01, EAL CA1.1 has been revised to include a value of 370.2 ft. (indication in Control Room reads only to one decimal place). While this value is slightly below the 370' 3" noted above, it ensures the EAL is not declared when flow remains above 1000 gpm. In addition, a flow rate slightly less than 1000 gpm does present an immediate challenge to the core. The RVLMS approximate equivalent value remains unchanged at Levels 1 through 8 (dry). The associated EAL Basis is also revised to support the updated RCS level value. Affected pages of the applicable Reference 1 enclosures have been updated accordingly and included in this letter.

For ANO-2, the minimum level for Shutdown Cooling operation is 24" above the bottom of the RCS hot leg or elevation 371' 1½", in accordance with OP-2203.029, "Loss of Shutdown Cooling," Attachment A, "RCS Level." For consistency with NEI 99-01, EAL CA1.1 has been revised to include the 24" value. The RVLMS approximate equivalent value remains unchanged at Levels 1 through 5 (dry). The associated EAL Basis is also revised to support the updated RCS level values. Affected pages of the applicable Reference 1 enclosures have been updated accordingly and included in this letter.

ANO RAI 8

The proposed EAL CA3.1 contains the condition "…due to the loss of RCS [reactor coolant system] cooling," which is not consistent with NEI 99-01, Revision 6. This deviation could result in potential misclassification for an event other than a loss of RCS cooling that leads to an unplanned RCS pressure increase.

Please provide justification in greater detail for this deviation, or revise accordingly.

Entergy Response:

Entergy agrees with the noted concern and, subsequently, the subject phrase has been removed from EAL CA3.1. The EAL will now state:

UNPLANNED RCS pressure rise > 10 psig (this EAL does not apply during water-solid plant conditions)

Affected pages of the applicable Reference 1 enclosures have been updated accordingly and included in this letter.

ANO RAI 9

For proposed EALs CU5.1 and SU7.1, State and local agency communications methods include the INFORM notification system (INFORM). Based on the information provided, the NRC staff could not determine whether INFORM was independent of the telephone systems provided on Table 1[2]C-5 or if INFORM supported two-way communications. Additionally, usage of the INFORM system was not identified in the emergency plan.

Please provide a justification for including the INFORM notification system as a State and local agency communication method. This justification should explain whether or not INFORM is independent of the provided telephone systems and if INFORM supports two-way communications.

Entergy Response:

Although INFORM is independent of the other telephone systems provided in the associated tables for these EALs, it does not support two-way communication and is, therefore, removed from Table 1[2]C-5 in EALs CU5.1 and SU7.1. Affected pages of the applicable Reference 1 enclosures have been updated accordingly and included in this letter.

ANO RAI 10

Proposed EALs FA1.1, FS1.1 and FG1.1 are assessed using threshold values that are provided by Table 1[2]F-1, "Fission Product Barrier Threshold Matrix."

a. The proposed Reactor Coolant System Barrier (RCB) 2 and Containment Barrier (CNB) 1 threshold values do not appear to be directly tied to having an RCS leak that is greater than the capacity of a charging pump, as indicated by either direct indications from control room panels or with the methodology provided by the excessive RCS leakage AOP. Using either a direct reading of RCS leakage or the AOP criteria to determine RCS leakage for both the RCS leakage AOP and the RCS barrier potential loss would facilitate timely and accurate assessment. As proposed, it appears that a mass balance must be performed to assess RCS leak rate.

   Please explain how ANO can assess RCB2 and CNB1 in a timely and accurate manner, given the proposed RCB2 and CNB1 threshold value wording, or revise accordingly.

Entergy Response:

NEI 99-01 Revision 6, Pressurized Water Reactor (PWR) RCS Potential Loss 1.A (RCB2) is based on unisolable RCS or SG tube leakage requiring the start of a standby charging pump. This threshold is based on the assumption that such a leak is in excess of normal charging pump capacity. However, not all plants have low capacity makeup pumps and placing additional pumps in service is not always the desired response to leakage. In addition, a plant may be running more than one pump to support current operations. The PWR RCS Potential Loss 1.A Developer's Notes provide for the use of alternative threshold wording, specifying an RCS leak rate (excluding normal reductions such as letdown and Reactor Coolant Pump (RCP) seal leakoff) in lieu of the starting of a standby charging pump. For ANO-1, a leak rate of 50 gpm is specified (ANO-1 does not have low capacity charging pumps). For ANO-2 a leak rate of 44 gpm is specified (capacity of a charging pump).

Per the generic bases for Containment Loss 1.A (CNB1), the condition of the faulted SG is determined consistent with either RCS Potential Loss 1.A (RCB2) or RCS Loss 1.A (RCB1).

Both SG leakage and RCS leakage AOPs (listed below) provide guidance for the timely and prompt estimation of RCS leak rates relative to RCB2 and CNB1.

1203.023 – Small Steam Generator Tube Leaks

1203.039 – Excess RCS Leakage

2203.016 – Excess RCS Leakage

2203.038 – Primary to Secondary Leakage

b. The proposed Unit 1 RCB3 threshold appears to be more aligned with a “typical” pressurized water reactor (PWR) vice site-specific values for ANO Unit 1.

ANO Unit 1 provides a threshold value that requires both the pressurized thermal shock limits of RT14 being applicable and an RCS pressure versus temperature that is to the left of the Nil Ductility Transition Temperature/Low Temperature Overpressure (NDTT/LTOP) limit lines provided by EOP Figure 3. However, it appears that either of these conditions could indicate that an extreme challenge to the RCS pressure barrier exists.

For the Unit 1 RCB3 threshold value, please provide a justification for including an “AND” logic to the PTS limits of RT14 and the NDTT/ LTOP limit lines of EOP Figure 3. (Note: this justification should explain differences between RT14 and EOP Figure 3 and explain why both conditions are required as a threshold value when either condition appears to be a severe challenge to the integrity of the RCS pressure boundary.)

<u>Entergy Response</u>:

Generically, pressurized thermal shock (PTS) concerns occur when a combination of two conditions exists:

1. Excessive RCS cooldown

   AND

2. The RCS is at a pressure and temperature on the wrong side of the Pressure-Temperature (P-T or PTS) curve (NDTT limit).

The combination of these two conditions can challenge the integrity of the RCS boundary and thus warrant a Potential Loss of the RCS due to potentially high thermal stresses induced by the excessive RCS cooldown combined with excessive RCS pressure. In accordance with the Technical Specification (TS) Basis associated with P-T curves, the limits define allowable operating regions and permit a large number of operating cycles while providing a wide margin to non-ductile failure. Therefore, operation beyond the acceptable regions defined on the curves is unlikely to pose an immediate threat to the integrity of the reactor coolant pressure boundary (RCPB). In fact, the TSs require an engineering evaluation of the transient impact on the RCPB, and may or may not require placing the unit in Cold Shutdown. One of the major concerns is the temperature gradient that may exist across the vessel or piping walls. An excessive RCS cooldown is required to present a temperature gradient that would be of significant concern. However, without coincident excessive pressure, the temperature gradient is not likely to pose an immediate threat to the RCPB.

If the "AND" condition were changed to an either/or, the potential for unnecessary Alert or higher classifications is increased. Because both a rapid cooldown and high pressure is required to pose a significant challenge to the RCPB, and because the P-T curves are established with significant margin, an Alert or higher classification is likely unwarranted if only one of the two conditions exists. Therefore, Entergy believes the "AND" condition is appropriate for this EAL. This is consistent with plant EOP bases that PTS concerns only apply when both the specified cooldown rate limits and NDTT/LTOP curve limits are exceeded.

For ANO-1, the first condition is met when, per Routine Task 14 (RT14), PTS limits apply. This results from any one of the following three conditions existing:

RCS cooldown rate > 100 °F with Tcold < 355 °F

RCS cooldown rate > 50 °F with Tcold < 300 °F

High Pressure Injection (HPI) in service with all RCPs off

For ANO-1, the second condition is met when RCS pressure and temperature are left of the NDTT/LTOP limit lines on EOP Figure 3.

Therefore, the appropriate logic wording for ANO-1 RCS Potential Loss threshold RCB3 is "AND."

c. The proposed Unit 2 RCB3 threshold appears to be more aligned with a "typical" PWR vice site-specific values for ANO Unit 2. ANO Unit 2 provides a threshold value that requires both an uncontrolled RCS cooldown and an RCS pressure/temperature that is to the left of the pressure-temperature (P-T) limit lines provided by Standard Attachment 1. It appears that operating the unit in the region to the left of the P-T limit lines provided by Standard Attachment 1, by itself, could indicate that an extreme challenge to the RCS pressure barrier exists.

   For the unit 2 RCB3 threshold value, please provide a justification for including "AND" logic to an uncontrolled RCS cooldown and the P-T limits of Standard Attachment 1.

<u>Entergy Response</u>:

Generically, PTS concerns exist when a combination of two conditions exists:

1. Excessive RCS cooldown.

   AND

2. The RCS is at a pressure and temperature on the wrong side of the P-T (PTS) curve (NDTT limit).

The combination of these two conditions can challenge the integrity of the RCS boundary and thus warrant a Potential Loss of the RCS due to potentially high thermal stresses induced by the excessive RCS cooldown combined with excessive RCS pressure (see response to Part b above).

For ANO-2, the first condition is met if there is an uncontrolled RCS cooldown (currently stated as a 50 °F step change below 500 °F from normal operating temperature (NOT).

For ANO-2, the second condition is met when RCS pressure and temperature are left of Line B (200 °F margin-to-saturation) on Standard Attachment 1, P-T limits.

Therefore, the appropriate logic wording for ANO-2 RCS Potential Loss threshold RCB3 is "AND."

In addition to the above, the 1st bullet of the current ANO-2 EAL contains the following parenthetical:

1. Uncontrolled RCS cooldown (50°F step change which is below 500°F from NOT)

Operations has determined that the wording of the parenthetical statement is unclear and, therefore, proposes to revise the wording consistent with the RCS cooldown TS limits:

1. Uncontrolled RCS cooldown (> 50 °F step change or > 100 °F change in less than a one-hour period)

In accordance with TS 3.4.9.1, "Pressure/Temperature Limits," the cooldown limits are applicable when RCS temperature is between 50 °F and 560 °F; therefore, the current reference to 500 °F is irrelevant and removed. The aforementioned revision provides clarity and meets the intent of the EAL bullet. Affected pages of the applicable Reference 1 enclosures have been updated accordingly and included in this letter.

ANO RAI 11

The Fuel Clad Barrier (FCB) 4, RCB4, and EAL SS6.1 threshold values include the condition "HPI [High Pressure Injection] [Once Through] cooling initiated." For some PWRs, implementation of procedural guidance would provide cooling by injecting water into the RCS and removing that water, such that core cooling is established. The proposed wording implies that not only are the steam generators ineffective for heat removal, but that an alternate heat removal path has been established. This is not consistent with the guidance in NEI 99-01, Revision 6, which provides a threshold value of "[i]nadequate heat removal capability via steam generators as indicated by (site-specific indications)."

Please explain how a timely and accurate assessment can be performed for FCB4, RCB4, and SS6.1 with the proposed condition requiring HPI [Once Through] cooling initiation, rather than the HPI [Once Through] cooling procedure implementation, or revise accordingly.

<u>Entergy Response</u>:

To resolve the subject concern, Entergy proposes to revise the subject condition to state the following:

<u>An on-shift SRO has determined that the </u>procedure conditions are met to commence initiation of HPI[Once Through] cooling.

The revised wording will ensure prompt declaration of the appropriate EALwhen conditions for HPI have been met, rather than waiting until HPI is actually placed in service. Entergy believes the revised wording meets the intent of NEI 99-01, Revision 6, as described in the RAI. Affected pages of the applicable Reference 1 enclosures have been updated accordingly and included in this letter.

ANO RAI 12

The threshold value for FCB5 is based on 300 microcuries/gram dose equivalent I-131 which typically corresponds to 2 percent to 5 percent fuel cladding damage. For ANO, this corresponds to fuel cladding damage of 1.49 percent for Unit 1 and 1.13 percent for Unit 2.

Please explain why the proposed FCB5 EAL radiation monitor threshold values do not correspond to 2 percent to 5 percent of cladding damage.

Entergy Response:

The NEI 99-01, Revision 6, developer notes direct that “the reading should be determined assuming the instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory, with RCS radioactivity concentration equal to 300 μCi/gm dose equivalent I-131, into the containment atmosphere.” The associated NEI basis states in part “reactor coolant activity above this level is greater than that expected for iodine spikes and corresponds to an approximate range of 2% to 5% fuel clad damage.”

The 2% - 5% rule of thumb used in the NEI basis for PWRs and BWRs originated in NUMARC/NESP-007 Rev 2 and could be confirmed using typical enrichment values and NUREG-1228 related source term/partitioning assumptions. Currently, most units operate with higher enrichment than what was common in the late 1980s and have been approved for power uprates. Additionally, newer source term and partitioning guidance such as NUREG-1940 are a factor. These combine such that typical reactor coolant concentrations to percent clad damage are approximately half of what was calculated using historical inputs and guidance. In addition, the use of a 300 uCi/gm dose equivalent I-131 (DEI) source term for FCB5 (NEI Fuel Clad Barrier Loss threshold 3.A) provides agreement within the EAL scheme with FCB6 (NEI Fuel Clad Barrier Loss threshold 3.B) which directly refers to a 300 uCi/gm DEI value.

ANO RAI 13

Please justify using a containment hydrogen concentration of greater than 3 percent for the proposed CNB7 threshold value, as this is not consistent with the explosive mixture provided by NEI 99-01, Revision 6. (Note: the proposed threshold value of containment hydrogen concentration of greater than 3 percent could result in an early or unwarranted General Emergency declaration.)

Entergy Response:

The containment hydrogen concentration in CNB7 is changed to "> 4%" for consistency with NEI 99-01, Revision 6. The statement "the 4% hydrogen concentration is generally considered the lower limit for hydrogen deflagrations" has been added to the basis information. Affected pages of the applicable Reference 1 enclosures have been updated accordingly and included in this letter.

ANO RAI 14

The proposed HA1.1 and HS1.1 definitions of the owner controlled area (OCA) and the protected area (PA) appear to be the same. The definition of the OCA indicates that it is demarcated by a vehicle barrier system and a security fence with access controlled by an access control point. The PA is "[a]n area encompassed by physical barriers (i.e., the security fence) and to which access is controlled." As such, it appears that HA1.1 and HS1.1 have similar threshold value criteria that could cause a delayed or inaccurate EAL classification.

Please explain how ANO can perform a timely and accurate assessment of HA1.1 and HS1.1 with the proposed definitions, or revise accordingly.

Entergy Response:

The definition of OCA provided in the subject EALs states that this area is considered the Security Owner Controlled Area (SOCA) at ANO. The SOCA is basically designated as the outside fence around the facility, while the PA is the inner fence. To enhance clarification of what these areas represent, the current OCA and Protected Area definitions contained in EALs HA1.1 and HS1.1 are revised as follows (deletions are struck through, additions are underlined):

SECURITY OWNER CONTROLLED AREA (SOCA) - ~~For the purposes of classification this is the Security Owner Controlled Area (SOCA).~~ The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of~~and a detection fence on the outside and~~ a delay fence with early warning capabilities~~on the inside of the passive and active barriers~~. The SOCA is the area between~~inside~~ the SOCA Fence and~~VBS up to~~ the PROTECTED AREA Boundary~~fence line~~. ~~Access to this area is controlled by the SOCA Personnel Access Control Point.~~

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel~~encompassed by physical barriers (i.e., the security fence) and~~ to ~~which access is~~ controll~~ed~~ access.

The above definitions are consistent with those contained in security procedure EN-NS-232, "General Employee Security Responsibilities." The revision of the above terms will prevent confusion or misinterpretation by maintaining consistent definitions of these areas. Affected pages of the applicable Reference 1 enclosures have been updated accordingly and included in this letter.

ANO RAI 15

The proposed EALs HU4.1 and HU4.2 appear to cover a wider range of areas than that provided by NEI 99-01, Revision 6 (EAL HU4). Please provide justification that all areas identified for this EAL contain equipment needed for safe operation, safe shutdown or safe cool-down, or revise as necessary to support accurate and timely assessment.

Entergy Response:

For ANO-1, there are approximately 40 rooms/areas within the Auxiliary Building associated with fire safe shutdown. For ANO-2, there are approximately 50 rooms/areas within the Auxiliary Building associated with fire safe shutdown. The large numbers of rooms/areas is largely due to cable runs traversing many different rooms/areas throughout the Auxiliary Building. Even if areas associated only with cable runs are neglected, there would remain 25 ANO-1 and 35 ANO-2 areas in the Auxiliary Building that would need to be listed in the associated EALs. Based on this large number of areas that can potentially affect fire safe shutdown equipment, Entergy proposes to maintain the generic listing in Tables 1H-1 and 2H-1 of “Auxiliary Building” for both units, including the exceptions listed in Table 1H-1. However, the reference to the Auxiliary Building Extension in Table 2H-2 is being established as a separate table entry and the specific area associated with fire safe shutdown in this building is added. This eliminates a very large area of the Auxiliary Building Extension from being of concern.

The generic “Reactor Building” entry in both tables is also being maintained, again largely due to the various areas where safety related equipment and cables may traverse. Further discussion of the Reactor Building in relation to station fires is included in response to RAI 16 below.

With respect to the Turbine Buildings, both tables are being modified to significantly reduce the areas of concern. For both units, this includes the path in which electrical cabling from offsite power and the Alternate AC Diesel Generator (also referred to as the station blackout diesel) enter the plant, connect with non-vital switchgear, and continue to the vital switchgear located in the Auxiliary Buildings.

The following changes are proposed:

Table 1H-1 Unit 1 Fire Areas
Reactor Building **All** elevations **Auxiliary Building** **All** elevations including: Penthouse/MSIV Room Exceptions: Boric Acid Mix Tank Room (Chem Add Area), 404' (157-B), EDG Exhaust Fan area on 386' (1-E and 2-E) **Turbine Building** **All** elevations on the west side of Turbine Building and including: Pipechase under ICW Coolers, CRD Pump Pit/T-28 Room/Area under ICW Pumps 372' Elevation from non-vital switchgear area to Auxiliary Building wall at DR 56 **Outside Areas** Manholes adjacent to Startup #2 XFMR (MH-03/MH-04) Manholes adjacent to Intake Structure (MH-05/MH-06) Intake Structure (354' and 366') Diesel Fuel Vault Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

Table 2H-1 Unit 2 Fire Areas
Reactor Building **All** elevations **Auxiliary Building** **All** elevations including: MG Set Room, UNEPR, LNEPR, 2B-53 Room **Auxiliary Building Extension** MSIV Room **Turbine Building** All elevations on the west side of Turbine Building and 372' Elevation from non-vital switchgear area to Auxiliary Building wall at DR 340 **Outside Areas** Intake Structure (354' and 366') Concrete Manhole East, NE of intake (2MH-01) Concrete Manhole East of Turbine Building next to train bay (2MH-03) Diesel Fuel Vault Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

The proposed changes to Tables 1H-1 and 2H-1 result in a significant reduction in the number of areas of concern. This subsequently significantly reduces the potential of unnecessary EAL declarations associated with HU4.1 and HU4.2. Affected pages of the applicable Reference 1 enclosures have been updated accordingly and included in this letter.

ANO RAI 16

The proposed EAL HU4.2 - Tables 1H-1, “Unit 1 Fire Areas,” and 2H-1, “Unit 2 Fire Areas,” include all elevations of the Reactor Building. This could result in an event declaration due to the spurious actuation of a single fire alarm. Based on the information provided in the license amendment request, the NRC staff could not determine if the containment fire detection system at ANO, in combination with the ANO containment ventilation system, supported the inclusion of the Reactor Building as a fire area for EAL HU4.2.

Please provide sufficient justification that demonstrates why, or why not, including the Reactor Building Table 1[2]H-1 could not result in unnecessary event declarations. If this justification demonstrates that including the Reactor Building is not appropriate as a fire area for HU4.2, please modify accordingly.

Entergy Response:

ANO EAL HU4.1 addresses the condition where a fire is reported and verified in a listed Fire Area. This verification could be from a report in the field or because multiple fire detection device alarms are received. This EAL includes a table that lists fire areas of concern, including the Reactor Building.

ANO EAL HU4.2 addresses receipt of a single fire detector without a corresponding verification. Entergy makes an exception in EAL HU4.2 to exclude the Reactor Building in Modes 1 and 2. Personnel safety concerns preclude entry into certain areas of the Reactor Building during these modes. In addition, there are areas within the Reactor Building where fire detectors are located that would be inaccessible during these modes due to elevated radiation levels. Industry experience has demonstrated that including the Reactor Building in Modes 1 and 2 in EAL HU4.2 can lead to unusual event emergency classifications based on a single spurious fire alarm, requiring subsequent emergency declaration retractions.

With respect to Reactor Building fire alarms, it can reasonably be expected that a fire that burns for 15 minutes would produce sufficient products of combustion to cause multiple fire detection devices to alarm. This is due to the products of combustion being transported to other areas inside the Reactor Building due to the forced flow ventilation system in operation. Likewise, receipt of a single fire alarm would likely be due to a spurious detector actuation.

There are four safety related Reactor Building Fan Cooling units located in each ANO Reactor Building. At least 3 of the 4 fans in each unit’s Reactor Building are normally in operation in Modes 1 and 2. For ANO-1, each fan unit delivers an air flow of approximately 30,000 cfm. For ANO-2, each fan unit delivers an air flow of approximately 27,000 cfm.

The fan units draw return air from the Reactor Building atmosphere and discharge into a common header which delivers cooled ventilating air to multiple areas inside the Reactor Building. This constant flow of air would draw any smoke towards the cooling units past the

installed detectors, thus initiating multiple smoke detector alarms. Actuation of more than one smoke detector is the most reliable indication of an actual fire because of the high volumetric air flow throughout the Reactor Building. Due to construction of the intermediate floors and multiple openings in the floors, it can be expected that smoke would migrate throughout the Reactor Building in a very short period and that 2 or more smoke detectors would alarm. Entergy considers basing emergency classifications on receiving more than one smoke detector actuation as the most reliable indication of a valid alarm and accurately meets the Initiating Condition of HU4, "FIRE potentially degrading the level of safety of the plant."

With consideration to the above discussion, Note 14 is added to EAL HU4.2 as follows:

> During Modes 1 and 2, HU4.2 is not applicable to a single fire alarm in the Reactor Building.

The following information is added to the basis for HU4.2:

> This EAL is not applicable for the Reactor Building in Modes 1 and 2. The Reactor Building air flow design and TS requirements for operation of Reactor Building Fan Coolers are such that multiple smoke detectors would be expected to alarm for a fire in the Reactor Building. A fire in the Reactor Building in these modes would therefore be classified under EAL HU4.1.

Verification of a single Reactor Building fire alarm that is likely to be spurious does not warrant the potential elevated exposure risks and industrial safety risks associated with an emergency entry of the Reactor Building in Modes 1 and 2. Therefore, Entergy proposes the aforementioned revision to EAL HU4.2 such that the EAL is only applicable to a single fire alarm in the Reactor Building in Modes 3, 4, 5 and 6.

The structure of the HU4 IC/EAL is modelled after Seabrook Station's adoption of NEI 99-01, Revision 6, EALs containing a similar exception, which was approved by the NRC in Amendment 152 to the Seabrook Station Facility, Operating License No. NPF-86, on February 10, 2017 (ML16358A411).

Based on the information above, Entergy considers the proposed revision to be an acceptable deviation from the generic NEI 99-01, Revision 6, guidance. This deviation is consistent with proposed Emergency Plan (EP) Frequently Asked Question (FAQ) 2018-03 (ML18081A309). Affected pages of the applicable Reference 1 enclosures have been updated accordingly and included in this letter.

Entergy believes the preceding information is in accordance with discussions held between the NRC and the licensee on August 1, 2018.

In addition to the RAI responses above, Entergy proposes two additional changes which were identified during the response preparation associated with ANO RAI 16 above.

1. To avoid unnecessary declarations of EAL HU4.1, the following Note 13 is proposed to be added to HU4.1:

   Note 13: Bullet 2 of this EAL (multiple fire alarm indications) is not applicable for LOCAs or MSL breaks in containment.

   Steam releases are known to trigger fire detectors in the vicinity of the leak. Because other EALs address LOCAs and MSL breaks, Entergy believes declaring HU4.1 during such an event would suggest to non-Entergy agencies (local/state government, NRC, etc.) that a fire is also occurring at the site. While it may be possible to experience a fire inside containment coincident with a LOCA or MSL break, such is unlikely, especially given the steam/water atmosphere created by the LOCA / MSL break. Therefore, Entergy proposes to add the aforementioned note and the following language to the HU4.1 basis that would eliminate this potential communication with offsite agencies when multiple fire detectors actuate inside containment coincident with a LOCA or MSL break inside containment.

   Because steam release due to a LOCA or MSL break inside containment can result in invalid fire detector actuations in containment, Note 13 eliminates the potential for EAL HU4.1 declaration due to such invalid alarms. This is reasonable based on the low probability of a fire occurring inside containment coincident with a LOCA or MSL break inside containment, and due to the low probability of a significant fire existing in a steam/water atmospheric environment.

2. With respect to EAL HU4.2, one of the listed criteria is associated with a fire that is NOT verified to exist within 30 minutes. The wording implies that a fire must be verified to exist within 30 minutes or the EAL is applicable. However, the intent of this criterion is to address those scenarios where a fire has not been proved or disproved within 30 minutes. While this intent is discussed in the associated basis, Entergy requests a clarification be made to this respective criterion in the EAL proper in order to avoid delays in determining if the EAL is applicable to a given event:

   The existence of a FIRE is **not** verified (i.e., proved or disproved) within 30 min. of alarm receipt (Note 1)

The Entergy response requires changes to certain enclosures included in the original Reference 1 application. For completeness and ease of NRC review, the following Reference 1 enclosures are being resubmitted in full as part of Entergy's response to the NRC's RAI:

2. Proposed EAL Technical Basis Document (Markup)
3. Proposed EAL Technical Basis Document (Clean)
4. NEI 99-01, Rev. 6, Deviations and Differences, ANO Units 1 and 2
5. Proposed EAL Matrix Chart and Review Table (for information only)
6. Supporting Referenced Document Pages

REFERENCES:

1. Entergy letter dated March 29, 2018, *License Amendment Request – Adoption of Emergency Action Level Schemes Pursuant to NEI 99-01, Revision 6*, Arkansas Nuclear One, Units 1 and 2, 0CAN031801 (ML18088B412)

2. NRC email dated August 2, 2018, *ANO-1 and 2 Final RAI RE: License Amendment Request to Adopt EAL Scheme Change Per NEI 99-01 Revision 6*, (EPID L-2018-LLA-0082) (0CNA081801) (ML18218A221)

Enclosure 2 to

0CAN091801

Proposed EAL Technical Basis Document (Markup)

Table of Contents

1.0 INTRODUCTION

This document provides an explanation and rationale for each Emergency Action Level (EAL) included in the EAL Upgrade Project for Arkansas Nuclear One (ANO). It should be used to facilitate review of the ANO EALs and provide historical documentation for future reference. Decision-makers responsible for implementation of 1903.010, Emergency Action Level Classification, may use this document as a technical reference in support of EAL interpretation. This information may assist the Emergency Director in making classifications, particularly those involving judgment or multiple events. The basis information may also be useful in training and for explaining event classifications to off-site officials.

The expectation is that emergency classifications are to be made as soon as conditions are present and recognizable for the classification, but within 15 minutes or less in all cases when conditions are present and have been recognized. Use of this document for assistance is not intended to delay the emergency classification.

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

2.0 DISCUSSION

2.1 Background

EALs are the plant-specific indications, conditions or instrument readings that are utilized to classify emergency conditions defined in the ANO Emergency Plan.

In 1992, the NRC endorsed NUMARC/NESP-007 “Methodology for Development of Emergency Action Levels” as an alternative to NUREG-0654 EAL guidance.

NEI 99-01 (NUMARC/NESP-007) Revisions 4 and 5 were subsequently issued for industry implementation. Enhancements over earlier revisions included:

- Consolidating the system malfunction initiating conditions and example emergency action levels which address conditions that may be postulated to occur during plant shutdown conditions.
- Initiating conditions and example emergency action levels that fully address conditions that may be postulated to occur at permanently Defueled Stations and Independent Spent Fuel Storage Installations (ISFSIs).
- Simplifying the fission product barrier EAL threshold for a Site Area Emergency.

Subsequently, Revision 6 of NEI 99-01 has been issued which incorporates resolutions to numerous implementation issues including the NRC EAL Frequently Asked Questions (FAQs). Using NEI 99-01 Revision 6, "Methodology for the Development of Emergency Action Levels for Non-Passive Reactors,” November 2012 (ref. 4.1.1), ANO conducted an EAL implementation upgrade project that produced the EALs discussed herein.

2.2 Fission Product Barriers

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

Many of the EALs derived from the NEI methodology are fission product barrier threshold based. That is, the conditions that define the EALs are based upon thresholds that represent the loss or potential loss of one or more of the three fission product barriers. “Loss” and “Potential Loss” signify the relative damage and threat of damage to the barrier. A “Loss” threshold means the barrier no longer assures containment of radioactive materials.
A “Potential Loss” threshold implies a greater probability of barrier loss and reduced certainty of maintaining the barrier.

The primary fission product barriers are:

A. <u>Fuel Clad Barrier (FCB):</u> The Fuel Clad Barrier consists of the cladding material that contains the fuel pellets.

B. <u>Reactor Coolant System Barrier (RCB):</u> The Reactor Coolant System Barrier includes the RCS primary side and its connections up to and including the pressurizer safety and relief valves, and other connections up to and including the primary isolation valves.

C. <u>Containment Barrier (CNB):</u> The Containment Barrier includes the Reactor Building and connections up to and including the outermost containment isolation valves. This barrier also includes the main steam, feedwater, and blowdown line extensions outside the Reactor Building up to and including the outermost secondary side isolation valve. Containment Barrier thresholds are used as criteria for escalation of the Emergency Classification Level (ECL) from an Alert to a Site Area Emergency or a General Emergency.

2.3 Fission Product Barrier Classification Criteria

The following criteria are the bases for event classification related to fission product barrier loss or potential loss:

<u>Alert:</u>

Any loss or any potential loss of either Fuel Clad or RCS Barrier

<u>Site Area Emergency:</u>

Loss or potential loss of any two barriers

<u>General Emergency:</u>

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

2.4 EAL Organization

The ANO EAL scheme includes the following features:

- Division of the EAL set into three broad groups:
    - EALs applicable under <u>any</u> plant operating modes – This group would be reviewed by the EAL-user any time emergency classification is considered.
    - EALs applicable only under <u>hot</u> operating modes – This group would only be reviewed by the EAL-user when the plant is in Hot Shutdown, Hot Standby, Startup, or Power Operation mode.
    - EALs applicable only under <u>cold</u> operating modes – This group would only be reviewed by the EAL-user when the plant is in Cold Shutdown, Refueling or Defueled mode.

  The purpose of the groups is to avoid review of hot condition EALs when the plant is in a cold condition and avoid review of cold condition EALs when the plant is in a hot condition. This approach significantly minimizes the total number of EALs that must be reviewed by the EAL-user for a given plant condition, reduces EAL-user reading burden and, thereby, speeds identification of the EAL that applies to the emergency.

- Within each group, assignment of EALs to categories and subcategories:

Category and subcategory titles are selected to represent conditions that are operationally significant to the EAL-user. The ANO EAL categories are aligned to and represent the NEI 99-01, "Recognition Categories." Subcategories are used in the ANO scheme as necessary to further divide the EALs of a category into logical sets of possible emergency classification thresholds. The ANO EAL categories and subcategories are listed below.

The primary tool for determining the emergency classification level is the EAL Classification Matrix. The user of the EAL Classification Matrix may (but is not required to) consult the EAL technical bases in order to obtain additional information concerning the EALs under classification consideration. The user should consult Section 3.0 and Attachment 1 of this document for such information.

EAL Groups, Categories and Subcategories

EAL Group/Category	EAL Subcategory
Any Operating Mode:	
A – **A**bnormal Rad Levels / Rad Effluent	1 – Radiological Effluent 2 – Irradiated Fuel Event 3 – Area Radiation Levels
H – **H**azards and Other Conditions Affecting Plant Safety	1 – Security 2 – Seismic Event 3 – Natural or Technological Hazard 4 – Fire 5 – Hazardous Gas 6 – Control Room Evacuation 7 – Emergency Director Judgment
E – Independent Spent Fuel Storage Installation (ISFSI)	1 – Confinement Boundary
Hot Conditions:	
S – **S**ystem Malfunction	1 – Loss of Essential AC Power 2 – Loss of Vital DC Power 3 – Loss of Control Room Indications 4 – RCS Activity 5 – RCS Leakage 6 – RPS Failure 7 – Loss of Communications 8 – Containment Failure 9 – Hazardous Event Affecting Safety Systems
F – **F**ission Product Barrier Degradation	None
Cold Conditions:	
C – **C**old Shutdown / Refueling System Malfunction	1 – RCS Level 2 – Loss of Essential AC Power 3 – RCS Temperature 4 – Loss of Vital DC Power 5 – Loss of Communications 6 – Hazardous Event Affecting Safety Systems

2.5 Technical Bases Information

EAL technical bases are provided in Attachment 1 for each EAL according to EAL group (Any, Hot, Cold), EAL category (A, C, E, F, H and S) and EAL subcategory. A summary explanation of each category and subcategory is given at the beginning of the technical bases discussions of the EALs included in the category. For each EAL, the following information is provided:

Category Letter & Title

Subcategory Number & Title

Initiating Condition (IC)

Site-specific description of the generic IC given in NEI 99-01 Rev. 6.

EAL Identifier (enclosed in rectangle)

Each EAL is assigned a unique identifier to support accurate communication of the emergency classification to onsite and offsite personnel. Four characters define each EAL identifier:

1. First character (letter): Corresponds to the EAL category as described above (A, C, E, F, H or S)
2. Second character (letter): The emergency classification (G, S, A or U)
   - G = General Emergency
   - S = Site Area Emergency
   - A = Alert
   - U = Unusual Event
3. Third character (number): Subcategory number within the given category. Subcategories are sequentially numbered beginning with the number one (1). If a category does not have a subcategory, this character is assigned the number one (1).
4. Fourth character (number): The numerical sequence of the EAL within the EAL subcategory. If the subcategory has only one EAL, it is given the number one (1).

Classification (enclosed in rectangle):

Unusual Event (U), Alert (A), Site Area Emergency (S) or General Emergency (G)

EAL (enclosed in rectangle)

Exact wording of the EAL as it appears in the EAL Classification Matrix. If an ANO Unit 2 EAL threshold value differs from Unit 1, the Unit 2 threshold is enclosed in brackets. For example, in the EAL threshold "RVLMS Levels 1 through 8 indicate DRY [RVLMS Levels 1 through 5 indicate DRY]", "RVLMS Levels 1 through 5 indicate DRY" apply only to Unit 2.

Mode Applicability

One or more of the following plant operating conditions comprise the mode to which each EAL is applicable: 1 - Power Operation, 2 - Startup, 3 – Hot Standby, 4 - Hot Shutdown, 5 - Cold Shutdown, 6 - Refueling, DEF - Defueled, or All. (See Section 2.6 for operating mode definitions).

Definitions:

If the EAL wording contains a defined term, the definition of the term is included in this section. These definitions can also be found in Section 5.1.

Basis:

An EAL basis section that provides ANO-relevant information concerning the EAL as well as a description of the rationale for the EAL as provided in NEI 99-01 Rev. 6.

Reference(s):

Source documentation from which the EAL is derived.

2.6 Operating Mode Applicability

Unit 1 (ref. 4.1.6):

1 Power Operation

$K_{eff} \geq 0.99$, reactor power > 5%

2 Startup

$K_{eff} \geq 0.99$, reactor power $\leq$ 5%

3 Hot Standby

$K_{eff} < 0.99$, reactor coolant temperature ≥ 280°F

4 Hot Shutdown

$K_{eff} < 0.99$, reactor coolant temperature 280°F > T_{avg} > 200°F and all reactor vessel head closure bolts fully tensioned

5 Cold Shutdown

$K_{eff} < 0.99$, reactor coolant temperature $\leq$ 200°F and all reactor vessel head closure bolts fully tensioned

6 Refueling

One or more reactor vessel head closure bolts less than fully tensioned

DEF Defueled

All fuel assemblies have been removed from Containment and placed in the spent fuel pool.

Unit 2 (ref. 4.1.6):

1 Power Operation

K_{eff} ≥ 0.99, reactor power > 5%, average coolant temperature ≥ 300°F

2 Startup

K_{eff} ≥ 0.99, reactor power ≤ 5%, average coolant temperature ≥ 300°F

3 Hot Standby

K_{eff} < 0.99, average coolant temperature ≥ 300°F

4 Hot Shutdown

K_{eff} < 0.99, average coolant temperature 300°F > T_{avg} > 200°F

5 Cold Shutdown

K_{eff} < 0.99, average coolant temperature ≤ 200°F

6 Refueling

K_{eff} ≤ 0.95, average coolant temperature ≤ 140°F, reactor vessel head unbolted or removed, and fuel in the vessel.

DEF Defueled

All fuel assemblies have been removed from Containment and placed in the spent fuel pool.

The plant operating mode that exists at the time that the event occurs (prior to any protective system or operator action being initiated in response to the condition) should be compared to the mode applicability of the EALs. If a lower or higher plant operating mode is reached before the emergency classification is made, the declaration shall be based on the mode that existed at the time the event occurred.

3.0 GUIDANCE ON MAKING EMERGENCY CLASSIFICATIONS

3.1 General Considerations

When making an emergency classification, the Emergency Director must consider all information having a bearing on the proper assessment of an Initiating Condition (IC). This includes the Emergency Action Level (EAL) plus the associated Operating Mode Applicability, Notes, and the informing basis information. In the Recognition Category F matrices, EALs are based on loss or potential loss of Fission Product Barrier Thresholds.

EAL matrices should be read from left to right, from General Emergency to Unusual Event, and top to bottom. Declaration decisions should be independently verified before declaration is made except when gaining this verification would exceed the 15 minute declaration requirement. Place keeping should be used on all EAL matrices.

3.1.1 Classification Timeliness

NRC regulations require the licensee to establish and maintain the capability to assess, classify, and declare an emergency condition within 15 minutes after the availability of indications to plant operators that an emergency action level has been exceeded and to promptly declare the emergency condition as soon as possible following identification of the appropriate emergency classification level. The NRC staff has provided guidance on implementing this requirement in NSIR/DPR-ISG-01, "Interim Staff Guidance, Emergency Planning for Nuclear Power Plants" (ref. 4.1.8).

3.1.2 Valid Indications

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

An indication, report, or condition is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

3.1.3 Imminent Conditions

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

3.1.4 Planned vs. Unplanned Events

A planned work activity that results in an expected event or condition which meets or exceeds an EAL does not warrant an emergency declaration provided that: 1) the activity proceeds as planned, and 2) the plant remains within the limits imposed by the operating license. Such activities include planned work to test, manipulate, repair, maintain or modify a system or component. In these cases, the controls associated with the planning, preparation and execution of the work will ensure that compliance is maintained with all aspects of the operating license provided that the activity proceeds and concludes as expected. Events or conditions of this type may be subject to the reporting requirements of 10 CFR 50.72 (ref. 4.1.4).

3.1.5 Classification Based on Analysis

The assessment of some EALs is based on the results of analyses that are necessary to ascertain whether a specific EAL threshold has been exceeded (e.g., dose assessments, chemistry sampling, RCS leak rate calculation, etc.). For these EALs, the EAL wording or the

associated basis discussion will identify the necessary analysis. In these cases, the 15-minute declaration period starts with the availability of the analysis results that show the threshold to be exceeded (i.e., this is the time that the EAL information is first available). The NRC expects licensees to establish the capability to initiate and complete EAL-related analyses within a reasonable period of time (e.g., maintain the necessary expertise on-shift).

3.1.6 Emergency Director Judgment

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

3.2 Classification Methodology

To make an emergency classification, the user will compare an event or condition (i.e., the relevant plant indications and reports) to an EAL(s) and determine if the EAL has been met or exceeded. The evaluation of an EAL must be consistent with the related Operating Mode Applicability and Notes. If an EAL has been met or exceeded, the associated IC is likewise met, the emergency classification process “clock” starts, and the ECL must be declared in accordance with plant procedures no later than fifteen minutes after the process “clock” started.

When assessing an EAL that specifies a time duration for the off-normal condition, the “clock” for the EAL time duration runs concurrently with the emergency classification process “clock.” For a full discussion of this timing requirement, refer to NSIR/DPR-ISG-01 (ref. 4.1.8).

3.2.1 Classification of Multiple Events and Conditions

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

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

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

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

~~Related guidance concerning classification of rapidly escalating events or conditions is provided in Regulatory Issue Summary (RIS) 2007-02, *Clarification of NRC Guidance for Emergency Notifications During Quickly Changing Events* (ref. 4.1.2).~~

3.2.2 Consideration of Mode Changes During Classification

The mode in effect at the time that an event or condition occurred, and prior to any plant or operator response, is the mode that determines whether or not an IC is applicable. If an event or condition occurs, and results in a mode change before the emergency is declared, the emergency classification level is still based on the mode that existed at the time that the event or condition was initiated (and not when it was declared). Once a different mode is reached, any new event or condition, not related to the original event or condition, requiring emergency classification should be evaluated against the ICs and EALs applicable to the operating mode at the time of the new event or condition.

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

3.2.3 Classification of Imminent Conditions

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

3.2.4 Emergency Classification Level Upgrading and Termination

An ECL may be terminated when the event or condition that meets the classified IC and EAL no longer exists, and other site-specific termination requirements are met.

~~As noted above, guidance concerning classification of rapidly escalating events or conditions is provided in RIS 2007-02 (ref. 4.1.2).~~

3.2.5 Classification of Short-Lived Events

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

3.2.6 Classification of Transient Conditions

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

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

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

> An ATWS occurs and the high pressure ECCS systems fail to automatically start. The plant enters an inadequate core cooling condition (a potential loss of both the Fuel Clad and RCS Barriers). If an operator manually starts a high pressure ECCS system in accordance with an EOP step and clears the inadequate core cooling condition prior to an emergency declaration, then the classification should be based on the ATWS only.

It is important to stress that the 15-minute emergency classification assessment period (process clock) is not a “grace period” during which a classification may be delayed to allow the performance of a corrective action that would obviate the need to classify the event. Emergency classification assessments must be deliberate and timely, with no undue delays. The provision discussed above addresses only those rapidly evolving situations when an operator is able to take a successful corrective action prior to the Emergency Director completing the review and steps necessary to make the emergency declaration. This provision is included to ensure that any public protective actions resulting from the emergency classification are truly warranted by the plant conditions.

3.2.7 After-the-Fact Discovery of an Emergency Event or Condition

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

In these cases, no emergency declaration is warranted; however, the guidance contained in NUREG-1022 (ref. 4.1.3) is applicable. Specifically, the event should be reported to the NRC in accordance with 10 CFR § 50.72 (ref. 4.1.4) within one hour of the discovery of the undeclared event or condition. The licensee should also notify appropriate State and local agencies in accordance with the agreed upon arrangements.

3.2.8 Retraction of an Emergency Declaration

Guidance on the retraction of an emergency declaration reported to the NRC is discussed in NUREG-1022 (ref. 4.1.3).

4.0 REFERENCES

4.1 Developmental

4.1.1 NEI 99-01 Revision 6, Methodology for the Development of Emergency Action Levels for Non-Passive Reactors, ADAMS Accession Number ML12326A805

4.1.2 RIS 2007-02 Clarification of NRC Guidance for Emergency Notifications During Quickly Changing Events, February 2, 2007.

4.1.3 NUREG-1022 Event Reporting Guidelines: 10CFR50.72 and 50.73

4.1.4 10 § CFR 50.72 Immediate Notification Requirements for Operating Nuclear Power Reactors

4.1.5 10 § CFR 50.73 License Event Report System

4.1.6 Unit 1[2] Technical Specifications Table 1.1-1[1.1], Modes[Operational Modes]

4.1.7 Arkansas Nuclear One Offsite Dose Calculation Manual (ODCM)

4.1.8 NSIR/DPR-ISG-01 Interim Staff Guidance, Emergency Planning for Nuclear Power Plants

4.1.9 Arkansas Nuclear One Emergency Plan

4.1.10 1015.008 Unit 2 SDC Control

4.2 Implementing

4.2.1 1903.010 Emergency Action Level Classification

4.2.2 NEI 99-01 Rev. 6 to ANO EAL Comparison Matrix

4.2.3 ANO EAL Matrix

5.0 DEFINITIONS, ACRONYMS & ABBREVIATIONS

5.1 Definitions (ref. 4.1.1 except as noted)

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

Alert

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

Confinement Boundary

The barrier(s) between spent fuel and the environment once the spent fuel is processed for dry storage. As related to the ANO ISFSI, the Confinement Boundary is comprised of either the Multi-assembly Sealed Basket (MSB) (SNC System) or Multi-Purpose Canister (MPC) (Holtec System).

Containment Closure

The ~~procedurally defined~~ action~~s~~ ~~taken~~ to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under ~~shutdown~~ existing plant conditions (ref. 4.1.10).

As applied to ANO, Containment Closure must be capable of being set within 30 minutes. Containment Closure is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

Emergency Action Level (EAL)

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

Emergency Classification Level (ECL)

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

~~Notification of~~ Unusual Event (~~NO~~UE)

Alert

Site Area Emergency (SAE)

General Emergency (GE)

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 require a post-event inspection to determine if the attributes of an explosion are present.

Faulted

The term applied to a steam generator that has a steam leak on the secondary side of sufficient size to cause an uncontrolled drop in steam generator pressure or the steam generator to become completely depressurized.

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.

Fission Product Barrier Threshold

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

Flooding

A condition where water is entering a room or area faster than installed equipment is capable of removal, resulting in a rise of water level within the room or area.

General Emergency

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

Hostage

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

Hostile Action

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

Hostile Force

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

Imminent

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

Impede(d)

Personnel access to a room or area is hindered to an extent that extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is **not** routinely employed).

Independent Spent Fuel Storage Installation (ISFSI)

A complex that is designed and constructed for the interim storage of spent nuclear fuel and other radioactive materials associated with spent fuel storage.

Initiating Condition (IC)

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

~~**Normal Levels**~~

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

~~**Owner Controlled Area (OCA)**~~

Projectile

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

Protected Area

An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

RCS Intact

The RCS should be considered intact when the RCS pressure boundary is in its normal condition for the cold shutdown mode of operation (e.g., no freeze seals or nozzle dams).

Refueling Pathway

All the cavities, tubes, canals and pools through which irradiated fuel may be moved, but **not** including the reactor vessel.

Ruptured

The condition of a steam generator in which primary-to-secondary leakage is of sufficient magnitude to require a safety injection (automatic or manual).

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 (as defined in 10CFR50.2):

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Security Condition

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

Security Owner Controlled Area (SOCA)

The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

Site Area Emergency

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

Site Boundary

That boundary defined by a 1046 meter (0.65 mile) radius around the plant (ref. 4.1.7).

Unisolable

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

Unplanned

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

Unusual Event

Events are in progress or have occurred which indicate a potential degradation in the level of safety of the plant or indicate a security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of SAFETY SYSTEMS occurs.

Valid

An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Visible Damage

Damage to a SAFETY SYSTEM train 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 SAFETY SYSTEM train.~~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.~~

5.2 Abbreviations/Acronyms

°F .... Degrees Fahrenheit

° .... Degrees

AC .... Alternating Current

ANO .... Arkansas Nuclear One

AOP .... Abnormal Operating Procedure

ATWS .... Anticipated Transient Without Scram

BMS .... Boron Management System

BWST .... Borated Water Storage Tank

CDE .... Committed Dose Equivalent

CET .... Core Exit Thermocouple

CFR .... Code of Federal Regulations

CIAS .... Containment Isolation Actuation Signal

CMT, CNTMT, CTMT .... Containment

CNB .... Containment Barrier

DBA .... Design Basis Accident

DBE .... Design Basis Earthquake

DC .... Direct Current
DEF .... Defueled
D/G .... Diesel Generator
DHR .... Decay Heat Removal
DROPS .... Diverse Reactor Overpressure Protection System
DSC .... Dry Shielded Canister
DSS .... Diverse Scram System
EAL .... Emergency Action Level
ECCS .... Emergency Core Cooling System
ECL .... Emergency Classification Level
DEF .... Defueled
ENS .... Emergency Notification System
EOF .... Emergency Operations Facility
EOP .... Emergency Operating Procedure
EPA .... Environmental Protection Agency
ERG .... Emergency Response Guideline
EPIP .... Emergency Plan Implementing Procedure
ESAS .... Engineered Safeguards Actuation System
ESF .... Engineered Safety Feature
ESFAS .... Engineered Safety Features Actuation System
FAA .... Federal Aviation Administration
FBI .... Federal Bureau of Investigation
FCB .... Fuel Clad Barrier
FEMA .... Federal Emergency Management Agency
GE .... General Emergency
HPI .... High Pressure Injection
IC .... Initiating Condition
IPEEE .... Individual Plant Examination of External Events (Generic Letter 88-20)
ISFSI .... Independent Spent Fuel Storage Installation
K_{eff} .... Effective Neutron Multiplication Factor
LCO .... Limiting Condition of Operation
LER .... Licensee Event Report
LNEPR .... Lower North Electrical Penetration Room
LOCA .... Loss of Coolant Accident

LRW .... Liquid Rad Waste
LTOP .... Low Temperature Overpressure
LWR .... Light Water Reactor
MCC .... Motor Control Center
MPC .... Maximum Permissible Concentration/Multi-Purpose Canister
mR, mRem, mrem, mREM .... milli-Roentgen Equivalent Man
MSL .... Main Steam Line
MTS .... Margin to Saturation
MW .... Megawatt
NDTT .... Nil Ductility Transition Temperature
NEI .... Nuclear Energy Institute
NEIC .... National Earthquake Information Center
NESP .... National Environmental Studies Project
NORAD .... North American Aerospace Defense Command
NOT .... Normal Operating Temperature
(NO)UE .... Notification of Unusual Event
NPP .... Nuclear Power Plant
NRC .... Nuclear Regulatory Commission
NSSS .... Nuclear Steam Supply System
OBE .... Operating Basis Earthquake
ODCM .... Off-site Dose Calculation Manual
ORO .... Offsite Response Organization
PA .... Protected Area
PAG .... Protective Action Guideline
PRA/PSA .... Probabilistic Risk Assessment / Probabilistic Safety Assessment
P-T .... Pressure-Temperature
PTS .... Pressurized Thermal Shock
PWR .... Pressurized Water Reactor
PSIG .... Pounds per Square Inch Gauge
R .... Roentgen
RB .... Reactor Building
RCC .... Reactor Control Console
RCB .... Reactor Coolant System Barrier
RCP .... Reactor Coolant Pump

RCS .... Reactor Coolant System
Rem, rem, REM .... Roentgen Equivalent Man
Rep CET .... Representative Core Exit Thermocouples
RETS .... Radiological Effluent Technical Specifications
RPS .... Reactor Protection System
RV .... Reactor Vessel
RVLMS .... Reactor Vessel Level Monitoring System
RWT .... Refueling Water Tank
SAR .... Safety Analysis Report
SBO .... Station Blackout
SCBA .... Self-Contained Breathing Apparatus
SDC .... Shutdown Cooling
SOCA .... Security Owner Controlled Area
SG .... Steam Generator
SI .... Safety Injection
SPDS .... Safety Parameter Display System
SPING .... Super Particulate Iodine Noble Gas
SRO .... Senior Reactor Operator
TEDE .... Total Effective Dose Equivalent
TOAF .... Top of Active Fuel
TSC .... Technical Support Center
UNEPR .... Upper North Electrical Penetration Room
USGS .... United States Geological Survey
VBS .... Vehicle Barrier System

6.0 ANO-TO-NEI 99-01 REV. 6 EAL CROSS-REFERENCE

This cross-reference is provided to facilitate association and location of an ANO EAL within the NEI 99-01 IC/EAL identification scheme. Further information regarding the development of the ANO EALs based on the NEI guidance can be found in the EAL Comparison Matrix.

ANO	NEI 99-01 Rev. 6	
EAL	**IC**	**Example EAL**
AU1.1	AU1	1, 2
AU1.2	AU1	3
AU2.1	AU2	1
AA1.1	AA1	1
AA1.2	AA1	2
AA1.3	AA1	3
AA1.4	AA1	4
AA2.1	AA2	1
AA2.2	AA2	2
AA2.3	AA2	3
AA3.1	AA3	1
AA3.2	AA3	2
AS1.1	AS1	1
AS1.2	AS1	2
AS1.3	AS1	3
AS2.1	AS2	1
AG1.1	AG1	1
AG1.2	AG1	2
AG1.3	AG1	3
AG2.1	AG2	1
CU1.1	CU1	1
CU1.2	CU1	2
CU2.1	CU2	1
CU3.1	CU3	1
CU3.2	CU3	2
CU4.1	CU4	1

ANO	NEI 99-01 Rev. 6	
EAL	**IC**	**Example EAL**
CU5.1	CU5	1, 2, 3
CA1.1	CA1	1
CA1.2	CA1	2
CA2.1	CA2	1
CA3.1	CA3	1, 2
CA6.1	CA6	1
CS1.1	CS1	1
CS1.2	CS1	2
CS1.3	CS1	3
CG1.1	CG1	1
CG1.2	CG1	2
EU1.1	EU1	1
FA1.1	FA1	1
FS1.1	FS1	1
FG1.1	FG1	1
HU1.1	HU1	1, 2, 3
HU2.1	HU2	1
HU3.1	HU3	1
HU3.2	HU3	2
HU3.3	HU3	3
HU3.4	HU3	4
HU4.1	HU4	1
HU4.2	HU4	2
HU4.3	HU4	3
HU4.4	HU4	4
HU7.1	HU7	1
HA1.1	HA1	1, 2
HA5.1	HA5	1
HA6.1	HA6	1
HA7.1	HA7	1
HS1.1	HS1	1

ANO	NEI 99-01 Rev. 6	
EAL	**IC**	**Example EAL**
HS6.1	HS6	1
HS7.1	HS7	1
HG7.1	HG7	1
SU1.1	SU1	1
SU3.1	SU2	1
SU4.1	SU3	1
SU4.2	SU3	2
SU5.1	SU4	1, 2, 3
SU6.1	SU5	1
SU6.2	SU5	2
SU7.1	SU6	1, 2, 3
SU8.1	SU7	1, 2
SA1.1	SA1	1
SA3.1	SA2	1
SA6.1	SA5	1
SA9.1	SA9	1
SS1.1	SS1	1
SS2.1	SS8	1
SS6.1	SS5	1
SG1.1	SG1	1
SG1.2	SG8	1

7.0 ATTACHMENTS

7.1 Attachment 1, Emergency Action Level Technical Bases

7.2 Attachment 2, Safe Operation & Shutdown Areas Tables 1[2]A-3 & 1[2]H-2 Bases

Category A – Abnormal Rad Levels / Rad Effluent

EAL Group: ANY (EALs in this category are applicable to any plant condition, hot or cold.)

Many EALs are based on actual or potential degradation of fission product barriers because of the elevated potential for offsite radioactivity release. Degradation of fission product barriers though is not always apparent via non-radiological symptoms. Therefore, direct indication of elevated radiological effluents or area radiation levels are appropriate symptoms for emergency classification.

At lower levels, abnormal radioactivity releases may be indicative of a failure of containment systems or precursors to more significant releases. At higher release rates, offsite radiological conditions may result which require offsite protective actions. Elevated area radiation levels in plant may also be indicative of the failure of containment systems or preclude access to plant vital equipment necessary to ensure plant safety.

Events of this category pertain to the following subcategories:

1. Radiological Effluent

Direct indication of effluent radiation monitoring systems provides a rapid assessment mechanism to determine releases in excess of classifiable limits. Projected offsite doses, actual offsite field measurements or measured release rates via sampling indicate doses or dose rates above classifiable limits.

2. Irradiated Fuel Event

Conditions indicative of a loss of adequate shielding or damage to irradiated fuel may preclude access to vital plant areas or result in radiological releases that warrant emergency classification.

3. Area Radiation Levels

Sustained general area radiation levels which may preclude access to areas requiring continuous occupancy also warrant emergency classification.

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

Initiating Condition: Release of gaseous or liquid radioactivity greater than 2 times the ODCM limits for 60 minutes or longer

EAL:

AU1.1 Unusual Event
Reading on **any** Table 1[2]A-1 effluent radiation monitor > column "UE" for ≥ 60 min. (Notes 1, 2, 3)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Note 3: 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.

Table 1A-1 Unit 1 Effluent Monitor Classification Thresholds (2 min. avg reading)

Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	RX-9820 (SPING 1)	4.15E+01 µCi/cc	4.15E+00 µCi/cc	4.15E-01 µCi/cc	1.21E-03 µCi/cc
Gaseous	Radwaste Area	RX-9825 (SPING 2)	2.67E+01 µCi/cc	2.67E+00 µCi/cc	2.67E-01 µCi/cc	4.94E-04 µCi/cc
Gaseous	Fuel Handling Area	RX-9830 (SPING 3)	6.20E+02 µCi/cc	6.20E+01 µCi/cc	6.20E+00 µCi/cc	5.44E-04 µCi/cc
Gaseous	Emergency Penetration Room	RX-9835 (SPING 4)	6.55E+02 µCi/cc	6.55E+01 µCi/cc	6.55E+00 µCi/cc	1.21E-02 µCi/cc
Liquid	Liquid Radwaste	RE-4642	----	----	----	2.46E+05 cpm

Table 2A-1 Unit 2 Effluent Monitor Classification Thresholds (2 min. avg reading)						
Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	2RX-9820 (SPING 5)	1.88E+01 µCi/cc	1.88E+00 µCi/cc	1.88E-01 µCi/cc	5.48E-04 µCi/cc
Gaseous	Radwaste Area	2RX-9825 (SPING 6)	2.35E+01 µCi/cc	2.35E+00 µCi/cc	2.35E-01 µCi/cc	4.35E-04 µCi/cc
Gaseous	Fuel Handling Area	2RX-9830 (SPING 7)	6.86E+02 µCi/cc	6.86E+01 µCi/cc	6.86E+00 µCi/cc	6.04E-04 µCi/cc
Gaseous	Emergency Penetration Room	2RX-9835 (SPING 8)	5.88E+02 µCi/cc	5.88E+01 µCi/cc	5.88E+00 µCi/cc	1.09E-02 µCi/cc
Liquid	BMS Liquid Discharge	2RE-2330	----	----	----	2.45E+04 cpm
Liquid	Regenerative Waste Discharge	2RE-4423	----	----	----	2.45E+05 cpm

Mode Applicability:

All

Definition(s):

VALID - An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Basis:

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

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

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

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

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

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

~~EAL #2 - This EAL addresses~~as well as radioactivity releases that cause effluent radiation monitor readings to exceed 2 times the limit established by a radioactivity discharge permit. ~~This EAL will~~ Such releases are 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 IC AA1.

Reference(s):

1. OP-1604.051 Eberline Radiation Monitor System
2. Offsite Dose Calculation Manual
3. EP-CALC-ANO-1701 Radiological Effluent EAL Values
4. NEI 99-01 AU1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

Initiating Condition: Release of gaseous or liquid radioactivity greater than 2 times the ODCM limits for 60 minutes or longer

EAL:

AU1.2 Unusual Event
Sample analysis for a gaseous or liquid release indicates a concentration or release rate > 2 x ODCM limits for ≥ 60 min. (Notes 1, 2)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Mode Applicability:

All

Definition(s):

None

Basis:

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

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

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

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

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

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

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

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

Escalation of the emergency classification level would be via IC AA1.

Reference(s):

1. Offsite Dose Calculation Manual
2. NEI 99-01 AU1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AA1.1 Alert

Reading on **any** Table 1[2]A-1 effluent radiation monitor > column "ALERT" for ≥ 15 min. (Notes 1, 2, 3, 4)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Note 3: 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.

Note 4 The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Table 1A-1 Unit 1 Effluent Monitor Classification Thresholds (2 min. avg reading)

Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	RX-9820 (SPING 1)	4.15E+01 μCi/cc	4.15E+00 μCi/cc	4.15E-01 μCi/cc	1.21E-03 μCi/cc
Gaseous	Radwaste Area	RX-9825 (SPING 2)	2.67E+01 μCi/cc	2.67E+00 μCi/cc	2.67E-01 μCi/cc	4.94E-04 μCi/cc
Gaseous	Fuel Handling Area	RX-9830 (SPING 3)	6.20E+02 μCi/cc	6.20E+01 μCi/cc	6.20E+00 μCi/cc	5.44E-04 μCi/cc
Gaseous	Emergency Penetration Room	RX-9835 (SPING 4)	6.55E+02 μCi/cc	6.55E+01 μCi/cc	6.55E+00 μCi/cc	1.21E-02 μCi/cc
Liquid	Liquid Radwaste	RE-4642	----	----	----	2.46E+05 cpm

Table 2A-1 Unit 2 Effluent Monitor Classification Thresholds (2 min. avg reading)							
Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	2RX-9820 (SPING 5)	1.88E+01 µCi/cc	1.88E+00 µCi/cc	1.88E-01 µCi/cc	5.48E-04 µCi/cc
Gaseous	Radwaste Area	2RX-9825 (SPING 6)	2.35E+01 µCi/cc	2.35E+00 µCi/cc	2.35E-01 µCi/cc	4.35E-04 µCi/cc
Gaseous	Fuel Handling Area	2RX-9830 (SPING 7)	6.86E+02 µCi/cc	6.86E+01 µCi/cc	6.86E+00 µCi/cc	6.04E-04 µCi/cc
Gaseous	Emergency Penetration Room	2RX-9835 (SPING 8)	5.88E+02 µCi/cc	5.88E+01 µCi/cc	5.88E+00 µCi/cc	1.09E-02 µCi/cc
Liquid	BMS Liquid Discharge	2RE-2330	----	----	----	2.45E+04 cpm
Liquid	Regenerative Waste Discharge	2RE-4423	----	----	----	2.45E+05 cpm

Mode Applicability:

All

Definition(s):

VALID - An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Basis:

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

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

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

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

Escalation of the emergency classification level would be via IC AS1.

Reference(s):

1. OP-1604.051 Eberline Radiation Monitor System
2. EP-CALC-ANO-1701 Radiological Effluent EAL Values
3. NEI 99-01 AA1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AA1.2 Alert
Dose assessment using actual meteorology indicates doses > 10 mrem TEDE or 50 mrem thyroid CDE at or beyond the SITE BOUNDARY. (Note 4)

Note 4: The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

Basis:

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

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

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

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

Escalation of the emergency classification level would be via IC AS1.

Reference(s):

1. OP-1904.002 Offsite Dose Projections
2. NEI 99-01 AA1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AA1.3 Alert
Analysis of a liquid effluent sample indicates a concentration or release rate that would result in doses > 10 mrem TEDE or 50 mrem thyroid CDE at or beyond the SITE BOUNDARY for 60 min. of exposure. (Notes 1, 2)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

Basis:

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

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

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

~~Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.~~This EAL is assessed per the ODCM (ref. 2).

Escalation of the emergency classification level would be via IC AS1.

Reference(s):

1. OP-1904.002 Offsite Dose Projections
2. Offsite Dose Calculation Manual
3. NEI 99-01 AA1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AA1.4 Alert

Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:

- Closed window dose rates > 10 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 50 mrem for 60 min. of inhalation.

(Notes 1, 2)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

Basis:

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

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

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

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

Escalation of the emergency classification level would be via IC AS1.

Reference(s):

1. OP-1905.002 Offsite Emergency Monitoring
2. NEI 99-01 AA1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AS1.1 Site Area Emergency

Reading on **any** Table 1[2]A-1 effluent radiation monitor > column "SAE" for ≥ 15 min. (Notes 1, 2, 3, 4)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Note 3: 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.

Note 4: The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Table 1A-1 Unit 1 Effluent Monitor Classification Thresholds (2 min. avg reading)

Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	RX-9820 (SPING 1)	4.15E+01 µCi/cc	4.15E+00 µCi/cc	4.15E-01 µCi/cc	1.21E-03 µCi/cc
	Radwaste Area	RX-9825 (SPING 2)	2.67E+01 µCi/cc	2.67E+00 µCi/cc	2.67E-01 µCi/cc	4.94E-04 µCi/cc
	Fuel Handling Area	RX-9830 (SPING 3)	6.20E+02 µCi/cc	6.20E+01 µCi/cc	6.20E+00 µCi/cc	5.44E-04 µCi/cc
	Emergency Penetration Room	RX-9835 (SPING 4)	6.55E+02 µCi/cc	6.55E+01 µCi/cc	6.55E+00 µCi/cc	1.21E-02 µCi/cc
Liquid	Liquid Radwaste	RE-4642	----	----	----	2.46E+05 cpm

Table 2A-1 Unit 2 Effluent Monitor Classification Thresholds (2 min. avg reading)						
Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	2RX-9820 (SPING 5)	1.88E+01 μCi/cc	1.88E+00 μCi/cc	1.88E-01 μCi/cc	5.48E-04 μCi/cc
Gaseous	Radwaste Area	2RX-9825 (SPING 6)	2.35E+01 μCi/cc	2.35E+00 μCi/cc	2.35E-01 μCi/cc	4.35E-04 μCi/cc
Gaseous	Fuel Handling Area	2RX-9830 (SPING 7)	6.86E+02 μCi/cc	6.86E+01 μCi/cc	6.86E+00 μCi/cc	6.04E-04 μCi/cc
Gaseous	Emergency Penetration Room	2RX-9835 (SPING 8)	5.88E+02 μCi/cc	5.88E+01 μCi/cc	5.88E+00 μCi/cc	1.09E-02 μCi/cc
Liquid	BMS Liquid Discharge	2RE-2330	----	----	----	2.45E+04 cpm
Liquid	Regenerative Waste Discharge	2RE-4423	----	----	----	2.45E+05 cpm

Mode Applicability:

All

Definition(s):

VALID - An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Basis:

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

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

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

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

Escalation of the emergency classification level would be via IC AG1.

Reference(s):

1. OP-1604.051 Eberline Radiation Monitor System
2. EP-CALC-ANO-1701 Radiological Effluent EAL Values
3. NEI 99-01 AS1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AS1.2 Site Area Emergency
Dose assessment using actual meteorology indicates doses > 100 mrem TEDE or 500 mrem thyroid CDE at or beyond the SITE BOUNDARY. (Note 4)

Note 4 The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - That boundary defined by a 1046 meter (0.65 mile) radius around the plant).

Basis:

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

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

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

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

Escalation of the emergency classification level would be via IC AG1.

Reference(s):

1. OP-1904.002 Offsite Dose Projections
2. NEI 99-01 AS1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AS1.3 Site Area Emergency

Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:

- Closed window dose rates > 100 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 500 mrem for 60 min. of inhalation.

(Notes 1, 2)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

Basis:

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

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

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

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

Escalation of the emergency classification level would be via IC AG1.

Reference(s):

1. OP-1905.002 Offsite Emergency Monitoring
2. NEI 99-01 AS1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AG1.1 General Emergency

Reading on **any** Table 1[2]A-1 effluent radiation monitor > column "GE" for ≥ 15 min. (Notes 1, 2, 3, 4)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Note 3: 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.

Note 4: The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Table 1A-1 Unit 1 Effluent Monitor Classification Thresholds (2 min. avg reading)

Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	RX-9820 (SPING 1)	4.15E+01 µCi/cc	4.15E+00 µCi/cc	4.15E-01 µCi/cc	1.21E-03 µCi/cc
Gaseous	Radwaste Area	RX-9825 (SPING 2)	2.67E+01 µCi/cc	2.67E+00 µCi/cc	2.67E-01 µCi/cc	4.94E-04 µCi/cc
Gaseous	Fuel Handling Area	RX-9830 (SPING 3)	6.20E+02 µCi/cc	6.20E+01 µCi/cc	6.20E+00 µCi/cc	5.44E-04 µCi/cc
Gaseous	Emergency Penetration Room	RX-9835 (SPING 4)	6.55E+02 µCi/cc	6.55E+01 µCi/cc	6.55E+00 µCi/cc	1.21E-02 µCi/cc
Liquid	Liquid Radwaste	RE-4642	----	----	----	2.46E+05 cpm

Table 2A-1 Unit 2 Effluent Monitor Classification Thresholds (2 min. avg reading)

Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	2RX-9820 (SPING 5)	1.88E+01 µCi/cc	1.88E+00 µCi/cc	1.88E-01 µCi/cc	5.48E-04 µCi/cc
Gaseous	Radwaste Area	2RX-9825 (SPING 6)	2.35E+01 µCi/cc	2.35E+00 µCi/cc	2.35E-01 µCi/cc	4.35E-04 µCi/cc
Gaseous	Fuel Handling Area	2RX-9830 (SPING 7)	6.86E+02 µCi/cc	6.86E+01 µCi/cc	6.86E+00 µCi/cc	6.04E-04 µCi/cc
Gaseous	Emergency Penetration Room	2RX-9835 (SPING 8)	5.88E+02 µCi/cc	5.88E+01 µCi/cc	5.88E+00 µCi/cc	1.09E-02 µCi/cc
Liquid	BMS Liquid Discharge	2RE-2330	----	----	----	2.45E+04 cpm
Liquid	Regenerative Waste Discharge	2RE-4423	----	----	----	2.45E+05 cpm

Mode Applicability:

All

Definition(s):

VALID - An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Basis:

This IC addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to the EPA Protective Action Guides (PAGs). It includes both monitored and un-monitored releases. Releases of this magnitude will require implementation of protective actions for the public.

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

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

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

Reference(s):

1. OP-1604.051 Eberline Radiation Monitor System
2. EP-CALC-ANO-1701 Radiological Effluent EAL Values
3. NEI 99-01 AG1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AG1.2 General Emergency
Dose assessment using actual meteorology indicates doses > 1,000 mrem TEDE or 5,000 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

Note 4 The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - That boundary defined by a 1046 meter (0.65 mile) radius around the plant).

Basis:

This IC addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to the EPA Protective Action Guides (PAGs). It includes both monitored and un-monitored releases. Releases of this magnitude will require implementation of protective actions for the public.

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

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

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

Reference(s):

1. OP-1904.002 Offsite Dose Projections
2. NEI 99-01 AG1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AG1.3 General Emergency
Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:
• Closed window dose rates > 1,000 mR/hr expected to continue for ≥ 60 min.
• Analyses of field survey samples indicate thyroid CDE > 5,000 mrem for 60 min. of inhalation
(Notes 1, 2)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

Basis:

This IC addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to the EPA Protective Action Guides (PAGs). It includes both monitored and un-monitored releases. Releases of this magnitude will require implementation of protective actions for the public.

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

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

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

Reference(s):

1. OP-1905.002 Offsite Emergency Monitoring
2. NEI 99-01 AG1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

Initiating Condition: UNPLANNED loss of water level above irradiated fuel

EAL:

AU2.1 Unusual Event

UNPLANNED water level drop in the REFUELING PATHWAY as indicated by low water level alarm, visual observation, or BWST[RWT] level drop due to makeup demands

AND

UNPLANNED rise in corresponding area radiation levels as indicated by **any** of the following radiation monitors:

- **Unit 1**
  - RE-8009 Spent Fuel Area
  - RE-8017 Fuel Handling Area
- **Unit 2**
  - 2RE-8914 Spent Fuel Area
  - 2RE-8915 Spent Fuel Area
  - 2RE-8916 Spent Fuel Area
  - 2RE-8912 Containment Incore Instrumentation

Mode Applicability:

All

Definition(s):

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

REFUELING PATHWAY – All the cavities, tubes, canals and pools through which irradiated fuel may be moved, but **not** including the reactor vessel.

Basis:

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

A water level ~~decrease~~ drop 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~~ a rise 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~~ rise due to planned evolutions such as lifting of the reactor vessel head or movement of a fuel assembly. Note that this EAL is applicable only in cases where the elevated reading is due to an UNPLANNED loss of water level.

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

Escalation of the emergency classification level would be via IC AA2.

Reference(s):

1. OP-1203.050 Unit 1 Spent Fuel Pool Emergencies
2. OP-2203.002 Spent Fuel Pool Emergencies
3. 1SAR 11.2.5 Area Radiation Monitoring Systems Table 11-15 Area Radiation Monitors
4. 2SAR 12.1.4 Area Radiation Monitoring System
5. NEI 99-01 AU2

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

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

EAL:

AA2.1 Alert
IMMINENT uncovery of irradiated fuel in the REFUELING PATHWAY.

Mode Applicability:

All

Definition(s):

CONFINEMENT BOUNDARY – The barrier(s) between spent fuel and the environment once the spent fuel is processed for dry storage. As related to the ANO ISFSI, the Confinement Boundary is comprised of either the Multi-assembly Sealed Basket (MSB) (SNC System) or Multi-Purpose Canister (MPC) (Holtec System).

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

REFUELING PATHWAY – All the cavities, tubes, canals and pools through which irradiated fuel may be moved, but **not** including the reactor vessel.

Basis:

This IC addresses events that have caused IMMINENT or actual damage to an irradiated fuel assembly, or a significant lowering of water level within the ~~spent fuel pool~~REFUELING PATHWAY~~ *(see Developer Notes)*~~. These events present radiological safety challenges to plant personnel and are precursors to a release of radioactivity to the environment. As such, they represent an actual or potential substantial degradation of the level of safety of the plant. This IC applies to irradiated fuel that is licensed for dry storage up to the point that the loaded storage cask is sealed. Once sealed, damage to a loaded cask causing loss of the CONFINEMENT BOUNDARY is classified in accordance with IC E-~~H~~U1.

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

~~EAL #1~~

This EAL escalates from ~~AU2~~ AU2.1 in that the loss of level, in the affected portion of the REFUELING PATHWAY, is of sufficient magnitude to have resulted in uncovery of irradiated fuel. Indications of irradiated fuel uncovery may include direct or indirect visual observation (e.g., reports from personnel or camera images), as well as significant changes in water and radiation levels, or other plant parameters. Computational aids may also be used (e.g., a boil-off curve). Classification of an event using this EAL should be based on the totality of available indications, reports and observations.

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

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

~~EAL #2~~

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

~~EAL #3~~

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

Escalation of the emergency classification level would be via IC~~s~~ AS1 ~~AS1or AS2 (*see AS2 Developer Notes*)~~.

Reference(s):

1. NEI 99-01 AA2

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

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

EAL:

AA2.2 Alert
Damage to irradiated fuel resulting in a release of radioactivity
AND
High alarm on **any** Table 1[2]A-2 radiation monitor.

Table 1A-2 Unit 1 Fuel Damage Radiation Monitors
• RE-8009 Spent Fuel Area • RE-8017 Fuel Handling • RE-8060 Containment High Range Radiation Monitor • RE-8061 Containment High Range Radiation Monitor • RX-9820 (SPING 1) Containment Purge • RX-9825 (SPING 2) Radwaste Area • RX-9830 (SPING 3) Fuel Handling Area

Table 2A-2 Unit 2 Fuel Damage Radiation Monitors
• 2RE-8905 Containment Equipment Hatch Area • 2RE-8909 Containment Personnel Access Area • 2RE-8912 Containment Incore Inst. • 2RE-8914 Spent Fuel Area • 2RE-8915 Spent Fuel Area • 2RE-8916 Spent Fuel Area • 2RE-8925-1 Containment High Range Radiation Monitor • 2RE-8925-2 Containment High Range Radiation Monitor • 2RX-9820 (SPING 5) Containment Purge • 2RX-9825 (SPING 6) Radwaste Area • 2RX-9830 (SPING 7) Fuel Handling Area

Mode Applicability:

All

Definition(s):

CONFINEMENT BOUNDARY – The barrier(s) between spent fuel and the environment once the spent fuel is processed for dry storage. As related to the ANO ISFSI, the Confinement Boundary is comprised of either the Multi-assembly Sealed Basket (MSB) (SNC System) or Multi-Purpose Canister (MPC) (Holtec System).

VALID – An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Basis:

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

This ~~IC~~ EAL 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-~~H~~U1.

EAL #~~This EAL escalates from AU2 in that the loss of level, in the affected portion of the REFUELING PATHWAY, is of sufficient magnitude to have resulted in uncovery of irradiated fuel. Indications of irradiated fuel uncovery may include direct or indirect visual observation (e.g., reports from personnel or camera images), as well as significant changes in water and radiation levels, or other plant parameters. Computational aids may also be used (e.g., a boil-off curve). Classification of an event using this EAL should be based on the totality of available indications, reports and observations.~~

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

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

This EAL addresses a release of radioactive material caused by mechanical damage to irradiated fuel. Damaging events may include the dropping, bumping or binding of an assembly, or dropping a heavy load onto an assembly. A rise in readings on radiation monitors should be

considered in conjunction with in-plant reports or observations of a potential fuel damaging event (e.g., a fuel handling accident). ~~EAL #3Spent fuel pool water level at this value is within the lower end of the level range necessary to prevent significant dose consequences from direct gamma radiation to personnel performing operations in the vicinity of the spent fuel pool. This condition reflects a significant loss of spent fuel pool water inventory and thus it is also a precursor to a loss of the ability to adequately cool the irradiated fuel assembles stored in the pool.~~

Escalation of the emergency classification level would be via IC~~s~~ AS1~~ or AS2 (*see AS2 Developer Notes*)~~.

Reference(s):

1. OP-1203.050 Unit 1 Spent Fuel Pool Emergencies
2. OP-1305.001 Radiation Monitoring System Check and Test
3. OP-2203.002 Spent Fuel Pool Emergencies
4. OP-1604.051 Eberline Radiation Monitoring System
5. OP-2304.133 Containment High Range Radiation Monitor Calibration
6. Offsite Dose Calculation Manual
7. NEI 99-01 AA2

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

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

EAL:

AA2.3 Alert
Lowering of spent fuel pool level to 387.0 ft. [389.5 ft.] (Alarm 2) on LIT-2020-3(4) [2LIT-2020-1(2)]

Mode Applicability:

All

Definition(s):

None

Basis:

This ~~IC~~ EAL addresses events that have caused ~~IMMINENT or actual damage to an irradiated fuel assembly, or~~ a significant lowering of water level within the spent fuel pool ~~*(see Developer Notes)*~~. These events present radiological safety challenges to plant personnel and are precursors to a release of radioactivity to the environment. As such, they represent an actual or potential substantial degradation of the level of safety of the plant.~~This IC applies to irradiated fuel that is licensed for dry storage up to the point that the loaded storage cask is sealed. Once sealed, damage to a loaded cask causing loss of the CONFINEMENT BOUNDARY is classified in accordance with IC E-HU1.~~

~~Escalation of the emergency would be based on either Recognition Category A or C ICs.~~ EAL #~~This EAL escalates from AU2 in that the loss of level, in the affected portion of the REFUELING PATHWAY, is of sufficient magnitude to have resulted in uncovery of irradiated fuel. Indications of irradiated fuel uncovery may include direct or indirect visual observation (e.g., reports from personnel or camera images), as well as significant changes in water and radiation levels, or other plant parameters. Computational aids may also be used (e.g., a boil-off curve). Classification of an event using this EAL should be based on the totality of available indications, reports and observations.~~

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

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

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

~~EAL #3~~Spent fuel pool water level at this value is within the lower end of the level range necessary to prevent significant dose consequences from direct gamma radiation to personnel performing operations in the vicinity of the spent fuel pool. This condition reflects a significant loss of spent fuel pool water inventory and thus it is also a precursor to a loss of the ability to adequately cool the irradiated fuel assembles stored in the pool.

Escalation of the emergency classification level would be via IC~~s~~ AS1 or AS2~~ (*see AS2 Developer Notes*)~~.

Post-Fukushima order EA-12-051 required the installation of reliable SFP level indication capable of identifying normal level (Level 1), SFP level 10 ft. above the top of the fuel racks (Level 2) and SFP level at the top of the fuel racks (Level 3) (ref. 1, 2).

Reference(s):

1. MOHR-ANO-1, ANO-1 SFPI (Level) Configuration, Sheet 1, Revision 0
2. MOHR-ANO-2, ANO-2 SFPI (Level) Configuration, Sheet 1, Revision 0
3. NEI 99-01 AA2

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

Initiating Condition: Spent fuel pool level at the top of the fuel racks

EAL:

AS2.1 Site Area Emergency
Lowering of spent fuel pool level to 377.0 ft. [379.5 ft.] (Alarm 3) on LIT-2020-3(4) [2LIT-2020-1(2)]

Mode Applicability:

All

Definition(s):

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

Basis:

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

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

Escalation of the emergency classification level would be via IC AG1 or AG2~~A~~.

Post-Fukushima order EA-12-051 required the installation of reliable SFP level indication capable of identifying normal level (Level 1), SFP level 10 ft. above the top of the fuel racks (Level 2) and SFP level at the top of the fuel racks (Level 3) (ref. 1, 2).

Reference(s):

1. MOHR-ANO-1, ANO-1 SFPI (Level) Configuration, Sheet 1, Revision 0
2. MOHR-ANO-2, ANO-2 SFPI (Level) Configuration, Sheet 1, Revision 0
3. NEI 99-01 AS2

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

Initiating Condition: Spent fuel pool level **cannot** be restored to at least the top of the fuel racks for 60 minutes or longer

EAL:

AG2.1 General Emergency
Spent fuel pool level **cannot** be restored to at least 377.0 ft. [379.5 ft.] (Alarm 3) on LIT-2020-3(4) [2LIT-2020-1(2)] for ≥ 60 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

All

Definition(s):

None

Basis:

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

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

Post-Fukushima order EA-12-051 required the installation of reliable SFP level indication capable of identifying normal level (Level 1), SFP level 10 ft. above the top of the fuel racks (Level 2) and SFP level at the top of the fuel racks (Level 3) (ref. 1, 2).

Reference(s):

1. MOHR-ANO-1, ANO-1 SFPI (Level) Configuration, Sheet 1, Revision 0
2. MOHR-ANO-2, ANO-2 SFPI (Level) Configuration, Sheet 1, Revision 0
3. NEI 99-01 AG2

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 3 – Area Radiation Levels

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

EAL:

AA3.1	**Alert**
Dose rate > 15 mR/hr in **EITHER** of the following areas: • Control Room • Central Alarm Station (by survey)	

Mode Applicability:

All

Definition(s):

IMPEDE(D) - Personnel access to a room or area is hindered to an extent that extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is **not** routinely employed).

Basis:

Areas that meet this threshold include the Control Room (CR) and the Central Alarm Station (CAS). The Control Room envelope (Unit 1 and Unit 2) is monitored for excessive radiation by five detectors. These radiation detectors are RE-8001, 2RE-8001A, 2RE-8001B, 2RE-8750-1A, and 2RE-8750-1B (ref. 1). The CAS is included in this EAL because of its importance to permitting access to areas required to assure safe plant operations. There are no permanently installed area radiation monitors in CAS that may be used to assess this EAL threshold. Therefore, this threshold is evaluated using local radiation survey for this area.

This IC addresses elevated radiation levels in certain plant rooms/areas sufficient to preclude or IMPEDE personnel from performing actions necessary to maintain normal plant operation, or to perform a normal plant cooldown and shutdown. As such, it represents an actual or potential substantial degradation of the level of safety of the plant. The Emergency Director should consider the cause of the ~~increased~~ rise in radiation levels and determine if another IC may be applicable. ~~For EAL #2, an Alert declaration is warranted if entry into the affected room/area is, or may be, procedurally required during the plant operating mode in effect at the time of the elevated radiation levels. The emergency classification is not contingent upon whether entry is actually necessary at the time of the increased radiation levels. Access should be considered as impeded if extraordinary measures are necessary to facilitate entry of personnel into the~~

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

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

~~The plant is in an operating mode different than the mode specified for the affected room/area (i.e., entry is not required during the operating mode in effect at the time of the elevated radiation levels). For example, the plant is in Mode 1 when the radiation increase occurs, and the procedures used for normal operation, cooldown and shutdown do not require entry into the affected room until Mode 4.~~

~~The increased radiation levels are a result of a planned activity that includes compensatory measures which address the temporary inaccessibility of a room or area (e.g., radiography, spent filter or resin transfer, etc.).~~

~~The action for which room/area entry is required is of an administrative or record keeping nature (e.g., normal rounds or routine inspections).~~

~~The access control measures are of a conservative or precautionary nature, and would not actually prevent or impede a required action.~~

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

Reference(s):

1. STM 1-62 Radiation Monitoring
2. NEI 99-01 AA3

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 3 – Area Radiation Levels

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

EAL:

AA3.2 Alert

An UNPLANNED event results in radiation levels that prohibit or IMPEDE access to **any** Table 1[2]A-3 room or area (Note 5)

Note 5: 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.

Table 1A-3 Unit 1 Safe Operation & Shutdown Rooms/Areas	
Room/Area	**Mode**
A-4 Switchgear Room	3, 4
Upper North Electrical Penetration Room	3, 4
Lower South Electrical Equipment Room	3, 4

Table 2A-3 Unit 2 Safe Operation & Shutdown Rooms/Areas	
Room/Area	**Mode**
Aux Building 317’ Emergency Core Cooling Rooms	3, 4
Aux Building 317’ Tendon Gallery Access	3, 4
Aux Building 335’ Charging Pumps / MCC 2B-52	3, 4
Aux Building 354’ MCC 2B-62 Area	3, 4
Emergency Diesel Generator Corridor	3, 4
Lower South Piping Penetration Room	3, 4
Aux Building 386’ Containment Hatch	3, 4

Mode Applicability:

3 – Hot Standby, 4 – Hot Shutdown

Definition(s):

IMPEDE(D) – Personnel access to a room or area is hindered to an extent that extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is **not** routinely employed).

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.

Basis:

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

For ~~EAL #2~~ AA3.2, 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~~ higher radiation levels. Access should be considered as IMPEDED if extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., installing temporary shielding, requiring use of non-routine protective equipment, requesting an extension in dose limits beyond normal administrative limits).

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

- The plant is in an operating mode different than the mode specified for the affected room/area (i.e., entry is not required during the operating mode in effect at the time of the elevated radiation levels). For example, the plant is in Mode 1 when the radiation ~~increase~~ rise occurs, and the procedures used for normal operation, cooldown and shutdown do not require entry into the affected room until Mode ~~4~~3.
- The ~~increased~~ higher radiation levels are a result of a planned activity that includes compensatory measures which address the temporary inaccessibility of a room or area (e.g., radiography, spent filter or resin transfer, etc.).
- ~~The action for which room/area entry is required is of an administrative or record keeping nature (e.g., normal rounds or routine inspections).~~
- The access control measures are of a conservative or precautionary nature, and would not actually prevent or IMPEDE a required action.

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

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.

The list of plant rooms or areas with entry-related mode applicability identified 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. 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) are not included. In addition, the list specifies the plant mode(s) during which entry would be required for each room or area (ref. 1).

EAL AA3.2 mode applicability has been limited to the mode limitations of Table 1[2]A-3 (Modes 3 and 4 **only**).

Reference(s):

1. Attachment 2 Safe Operation & Shutdown Areas Tables 1[2]A-3 & 1[2]H-2 Bases
2. NEI 99-01 AA3

Category C – Cold Shutdown / Refueling System Malfunction

EAL Group: Cold Conditions (RCS temperature ≤ 200°F); EALs in this category are applicable only in one or more cold operating modes.

Category C EALs are directly associated with cold shutdown or refueling system safety functions. Given the variability of plant configurations (e.g., systems out-of-service for maintenance, containment open, reduced AC power redundancy, time since shutdown) during these periods, the consequences of any given initiating event can vary greatly. For example, a loss of decay heat removal capability that occurs at the end of an extended outage has less significance than a similar loss occurring during the first week after shutdown. Compounding these events is the likelihood that instrumentation necessary for assessment may also be inoperable. The cold shutdown and refueling system malfunction EALs are based on performance capability to the extent possible with consideration given to RCS integrity, CONTAINMENT CLOSURE, and fuel clad integrity for the applicable operating modes (5 - Cold Shutdown, 6 - Refueling, DEF – Defueled).

The events of this category pertain to the following subcategories:

1. RCS Level

RCS water level is directly related to the status of adequate core cooling and, therefore, fuel clad integrity.

2. Loss of Vital AC Power

Loss of vital plant electrical power can compromise plant SAFETY SYSTEM operability including decay heat removal and emergency core cooling systems which may be necessary to ensure fission product barrier integrity. This category includes loss of onsite and offsite power sources for 4.16 KV vital buses.

3. RCS Temperature

Uncontrolled or inadvertent temperature or pressure rises are indicative of a potential loss of safety functions.

4. Loss of Vital DC Power

Loss of emergency plant electrical power can compromise plant SAFETY SYSTEM operability including decay heat removal and emergency core cooling systems which may be necessary to ensure fission product barrier integrity. This category includes loss of power to or degraded voltage on the 125V DC vital buses.

5. Loss of Communications

Certain events that degrade plant operator ability to effectively communicate with essential personnel within or external to the plant warrant emergency classification.

6. Hazardous Event Affecting Safety Systems

Certain hazardous natural and technological events may result in VISIBLE DAMAGE to or degraded performance of safety systems warranting classification.

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: UNPLANNED loss of RCS inventory

EAL:

CU1.1	**Unusual Event**
UNPLANNED loss of reactor coolant results in RCS water level less than a required lower limit for ≥ 15 min. (Note 1)	

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

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.

Basis:

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

Refueling evolutions that ~~decrease~~lower RCS water inventory are carefully planned and controlled. An UNPLANNED event that results in water level ~~decreasing~~lowering 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.

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

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

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

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

Reference(s):

1. OP-1015.002 Decay Heat Removal and LTOP System
2. OP-1015.008 Unit 2 SDC Control
3. NEI 99-01 CU1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: UNPLANNED loss of RCS inventory

EAL:

CU1.2 Unusual Event

RCS level **cannot** be monitored

AND EITHER:

- UNPLANNED rise in **any** Table 1[2]C-1 sump/tank level due to loss of RCS inventory
- Visual observation of UNISOLABLE RCS leakage

Table 1C-1 Unit 1 Sumps / Tanks
• Reactor Building Sump • Reactor Drain Tank • Aux. Building Equipment Drain Tank • Aux. Building Sump • Quench Tank

Table 2C-1 Unit 2 Sumps / Tanks
• CNTMT Sump • Reactor Drain Tank • LRW Waste Tank (2T-20) • Holdup Tank • Aux. Building Sump • Quench Tank

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

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

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

Basis:

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

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

~~EAL #1 recognizes that the minimum required (reactor vessel/RCS [*PWR*] or RPV [*BWR*]) 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.~~

This EAL ~~#2~~ addresses a condition where all means to determine ~~(reactor vessel/~~RCS ~~[PWR] or RPV [BWR])~~ 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 (Table C-1). Sump and/or tank level changes must be evaluated against other potential sources of water flow to ensure they are indicative of leakage from the ~~(reactor vessel/~~RCS ~~[PWR] or RPV [BWR])~~.

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

Reference(s):

1. OP-1203.039 Excess RCS Leakage
2. OP-2203.016 Excess RCS Leakage
3. NEI 99-01 CU1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Significant Loss of RCS inventory

EAL:

CA1.1 Alert

Loss of RCS inventory as indicated by **EITHER**:

- RVLMS Levels 1 through 8 [1 through 5] indicate DRY
- Reactor vessel level < 370.2 ft. (LT-1195/LT-1196) [< 24 in. (L4791/L4792)] (minimum level for DHR operation @ 1000 gpm)[(minimum level for SDC operation)]

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

None

Basis:

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 this EAL ~~#1~~, a lowering of RPV water level below ~~(site-specific level) ft~~ the specified level indicates that operator actions have not been successful in restoring and maintaining RCS ~~(reactor vessel/RCS [PWR] or RPV [BWR])~~ water level. The heat-up rate of the coolant will ~~increase~~ rise as the available water inventory is reduced. A continuing ~~decrease~~ drop in water level will lead to core uncovery.

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

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

~~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 ~~RCS the (reactor vessel/RCS [PWR] or RPV [BWR]) inventory~~ water level continues to lower, then escalation to Site Area Emergency would be via IC CS1.

A loss of DHR/SDC will occur at approximately RLVMS Level 8 (Unit 1) or RVLMS Level 5 (Unit 2). However, RVLMS may not be available in the cold shutdown modes. Redundant means of level indication is provided in these modes and included in this EAL. The point at which a loss of DHR/SDC is likely to occur is 370.2 ft. (Unit 1) or 24 in. (Unit 2) as indicated in the respective Control Rooms. The value selected for ANO-1 is based on 1000 gpm DHR flow which is the flow rate at which the low flow alarm is received. The ANO-2 value is the proceduralized minimum value. Below these levels, a loss of suction to decay heat removal systems will occur (ref. 1, 2, 3). The inability to restore and maintain level after reaching this value would be indicative of a failure of the RCS barrier.

Reference(s):

1. OP-1104.004 Decay Heat Removal Operating Procedure
2. OP-1105.008 Inadequate Core Cooling Monitor and Display
3. OP-2105.003 Reactor Vessel Level Monitoring System Operations
4. OP-2203.029 Loss of Shutdown Cooling
5. Calculation No. 90-E-0116-01 ANO-2 EOP Setpoint Basis Document, Setpoints R.3 and R.9
6. NEI 99-01 CA1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Significant Loss of RCS inventory

EAL:

CA1.2 Alert

RCS level **cannot** be monitored for ≥ 15 min. (Note 1)

AND EITHER:

- UNPLANNED rise in **any** Table 1[2]C-1 Sump / Tank level due to a loss of RCS inventory
- Visual observation of UNISOLABLE RCS leakage

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1C-1 Unit 1 Sumps / Tanks
• Reactor Building Sump
• Reactor Drain Tank
• Aux. Building Equipment Drain Tank
• Aux. Building Sump
• Quench Tank

Table 2C-1 Unit 2 Sumps / Tanks
• CNTMT Sump
• Reactor Drain Tank
• LRW Waste Tank (2T-20)
• Holdup Tank
• Aux. Building Sump
• Quench Tank

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

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

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

Basis:

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) indicates that operator actions have not been successful in restoring and maintaining (reactor vessel/RCS [*PWR*] or RPV [*BWR*]) water level. The heat-up rate of the coolant will increase as the available water inventory is reduced. A continuing decrease in water level will lead to core uncovery.~~

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

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

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

If the ~~(reactor vessel/~~RCS ~~[PWR] or RPV [BWR])~~ inventory level continues to lower, then escalation to Site Area Emergency would be via IC CS1.

Reference(s):

1. OP-1203.039 Excess RCS Leakage
2. OP-2203.016 Excess RCS Leakage
3. NEI 99-01 CA1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Loss of RCS inventory affecting core decay heat removal capability

EAL:

CS1.1 Site Area Emergency
CONTAINMENT CLOSURE **not** established
AND
RVLMS Levels 1 through 9 [1 through 6] indicate DRY

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE - The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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

Basis:

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

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

Outage/shutdown contingency plans typically provide for re-establishing or verifying CONTAINMENT CLOSURE following a loss of heat removal or RCS inventory control functions. ~~The difference in the specified RCS/reactor vessel levels of EALs 1.b and 2.b reflect the fact~~

~~that with CONTAINMENT CLOSURE established, there is a lower probability of a fission product release to the environment.~~

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

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

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

Escalation of the emergency classification level would be via IC CG1 or AG1.

Reference(s):

1. OP-1105.008 Inadequate Core Cooling Monitor and Display
2. OP-2105.003 Reactor Vessel Level Monitoring System Operations
3. NEI 99-01 CS1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Loss of RCS inventory affecting core decay heat removal capability

EAL:

CS1.2 Site Area Emergency

[RVLMS Levels 1 through 7 indicate DRY

OR]

RCS level **cannot** be monitored for ≥ 30 min. (Note 1)

AND

Core uncovery is indicated by **any** of the following:

- UNPLANNED rise in **any** Table 1[2]C-1 sump/tank level of sufficient magnitude to indicate core uncovery
- Containment high range radiation monitor RE-8060/8061 [2RE-8925-1/8925-2] reading > 10 R/hr
- Erratic Source Range Monitor indication

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1C-1 Unit 1 Sumps / Tanks
• Reactor Building Sump • Reactor Drain Tank • Aux. Building Equipment Drain Tank • Aux. Building Sump • Quench Tank

Table 2C-1 Unit 2 Sumps / Tanks
• CNTMT Sump • Reactor Drain Tank • LRW Waste Tank (2T-20) • Holdup Tank • Aux. Building Sump • Quench Tank

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE - The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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

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.

Basis:

When in service, the Unit 2 RVLMS can measure RCS level below the top of active fuel. Level 7 DRY on this system is an indication of core uncovery.

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

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

Outage/shutdown contingency plans typically provide for re-establishing or verifying CONTAINMENT CLOSURE 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~~ CS1.1 and CS1.2 reflect the fact that with CONTAINMENT CLOSURE established, there is a lower probability of a fission product release to the environment.

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

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

~~These~~ This EAL~~s~~ addresses 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*.

Containment High Range Radiation Monitors RE-8060/8061 [2RE-8925-1/8925-2] are the site-specific radiation monitors that would be indicative of possible core uncovery in the Refueling mode. The dose rate due to core shine when the top of the core becomes uncovered should result in dose rates > 10 R/hr.

Escalation of the emergency classification level would be via IC CG1 or AG1.

Reference(s):

1. OP-1203.039 Excess RCS Leakage
2. OP-2203.016 Excess RCS Leakage
3. OP-2105.003 Reactor Vessel Level Monitoring System Operations
4. 1SAR Table 7-11
5. 2SAR 12.1.4.2
6. NEI 99-01 CS1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Loss of RCS inventory affecting fuel clad integrity with containment challenged

EAL:

CG1.1 General Emergency – UNIT 2 ONLY
RVLMS Levels 1 through 7 indicate DRY
AND
Any Containment Challenge indication, Table 1[2]C-2

Note 6: If CONTAINMENT CLOSURE is re-established prior to exceeding the 30-minute time limit, declaration of a General Emergency is **not** required.

Table 1[2]C-2 Containment Challenge Indications
• CONTAINMENT CLOSURE **not** established (Note 6) • Containment hydrogen concentration > 4% • UNPLANNED rise in containment pressure

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE - The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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

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.

Basis:

When in service, the Unit 2 RVLMS can measure RCS level below the top of active fuel. Level 7 DRY on this system is an indication of core uncovery.

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

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

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

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

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

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

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

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

Reference(s):

1. OP-1203.039 Excess RCS Leakage
2. OP-2203.016 Excess RCS Leakage
3. OP-2105.003 Reactor Vessel Level Monitoring System Operations
4. 1SAR Table 7-11
5. 2SAR 12.1.4.2
6. Unit 1 SAMG Figure III-1B
7. Unit 2 SAMG Phase 1 Instructions, Containment Flowchart
8. NEI 99-01 CG1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Loss of RCS inventory affecting fuel clad integrity with containment challenged

EAL:

CG1.2 General Emergency

RCS level **cannot** be monitored for ≥ 30 min. (Note 1)

AND

Core uncovery is indicated by **any** of the following:

- UNPLANNED rise in **any** Table 1[2]C-1 sump/tank level of sufficient magnitude to indicate core uncovery
- Containment High Range Radiation Monitor RE-8060/8061 [2RE-8925-1/8925-2] reading > 10 R/hr
- Erratic Source Range Monitor indication

AND

Any Containment Challenge indication, Table 1[2]C-2

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 6: If CONTAINMENT CLOSURE is re-established prior to exceeding the 30-minute time limit, declaration of a General Emergency is **not** required.

Table 1C-1 Unit 1 Sumps / Tanks
• Reactor Building Sump • Reactor Drain Tank • Aux. Building Equipment Drain Tank • Aux. Building Sump • Quench Tank

Table 2C-1   Unit 2 Sumps / Tanks
• CNTMT Sump • Reactor Drain Tank • LRW Waste Tank (2T-20) • Holdup Tank • Aux. Building Sump • Quench Tank

Table 1[2]C-2 Containment Challenge Indications
• CONTAINMENT CLOSURE **not** established (Note 6) • Containment hydrogen concentration > 4% • UNPLANNED rise in containment pressure

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE - The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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

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.

Basis:

When in service, the Unit 2 RVLMS can measure RCS level below the top of active fuel. Level 7 DRY on this system is an indication of core uncovery.

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

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

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

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

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

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

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

Containment High Range Radiation Monitor RE-8060/8061 [2RE-8925-1/8925-2] are the site-specific radiation monitors that would be indicative of possible core uncovery in the Refueling mode. The dose rate due to core shine when the top of the core becomes uncovered should result in dose rates > 10 R/hr.

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

Reference(s):

1. OP-1203.039 Excess RCS Leakage
2. OP-2203.016 Excess RCS Leakage
3. OP-2105.003 Reactor Vessel Level Monitoring System Operations
4. 1SAR Table 7-11
5. 2SAR 12.1.4.2
6. Unit 1 SAMG Figure III-1B
7. Unit 2 SAMG Phase 1 Instructions, Containment Flowchart
8. NEI 99-01 CG1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 2 – Loss of Vital AC Power

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

EAL:

CU2.1 Unusual Event

AC power capability, Table 1[2]C-3, to vital 4.16 KV buses A3 [2A3] and A4 [2A4] reduced to a single power source for ≥ 15 min. (Note 1)

AND

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

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1C-3 Unit 1 AC Power Sources
Offsite • Startup Transformer No. 1 • Startup Transformer No. 2 • Unit Auxiliary Transformer (from 22 KV switchyard) **Onsite** • DG1 • DG2 • AAC Gen

Table 2C-3 Unit 2 AC Power Sources
Offsite • Startup Transformer No. 3 • Startup Transformer No. 2 • Unit Auxiliary Transformer (backfed from main transformer) **Onsite** • 2DG1 • 2DG2 • AAC Gen

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling, DEF - Defueled

Definition(s):

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 (as defined in 10 CFR 50.2):

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

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

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

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

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

Fifteen minutes was selected as a 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.

This EAL is the cold condition equivalent of the hot condition EAL SA1.1.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations
5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. NEI 99-01 CU2

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 2 – Loss of Vital AC Power

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

EAL:

CA2.1 Alert
Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3 [2A3] and A4 [2A4] for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling, DEF - Defueled

Definition(s):

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 (as defined in 10 CFR 50.2):

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

Although the AAC may be considered available, it will not prevent declaration of this EAL unless it is powering a vital bus within the 15-minute time period of the EAL.

This IC addresses a total loss of AC power that compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink. Mitigative strategies using non-safety related power sources (FLEX generators, etc.) may be effective in supplying power to these buses. These power sources must be controlled in

accordance with abnormal or emergency operating procedures, or beyond design basis accident response guidelines (e.g., FLEX support guidelines) and must be capable (alone or in combination) of supplying power for long term decay heat removal systems.

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

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

Escalation of the emergency classification level would be via IC CS1 or AS1.

This EAL is the cold condition equivalent of the hot condition EAL SS1.1.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations
5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. NEI 99-01 CU2

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 3 – RCS Temperature

Initiating Condition: UNPLANNED rise in RCS temperature

EAL:

CU3.1 Unusual Event
UNPLANNED rise in RCS temperature to > 200°F

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling°

Definition(s):

CONTAINMENT CLOSURE – The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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.

Basis:

This IC addresses an UNPLANNED ~~increase~~ rise in RCS temperature above the Technical Specification cold shutdown temperature limit ~~or the inability to determine RCS temperature and level,~~and represents a potential degradation of the level of safety of the plant. If the RCS is not intact and CONTAINMENT CLOSURE is not established during this event, the Emergency Director should also refer to ~~IC~~ EAL CA3.1.

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

During an outage, the level in the reactor vessel will normally be maintained at or 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 lowered~~reduced~~ inventory may result in a rapid ~~increase~~ rise in reactor coolant temperature depending on the time after shutdown.

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

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

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

Reference(s):

1. Unit 1 and Unit 2 Technical Specifications Table 1.1-1
2. NEI 99-01 CU3

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 3 – RCS Temperature

Initiating Condition: UNPLANNED rise in RCS temperature

EAL:

CU3.2	**Unusual Event**
Loss of **all** RCS temperature and RCS level indication for ≥ 15 min. (Note 1)	

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE – The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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.

Basis:

This ~~IC~~ ~~EAL~~EAL addresses ~~an UNPLANNED increase in RCS temperature above the Technical Specification cold shutdown temperature limit, or~~ the inability to determine RCS temperature and level, ~~and~~and represents a potential degradation of the level of safety of the plant. If the RCS is not intact and CONTAINMENT CLOSURE is not established during this event, the Emergency Director should also refer to ~~IC~~ EAL CA3.1.

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

~~EAL #1 involves a loss of decay heat removal capability, or an addition of heat to the RCS in excess of that which can currently be removed, such that reactor coolant temperature cannot be~~

~~maintained below the cold shutdown temperature limit specified in Technical Specifications. During this condition, there is no immediate threat of fuel damage because the core decay heat load has been reduced since the cessation of power operation.~~

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

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

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

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

Reference(s):

1. NEI 99-01 CU3

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 3 – RCS Temperature

Initiating Condition: Inability to maintain plant in cold shutdown

EAL:

CA3.1 Alert

UNPLANNED rise in RCS temperature to > 200°F for > Table 1[2]C-4 duration (Note 1)

OR

UNPLANNED RCS pressure rise > 10 psig (this EAL does not apply during water-solid plant conditions)

Note 1: The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

<table>
<tr><th colspan="3">Table 1[2]C-4 RCS Heat-up Duration Thresholds</th></tr>
<tr><th>RCS Status</th><th>CONTAINMENT CLOSURE Status</th><th>Heat-up Duration</th></tr>
<tr><td>Intact (but not lowered inventory)</td><td>N/A</td><td>60 min.*</td></tr>
<tr><td rowspan="2">Not intact
OR
lowered inventory</td><td>established</td><td>20 min.*</td></tr>
<tr><td>not established</td><td>0 min.</td></tr>
<tr><td colspan="3">* If an RCS heat removal system is in operation within this time frame and RCS temperature is being reduced, the EAL is not applicable.</td></tr>
</table>

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE – The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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.

Basis:

In the absence of reliable RCS temperature indication, classification should be based on the RCS pressure rise criteria when the RCS is intact in Mode 5 or based on time to boil data when in Mode 6 or the RCS is not intact in Mode 5.

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

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

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

The RCS Heat-up Duration Thresholds table also addresses ~~an increase~~a rise in RCS temperature with the RCS intact. The status of CONTAINMENT CLOSURE 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~~ rise without a substantial degradation in plant safety.

Finally, in the case where there is a~~n~~ ~~increase~~ rise in RCS temperature, the RCS is not intact or is at lowered~~reduced~~ inventory ~~[*PWR*],~~ and CONTAINMENT CLOSURE 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~~The RCS pressure rise threshold provides a pressure-based indication of RCS heat-up in the absence of RCS temperature monitoring capability.

Escalation of the emergency classification level would be via IC CS1 or AS1.

Reference(s):

1. Unit 1 and Unit 2 Technical Specifications Table 1.1-1
2. NEI 99-01 CA3

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 4 – Loss of Vital DC Power

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

EAL:

CU4.1 Unusual Event
Indicated voltage is < 105 VDC on vital 125 VDC buses for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

Unit 1 batteries D06 and D07 and Unit 2 batteries 2D11 and 2D12 contain 58 cells each with a minimum cell voltage of 1.81 V or 105 VDC.

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~~ raise the time available to restore a vital DC bus to service. Thus, this condition is considered to be a potential degradation of the level of safety of the plant.

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

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

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

This EAL is the cold condition equivalent of the hot condition EAL SS2.1.

Reference(s):

1. 1SAR 8.3.2.1.1 Batteries
2. 2SAR 8.3.2.1.1 Batteries
3. NEI 99-01 CU4

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 5 – Loss of Communications

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

EAL:

CU5.1 Unusual Event

Loss of **all** Table 1[2]C-5 onsite communication methods

OR

Loss of **all** Table 1[2]C-5 State and local agency communication methods

OR

Loss of **all** Table 1[2]C-5 NRC communication methods

Table 1[2]C-5 Communication Methods			
System	**Onsite**	**ORO**	**NRC**
Station radio system	X		
ANO plant phone system	X		
Gaitronics	X		
Telephone Systems: • Commercial • Microwave • Satellite • VOIP		X	X
Emergency Notification System (ENS)			X

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling, DEF – Defueled

Definition(s):

None

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 State and local agencie~~ORO~~s and the NRC.

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

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

~~EAL #2~~The second EAL condition addresses a total loss of the communications methods used to notify all State and local agencies~~OROs~~ of an emergency declaration. The State and local agencies~~OROs~~ referred to here are the Arkansas Department of Health, Arkansas Department of Emergency Management, Pope, Yell, Johnson, and Logan County offsite agencies ~~(see Developer Notes)~~.

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

This EAL is the cold condition equivalent of the hot condition EAL SU7.1.

Reference(s):

1. OP-1903.062 Communications System Operating Procedure
2. NEI 99-01 CU5

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 6 – Hazardous Event Affecting Safety Systems

Initiating Condition: Hazardous event affecting SAFETY SYSTEMS needed for the current operating mode

EAL:

CA6.1 Alert

The occurrence of **any** Table 1[2]C-6 hazardous event

AND

Event damage has caused indications of degraded performance on one train of a SAFETY SYSTEM needed for the current operating mode

AND EITHER:

- Event damage has caused indications of degraded performance to the second train of the SAFETY SYSTEM needed for the current operating mode
- Event damage has resulted in VISIBLE DAMAGE to the second train of the SAFETY SYSTEM needed for the current operating mode

(Notes 10, 11)

Note 10: If the affected SAFETY SYSTEM train was already inoperable or out of service before the hazardous event occurred, then emergency classification is **not** warranted.

Note 11: If the hazardous event **only** resulted in VISIBLE DAMAGE, with **no** indications of degraded performance to at least one train of a SAFETY SYSTEM, then this emergency classification is **not** warranted.

Table 1[2]C-6 Hazardous Events
• Seismic event (earthquake) • Internal or external FLOODING event • High winds or tornado strike • FIRE • EXPLOSION • Other events with similar hazard characteristics as determined by the Shift Manager

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

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 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.

FLOODING - A condition where water is entering a room or area faster than installed equipment is capable of removal, resulting in a rise of water level within the room or area.

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

VISIBLE DAMAGE - Damage to a SAFETY SYSTEM train 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 SAFETY SYSTEM train.

Basis:

This IC addresses a hazardous event that causes damage to SAFETY SYSTEMS needed for the current operating mode. In order to provide the appropriate context for consideration of an ALERT classification, the hazardous event must have caused indications of degraded SAFETY SYSTEM performance in one train, and there must be either indications of performance issues with the second SAFETY SYSTEM train or VISIBLE DAMAGE to the second train such that the potential exists for this second SAFETY SYSTEM train to have performance issues. In other words, in order for this EAL to be classified, the hazardous event must occur, at least one SAFETY SYSTEM train must have indications of degraded performance, and the second SAFETY SYSTEM train must have indications of degraded performance or VISIBLE DAMAGE such that the potential exists for performance issues. Note that this second SAFETY SYSTEM

train is from the same SAFETY SYSTEM that has indications of degraded performance; commercial nuclear power plants are designed to be able to support single system issues without compromising public health and safety from radiological events.

Indications of degraded performance 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.

VISIBLE DAMAGE addresses damage to a SAFETY SYSTEM train that is not in service/operation and that potentially could cause performance issues. Operators will make this determination based on the totality of available event and damage report information. This is intended to be a brief assessment not requiring lengthy analysis or quantification of the damage. This VISIBLE DAMAGE should be significant enough to cause concern regarding the operability or reliability of the SAFETY SYSTEM train.
~~This IC addresses a hazardous event that causes damage to a SAFETY SYSTEM, or a structure containing SAFETY SYSTEM components, needed for the current operating mode. This condition significantly reduces the margin to a loss or potential loss of a fission product barrier, and therefore represents an actual or potential substantial degradation of the level of safety of the plant.~~

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

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

Escalation of the emergency classification level would be via IC CS1 or AS1.

This EAL is the cold condition equivalent of the hot condition EAL SA9.1.

Reference(s):

1. EP FAQ 2016-002
2. NEI 99-01 CA6

Category E – Independent Spent Fuel Storage Installation (ISFSI)

EAL Group: ANY (EALs in this category are applicable to any plant condition, hot or cold.)

An independent spent fuel storage installation (ISFSI) is a complex that is designed and constructed for the interim storage of spent nuclear fuel and other radioactive materials associated with spent fuel storage. A significant amount of the radioactive material contained within a canister must escape its packaging and enter the biosphere for there to be a significant environmental effect resulting from an accident involving the dry storage of spent nuclear fuel.

An Unusual Event is declared on the basis of the occurrence of an event of sufficient magnitude that a loaded cask CONFINEMENT BOUNDARY is damaged or violated.

The ANO ISFSI is located wholly within the plant PROTECTED AREA. Therefore any security event related to the ISFSI is classified under Category H1 security event related EALs.

Category: E – ISFSI

Subcategory: Confinement Boundary

Initiating Condition: Damage to a loaded cask CONFINEMENT BOUNDARY

EAL:

EU1.1 Unusual Event

Damage to a loaded cask CONFINEMENT BOUNDARY as indicated by an on-contact radiation reading on the surface of a loaded spent fuel cask (VSC-24 VCC or HI-STORM overpack) > **any** Table 1[2]-E-1 value

Table 1[2]E-1 ISFSI Dose Rates	
VSC-24 VCC	**HI-STORM**
• 200 mrem/hr on the sides • 400 mrem/hr on the top • 700 mrem/hr at the air inlet • 200 mrem/hr at the air outlet	• 60 mrem/hr (gamma + neutron) on the top or outlet vent • 600 mrem/hr (gamma + neutron) on the side of the overpack (excluding inlet and outlet ducts)

Mode Applicability:

All

Definition(s):

CONFINEMENT BOUNDARY – The barrier(s) between spent fuel and the environment once the spent fuel is processed for dry storage. As related to the ANO ISFSI, the Confinement Boundary is comprised of either the Multi-assembly Sealed Basket (MSB) (SNC System) or Multi-Purpose Canister (MPC) (Holtec System).

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

Basis:

This IC addresses an event that results in damage to the CONFINEMENT BOUNDARY of a storage cask containing spent fuel. It applies to irradiated fuel that is licensed for dry storage beginning at the point that the loaded storage cask is sealed. The issues of concern are the

creation of a potential or actual release path to the environment, degradation of one or more fuel assemblies due to environmental factors, and configuration changes which could cause challenges in removing the cask or fuel from storage.

The existence of "damage" is determined by radiological survey. The specified EAL threshold values correspond to 2 times the cask technical specification values (ref. 1, 2). The technical specification (licensing bases document) multiple of "2 times", which is also used in Recognition Category A IC AU1, is used here to distinguish between non-emergency and emergency conditions. The emphasis for this classification is the degradation in the level of safety of the spent fuel cask and not the magnitude of the associated dose or dose rate. It is recognized that in the case of extreme damage to a loaded cask, the fact that the "on-contact" dose rate limit is exceeded may be determined based on measurement of a dose rate at some distance from the cask.

Security-related events for ISFSIs are covered under ICs HU1 and HA1.

Reference(s):

1. Certificate of Compliance Appendix A Technical Specifications for the HI-STORM 100 Cask System Section 5.7.4
2. VSC-24 Storage Cask Final Safety Analysis Report Section 1.2.4 Maximum External Surface Dose Rate
3. NEI 99-01 E-HU1

Category F – Fission Product Barrier Degradation

EAL Group: Hot Conditions (RCS temperature > 200°F); EALs in this category are applicable only in one or more hot operating modes.

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

A. Fuel Clad Barrier (FCB): The Fuel Clad Barrier consists of the cladding material that contains the fuel pellets.

B. Reactor Coolant System Barrier (RCB): The RCS Barrier includes the RCS primary side and its connections up to and including the pressurizer safety and relief valves, and other connections up to and including the primary isolation valves.

C. Containment Barrier (CNB): The Containment Barrier includes the Reactor Building and connections up to and including the outermost containment isolation valves. This barrier also includes the main steam, feedwater, and blowdown line extensions outside the Reactor Building up to and including the outermost secondary side isolation valve. Containment Barrier thresholds are used as criteria for escalation of the Emergency Classification Level (ECL) from an Alert to a Site Area Emergency or a General Emergency.

The EALs in this category require evaluation of the loss and potential loss thresholds listed in the fission product barrier matrix of Table F-1. “Loss” and “Potential Loss” signify the relative damage and threat of damage to the barrier. “Loss” means the barrier no longer assures containment of radioactive materials. “Potential Loss” means integrity of the barrier is threatened and could be lost if conditions continue to degrade. The number of barriers that are lost or potentially lost and the following criteria determine the appropriate emergency classification level:

Alert:

Any loss or any potential loss of either Fuel Clad or RCS Barrier

Site Area Emergency:

Loss or potential loss of any two barriers

General Emergency:

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

The logic used for emergency classification based on fission product barrier monitoring should reflect the following considerations:

- The Fuel Clad Barrier and the RCS Barrier are weighted more heavily than the Containment Barrier.
- Unusual Event ICs associated with RCS and Fuel Clad Barriers are addressed under System Malfunction ICs.
- For accident conditions involving a radiological release, evaluation of the fission product barrier thresholds will need to be performed in conjunction with dose assessments to ensure correct and timely escalation of the emergency classification. For example, an evaluation of the fission product barrier thresholds may result in a Site Area Emergency classification while a dose assessment may indicate that an EAL for General Emergency IC AG1 has been exceeded.
- The fission product barrier thresholds specified within a scheme reflect plant-specific ANO design and operating characteristics.
- As used in this category, the term RCS leakage encompasses not just those types defined in Technical Specifications but also includes the loss of RCS mass to any location – inside the containment, an interfacing system, or outside of the containment. The release of liquid or steam mass from the RCS due to the as-designed/expected operation of a relief valve is not considered to be RCS leakage.
- At the Site Area Emergency level, EAL users should maintain cognizance of how far present conditions are from meeting a threshold that would require a General Emergency declaration. For example, if the Fuel Clad and RCS fission product barriers were both lost, then there should be frequent assessments of containment radioactive inventory and integrity. Alternatively, if both the Fuel Clad and RCS fission product barriers were potentially lost, the Emergency Director would have more assurance that there was no immediate need to escalate to a General Emergency.

Category: F – Fission Product Barrier Degradation

Subcategory: N/A

Initiating Condition: **Any** loss or **any** potential loss of either Fuel Clad or RCS

EAL:

FA1.1 Alert
Any loss or **any** potential loss of either Fuel Clad or RCS barrier (Table 1[2]F-1)

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

Fuel Clad, RCS and Containment comprise the fission product barriers. Table 1[2]F-1 lists the fission product barrier thresholds, bases and references.

At the Alert classification level, Fuel Clad and RCS barriers are weighted more heavily than the Containment barrier. Unlike the Containment barrier, loss or potential loss of either the Fuel Clad or RCS barrier may result in the relocation of radioactive materials or degradation of core cooling capability. Note that the loss or potential loss of Containment barrier in combination with loss or potential loss of either Fuel Clad or RCS barrier results in declaration of a Site Area Emergency under EAL FS1.1.

Reference(s):

1. NEI 99-01 FA1

Category: F – Fission Product Barrier Degradation

Subcategory: N/A

Initiating Condition: Loss or potential loss of **any** two barriers

EAL:

FS1.1 Site Area Emergency
Loss or potential loss of **any** two barriers (Table 1[2]F-1)

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

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

Basis:

Fuel Clad, RCS and Containment comprise the fission product barriers. Table 1[2]F-1 lists the fission product barrier thresholds, bases and references.

At the Site Area Emergency classification level, each barrier is weighted equally. A Site Area Emergency is therefore appropriate for any combination of the following conditions:

- One barrier loss and a second barrier loss (i.e., loss - loss)
- One barrier loss and a second barrier potential loss (i.e., loss - potential loss)
- One barrier potential loss and a second barrier potential loss (i.e., potential loss - potential loss)

At the Site Area Emergency classification level, the ability to dynamically assess the proximity of present conditions with respect to the threshold for a General Emergency is important. For example, the existence of Fuel Clad and RCS Barrier loss thresholds in addition to offsite dose assessments would require continual assessments of radioactive inventory and Containment integrity in anticipation of reaching a General Emergency classification. Alternatively, if both Fuel Clad and RCS potential loss thresholds existed, the Emergency Director would have greater assurance that escalation to a General Emergency is less IMMINENT.

Reference(s):

1. NEI 99-01 FS1

Category: F – Fission Product Barrier Degradation

Subcategory: N/A

Initiating Condition: Loss of **any** two barriers and loss or potential loss of third barrier

EAL:

FG1.1 General Emergency
Loss of **any** two barriers
AND
Loss or potential loss of the third barrier (Table 1[2]F-1)

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

Fuel Clad, RCS and Containment comprise the fission product barriers. Table 1[2]F-1 lists the fission product barrier thresholds, bases and references.

At the General Emergency classification level each barrier is weighted equally. A General Emergency is therefore appropriate for any combination of the following conditions:

- Loss of Fuel Clad, RCS and Containment Barriers
- Loss of Fuel Clad and RCS Barriers with potential loss of Containment Barrier
- Loss of RCS and Containment Barriers with potential loss of Fuel Clad Barrier
- Loss of Fuel Clad and Containment Barriers with potential loss of RCS Barrier

Reference(s):

1. NEI 99-01 FG1

Table 1[2]F-1 Fission Product Barrier Threshold Matrix & Bases

Table 1[2]F-1 lists the threshold conditions that define the Loss and Potential Loss of the three fission product barriers (Fuel Clad, Reactor Coolant System, and Containment). The table is structured so that each of the three barriers occupies adjacent columns. Each fission product barrier column is further divided into two columns; one for Loss thresholds and one for Potential Loss thresholds.

The first column of the table (to the left of the Fuel Clad Loss column) lists the categories (types) of fission product barrier thresholds. The fission product barrier categories are:

A. RCS or S/G Tube Leakage
B. Inadequate Heat removal
C. Containment Radiation / RCS Activity
D. Containment Integrity or Bypass
E. Emergency Director Judgment

Each category occupies a row in Table 1[2]F-1 thus forming a matrix defined by the categories. The intersection of each row with each Loss/Potential Loss column forms a cell in which one or more fission product barrier thresholds appear. If NEI 99-01 does not define a threshold for a barrier Loss/Potential Loss, the word "None" is entered in the cell.

Thresholds are assigned sequential numbers within each barrier column beginning with number one (ex., FCB1, FCB2…FCB9).

If a cell in Table 1[2]F-1 contains more than one numbered threshold, each of the numbered thresholds, if exceeded, signifies a Loss or Potential Loss of the barrier. It is not necessary to exceed all of the thresholds in a category before declaring a barrier Loss/Potential Loss.

Subdivision of Table 1[2]F-1 by category facilitates association of plant conditions to the applicable fission product barrier Loss and Potential Loss thresholds. This structure promotes a systematic approach to assessing the classification status of the fission product barriers.

When equipped with knowledge of plant conditions related to the fission product barriers, the EAL-user first scans down the category column of Table 1[2]F-1, locates the likely category and then reads across the fission product barrier Loss and Potential Loss thresholds in that category to determine if a threshold has been exceeded. If a threshold has not been exceeded, the EAL-user proceeds to the next likely category and continues review of the thresholds in the new category.

If the EAL-user determines that any threshold has been exceeded, by definition, the barrier is lost or potentially lost – even if multiple thresholds in the same barrier column are exceeded, only that one barrier is lost or potentially lost. The EAL-user must examine each of the three fission product barriers to determine if other barrier thresholds in the category are lost or potentially lost. For example, if containment radiation is sufficiently high, a Loss of the Fuel

Clad and RCS Barriers and a Potential Loss of the Containment Barrier can occur. Barrier Losses and Potential Losses are then applied to the algorithms given in EALs FG1.1, FS1.1, and FA1.1 to determine the appropriate emergency classification.

In the remainder of this Attachment, the Fuel Clad Barrier threshold bases appear first, followed by the RCS Barrier and finally the Containment Barrier threshold bases. In each barrier, the bases are given according category Loss followed by category Potential Loss beginning with Category A, then B,…, E.

Attachment 1 – Emergency Action Level Technical Bases

Table 1[2]F-1 Fission Product Barrier Threshold Matrix						
	Fuel Clad Barrier (FCB)		Reactor Coolant System Barrier (RCB)		Containment Barrier (CNB)	
Category	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**
A **RCS or S/G Tube Leakage**	None	FCB1 RVLMS Levels 1 through 9 [1 through 7] indicate DRY	RCB1 An automatic or manual ESAS [ESFAS] actuation required by EITHER: • UNISOLABLE RCS leakage • S/G tube RUPTURE	RCB2 • UNISOLABLE RCS leakage or S/G tube leakage > 50[44] gpm excluding normal reductions in RCS inventory (e.g., letdown, RCP seal leakoff) RCB3 Unit 1: PTS limits apply (RT14) **AND** RCS pressure and temperature are left of the NDTT/LTOP limit lines on EOP Figure 3 (Note 12) Unit 2: Uncontrolled RCS cooldown (> 50 °F step change or > 100 °F change in less than a one-hour period) **AND** RCS pressure and temperature are to the left of line B (200 degrees MTS), Standard Attachment 1, P-T Limits (Note 12)	CNB1 A S/G that is leaking > 50[44] gpm (excluding normal reductions in RCS inventory) or that is RUPTURED is also FAULTED outside of containment	None
B **Inadequate Heat Removal**	FCB2 CETs > 1200°F	FCB3 CETs > 700°F FCB4 RCS heat removal **cannot** be established using steam generators **AND** An on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling	None	RCB4 RCS heat removal **cannot** be established using steam generators **AND** An on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling	None	CNB2 CETs > 1200°F **AND** Restoration procedures **not** effective within 15 min. (Note 1)
C **CTMT Radiation / RCS Activity**	FCB5 Containment High Range Radiation Monitor RE-8060/8061 [2RE-8925-1/ 8925-2] > 750 [700] R/hr FCB6 Coolant activity > 300 µCi/gm dose equivalent I-131	None	RCB5 Containment High Range Radiation Monitor RE-8060/8061 [2RE-8925-1/8925-2] > 40 [50] R/hr	None	None	CNB3 Containment High Range Radiation Monitor RE-8060/8061 [2RE-8925-1/8925-2] > 10,000 [12,000] R/hr

Table 1[2]F-1 Fission Product Barrier Threshold Matrix

	Fuel Clad Barrier (FCB)		Reactor Coolant System Barrier (RCB)		Containment Barrier (CNB)	
Category	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**
D **CTMT Integrity or Bypass**	None	None	None	None	CNB4 Containment isolation is required **AND EITHER:** • Containment integrity has been lost based on Emergency Director judgment • UNISOLABLE pathway from Containment to the environment exists CNB5 Indications of RCS leakage outside of Containment	CNB6 Containment pressure > 73.7 psia CNB7 Containment hydrogen concentration > 4% CNB8 Containment pressure > 44.7 psia [23.3 psia] with < one full train of containment heat removal systems (Note 9) operating per design for ≥ 15 min. (Note 1)
E **Emergency Director Judgment**	FCB7 **Any** condition in the opinion of the Emergency Director that indicates loss of the Fuel Clad barrier	FCB8 **Any** condition in the opinion of the Emergency Director that indicates potential loss of the Fuel Clad barrier	RCB6 **Any** condition in the opinion of the Emergency Director that indicates loss of the RCS barrier	RCB7 **Any** condition in the opinion of the Emergency Director that indicates potential loss of the RCS barrier	CNB9 **Any** condition in the opinion of the Emergency Director that indicates loss of the Containment barrier	CNB10 **Any** condition in the opinion of the Emergency Director that indicates potential loss of the Containment barrier

Barrier: Fuel Clad

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Loss

Threshold:

None

Barrier: Fuel Clad

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Potential Loss

Threshold:

FCB1
RVLMS Levels 1 through 9 [1 through 7] indicate DRY

Definition(s):

None

Basis:

This reading indicates a reduction in reactor vessel water level sufficient to allow the onset of heat-induced cladding damage.

There is no Fuel Clad Barrier Loss threshold associated with RCS or S/G Tube Leakage.

Reference(s):

1. ULD-1-SYS-24 Unit 1 Inadequate Core Cooling System
2. Calculation 84-EQ-0080-02 Loop Error Analysis for Reactor Vessel Level Monitoring System
3. ULD-2-SYS-24 Unit 2 Inadequate Core Cooling Monitoring System
4. Calculation 90-E-0116-01 Unit 2 EOP Setpoint Document, Setpoint R.3
5. NEI 99-01 RCS or SG Tube Leakage Potential Loss 1.A

Barrier: Fuel Clad

Category: B – Inadequate Heat Removal

Degradation Threat: Loss

Threshold:

FCB2
CETs > 1200 °F

Definition(s):

None

Basis:

This reading indicates temperatures within the core are sufficient to cause significant superheating of reactor coolant.

Reference(s):

1. NEI 99-01 Inadequate Heat Removal Loss 2.A

Barrier: Fuel Clad

Category: B – Inadequate Heat Removal

Degradation Threat: Potential Loss

Threshold:

FCB3
CETs > 700 °F

Definition(s):

None

Basis:

This reading indicates a reduction in reactor vessel water level sufficient to allow the onset of heat-induced cladding damage.

Reference(s):

1. NEI 99-01 Inadequate Heat Removal Potential Loss 2.A

Barrier: Fuel Clad

Category: B – Inadequate Heat Removal

Degradation Threat: Potential Loss

Threshold:

FCB4

RCS heat removal **cannot** be established using steam generators

AND

An on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling

Definition(s):

None

Basis:

This condition indicates an extreme challenge to the ability to remove RCS heat using the steam generators (i.e., loss of an effective secondary-side heat sink). This condition represents a potential loss of the Fuel Clad Barrier. In accordance with EOPs, there may be unusual accident conditions during which operators intentionally reduce the heat removal capability of the steam generators; during these conditions, classification using this threshold is not warranted.

In combination with Potential Loss RCB4, meeting this threshold results in a Site Area Emergency.

Reference(s):

1. OP-1202.004 Overheating
2. OP-1202.013 Figure 4, Core Exit Thermocouple for Inadequate Core Cooling
3. OP-2202.006 Loss of Feedwater
4. OP-2202.009 Functional Recovery, Safety Function Status Check 5
5. NEI 99-01 Inadequate Heat Removal Potential Loss 2.B

Barrier: Fuel Clad

Category: C – CTMT Radiation / RCS Activity

Degradation Threat: Loss

Threshold:

FCB5 Containment High Range Radiation Monitor RE-8060/8061 [2RE-8925-1/8925-2] > 750 [700] R/hr

Definition(s):

None

Basis:

The containment radiation monitor reading (768[682] R/hr rounded to 750[700] R/hr for readability) corresponds to an instantaneous release of all reactor coolant mass into the containment, assuming that reactor coolant activity equals 300 μCi/gm dose equivalent I-131. Reactor coolant activity above this level is greater than that expected for iodine spikes and corresponds to 51.49[1.13]~~an approximate range of 2% to 3~~% fuel clad damage. Since this condition indicates that a significant amount of fuel clad damage has occurred, it represents a loss of the Fuel Clad Barrier.

The radiation monitor reading in this threshold is higher than that specified for RCS Barrier Loss threshold ~~C.1~~RCB5 since it indicates a loss of both the Fuel Clad Barrier and the RCS Barrier. Note that a combination of the two monitor readings appropriately escalates the ECL to a Site Area Emergency.

There is no Potential Loss threshold associated with CTMT Radiation/RCS Activity ~~/Containment Radiation~~.

~~Basis~~ Reference(s):

1. EP-CALC-ANO-1702 Containment High Range Radiation Monitor EAL Values
2. NEI 99-01 RCS Activity/Containment Radiation FC Loss 3.A

Barrier: Fuel Clad

Category: C – CTMT Radiation / RCS Activity

Degradation Threat: Loss

Threshold:

FCB6
Coolant activity > 300 µCi/gm dose equivalent I-131

Definition(s):

None

Basis:

This threshold indicates that RCS radioactivity concentration is greater than 300 µCi/gm dose equivalent I-131. Reactor coolant activity above this level is greater than that expected for iodine spikes and corresponds to an approximate range of 2% to 5% fuel clad damage. Since this condition indicates that a significant amount of fuel clad damage has occurred, it represents a loss of the Fuel Clad Barrier.

It is recognized that sample collection and analysis of reactor coolant with highly elevated activity levels could require several hours to complete. Nonetheless, a sample-related threshold is included as a backup to other indications.

There is no Potential Loss threshold associated with CTMT Radiation/RCS Activity ~~/Containment Radiation~~.

Reference(s):

1. NEI 99-01 RCS Activity/Containment Radiation Fuel Clad Loss 3.B

Barrier: Fuel Clad

Category: C – CTMT Radiation / RCS Activity

Degradation Threat: Potential Loss

Threshold:

None

Barrier: Fuel Clad

Category: D – CTMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

None

Barrier: Fuel Clad

Category: D – CTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

None

Barrier: Fuel Clad

Category: E – Emergency Director Judgment

Degradation Threat: Loss

Threshold:

FCB7
Any condition in the opinion of the Emergency Director that indicates loss of the Fuel Clad barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that are to be used by the Emergency Director in determining whether the Fuel Clad barrier is lost.

Reference(s):

1. NEI 99-01 Emergency Director Judgment Fuel Clad Loss 6.A

Barrier: Fuel Clad

Category: E – Emergency Director Judgment

Degradation Threat: Potential Loss

Threshold:

FCB8
Any condition in the opinion of the Emergency Director that indicates potential loss of the Fuel Clad barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that are to be used by the Emergency Director in determining whether the Fuel Clad barrier is potentially lost. The Emergency Director should also consider whether or not to declare the barrier potentially lost in the event that barrier status cannot be monitored.

Reference(s):

1. NEI 99-01 Emergency Director Judgment Potential Fuel Clad Loss 6.A

Barrier: Reactor Coolant System

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Loss

Threshold:

RCB1

An automatic or manual ESAS [ESFAS] actuation required by **EITHER:**

- UNISOLABLE RCS leakage
- S/G tube RUPTURE

Definition(s):

FAULTED - The term applied to a steam generator that has a steam leak on the secondary side of sufficient size to cause an uncontrolled drop in steam generator pressure or the steam generator to become completely depressurized.

RUPTURED - The condition of a steam generator in which primary-to-secondary leakage is of sufficient magnitude to require a safety injection (automatic or manual).

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

Basis:

Failure to isolate the leak (from the Control Room or locally), within 15 minutes or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification.

This threshold is based on an UNISOLABLE RCS leak of sufficient size to require an automatic or manual actuation of the Emergency Core Cooling System (ECCS). This condition clearly represents a loss of the RCS Barrier.

This threshold is applicable to unidentified and pressure boundary leakage, as well as identified leakage. It is also applicable to UNISOLABLE RCS leakage through an interfacing system. The mass loss may be into any location – inside containment, to the secondary-side (i.e., steam generator tube leakage) or outside of containment.

A steam generator with primary-to-secondary leakage of sufficient magnitude to require a safety injection is considered to be RUPTURED. If a RUPTURED steam generator is also FAULTED outside of containment, the declaration escalates to a Site Area Emergency since the Containment Barrier Loss threshold ~~1.A~~CNB1 will also be met.

Reference(s):

1. OP-1202.010 ESAS
2. OP-2202.003 Loss of Coolant Accident
3. NEI 99-01 RCS or SG Tube Leakage Reactor Coolant System Loss 1.A

Barrier: Reactor Coolant System

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Potential Loss

Threshold:

RCB2 UNISOLABLE RCS leakage or S/G tube leakage > 50[44] gpm excluding normal reductions in RCS inventory (e.g., letdown, RCP seal leakoff)

Definition(s):

FAULTED - The term applied to a steam generator that has a steam leak on the secondary side of sufficient size to cause an uncontrolled drop in steam generator pressure or the steam generator to become completely depressurized.

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

Basis:

Failure to isolate the leak (from the Control Room or locally), within 15 minutes or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification.

This threshold is based on an UNISOLABLE RCS leak that results in the inability to maintain pressurizer level within specified limits by operation of a normally used makeup [charging] ~~(makeup)~~ pump, but an ~~ECCS (SI)~~ESAS [ESFAS] actuation has not occurred. ~~The threshold is met when letdown has been isolated and an operating procedure, or operating crew supervision, directs that a standby charging (makeup)makeup [charging] pump be placed in service to restore and maintain pressurizer level.~~

This threshold is applicable to unidentified and pressure boundary leakage, as well as identified leakage. It is also applicable to UNISOLABLE RCS leakage through an interfacing system. The mass loss may be into any location – inside containment, to the secondary-side (i.e., steam generator tube leakage) or outside of containment.

If a leaking steam generator is also FAULTED outside of containment, the declaration escalates to a Site Area Emergency since the Containment Barrier Loss threshold ~~1.A~~CNB1 will also be met.

Reference(s):

1. 1SAR 9.1 Makeup and Purification System
2. 2SAR 9.3.4 Chemical and Volume Control System
3. NEI 99-01 RCS or SG Tube Leakage Reactor Coolant System Potential Loss 1.A

Barrier: Reactor Coolant System

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Potential Loss

Threshold:

RCB3

Unit 1:

PTS limits apply (RT14)

AND

RCS pressure and temperature are left of the NDTT/LTOP limit lines, on EOP Figure 3 (Note 12)

Unit 2:

Uncontrolled RCS cooldown (> 50 °F step change or > 100 °F change in less than a one-hour period)

AND

RCS pressure and temperature are to the left of line B (200 degrees MTS), Standard Attachment 1, P-T Limits (Note 12)

Note 12: Once PTS limits are first invoked, if RCS temperature and pressure are not brought within the limits within 15 minutes, this threshold is met and an immediate declaration is warranted. This threshold is met immediately upon exceeding the limits after this initial 15 minute period until PTS limits no longer apply.

Definition(s):

None

Basis:

This condition indicates an extreme challenge to the integrity of the RCS pressure boundary due to pressurized thermal shock – a transient that causes rapid RCS cooldown while the RCS is in Mode 3 or higher (i.e., hot and pressurized).

Reference(s):

1. OP-1202.012 Repetitive Task 14 Control RCS Pressure
2. OP-1202.013 EOP Figures, Figure 3 RCS Pressure vs Temperature Limits
3. OP-1202.011 HPI Cooldown
4. Calculation No: 90-E-0116-01 ANO- EOP Setpoint Basis Document OP Setpoint P.2, RCS Pressure-Temperature
5. OP-2202.010 Standard Attachments, Attachment 1, P-T Limits
6. NEI 99-01 RCS or SG Tube Leakage Reactor Coolant System Potential Loss 1.B

Barrier: Reactor Coolant System

Category: B – Inadequate Heat Removal

Degradation Threat: Loss

Threshold:

None

Barrier: Reactor Coolant System

Category: B – Inadequate Heat Removal

Degradation Threat: Potential Loss

Threshold:

RCB4
RCS heat removal **cannot** be established using steam generators
AND
An on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling

Definition(s):

None

Basis:

This condition indicates an extreme challenge to the ability to remove RCS heat using the steam generators (i.e., loss of an effective secondary-side heat sink). This condition represents a potential loss of the RCS Barrier. In accordance with EOPs, there may be unusual accident conditions during which operators intentionally reduce the heat removal capability of the steam generators; during these conditions, classification using this threshold is not warranted.

In combination with Potential Loss FCB4, meeting this threshold results in a Site Area Emergency.

~~Meeting this threshold results in a Site Area Emergency because this threshold is identical to Fuel Clad Barrier Potential Loss threshold 2.B~~FCB4~~; both will be met.~~ This condition warrants a Site Area Emergency declaration because inadequate RCS heat removal may result in fuel heat-up sufficient to damage the cladding and ~~increase~~raise RCS pressure to the point where mass will be lost from the system.

There is no RCS barrier Loss threshold associated with Inadequate Heat Removal.

Reference(s):

1. OP-1202.004 Overheating
2. OP-1202.013 Figure 4, Core Exit Thermocouple for Inadequate Core Cooling
3. OP-2202.006 Loss of Feedwater
4. OP-2202.009 Functional Recovery, Safety Function Status Check 5
5. NEI 99-01 Inadequate Heat Removal RCS Potential Loss 2.B

Barrier: Reactor Coolant System

Category: C – CTMT Radiation/ RCS Activity

Degradation Threat: Loss

Threshold:

RCB5
Containment High Range Radiation Monitor RE-8060/8061 [2RE-8925-1/8925-2] > 40 [50] R/hr

Definition(s):

None

Basis:

NRC Information Notice 97-045, Supplement 1, identifies the potential for erratic indications from the high range radiation monitors (HRRMs) as a result of thermally induced currents (TIC) which may cause the HRRM to read falsely high (for approximately 15 minutes) on a rapid temperature rise, and fail low intermittently on a rapid temperature fall. Because of this phenomenon, any trends or alarms on the HRRM's should be validated by comparison to the containment low range/area radiation monitors and Air Monitoring Systems trends before actions are taken.

The containment radiation monitor reading (42.8[50.4] R/hr rounded to 40[50] R/hr for readability) corresponds to an instantaneous release of all reactor coolant mass into the containment, assuming that reactor coolant activity equals Technical Specification allowable limits. This value is lower than that specified for Fuel Clad Barrier Loss threshold ~~3.A~~FCB5 since it indicates a loss of the RCS Barrier only.

There is no Potential Loss threshold associated with ~~RCS Activity / Containment~~CTMT Radiation/RCS Activity.

Reference(s):

1. EP-CALC-ANO-1702 Containment High Range Radiation Monitor EAL Values
2. NEI 99-01 CMT Radiation / RCS Activity RCS Loss 3.A

Barrier: Reactor Coolant System

Category: B – CTMT Radiation/ RCS Activity

Degradation Threat: Potential Loss

Threshold:

None

Barrier: Reactor Coolant System

Category: D – CTMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

None

Barrier: Reactor Coolant System

Category: D – CTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

None

Barrier: Reactor Coolant System

Category: E – Emergency Director Judgment

Degradation Threat: Loss

Threshold:

RCB6
Any condition in the opinion of the Emergency Director that indicates loss of the RCS barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the RCS Barrier is lost.

Reference(s):

1. NEI 99-01 Emergency Director Judgment RCS Loss 6.A

Barrier: Reactor Coolant System

Category: E – Emergency Director Judgment

Degradation Threat: Potential Loss

Threshold:

RCB7
Any condition in the opinion of the Emergency Director that indicates potential loss of the RCS barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the RCS Barrier is potentially lost. The Emergency Director should also consider whether or not to declare the barrier potentially lost in the event that barrier status cannot be monitored.

Reference(s):

1. NEI 99-01 Emergency Director Judgment RCS Potential Loss 6.A

Barrier: Containment

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Loss

Threshold:

CNB1
A S/G that is leaking > 50[44] gpm (excluding normal reductions in RCS inventory) or that is RUPTURED ~~S/G~~ is also FAULTED outside of containment

Definition(s):

FAULTED - The term applied to a steam generator that has a steam leak on the secondary side of sufficient size to cause an uncontrolled drop in steam generator pressure or the steam generator to become completely depressurized.

RUPTURED - The condition of a steam generator in which primary-to-secondary leakage is of sufficient magnitude to require a safety injection (automatic or manual).

Basis:

This threshold addresses a leaking or RUPTURED Steam Generator (SG) that is also FAULTED outside of containment. The condition of the SG, whether leaking or RUPTURED, is determined in accordance with the thresholds for RCS Barrier Potential Loss ~~1.A~~ RCB2 and Loss ~~1.A~~RCB1, respectively. This condition represents a bypass of the containment barrier.

FAULTED is a defined term within the NEI 99-01 methodology; this determination is not necessarily dependent upon entry into, or diagnostic steps within, an EOP. For example, if the pressure in a steam generator is droppe~~ecreas~~ing uncontrollably (~~[~~part of the FAULTED definition)~~]~~ and the FAULTED steam generator isolation procedure is not entered because EOP user rules are dictating implementation of another procedure to address a higher priority condition, the steam generator is still considered FAULTED for emergency classification purposes.

The FAULTED criterion establishes an appropriate lower bound on the size of a steam release that may require an emergency classification. Steam releases of this size are readily observable with normal Control Room indications. The lower bound for this aspect of the containment barrier is analogous to the lower bound criteria specified in IC SU4 for the fuel clad barrier (i.e., RCS activity values) and IC SU5 for the RCS barrier (i.e., RCS leak rate values).

This threshold also applies to prolonged steam releases necessitated by operational considerations such as the forced steaming of a leaking or RUPTURED steam generator directly to atmosphere to cooldown the plant~~, or to drive an auxiliary (emergency) feed water pump~~. These types of conditions will result in a significant and sustained release of radioactive

steam to the environment (and are thus similar to a FAULTED condition). The inability to isolate the steam flow without an adverse effect on plant cooldown meets the intent of a loss of containment.

Steam releases associated with the expected operation of a SG power operated relief valve or safety relief valve do not meet the intent of this threshold. Such releases may occur intermittently for a short period of time following a reactor trip as operators process through emergency operating procedures to bring the plant to a stable condition and prepare to initiate a plant cooldown. Steam releases associated with the unexpected operation of a valve (e.g., a stuck-open safety valve) do meet this threshold.

Following a~~n~~ SG tube leak or rupture, there may be minor radiological releases through a secondary-side system component (e.g., air ejectors, glad seal exhausters, valve packing, etc.). These types of releases do not constitute a loss or potential loss of containment but should be evaluated using the Recognition Category A ICs.

The ~~emergency classification level~~ECLs resulting from primary-to-secondary leakage, with or without a steam release from the FAULTED SG, are summarized below.

	Affected SG is FAULTED Outside of Containment?	
P-to-S Leak Rate	**Yes**	**No**
Less than or equal to 25 gpm	No classification	No classification
Greater than 25 gpm	Unusual Event per ~~SU4~~SU5.1	Unusual Event per ~~SU4~~SU5.1
Greater than 50[44] gpm (*RCS Barrier Potential Loss*)	Site Area Emergency per FS1.1	Alert per FA1.1
Requires an automatic or manual ESAS [ESFAS]~~ECCS (SIAS)~~ actuation (*RCS Barrier Loss*)	Site Area Emergency per FS1.1	Alert per FA1.1

There is no Potential Loss threshold associated with RCS or S/G Tube Leakage.

Reference(s):

1. NEI 99-01 RCS or SG Tube Leakage Containment Loss 1.A

Barrier: Containment

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Potential Loss

Threshold:

None

Barrier: Containment

Category: B – Inadequate Heat Removal

Degradation Threat: Loss

Threshold:

None

Barrier: Containment

Category: B – Inadequate Heat Removal

Degradation Threat: Potential Loss

Threshold:

CNB2
CETs > 1200°F
AND
Restoration procedures **not** effective within 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Definition(s):

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

Basis:

The restoration procedure is considered "effective" if core exit thermocouple readings are dropp~~decreas~~ing and/or if reactor vessel level is ris~~increas~~ing. Whether or not the procedure(s) will be effective should be apparent within 15 minutes. The Emergency Director should escalate the emergency classification level as soon as it is determined that the procedure(s) will not be effective.

This condition represents an IMMINENT core melt sequence which, if not corrected, could lead to vessel failure and an increased potential for containment failure. For this condition to occur, there must already have been a loss of the RCS Barrier and the Fuel Clad Barrier. If implementation of a procedure(s) to restore adequate core cooling is not effective (successful) within 15 minutes, it is assumed that the event trajectory will likely lead to core melting and a subsequent challenge of the Containment Barrier.

Severe accident analyses (e.g., NUREG-1150) have concluded that function restoration procedures can arrest core degradation in a significant fraction of core damage scenarios, and that the likelihood of containment failure is very small in these events. Given this, it is appropriate to provide 15 minutes beyond the required entry point to determine if procedural actions can reverse the core melt sequence.

Reference(s):

1. NEI 99-01 Inadequate Heat Removal Containment Potential Loss 2.A

Barrier: Containment

Category: C – CTMT Radiation/RCS Activity

Degradation Threat: Loss

Threshold:

None

Barrier: Containment

Category: C – CTMT Radiation/RCS Activity

Degradation Threat: Potential Loss

Threshold:

CNB3
Containment High Range Radiation Monitor RE-8060/8061 [2RE-8925-1/8925-2] > 10,000 [12,000] R/hr

Definition(s):

None

Basis:

The containment radiation monitor reading (10,300[12,100] R/hr rounded to 10,000[12,000] R/hr for readability) corresponds to an instantaneous release of all reactor coolant mass into the containment, assuming that 20% of the fuel cladding has failed. This level of fuel clad failure is well above that used to determine the analogous Fuel Clad Barrier Loss and RCS Barrier Loss thresholds.

NUREG-1228, Source Estimations During Incident Response to Severe Nuclear Power Plant Accidents, indicates the fuel clad failure must be greater than approximately 20% in order for there to be a major release of radioactivity requiring offsite protective actions. For this condition to exist, there must already have been a loss of the RCS Barrier and the Fuel Clad Barrier. It is therefore prudent to treat this condition as a potential loss of containment which would then escalate the ~~emergency classification level~~ECL to a General Emergency.

There is no Loss threshold associated with ~~RCS Activity/Containment~~CTMT Radiation/RCS Activity.

Reference(s):

1. EP-CALC-ANO-1702 Containment High Range Radiation Monitor EAL Values
2. NEI 99-01 CTMT Radiation / RCS Activity Containment Potential Loss 3.A

Barrier: Containment

Category: D – CTMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

CNB4
Containment isolation is required
AND EITHER:
• Containment integrity has been lost based on Emergency Director judgment
• UNISOLABLE pathway from Containment to the environment exists

Definition(s):

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

Basis:

Failure to isolate the leak (from the Control Room or locally), within 15 minutes or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification.

The status of the containment barrier during an event involving steam generator tube leakage is assessed using Loss Threshold ~~1.A~~CNB1.

These thresholds address a situation where containment isolation is required and one of two conditions exists as discussed below. Users are reminded that there may be accident and release conditions that simultaneously meet both bulleted thresholds ~~4.A.1 and 4.A.2~~.

~~4.A.1~~First Threshold – Containment integrity has been lost, i.e., the actual containment atmospheric leak rate likely exceeds that associated with allowable leakage (or sometimes referred to as design leakage). Following the release of RCS mass into containment, containment pressure will fluctuate based on a variety of factors; a loss of containment integrity condition may (or may not) be accompanied by a noticeable drop in containment pressure. Recognizing the inherent difficulties in determining a containment leak rate during accident conditions, it is expected that the Emergency Director will assess this threshold using judgment, and with due consideration given to current plant conditions, and available operational and radiological data (e.g., containment pressure, readings on radiation monitors outside containment, operating status of containment pressure control equipment, etc.).

Refer to the middle piping run of Figure ~~9-F-4~~1. Two simplified examples are provided. One is leakage from a penetration and the other is leakage from an in-service system valve. Depending upon radiation monitor locations and sensitivities, the leakage could be detected by any of the four monitors depicted in the figure.

Another example would be a loss or potential loss of the RCS barrier, and the simultaneous occurrence of two FAULTED locations on a steam generator where one fault is located inside containment (e.g., on a steam or feedwater line) and the other outside of containment. In this case, the associated steam line provides a pathway for the containment atmosphere to escape to an area outside the containment.

Following the leakage of RCS mass into containment and a rise in containment pressure, there may be minor radiological releases associated with allowable (design) containment leakage through various penetrations or system components. These releases do not constitute a loss or potential loss of containment but should be evaluated using the Recognition Category A ICs.

~~4.A.2~~Second Threshold – Conditions are such that there is an UNISOLABLE pathway for the migration of radioactive material from the containment atmosphere to the environment. As used here, the term “environment” includes the atmosphere of a room or area, outside the containment, that may, in turn, communicate with the outside-the-plant atmosphere (e.g., through discharge of a ventilation system or atmospheric leakage). Depending upon a variety of factors, this condition may or may not be accompanied by a noticeable drop in containment pressure.

Refer to the top piping run of Figure ~~9-F-4~~1. In this simplified example, the inboard and outboard isolation valves remained open after a containment isolation was required (i.e., containment isolation was not successful). There is now an UNISOLABLE pathway from the containment to the environment.

The existence of a filter is not considered in the threshold assessment. Filters do not remove fission product noble gases. In addition, a filter could become ineffective due to iodine and/or particulate loading beyond design limits (i.e., retention ability has been exceeded) or water saturation from steam/high humidity in the release stream.

Leakage between two interfacing liquid systems, by itself, does not meet this threshold.

Refer to the bottom piping run of Figure ~~9-F-4~~1. In this simplified example, leakage in an RCP seal cooler is allowing radioactive material to enter the Auxiliary Building. The radioactivity would be detected by the Process Monitor. If there is no leakage from the closed water cooling system to the Auxiliary Building, then no threshold has been met. If the pump developed a leak that allowed steam/water to enter the Auxiliary Building, then second threshold ~~4.B~~ would be met. Depending upon radiation monitor locations and sensitivities, this leakage could be detected by any of the four monitors depicted in the figure and cause the first threshold ~~4.A.1~~ to be met as well.

Following the leakage of RCS mass into containment and a rise in containment pressure, there may be minor radiological releases associated with allowable containment leakage through various penetrations or system components. Minor releases may also occur if a containment isolation valve(s) fails to close but the containment atmosphere escapes to an enclosed system. These releases do not constitute a loss or potential loss of containment but should be evaluated using the Recognition Category A ICs.

Reference(s):

1. NEI 99-01 CTMT Integrity or Bypass Containment Loss 4.A

Barrier: Containment

Category: D – CTMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

CNB5
Indications of RCS leakage outside of Containment

Definition(s):

None

Basis:

To ensure proper escalation of the emergency classification, the RCS leakage outside of containment must be related to the mass loss that is causing the RCS Loss RCB1 and/or Potential Loss RCB2 threshold ~~1.A~~ to be met.

The status of the containment barrier during an event involving steam generator tube leakage is assessed using Containment Loss Threshold CNB1.

Containment sump, temperature, pressure and/or radiation levels will ri~~increa~~se if reactor coolant mass is leaking into the containment. If these parameters have not risen~~increased~~, then the reactor coolant mass may be leaking outside of containment (i.e., a containment bypass sequence). Ri~~Increa~~ses in sump, temperature, pressure, flow and/or radiation level readings outside of the containment may indicate that the RCS mass is being lost outside of containment.

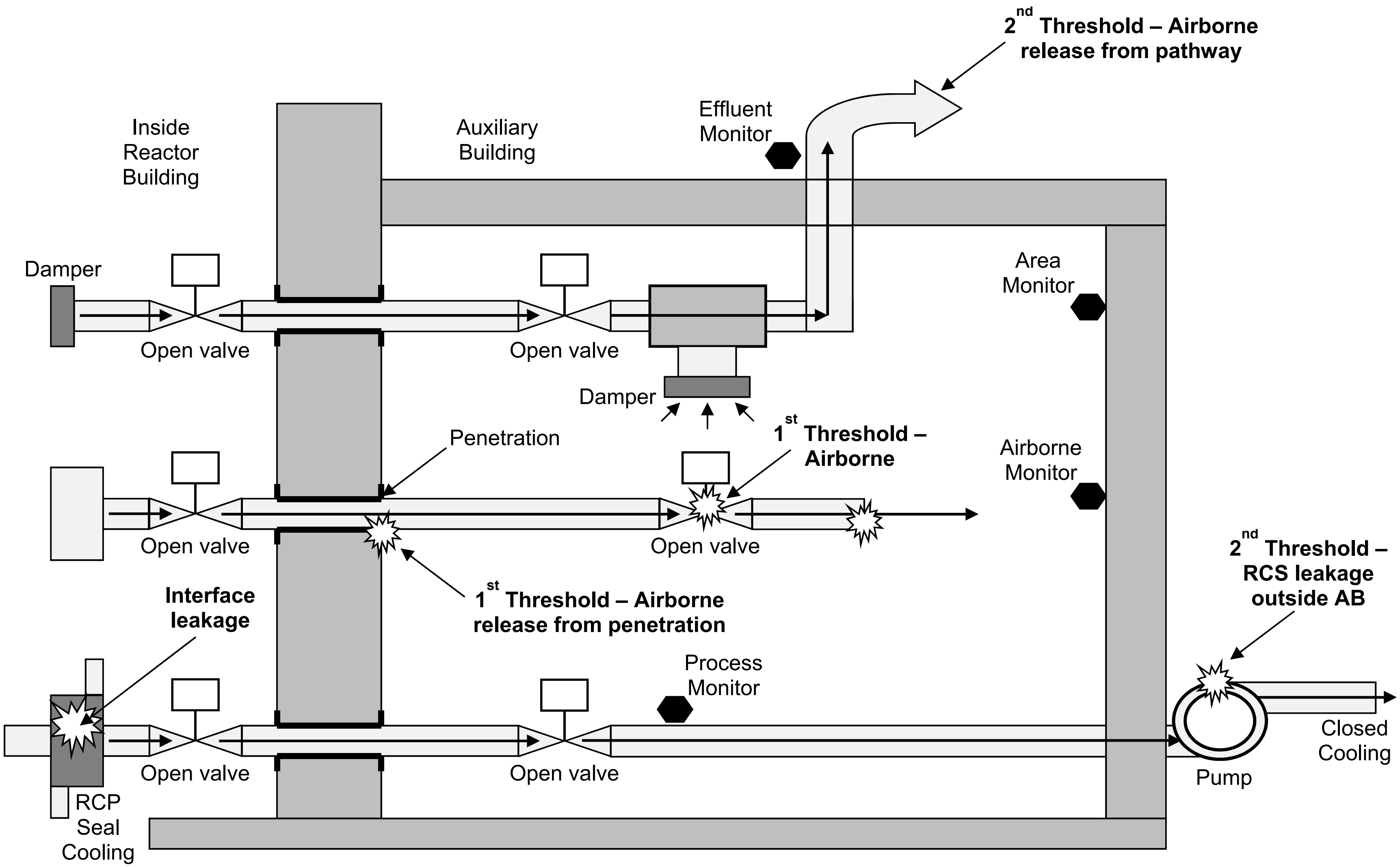
Unexpected elevated readings and alarms on radiation monitors with detectors outside containment should be corroborated with other available indications to confirm that the source is a loss of RCS mass outside of containment. If the fuel clad barrier has not been lost, radiation monitor readings outside of containment may not ri~~increa~~se significantly; however, other unexpected changes in sump levels, area temperatures or pressures, flow rates, etc. should be sufficient to determine if RCS mass is being lost outside of the containment.

Refer to the middle piping run of Figure ~~9-F-4~~1. In this simplified example, a leak has occurred at a reducer on a pipe carrying reactor coolant in the Auxiliary Building. Depending upon radiation monitor locations and sensitivities, the leakage could be detected by any of the four monitors depicted in the figure and cause threshold CNB4 to be met as well.

Reference(s):

1. NEI 99-01 CTMT Integrity or Bypass Containment Loss 4.B

Figure 1: Containment Integrity or Bypass Examples



Barrier: Containment

Category: D – CTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

CNB6
Containment pressure > 73.7 psia

Definition(s):

None

Basis:

If containment pressure exceeds the design pressure, there exists a potential to lose the Containment Barrier. To reach this level, there must be an inadequate core cooling condition for an extended period of time; therefore, the RCS and Fuel Clad barriers would already be lost. Thus, this threshold is a discriminator between a Site Area Emergency and General Emergency since there is now a potential to lose the third barrier.

Reference(s):

1. 1SAR 1.4.43 Criterion 50 - Containment Design Basis
2. 2SAR Table 6.2-7 Principle Containment Design Parameters
3. NEI 99-01 CTMT Integrity or Bypass Containment Potential Loss 4.A

Barrier: Containment

Category: D – CTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

CNB7
Containment hydrogen concentration > 4%

Definition(s):

None

Basis:

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). The 4% hydrogen concentration is generally considered the lower limit for hydrogen deflagrations. 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 potential loss of the Containment Barrier.

Reference(s):

1. Unit 1 SAMG Figure III-1B
2. Unit 2 SAMG Phase 1 Instructions, Containment Flowchart
3. NEI 99-01 CTMT Integrity or Bypass Containment Potential Loss 4.B

Barrier: Containment

Category: D – CTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

CNB8
Containment pressure > 44.7 psia [23.3 psia] with < one full train of containment heat removal systems (Note 9) operating per design for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 9: One full train of containment heat removal systems consists of one train of RB [Containment] Spray and one train of RB [Containment] Cooling System.

Definition(s):

None

Basis:

This threshold describes a condition where containment pressure is greater than the setpoint at which containment energy (heat) removal systems are designed to automatically actuate, and less than one full train of equipment is capable of operating per design. The 15-minute criterion is included to allow operators time to manually start equipment that may not have automatically started, if possible. This threshold represents a potential loss of containment in that containment heat removal/depressurization systems (e.g., containment sprays~~, ice condenser fans, etc.,~~ but not including containment venting strategies) are either lost or performing in a degraded manner.

Reference(s):

1. 1SAR 6.2 Reactor Building Spray System
2. 1SAR 6.3 Reactor Building Cooling System
3. OP-2202.003 Loss of Coolant Accident
4. OP-2202.010 Standard Attachments, Attachment 22
5. 2SAR 6.2.2 Containment Heat Removal Systems
6. 2SAR 7.3.1.1.11.2 Containment Spray System
7. NEI 99-01 CTMT Integrity or Bypass Containment Potential Loss 4.C

Barrier: Containment

Category: E – Emergency Director Judgment

Degradation Threat: Loss

Threshold:

CNB9
Any condition in the opinion of the Emergency Director that indicates loss of the Containment barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the Containment Barrier is lost.

Reference(s):

1. NEI 99-01 Emergency Director Judgment Containment Loss 6.A

Barrier: Containment

Category: E – Emergency Director Judgment

Degradation Threat: Potential Loss

Threshold:

CNB10
Any condition in the opinion of the Emergency Director that indicates potential loss of the Containment barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the Containment Barrier is potentially lost. The Emergency Director should also consider whether or not to declare the barrier potentially lost in the event that barrier status cannot be monitored.

Reference(s):

1. NEI 99-01 Emergency Director Judgment Containment Potential Loss 6.A

Category H – Hazards and Other Conditions Affecting Plant Safety

EAL Group: ANY (EALs in this category are applicable to any plant condition, hot or cold.)

Hazards are non-plant, system-related events that can directly or indirectly affect plant operation, reactor plant safety or personnel safety.

1. Security

Unauthorized entry attempts into the PROTECTED AREA, bomb threats, sabotage attempts, and actual security compromises threatening loss of physical control of the plant.

2. Seismic Event

Natural events such as earthquakes have potential to cause plant structure or equipment damage of sufficient magnitude to threaten personnel or plant safety.

3. Natural or Technological Hazard

Other natural and non-naturally occurring events that can cause damage to plant facilities include tornados, FLOODING, hazardous material releases and events restricting site access warranting classification.

4. Fire

FIRES can pose significant hazards to personnel and reactor safety. Appropriate for classification are FIRES within the plant PROTECTED AREA or which may affect operability of equipment needed for safe shutdown.

5. Hazardous Gas

Toxic, corrosive, asphyxiant or flammable gas leaks can affect normal plant operations or preclude access to plant areas required to safely shutdown the plant.

6. Control Room Evacuation

Events that are indicative of loss of Control Room habitability. If the Control Room must be evacuated, additional support for monitoring and controlling plant functions is necessary through the emergency response facilities.

7. Emergency Director Judgment

The EALs defined in other categories specify the predetermined symptoms or events that are indicative of emergency or potential emergency conditions and thus warrant classification. While these EALs have been developed to address the full spectrum of possible emergency conditions which may warrant classification and subsequent implementation of the Emergency Plan, a provision for classification of emergencies based on operator/management experience and judgment is still necessary. The EALs of this category provide the Emergency Director the latitude to classify emergency conditions consistent with the established classification criteria based upon Emergency Director judgment.

Category: H – Hazards

Subcategory: 1 – Security

Initiating Condition: Confirmed SECURITY CONDITION or threat

EAL:

HU1.1 Unusual Event
A SECURITY CONDITION that does **not** involve a HOSTILE ACTION as reported by ANO Security Shift Supervision
OR
Notification of a credible security threat directed at the site
OR
A validated notification from the NRC providing information of an aircraft threat

Mode Applicability:

All

Definition(s):

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

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

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

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

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

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

Basis:

This IC addresses events that pose a threat to plant personnel or SAFETY SYSTEM equipment, and thus represent a potential degradation in the level of plant safety. Security events which do not meet one of these EALs are adequately addressed by the requirements of 10 CFR 73.71 or 10 CFR 50.72. Security events assessed as HOSTILE ACTIONS are classifiable under ICs HA1~~,~~ and HS1~~ and HG1~~.

Timely and accurate communications between Security Shift Supervision and the Control Room is essential for proper classification of a security-related event. Classification of these events will initiate appropriate threat-related notifications to plant personnel and Offsite Response Organizations.

Security plans and terminology are based on the guidance provided by NEI 03-12, *Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan [and Independent Spent Fuel Storage Installation Security Program]*.

The first threshold ~~EAL #1~~ references the Security Shift Supervision ~~(site-specific security shift supervision)~~because these are the individuals trained to confirm that a security event is occurring or has occurred. Training on security event confirmation and classification is controlled due to the nature of Safeguards and 10 CFR 2.39 information.

The second threshold ~~EAL #2~~ addresses the receipt of a credible security threat. The credibility of the threat is assessed in accordance with OP-1203.048 Security Event ~~(site-specific procedure)~~.

The third threshold ~~EAL #3~~ addresses the threat from the impact of an aircraft on the plant. The NRC Headquarters Operations Officer (HOO) will communicate to the licensee if the threat involves an aircraft. The status and size of the plane may also be provided by NORAD through

the NRC. Validation of the threat is performed in accordance with 11-S-82-1 Security Contingency Events (ref. 2)~~(site-specific procedure)~~.

Emergency plans and implementing procedures are public documents; therefore, EALs should not incorporate Security-sensitive information. This includes information that may be advantageous to a potential adversary, such as the particulars concerning a specific threat or threat location. Security-sensitive information should be contained in non-public documents such as the Security Plan for ANO (ref. 1).

Escalation of the emergency classification level would be via IC HA1.

Reference(s):

1. ANO Security Plan
2. OP-1203.048 Security Event
3. NEI 99-01 HU1

Category: H – Hazards

Subcategory: 1 – Security

Initiating Condition: HOSTILE ACTION within the SECURITY OWNER CONTROLLED AREA or airborne attack threat within 30 minutes

EAL:

HA1.1 Alert
A HOSTILE ACTION is occurring or has occurred within the SECURITY OWNER CONTROLLED AREA as reported by ANO Security Shift Supervision
OR
A validated notification from NRC of an aircraft attack threat within 30 min. of the site

Mode Applicability:

All

Definition(s):

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

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

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

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

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

Basis:

This IC addresses the occurrence of a HOSTILE ACTION within the SECURITY OWNER CONTROLLED AREA or notification of an aircraft attack threat. This event will require rapid response and assistance due to the possibility of the attack progressing to the PROTECTED AREA, or the need to prepare the plant and staff for a potential aircraft impact.

Timely and accurate communications between Security Shift Supervision and the Control Room is essential for proper classification of a security-related event.

Security plans and terminology are based on the guidance provided by NEI 03-12, *Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan [and Independent Spent Fuel Storage Installation Security Program]*.

As time and conditions allow, these events require a heightened state of readiness by the plant staff and implementation of onsite protective measures (e.g., evacuation, dispersal or sheltering). The Alert declaration will also heighten the awareness of Offsite Response Organizations (OROs), allowing them to be better prepared should it be necessary to consider further actions.

This ~~IC~~ EAL does not apply to incidents that are accidental events, acts of civil disobedience, or otherwise are not a HOSTILE ACTION perpetrated by a HOSTILE FORCE. Examples include the crash of a small aircraft, shots from hunters, physical disputes between employees, etc. Reporting of these types of events is adequately addressed by other EALs, or the requirements of 10 CFR 73.71 or 10 CFR 50.72.

The first threshold ~~EAL #1~~ is applicable for any HOSTILE ACTION occurring, or that has occurred, in the SECURITY OWNER CONTROLLED AREA. ~~This includes any action directed against an ISFSI that is located outside the plant PROTECTED AREA.~~

The second threshold ~~EAL #2~~ addresses the threat from the impact of an aircraft on the plant, and the anticipated arrival time is within 30 minutes. The intent of this EAL is to ensure that threat-related notifications are made in a timely manner so that plant personnel and OROs are in a heightened state of readiness. This EAL is met when the threat-related information has been validated in accordance with OP-1203.048 Security Event (ref. 2)~~(site-specific procedure)~~.

The NRC Headquarters Operations Officer (HOO) will communicate to the licensee if the threat involves an aircraft. The status and size of the plane may be provided by NORAD through the NRC.

In some cases, it may not be readily apparent if an aircraft impact within the SECURITY OWNER CONTROLLED AREA was intentional (i.e., a HOSTILE ACTION). It is expected, although not certain, that notification by an appropriate Federal agency to the site would clarify

this point. In this case, the appropriate federal agency is intended to be NORAD, FBI, FAA or NRC. The emergency declaration, including one based on other ICs/EALs, should not be unduly delayed while awaiting notification by a Federal agency.

Emergency plans and implementing procedures are public documents; therefore, EALs should not incorporate Security-sensitive information. This includes information that may be advantageous to a potential adversary, such as the particulars concerning a specific threat or threat location. Security-sensitive information should be contained in non-public documents such as the Security Plan for ANO (ref. 1).

Escalation of the emergency classification level would be via IC HS1.

Reference(s):

1. ANO Security Plan
2. OP-1203.048 Security Event
3. NEI 99-01 HA1

Category: H – Hazards

Subcategory: 1 – Security

Initiating Condition: HOSTILE ACTION within the PROTECTED AREA

EAL:

HS1.1 Site Area Emergency
A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by ANO Security Shift Supervision

Mode Applicability:

All

Definition(s):

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

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

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

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

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

Basis:

This IC addresses the occurrence of a HOSTILE ACTION within the PROTECTED AREA. This event will require rapid response and assistance due to the possibility for damage to plant equipment.

Timely and accurate communications between Security Shift Supervision and the Control Room is essential for proper classification of a security-related event (ref. 1, 2).

Security plans and terminology are based on the guidance provided by NEI 03-12, *Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan [and Independent Spent Fuel Storage Installation Security Program]*.

As time and conditions allow, these events require a heightened state of readiness by the plant staff and implementation of onsite protective measures (e.g., evacuation, dispersal or sheltering). The Site Area Emergency declaration will mobilize Offsite Response Organization (ORO) ~~-~~resources and have them available to develop and implement public protective actions in the unlikely event that the attack is successful in impairing multiple safety functions.

This ~~IC~~ EAL does not apply to ~~a HOSTILE ACTION directed at an ISFSI Protected Area located outside the PROTECTED AREA; such an attack should be assessed using IC HA1. It also does not apply to~~ incidents that are accidental events, acts of civil disobedience, or otherwise are not a HOSTILE ACTION perpetrated by a HOSTILE FORCE. Examples include the crash of a small aircraft, shots from hunters, physical disputes between employees, etc. Reporting of these types of events is adequately addressed by other EALs, or the requirements of 10 CFR 73.71 or 10 CFR 50.72.

Emergency plans and implementing procedures are public documents; therefore, EALs should not incorporate Security-sensitive information. This includes information that may be advantageous to a potential adversary, such as the particulars concerning a specific threat or threat location. Security-sensitive information should be contained in non-public documents such as the Security Plan for ANO (ref. 1).

~~Escalation of the emergency classification level would be via IC HG1.~~

Reference(s):

1. ANO Security Plan
2. OP-1203.048 Security Event
3. NEI 99-01 HS1

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 2 – Seismic Event

Initiating Condition: Seismic event greater than OBE levels

EAL:

HU2.1 Unusual Event
Seismic event > OBE as indicated by annunciation of the 0.10 g acceleration alarm

Mode Applicability:

All

Definition(s):

None

Basis:

This IC addresses a seismic event that results in accelerations at the plant site greater than those specified for an Operating Basis Earthquake (OBE). An earthquake greater than an OBE but less than a ~~Safe Shutdown Earthquake (SSE)~~Design Basis Earthquake (DBE) should have no significant impact on safety-related systems, structures and components; however, some time may be required for the plant staff to ascertain the actual post-event condition of the plant (e.g., performs walk-downs and post-event inspections). Given the time necessary to perform walk-downs and inspections, and fully understand any impacts, this event represents a potential degradation of the level of safety of the plant.

Event verification with external sources should not be necessary during or following an OBE. Earthquakes of this magnitude should be readily felt by on-site personnel and recognized as a seismic event (e.g., lateral accelerations in excess of 0.~~08g~~1g). The Shift Manager or Emergency Director may seek external verification if deemed appropriate (e.g., a call to the USGS, check internet news sources, etc.); however, the verification action must not preclude a timely emergency declaration.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA9.

Two strong motion triaxial accelerometers, ACS-8001 and ACS-8003, located at the base slab provide alarms to the Unit 1 control room via the seismic network control center, C529-NCC. One alarm from C529-NCC is triggered when a setpoint of 0.01g has been exceeded. This alarm indicates that an earthquake has occurred and the seismic monitoring system is recording seismic data. Another alarm from C529-NCC is triggered when the pre-determined value of 0.1g, indicating the OBE has been exceeded (ref. 2, 3).

To avoid inappropriate emergency classification resulting from spurious actuation of the seismic instrumentation or felt motion not attributable to seismic activity, an offsite agency (USGS, National Earthquake Information Center (NEIC)) can confirm that an earthquake has occurred in the area of the plant. Such confirmation should not, however, preclude a timely emergency declaration based on receipt of the OBE alarm. If requested, provide the analyst with the following ANO coordinates: **35º 18' 36" north latitude, 93º 13' 53" west longitude** (ref. 4). Alternatively, near real-time seismic activity can be accessed via the NEIC website:

Reference(s):

1. 1SAR 2.2.1 Location
2. 1SAR 2.7.2 Site Seismic Evaluation
3. 1SAR 2.7.6 Time-History Accelerograph
4. OP-1203.025 Natural Emergencies
5. OP-2203.008 Natural Emergencies
6. NEI 99-01 HU2

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 3 – Natural or Technological Hazard

Initiating Condition: Hazardous event

EAL:

HU3.1	**Unusual Event**
A tornado strike within the PROTECTED AREA	

Mode Applicability:

All

Definition(s):

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

Basis:

This IC addresses hazardous events that are considered to represent a potential degradation of the level of safety of the plant.

This EAL~~EAL #1~~ addresses a tornado striking (touching down) within the PROTECTED AREA.

~~EAL #2 addresses flooding of a building room or area that results in operators isolating power to a SAFETY SYSTEM component due to water level or other wetting concerns. Classification is also required if the water level or related wetting causes an automatic isolation of a SAFETY SYSTEM component from its power source (e.g., a breaker or relay trip). To warrant classification, operability of the affected component must be required by Technical Specifications for the current operating mode.~~

~~EAL #3 addresses a hazardous materials event originating at an offsite location and of sufficient magnitude to impede the movement of personnel within the PROTECTED AREA.~~

~~EAL #4 addresses a hazardous event that causes an on-site impediment to vehicle movement and significant enough to prohibit the plant staff from accessing the site using personal vehicles. Examples of such an event include site flooding caused by a hurricane, heavy rains, up-river water releases, dam failure, etc., or an on-site train derailment blocking the access road.~~

~~This EAL is not intended apply to routine impediments such as fog, snow, ice, or vehicle breakdowns or accidents, but rather to more significant conditions such as the Hurricane Andrew strike on Turkey Point in 1992, the flooding around the Cooper Station during the Midwest floods of 1993, or the flooding around Ft. Calhoun Station in 2011.~~

~~EAL #5 addresses (site-specific description).~~

Escalation of the emergency classification level would be based on ICs in Recognition Categories A, F, S or C.

If damage is confirmed visually or by other in-plant indications, the event may be escalated to an Alert under EAL CA6.1 or SA9.1.

A tornado striking (touching down) within the PROTECTED AREA warrants declaration of an Unusual Event regardless of the measured wind speed at the meteorological tower. A tornado is defined as a violently rotating column of air in contact with the ground and extending from the base of a thunderstorm.

Reference(s):

1. OP-1203.025 Natural Emergencies
2. OP-2203.008 Natural Emergencies
3. NEI 99-01 HU3

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 3 – Natural or Technological Hazard

Initiating Condition: Hazardous event

EAL:

HU3.2 Unusual Event
Internal room or area FLOODING of a magnitude sufficient to require manual or automatic electrical isolation of a SAFETY SYSTEM component required by Technical Specifications for the current operating mode

Mode Applicability:

All

Definition(s):

FLOODING - A condition where water is entering a room or area faster than installed equipment is capable of removal, resulting in a rise of water level within the room or area.

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

This IC addresses hazardous events that are considered to represent a potential degradation of the level of safety of the plant.

~~EAL #1 addresses a tornado striking (touching down) within the PROTECTED AREA.~~

This EAL addresses FLOODING of a building room or area that results in operators isolating power to a SAFETY SYSTEM component due to water level or other wetting concerns. Classification is also required if the water level or related wetting causes an automatic isolation of a SAFETY SYSTEM component from its power source (e.g., a breaker or relay trip). To

warrant classification, operability of the affected component must be required by Technical Specifications for the current operating mode.

~~EAL #3 addresses a hazardous materials event originating at an offsite location and of sufficient magnitude to impede the movement of personnel within the PROTECTED AREA.~~

~~EAL #4 addresses a hazardous event that causes an on-site impediment to vehicle movement and significant enough to prohibit the plant staff from accessing the site using personal vehicles. Examples of such an event include site flooding caused by a hurricane, heavy rains, up-river water releases, dam failure, etc., or an on-site train derailment blocking the access road.~~

~~This EAL is not intended apply to routine impediments such as fog, snow, ice, or vehicle breakdowns or accidents, but rather to more significant conditions such as the Hurricane Andrew strike on Turkey Point in 1992, the flooding around the Cooper Station during the Midwest floods of 1993, or the flooding around Ft. Calhoun Station in 2011.~~

~~EAL #5 addresses (site-specific description).~~

Escalation of the emergency classification level would be based on ICs in Recognition Categories A, F, S or C.

Refer to EAL CA6.1 or SA9.1 for internal FLOODING affecting more than one SAFETY SYSTEM train.

Reference(s):

1. OP-1203.025 Natural Emergencies
2. OP-2203.008 Natural Emergencies
3. NEI 99-01 HU3

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 3 – Natural or Technological Hazard

Initiating Condition: Hazardous event

EAL:

HU3.3	**Unusual Event**
Movement of personnel within the PROTECTED AREA is IMPEDED due to an event external to the PROTECTED AREA involving hazardous materials (e.g., an offsite chemical spill or toxic gas release)	

Mode Applicability:

All

Definition(s):

IMPEDE(D) - Personnel access to a room or area is hindered to an extent that extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is **not** routinely employed).

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

Basis:

This IC addresses hazardous events that are considered to represent a potential degradation of the level of safety of the plant.

This EAL ~~EAL #1 addresses a tornado striking (touching down) within the PROTECTED AREA.~~

~~This EAL addresses flooding of a building room or area that results in operators isolating power to a SAFETY SYSTEM component due to water level or other wetting concerns. Classification is also required if the water level or related wetting causes an automatic isolation of a SAFETY SYSTEM component from its power source (e.g., a breaker or relay trip). To warrant classification, operability of the affected component must be required by Technical Specifications for the current operating mode.~~

~~EAL #3~~ addresses a hazardous materials event originating at a~~n~~ ~~offsite~~ location outside the PROTECTED AREA and of sufficient magnitude to IMPEDE the movement of personnel within the PROTECTED AREA.

~~EAL #4 addresses a hazardous event that causes an on-site impediment to vehicle movement and significant enough to prohibit the plant staff from accessing the site using personal vehicles.~~

~~Examples of such an event include site flooding caused by a hurricane, heavy rains, up-river water releases, dam failure, etc., or an on-site train derailment blocking the access road.~~

~~This EAL is not intended apply to routine impediments such as fog, snow, ice, or vehicle breakdowns or accidents, but rather to more significant conditions such as the Hurricane Andrew strike on Turkey Point in 1992, the flooding around the Cooper Station during the Midwest floods of 1993, or the flooding around Ft. Calhoun Station in 2011.~~

~~EAL #5 addresses (site-specific description).~~

Escalation of the emergency classification level would be based on ICs in Recognition Categories A, F, S or C.

Reference(s):

1. NEI 99-01 HU3

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 3 – Natural or Technological Hazard

Initiating Condition: Hazardous event

EAL:

HU3.4 Unusual Event
A hazardous event that results in on-site conditions sufficient to prohibit the plant staff from accessing the site via personal vehicles (Note 7)

Note 7: This EAL does **not** apply to routine traffic impediments such as fog, snow, ice, or vehicle breakdowns or accidents.

Mode Applicability:

All

Definition(s):

FLOODING - A condition where water is entering a room or area faster than installed equipment is capable of removal, resulting in a rise of water level within the room or area.

Basis:

This IC addresses hazardous events that are considered to represent a potential degradation of the level of safety of the plant. ~~EAL #1 addresses a tornado striking (touching down) within the PROTECTED AREA.~~

~~This EAL addresses flooding of a building room or area that results in operators isolating power to a SAFETY SYSTEM component due to water level or other wetting concerns. Classification is also required if the water level or related wetting causes an automatic isolation of a SAFETY SYSTEM component from its power source (e.g., a breaker or relay trip). To warrant classification, operability of the affected component must be required by Technical Specifications for the current operating mode.~~

~~EAL #3 addresses a hazardous materials event originating at an offsite location and of sufficient magnitude to impede the movement of personnel within the PROTECTED AREA.~~

This EAL ~~EAL #4~~ addresses a hazardous event that causes an on-site impediment to vehicle movement and significant enough to prohibit the plant staff from accessing the site using personal vehicles. Examples of such an event include site FLOODING caused by a hurricane, heavy rains, up-river water releases, dam failure, etc., or an on-site train derailment blocking the access road.

This EAL is not intended to apply to routine impediments such as fog, snow, ice, or vehicle breakdowns or accidents, but rather to more significant conditions such as the Hurricane Andrew strike on Turkey Point in 1992, the FLOODING around the Cooper Station during the Midwest floods of 1993, or the FLOODING around Ft. Calhoun Station in 2011.

~~EAL #5 addresses (site-specific description).~~ Escalation of the emergency classification level would be based on ICs in Recognition Categories A, F, S or C.

Reference(s):

1. NEI 99-01 HU3

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 4 – Fire

Initiating Condition: FIRE potentially degrading the level of safety of the plant

EAL:

HU4.1 Unusual Event

A FIRE is **not** extinguished within 15 min. of **any** of the following FIRE detection indications (Note 1):

- Report from the field (i.e., visual observation)
- Receipt of multiple (more than 1) fire alarms or indications (Note 13)
- Field verification of a single fire alarm

AND

The FIRE is located within **any** Table 1[2]H-1 area

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 13 Bullet 2 of this EAL (multiple fire alarm indications) is not applicable for LOCAs or MSL breaks in containment.

Table 1H-1 Unit 1 Fire Areas

Reactor Building

All elevations

Auxiliary Building

All elevations including: Penthouse/MSIV Room

Exceptions:

Boric Acid Mix Tank Room (Chem Add Area), 404' (157-B), EDG Exhaust Fan area on 386' (1-E and 2-E)

Turbine Building

All elevations on the west side of Turbine Building and including: Pipechase under ICW Coolers, CRD Pump Pit/T-28 Room/Area under ICW Pumps

372' Elevation from non-vital switchgear area to Auxiliary Building wall at DR 56

Outside Areas

Manholes adjacent to Startup #2 XFMR (MH-03/MH-04)

Manholes adjacent to Intake Structure (MH-05/MH-06)

Intake Structure (354' and 366')

Diesel Fuel Vault

Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

Table 2H-1 Unit 2 Fire Areas

Reactor Building

All elevations

Auxiliary Building

All elevations including: MG Set Room, UNEPR, LNEPR, 2B-53 Room

Auxiliary Building Extension

MSIV Room

Turbine Building

All elevations on the west side of Turbine Building and 372' Elevation from non-vital switchgear area to Auxiliary Building wall at DR 340

Outside Areas

Intake Structure (354' and 366')

Concrete Manhole East, NE of intake (2MH-01)

Concrete Manhole East of Turbine Building next to train bay (2MH-03)

Diesel Fuel Vault

Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

Mode Applicability:

All

Definition(s):

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.

VALID - An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Basis:

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

~~EAL #1~~

The intent of the 15-minute duration is to size the FIRE and to discriminate against small FIRES that are readily extinguished (e.g., smoldering waste paper basket). In addition to alarms, other indications of a FIRE could be a drop in fire main pressure, automatic activation of a suppression system, etc.

Upon receipt, operators will take prompt actions to confirm the validity of an initial fire alarm, indication, or report. For EAL assessment purposes, the emergency declaration clock starts at the time that the initial alarm, indication, or report was received, and not the time that a subsequent verification action was performed. Similarly, the fire duration clock also starts at the time of receipt of the initial alarm, indication or report. ~~EAL #2~~

~~This EAL addresses receipt of a single fire alarm, and the existence of a FIRE is not verified (i.e., proved or disproved) within 30-minutes of the alarm. Upon receipt, operators will take prompt actions to confirm the validity of a single fire alarm. For EAL assessment purposes, the 30-minute clock starts at the time that the initial alarm was received, and not the time that a subsequent verification action was performed.~~

~~A single fire alarm, absent other indication(s) of a FIRE, may be indicative of equipment failure or a spurious activation, and not an actual FIRE. For this reason, additional time is allowed to verify the validity of the alarm. The 30-minute period is a reasonable amount of time to determine if an actual FIRE exists; however, after that time, and absent information to the contrary, it is assumed that an actual FIRE is in progress.~~

~~If an actual FIRE is verified by a report from the field, then EAL #1 is immediately applicable, and the emergency must be declared if the FIRE is not extinguished within 15-minutes of the report. If the alarm is verified to be due to an equipment failure or a spurious activation, and this verification occurs within 30-minutes of the receipt of the alarm, then this EAL is not applicable and no emergency declaration is warranted.~~

~~EAL #3~~

~~In addition to a FIRE addressed by EAL #1 or EAL #2, a FIRE within the plant PROTECTED AREA not extinguished within 60-minutes may also potentially degrade the level of plant safety. This basis extends to a FIRE occurring within the PROTECTED AREA of an ISFSI located outside the plant PROTECTED AREA. [Sentence for plants with an ISFSI outside the plant Protected Area]~~

~~EAL #4~~

~~If a FIRE within the plant or ISFSI [for plants with an ISFSI outside the plant Protected Area] PROTECTED AREA is of sufficient size to require a response by an offsite firefighting agency (e.g., a local town Fire Department), then the level of plant safety is potentially degraded. The dispatch of an offsite firefighting agency to the site requires an emergency declaration only if it is needed to actively support firefighting efforts because the fire is beyond the capability of the Fire Brigade to extinguish. Declaration is not necessary if the agency resources are placed on stand-by, or supporting post-extinguishment recovery or investigation actions.~~

~~Basis-Related Requirements from Appendix R~~

~~Appendix R to 10 CFR 50, states in part:~~

> ~~Criterion 3 of Appendix A to this part specifies that "Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions."~~
>
> ~~When considering the effects of fire, those systems associated with achieving and maintaining safe shutdown conditions assume major importance to safety because damage to them can lead to core damage resulting from loss of coolant through boil-off.~~
>
> ~~Because fire may affect safe shutdown systems and because the loss of function of systems used to mitigate the consequences of design basis accidents under post-fire conditions does not per se impact public safety, the need to limit fire damage to systems required to achieve and maintain safe shutdown conditions is greater than the need to limit fire damage to those systems required to mitigate the consequences of design basis accidents.~~

~~In addition, Appendix R to 10 CFR 50, requires, among other considerations, the use of 1-hour fire barriers for the enclosure of cable and equipment and associated non-safety circuits of one redundant train (G.2.c). As used in EAL #2, the 30-minutes to verify a single alarm is well within this worst-case 1-hour time period.~~

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via ~~IC~~ EAL CA6.1 or ~~SA9~~SA9.1.

The 15 minute requirement begins with a credible notification that a FIRE is occurring, or receipt of multiple VALID fire detection system alarms or field validation of a single fire alarm. The alarm is to be validated using available Control Room indications or alarms to prove that it is not spurious, or by reports from the field.

Table 1[2]H-1 Fire Areas are those areas that contain equipment necessary for safe operation and shutdown of the plant (ref. 1, 2).

Reference(s):

1. OP-1203.049 Fires in Areas Affecting Safe Shutdown
2. OP- 2203.049 Fires in Areas Affecting Safe Shutdown
3. NEI 99-01 HU4

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 4 – Fire

Initiating Condition: FIRE potentially degrading the level of safety of the plant

EAL:

HU4.2 Unusual Event
Receipt of a single fire alarm (i.e., **no** other indications of a FIRE) (Note 14)
AND
The fire alarm is indicating a FIRE within **any** Table 1[2]H-1 area
AND
The existence of a FIRE is **not** verified (i.e., proved or disproved) within 30 min. of alarm receipt (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 14: During Modes 1 and 2, HU4.2 is not applicable to a single fire alarm in the Reactor Building.

Table 1H-1 Unit 1 Fire Areas
Reactor Building **All** elevations
Auxiliary Building **All** elevations including: Penthouse/MSIV Room Exceptions: Boric Acid Mix Tank Room (Chem Add Area), 404' (157-B), EDG Exhaust Fan area on 386' (1-E and 2-E)
Turbine Building **All** elevations on the west side of Turbine Building and including: Pipechase under ICW Coolers, CRD Pump Pit/T-28 Room/Area under ICW Pumps 372' Elevation from non-vital switchgear area to Auxiliary Building wall at DR 56
Outside Areas Manholes adjacent to Startup #2 XFMR (MH-03/MH-04) Manholes adjacent to Intake Structure (MH-05/MH-06) Intake Structure (354' and 366') Diesel Fuel Vault

Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

Table 2H-1 Unit 2 Fire Areas
Reactor Building **All** elevations **Auxiliary Building** **All** elevations including: MG Set Room, UNEPR, LNEPR, 2B-53 Room **Auxiliary Building Extension** MSIV Room **Turbine Building** All elevations on the west side of Turbine Building and 372' Elevation from non-vital switchgear area to Auxiliary Building wall at DR 340 **Outside Areas** Intake Structure (354' and 366') Concrete Manhole East, NE of intake (2MH-01) Concrete Manhole East of Turbine Building next to train bay (2MH-03) Diesel Fuel Vault Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

Mode Applicability:

All

Definition(s):

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.

VALID - An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Basis:

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

~~EAL #1~~

~~The intent of the 15-minute duration is to size the FIRE and to discriminate against small FIRES that are readily extinguished (e.g., smoldering waste paper basket). In addition to alarms, other indications of a FIRE could be a drop in fire main pressure, automatic activation of a suppression system, etc.~~

~~Upon receipt, operators will take prompt actions to confirm the validity of an initial fire alarm, indication, or report. For EAL assessment purposes, the emergency declaration clock starts at the time that the initial alarm, indication, or report was received, and not the time that a subsequent verification action was performed. Similarly, the fire duration clock also starts at the time of receipt of the initial alarm, indication or report.~~

~~EAL #2~~

This EAL addresses receipt of a single fire alarm, and the existence of a FIRE is not verified (i.e., proved or disproved) within 30-minutes of the alarm. Upon receipt, operators will take prompt actions to confirm the validity of a single fire alarm. For EAL assessment purposes, the 30-minute clock starts at the time that the initial alarm was received, and not the time that a subsequent verification action was performed.

A single fire alarm, absent other indication(s) of a FIRE, may be indicative of equipment failure or a spurious activation, and not an actual FIRE. For this reason, additional time is allowed to verify the validity of the alarm. The 30-minute period is a reasonable amount of time to determine if an actual FIRE exists; however, after that time, and absent information to the contrary, it is assumed that an actual FIRE is in progress.

This EAL is not applicable for the Reactor Building in Modes 1 and 2. The Reactor Building air flow design and Technical Specification requirements for operation of Reactor Building Fan Coolers are such that multiple smoke detectors would be expected to alarm for a fire in the Reactor Building. A fire in the Reactor Building in these modes would therefore be classified under EAL HU4.1.

If an actual FIRE is verified by a report from the field, then HU4.1 ~~EAL #1~~ is immediately applicable, and the emergency must be declared if the FIRE is not extinguished within 15-minutes of the report. If the alarm is verified to be due to an equipment failure or a spurious activation, and this verification occurs within 30-minutes of the receipt of the alarm, then this EAL is not applicable and no emergency declaration is warranted. ~~EAL #3~~

~~In addition to a FIRE addressed by EAL #1 or EAL #2, a FIRE within the plant PROTECTED AREA not extinguished within 60-minutes may also potentially degrade the level of plant safety.~~ ~~*This basis extends to a FIRE occurring within the PROTECTED AREA of an ISFSI located outside the plant PROTECTED AREA.* [*Sentence for plants with an ISFSI outside the plant Protected Area*]~~

~~EAL #4~~

Basis-Related Fire Protection Requirements ~~from Appendix R~~

~~Appendix R to 10 CFR 50, states in part:~~

Criterion 3 of 10 CFR 50, Appendix A, states, in part:

> "Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions."

In this respect, noncombustible and heat resistant materials are used wherever practical throughout the unit, particularly in locations such as the containment and Control Room. Fire detection and fighting systems of appropriate capacity and capability are provided and designed to minimize the adverse effects of fires on SSCs important to safety. Firefighting systems are designed to assure that the rupture or inadvertent operation of a fire system does not significantly impair the safety capability of these structures, systems, and components.

> ~~When considering the effects of fire, those systems associated with achieving and maintaining safe shutdown conditions assume major importance to safety because damage to them can lead to core damage resulting from loss of coolant through boil-off.~~

> ~~Because fire may affect safe shutdown systems and because the loss of function of systems used to mitigate the consequences of design basis accidents under post-fire conditions does not per se impact public safety, the need to limit fire damage to systems required to achieve and maintain safe shutdown conditions is greater than the need to limit fire damage to those systems required to mitigate the consequences of design basis accidents.~~

In addition, ~~Appendix R to 10 CFR 50, requires, among other considerations,~~ the use of 1-hour fire barriers for the enclosure of cable and equipment and associated non-safety circuits of one redundant train is employed~~(G.2.c)~~. As used in HU4.2~~EAL #2~~, the 30-minutes to verify a single alarm is well within this worst-case 1-hour time period.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via ~~IC~~ EAL CA6.1 or ~~SA9~~SA9.1.

The 30-minute requirement begins upon receipt of a single VALID fire detection system alarm. The alarm is to be validated using available Control Room indications or alarms to prove that it is not spurious, or by reports from the field. Actual field reports must be made within the 30-minute time limit or a classification must be made. If a fire is verified to be occurring by field report, classification shall be made based on EAL HU4.1, with the 15-minute requirement beginning with the verification of the fire by field report.

Table 1[2]H-1 Fire Areas are those areas that contain equipment necessary for safe operation and shutdown of the plant (ref. 1, 2).

Reference(s):

1. OP-1203.049 Fires in Areas Affecting Safe Shutdown

2. OP- 2203.049 Fires in Areas Affecting Safe Shutdown
3. NEI 99-01 HU4

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 4 – Fire

Initiating Condition: FIRE potentially degrading the level of safety of the plant

EAL:

HU4.3 Unusual Event
A FIRE within the PROTECTED AREA **not** extinguished within 60 min. of the initial report, alarm or indication (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

All

Definition(s):

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.

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

Basis:

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

~~EAL #1~~

~~The intent of the 15-minute duration is to size the FIRE and to discriminate against small FIRES that are readily extinguished (e.g., smoldering waste paper basket). In addition to alarms, other indications of a FIRE could be a drop in fire main pressure, automatic activation of a suppression system, etc.~~

~~Upon receipt, operators will take prompt actions to confirm the validity of an initial fire alarm, indication, or report. For EAL assessment purposes, the emergency declaration clock starts at the time that the initial alarm, indication, or report was received, and not the time that a subsequent verification action was performed. Similarly, the fire duration clock also starts at the time of receipt of the initial alarm, indication or report.~~

~~EAL #2~~

~~This EAL addresses receipt of a single fire alarm, and the existence of a FIRE is not verified (i.e., proved or disproved) within 30-minutes of the alarm. Upon receipt, operators will take prompt actions to confirm the validity of a single fire alarm. For EAL assessment purposes, the 30-minute clock starts at the time that the initial alarm was received, and not the time that a subsequent verification action was performed.~~

~~A single fire alarm, absent other indication(s) of a FIRE, may be indicative of equipment failure or a spurious activation, and not an actual FIRE. For this reason, additional time is allowed to verify the validity of the alarm. The 30-minute period is a reasonable amount of time to determine if an actual FIRE exists; however, after that time, and absent information to the contrary, it is assumed that an actual FIRE is in progress.~~

~~If an actual FIRE is verified by a report from the field, then~~ HU4.1 ~~EAL #1 is immediately applicable, and the emergency must be declared if the FIRE is not extinguished within 15-minutes of the report. If the alarm is verified to be due to an equipment failure or a spurious activation, and this verification occurs within 30-minutes of the receipt of the alarm, then this EAL is not applicable and no emergency declaration is warranted.~~ ~~EAL #3~~

In addition to a FIRE addressed by EAL HU4.1 ~~#1~~ or HU4.2~~EAL #2~~, a FIRE within the plant PROTECTED AREA not extinguished within 60-minutes may also potentially degrade the level of plant safety.

~~This basis extends to a FIRE occurring within the PROTECTED AREA of an ISFSI located outside the plant PROTECTED AREA. [*Sentence for plants with an ISFSI outside the plant Protected Area*]~~

~~EAL #4~~

~~If a FIRE within the plant *or ISFSI* [*for plants with an ISFSI outside the plant Protected Area*] PROTECTED AREA is of sufficient size to require a response by an offsite firefighting agency (e.g., a local town Fire Department), then the level of plant safety is potentially degraded. The dispatch of an offsite firefighting agency to the site requires an emergency declaration only if it is needed to actively support firefighting efforts because the fire is beyond the capability of the Fire Brigade to extinguish. Declaration is not necessary if the agency resources are placed on stand-by, or supporting post-extinguishment recovery or investigation actions.~~

~~Basis-Related Requirements from Appendix R~~

~~Appendix R to 10 CFR 50, states in part:~~

~~Criterion 3 of Appendix A to this part specifies that "Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions."~~

~~When considering the effects of fire, those systems associated with achieving and maintaining safe shutdown conditions assume major importance to safety because damage to them can lead to core damage resulting from loss of coolant through boil-off.~~

~~Because fire may affect safe shutdown systems and because the loss of function of systems used to mitigate the consequences of design basis accidents under post-fire conditions does not per se impact public safety, the need to limit fire damage to systems required to achieve and maintain safe shutdown conditions is greater than the need to limit fire damage to those systems required to mitigate the consequences of design basis accidents.~~

~~In addition, Appendix R to 10 CFR 50, requires, among other considerations, the use of 1-hour fire barriers for the enclosure of cable and equipment and associated non-safety circuits of one redundant train (G.2.c). As used in EAL #2, the 30-minutes to verify a single alarm is well within this worst-case 1-hour time period.~~

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via ~~IC~~ EAL CA6.1 or ~~SA9~~SA8.1.

Reference(s):

1. NEI 99-01 HU4

Attachment 1 – Emergency Action Level Technical Bases

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 4 – Fire

Initiating Condition: FIRE potentially degrading the level of safety of the plant

EAL:

HU4.4 Unusual Event
A FIRE within the PROTECTED AREA that requires firefighting support by an offsite fire response agency to extinguish

Mode Applicability:

All

Definition(s):

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.

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

Basis:

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

~~EAL #1~~

~~The intent of the 15-minute duration is to size the FIRE and to discriminate against small FIRES that are readily extinguished (e.g., smoldering waste paper basket). In addition to alarms, other indications of a FIRE could be a drop in fire main pressure, automatic activation of a suppression system, etc.~~

~~Upon receipt, operators will take prompt actions to confirm the validity of an initial fire alarm, indication, or report. For EAL assessment purposes, the emergency declaration clock starts at the time that the initial alarm, indication, or report was received, and not the time that a subsequent verification action was performed. Similarly, the fire duration clock also starts at the time of receipt of the initial alarm, indication or report.~~

~~EAL #2~~

~~This EAL addresses receipt of a single fire alarm, and the existence of a FIRE is not verified (i.e., proved or disproved) within 30-minutes of the alarm. Upon receipt, operators will take prompt actions to confirm the validity of a single fire alarm. For EAL assessment purposes, the 30-minute clock starts at the time that the initial alarm was received, and not the time that a subsequent verification action was performed.~~

~~A single fire alarm, absent other indication(s) of a FIRE, may be indicative of equipment failure or a spurious activation, and not an actual FIRE. For this reason, additional time is allowed to verify the validity of the alarm. The 30-minute period is a reasonable amount of time to determine if an actual FIRE exists; however, after that time, and absent information to the contrary, it is assumed that an actual FIRE is in progress.~~

~~If an actual FIRE is verified by a report from the field, then~~ HU4.1 ~~EAL #1~~ ~~is immediately applicable, and the emergency must be declared if the FIRE is not extinguished within 15-minutes of the report. If the alarm is verified to be due to an equipment failure or a spurious activation, and this verification occurs within 30-minutes of the receipt of the alarm, then this EAL is not applicable and no emergency declaration is warranted.~~ ~~EAL #3~~

~~In addition to a FIRE addressed by EAL #1 or EAL #2, a FIRE within the plant PROTECTED AREA not extinguished within 60-minutes may also potentially degrade the level of plant safety.~~ ~~*This basis extends to a FIRE occurring within the PROTECTED AREA of an ISFSI located outside the plant PROTECTED AREA.* [*Sentence for plants with an ISFSI outside the plant Protected Area*]~~

~~EAL #4~~

If a FIRE within the plant ~~or ISFSI [*for plants with an ISFSI outside the plant Protected Area*]~~ PROTECTED AREA is of sufficient size to require a response by an offsite firefighting agency (e.g., a local town Fire Department), then the level of plant safety is potentially degraded. The dispatch of an offsite firefighting agency to the site requires an emergency declaration only if it is needed to actively support firefighting efforts because the fire is beyond the capability of the Fire Brigade to extinguish. Declaration is not necessary if the agency resources are placed on stand-by, or supporting post-extinguishment recovery or investigation actions.

~~Basis-Related Requirements from Appendix R~~

~~Appendix R to 10 CFR 50, states in part:~~

~~Criterion 3 of Appendix A to this part specifies that "Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions."~~

~~When considering the effects of fire, those systems associated with achieving and maintaining safe shutdown conditions assume major importance to safety because damage to them can lead to core damage resulting from loss of coolant through boil-off.~~

~~Because fire may affect safe shutdown systems and because the loss of function of systems used to mitigate the consequences of design basis accidents under post-fire conditions does not~~

~~per se impact public safety, the need to limit fire damage to systems required to achieve and maintain safe shutdown conditions is greater than the need to limit fire damage to those systems required to mitigate the consequences of design basis accidents.~~

~~In addition, Appendix R to 10 CFR 50, requires, among other considerations, the use of 1-hour fire barriers for the enclosure of cable and equipment and associated non-safety circuits of one redundant train (G.2.c). As used in EAL #2, the 30-minutes to verify a single alarm is well within this worst-case 1-hour time period.~~

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via ~~IC~~ EAL CA6.1 or ~~SA9~~SA9.1.

Reference(s):

1. NEI 99-01 HU4

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 5 – Hazardous Gas

Initiating Condition: Gaseous release IMPEDING access to equipment necessary for normal plant operations, cooldown or shutdown

EAL:

HA5.1 Alert

Release of a toxic, corrosive, asphyxiant or flammable gas into **any** Table 1[2]H-2 room or area

AND

Entry into the room or area is prohibited or IMPEDED (Note 5)

Note 5: 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.

Table 1H-2 Unit 1 Safe Operation & Shutdown Rooms/Areas	
Room/Area	**Mode**
A-4 Switchgear Room	3, 4
Upper North Electrical Penetration Room	3, 4
Lower South Electrical Equipment Room	3, 4

Table 2H-2 Unit 2 Safe Operation & Shutdown Rooms/Areas	
Room/Area	**Mode**
Aux Building 317’ Emergency Core Cooling Rooms	3, 4
Aux Building 317’ Tendon Gallery Access	3, 4
Aux Building 335’ Charging Pumps / MCC 2B-52	3, 4
Aux Building 354’ MCC 2B-62 Area	3, 4
Emergency Diesel Generator Corridor	3, 4
Lower South Piping Penetration Room	3, 4
Aux Building 386’ Containment Hatch	3, 4

Mode Applicability:

3 – Hot Standby, 4 – Hot Shutdown

Definition(s):

IMPEDE(D) - Personnel access to a room or area is hindered to an extent that extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is **not** routinely employed).

Basis:

This IC addresses an event involving a release of a hazardous gas that precludes or IMPEDES access to equipment necessary to maintain normal plant operation, or required for a normal plant cooldown and shutdown. This condition represents an actual or potential substantial degradation of the level of safety of the plant.

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 gaseous release. The emergency classification is not contingent upon whether entry is actually necessary at the time of the release.

Evaluation of the IC and EAL do not require atmospheric sampling; it only requires the Emergency Director's judgment that the gas concentration in the affected room/area is sufficient to preclude or significantly IMPEDE procedurally required access. This judgment may be based on a variety of factors including an existing job hazard analysis, report of ill effects on personnel, advice from a subject matter expert or operating experience with the same or similar hazards. Access should be considered as IMPEDED if extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is not routinely employed).

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 gaseous release). For example, the plant is in Mode 1 when the gaseous release occurs, and the procedures used for normal operation, cooldown and shutdown do not require entry into the affected room until Mode 4.

- The gas release is a planned activity that includes compensatory measures which address the temporary inaccessibility of a room or area (e.g., fire suppression system testing).

- ~~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.

- 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.

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

This EAL does not apply to firefighting activities that generate smoke and that automatically or manually activate a fire suppression system in an area~~, or to intentional inerting of containment. (BWR only)~~.

The list of plant rooms or areas with entry-related mode applicability identified 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. 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) are not included. In addition, the list specifies the plant mode(s) during which entry would be required for each room or area (ref. 1).

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

EAL HA5.1 mode applicability has been limited to the mode limitations of Table 1[2]H-2 (Modes 3 and 4 **only**).

Reference(s):

1. Attachment 2 Safe Operation & Shutdown Areas Tables 1[2]A-3 & 1[2]H-2 Bases
2. NEI 99-01 HA5

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 6 – Control Room Evacuation

Initiating Condition: Control Room evacuation resulting in transfer of plant control to alternate locations

EAL:

HA6.1 Alert
An event has resulted in plant control being transferred from the Control Room to alternate locations

Mode Applicability:

All

Definition(s):

None

Basis:

This IC addresses an evacuation of the Control Room that results in transfer of plant control to alternate locations outside the Control Room. The loss of the ability to control the plant from the Control Room is considered to be a potential substantial degradation in the level of plant safety.

Following a Control Room evacuation, control of the plant will be transferred to alternate shutdown locations. The necessity to control a plant shutdown from outside the Control Room, in addition to responding to the event that required the evacuation of the Control Room, will present challenges to plant operators and other on-shift personnel. Activation of the ERO and emergency response facilities will assist in responding to these challenges.

Transfer of plant control begins when the last licensed operator leaves the Control Room.

Escalation of the emergency classification level would be via IC HS6.

Reference(s):

1. OP-1203.002 Alternate Shutdown
2. OP- 2203.014 Alternate Shutdown
3. NEI 99-01 HA6

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 6 – Control Room Evacuation

Initiating Condition: Inability to control a key safety function from outside the Control Room

EAL:

HS6.1 Site Area Emergency

An event has resulted in plant control being transferred from the Control Room to alternate locations

AND

Control of **any** of the following key safety functions is **not** re-established within 15 min. (Note 1):

- Reactivity (Modes 1, 2 and 3 **only**)
- Core cooling
- RCS heat removal

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 - Refueling

Definition(s):

None

Basis:

This IC addresses an evacuation of the Control Room that results in transfer of plant control to alternate locations, and the control of a key safety function cannot be reestablished in a timely manner. The failure to gain control of a key safety function following a transfer of plant control to alternate locations is a precursor to a challenge to one or more fission product barriers within a relatively short period of time.

The determination of whether or not "control" is established at the remote safe shutdown location(s) is based on Emergency Director judgment. The Emergency Director is expected to make a reasonable, informed judgment within 15 ~~(the site-specific time for transfer)~~ minutes whether or not the operating staff has control of key safety functions from the remote safe shutdown location(s).

Transfer of plant control and the time period to establish control begins when the last licensed operator leaves the Control Room.

Escalation of the emergency classification level would be via IC FG1 or CG1

Reference(s):

1. OP-1203.002 Alternate Shutdown
2. OP-2203.014 Alternate Shutdown
3. NEI 99-01 HS6

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Director Judgment

Initiating Condition: Other conditions exist that in the judgment of the Emergency Director warrant declaration of a UE

EAL:

HU7.1 Unusual Event
Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. **No** releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of SAFETY SYSTEMS occurs.

Mode Applicability:

All

Definition(s):

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for an UNUSUAL EVENT~~NOUE~~.

Reference(s):

1. NEI 99-01 HU7

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Director Judgment

Initiating Condition: Other conditions exist that in the judgment of the Emergency Director warrant declaration of an ALERT

EAL:

HA7.1 Alert
Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. **Any** releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.

Mode Applicability:

All

Definition(s):

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

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

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

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

Basis:

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

Reference(s):

1. NEI 99-01 HA7

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Director Judgment

Initiating Condition: Other conditions exist that in the judgment of the Emergency Director warrant declaration of a SITE AREA EMERGENCY

EAL:

HS7.1 Site Area Emergency
Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or HOSTILE ACTION that results in intentional damage or malicious acts, (1) toward site personnel or equipment that could lead to the likely failure of or, (2) that prevent effective access to equipment needed for the protection of the public. **Any** releases are **not** expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels beyond the SITE BOUNDARY.

Mode Applicability:

All

Definition(s):

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

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

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

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

SITE BOUNDARY - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

Basis:

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for a SITE AREA EMERGENCY.

Reference(s):

1. NEI 99-01 HS7

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Director Judgment

Initiating Condition: Other conditions exist that in the judgment of the Emergency Director warrant declaration of a GENERAL EMERGENCY

EAL:

HG7.1 General Emergency
Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.

Mode Applicability:

All

Definition(s):

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

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

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

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

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

Basis:

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

Reference(s):

1. NEI 99-01 HG7

Category S – System Malfunction

EAL Group: Hot Conditions (RCS temperature > 200°F); EALs in this category are applicable only in one or more hot operating modes.

Numerous system-related equipment failure events that warrant emergency classification have been identified in this category. They may pose actual or potential threats to plant safety.

The events of this category pertain to the following subcategories:

1. Loss of Vital AC Power

Loss of vital electrical power can compromise plant SAFETY SYSTEM operability including decay heat removal and emergency core cooling systems which may be necessary to ensure fission product barrier integrity. This category includes loss of onsite and offsite sources for vital 4.16 KV buses.

2. Loss of Vital DC Power

Loss of emergency electrical power can compromise plant SAFETY SYSTEM operability including decay heat removal and emergency core cooling systems which may be necessary to ensure fission product barrier integrity. This category includes loss of vital plant 125V DC power sources.

3. Loss of Control Room Indications

Certain events that degrade plant operator ability to effectively assess plant conditions within the plant warrant emergency classification. Losses of indicators are in this subcategory.

4. RCS Activity

During normal operation, reactor coolant fission product activity is very low. Small concentrations of fission products in the coolant are primarily from the fission of tramp uranium in the fuel clad or minor perforations in the clad itself. Any significant rise from these base-line levels (2% - 5% clad failures) is indicative of fuel failures and is covered under the Fission Product Barrier Degradation category. However, lesser amounts of clad damage may result in coolant activity exceeding Technical Specification limits. These fission products will be circulated with the reactor coolant and can be detected by coolant sampling.

5. RCS Leakage

The reactor vessel provides a volume for the coolant that covers the reactor core. The reactor pressure vessel and associated pressure piping (reactor coolant system) together provide a barrier to limit the release of radioactive material should the reactor fuel clad integrity fail. Excessive RCS leakage greater than Technical Specification limits indicates potential pipe cracks that may propagate to an extent threatening fuel clad, RCS and containment integrity.

6. RPS Failure

This subcategory includes events related to failure of the Reactor Protection System (RPS) to initiate and complete reactor trips. In the plant licensing basis, postulated failures of the RPS to complete a reactor trip comprise a specific set of analyzed events referred to as Anticipated Transient Without Scram (ATWS) events. For EAL classification, however, ATWS is intended to mean any trip failure event that does not achieve reactor shutdown. If RPS actuation fails to assure reactor shutdown, positive control of reactivity is at risk and could cause a threat to fuel clad, RCS and containment integrity.

7. Loss of Communications

Certain events that degrade plant operator ability to effectively communicate with essential personnel within or external to the plant warrant emergency classification.

8. Containment Failure

Failure of containment isolation capability (under conditions in which the containment is not currently challenged) warrants emergency classification. Failure of containment pressure control capability also warrants emergency classification.

9. Hazardous Event Affecting Safety Systems

Various natural and technological events that result in degraded plant safety system performance or significant VISIBLE DAMAGE warrant emergency classification under this subcategory.

Category: S – System Malfunction

Subcategory: 1 – Loss of Vital AC Power

Initiating Condition: Loss of **all** offsite AC power capability to vital buses for 15 minutes or longer

EAL:

SU1.1 Unusual Event
Loss of **all** offsite AC power capability, Table 1[2]S-1, to vital 4.16 KV buses A3 [2A3] and A4 [2A4] for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1S-1 Unit 1 AC Power Sources
Offsite
• Startup Transformer No. 1
• Startup Transformer No. 2
• Unit Auxiliary Transformer (from 22 KV switchyard)
Onsite
• Unit Auxiliary Transformer (main generator via main transformer)
• DG1
• DG2
• AAC Gen

Table 2S-1 Unit 2 AC Power Sources
Offsite • Startup Transformer No. 3 • Startup Transformer No. 2 • Unit Auxiliary Transformer (backfed from main transformer) **Onsite** • Unit Auxiliary Transformer (main generator via main transformer) • 2DG1 • 2DG2 • AAC Gen

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 – Hot Shutdown

Definition(s):

None

Basis:

This IC addresses a prolonged loss of offsite power. The loss of offsite power sources renders the plant more vulnerable to a complete loss of power to AC ~~emergency~~ vital buses. This condition represents a potential reduction in the level of safety of the plant.

For emergency classification purposes, "capability" means that an offsite AC power source(s) is available to the ~~emergency~~ vital buses, whether or not the buses are powered from it.

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

Escalation of the emergency classification level would be via IC SA1.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations

5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. NEI 99-01 SU1

Category: S – System Malfunction

Subcategory: 1 – Loss of Vital AC Power

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

EAL:

SA1.1 Alert
AC power capability, Table 1[2]S-1, to vital 4.16 KV buses A3 [2A3] and A4 [2A4] reduced to a single power source for ≥ 15 min. (Note 1) **AND** **Any** additional single power source failure will result in loss of **all** AC power to SAFETY SYSTEMS

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1S-1 Unit 1 AC Power Sources
Offsite • Startup Transformer No. 1 • Startup Transformer No. 2 • Unit Auxiliary Transformer (from 22 KV switchyard) **Onsite** • Unit Auxiliary Transformer (main generator via main transformer) • DG1 • DG2 • AAC Gen

Table 2S-1 Unit 2 AC Power Sources
Offsite • Startup Transformer No. 3 • Startup Transformer No. 2 • Unit Auxiliary Transformer (backfed from main transformer) **Onsite** • Unit Auxiliary Transformer (main generator via main transformer) • 2DG1 • 2DG2 • AAC Gen

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 – Hot Shutdown

Definition(s):

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

This IC describes a significant degradation of offsite and onsite AC power sources such that any additional single failure would result in a loss of all AC power to SAFETY SYSTEMS. In this condition, the sole AC power source may be powering one, or more than one, train of safety-related equipment. This IC provides an escalation path from IC SU1.

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

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

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

Escalation of the emergency classification level would be via IC SS1.

This EAL is the hot condition equivalent of the cold condition EAL CU2.1.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations
5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. NEI 99-01 SA1

Category: S – System Malfunction

Subcategory: 1 – Loss of Vital AC Power

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

EAL:

SS1.1 Site Area Emergency
Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3 [2A3] and A4 [2A4] for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 – Hot Shutdown

Definition(s):

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

Although the AAC may be considered available, it will not prevent declaration of this EAL unless it is powering a vital bus within the 15 minute time period of the EAL.

This IC addresses a total loss of AC power that compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink. Mitigative strategies using non-safety related power sources (FLEX generators, etc.) may be effective in supplying power to these buses. These power sources must be controlled in accordance with abnormal or emergency operating procedures, or beyond design basis

accident response guidelines (e.g., FLEX support guidelines) and must be capable (alone or in combination) of supplying power for long term decay heat removal systems. In addition, fission product barrier monitoring capabilities may be degraded under these conditions. This IC represents a condition that involves actual or likely major failures of plant functions needed for the protection of the public.

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

Escalation of the emergency classification level would be via IC~~s~~ AG1, FG1 or SG1.

This EAL is the hot condition equivalent of the cold condition EAL CA2.1.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations
5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. NEI 99-01 SS1

Category: S – System Malfunction

Subcategory: 1 – Loss of Vital AC Power

Initiating Condition: Prolonged loss of **all** offsite and **all** onsite AC power to vital buses

EAL:

SG1.1 General Emergency

Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3 [2A3] and A4 [2A4]

AND EITHER:

- Restoration of at least one vital 4.16 KV bus in < 4 hours is **not** likely (Note 1)
- CETs > 1200°F

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 – Hot Shutdown

Definition(s):

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

This IC addresses a prolonged loss of all power sources to AC ~~emergency~~ vital buses. A loss of all AC power compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink. Mitigative strategies using non-safety related power sources (FLEX generators, etc.) may be effective in supplying power to these buses. These power sources must be controlled in accordance with abnormal or

emergency operating procedures, or beyond design basis accident response guidelines (e.g., FLEX support guidelines) and must be capable (alone or in combination) of supplying power for long term decay heat removal systems. A prolonged loss of these buses will lead to a loss of one or more fission product barriers. In addition, fission product barrier monitoring capabilities may be degraded under these conditions.

The EAL should require declaration of a General Emergency prior to meeting the thresholds for IC FG1. This will allow additional time for implementation of offsite protective actions.

Escalation of the emergency classification from Site Area Emergency will occur if it is projected that power cannot be restored to at least one AC ~~emergency~~ vital bus by the end of the analyzed station blackout coping period. Beyond this time, plant responses and event trajectory are subject to greater uncertainty, and there is a~~n~~ ~~increased~~ greater likelihood of challenges to multiple fission product barriers. 4 hours is the site-specific SBO coping analysis time (ref. 4, 5).

The estimate for restoring at least one ~~emergency~~ vital bus should be based on a realistic appraisal of the situation. Mitigation actions with a low probability of success should not be used as a basis for delaying a classification upgrade. The goal is to maximize the time available to prepare for, and implement, protective actions for the public.

The EAL will also require a General Emergency declaration if the loss of AC power results in parameters that indicate an inability to adequately remove decay heat from the core.

Reference(s):

1. OP-1202.005 Inadequate Core Cooling
2. OP-2202.009 Functional Recovery
3. OP-2202.011 Lower Mode Functional Recovery
4. Unit 1 Calculation 85-E-0072-02 Time from Loss of All AC Power to Loss of Subcooling
5. Unit 2 Calculation 85-E-0072-01 Time from Loss of All AC Power to Loss of Subcooling
6. 1SAR Figure 8-1 Station Single Line Diagram
7. OP-1202.007 Degraded Power
8. OP-1202.008 Blackout
9. OP-2104.037 Alternate AC Diesel Generator Operations
10. 2SAR Figure 8.3-1 Station Single Line Diagram
11. OP-2202.007 Loss of Off-Site Power
12. OP-2202.008 Station Blackout
13. OP-2107.006 Backfeed of Unit Auxiliary Transformer
14. NEI 99-01 SG1

Category: S – System Malfunction

Subcategory: 1 – Loss of Vital AC Power

Initiating Condition: Loss of **all** vital AC and vital DC power sources for 15 minutes or longer

EAL:

SG1.2 General Emergency

Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3 [2A3] and A4 [2A4] for ≥ 15 min. (Note 1)

AND

Indicated voltage is < 105 VDC on D01 [2D01] and D02 [2D02] vital 125 VDC buses for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 – Hot Shutdown

Definition(s):

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

Unit 1 batteries D06 and D07 and Unit 2 batteries 2D11 and 2D12 contain 58 cells each with a minimum cell voltage of 1.81 V or 105 VDC (ref. 9, 10).

This IC addresses a concurrent and prolonged loss of both vital AC and Vital DC power. A loss of all vital AC power compromises the performance of all SAFETY SYSTEMS requiring electric

power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink. Mitigative strategies using non-safety related power sources (FLEX generators, etc.) may be effective in supplying power to these buses. These power sources must be controlled in accordance with abnormal or emergency operating procedures, or beyond design basis accident response guidelines (e.g., FLEX support guidelines) and must be capable (alone or in combination) of supplying power for long term decay heat removal systems. A loss of vital DC power compromises the ability to monitor and control SAFETY SYSTEMS. A sustained loss of both vital AC and vital DC power will lead to multiple challenges to fission product barriers.

Fifteen minutes was selected as a threshold to exclude transient or momentary power losses. The 15-minute emergency declaration clock begins at the point when both EAL thresholds are met.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations
5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. 1SAR 8.3.2.1.1 Batteries
10. 2SAR 8.3.2.1.1 Batteries
11. OP-1203.036 Loss of 125V DC
12. OP-2203.037 Loss of 125V DC
13. 2SAR Figure 8.3-6 Low Voltage Safety System Power Supplies
14. NEI 99-01 SG8

Category: S – System Malfunction

Subcategory: 2 – Loss of Vital DC Power

Initiating Condition: Loss of **all** vital DC power for 15 minutes or longer

EAL:

SS2.1 Site Area Emergency
Indicated voltage is < 105 VDC on D01 [2D01] and D02 [2D02] vital 125 VDC buses for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

Unit 1 batteries D06 and D07 and Unit 2 batteries 2D11 and 2D12 contain 58 cells each with a minimum cell voltage of 1.81 V or 105 VDC (ref. 2, 3).

This IC addresses a loss of vital DC power which compromises the ability to monitor and control SAFETY SYSTEMS. In modes above Cold Shutdown, this condition involves a major failure of plant functions needed for the protection of the public.

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

Escalation of the emergency classification level would be via IC~~s~~ AG1, FG1 or SG1~~SG8~~.

This EAL is the hot condition equivalent of the cold condition EAL CU4.1.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. 1SAR 8.3.2.1.1 Batteries
3. 2SAR 8.3.2.1.1 Batteries
4. OP-1203.036 Loss of 125V DC
5. OP-2203.037 Loss of 125V DC
6. 2SAR Figure 8.3-6 Low Voltage Safety System Power Supplies
7. NEI 99-01 SS8

Category: S – System Malfunction

Subcategory: 3 – Loss of Control Room Indications

Initiating Condition: UNPLANNED loss of Control Room indications for 15 minutes or longer

EAL:

SU3.1 Unusual Event
An UNPLANNED event results in the inability to monitor one or more Table 1[2]S-2 parameters from within the Control Room for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1[2]S-2 Safety System Parameters
• Reactor power • RCS level • RCS pressure • CET temperature • Level in at least one S/G • EFW flow to at least one S/G

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

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.

Basis:

This IC addresses the difficulty associated with monitoring normal plant conditions without the ability to obtain SAFETY SYSTEM parameters from within the Control Room. This condition is a precursor to a more significant event and represents a potential degradation in the level of safety of the plant.

As used in this EAL, an "inability to monitor" means that values for one or more of the listed parameters cannot be determined from within the Control Room. This situation would require a loss of all of the Control Room sources for the given parameter(s). For example, the reactor power level cannot be determined from any analog, digital and recorder source within the Control Room.

An event involving a loss of plant indications, annunciators and/or display systems is evaluated in accordance with 10 CFR 50.72 (and associated guidance in NUREG-1022) to determine if an NRC event report is required. The event would be reported if it significantly impaired the capability to perform emergency assessments. In particular, emergency assessments necessary to implement abnormal operating procedures, emergency operating procedures, and emergency plan implementing procedures addressing emergency classification, accident assessment, or protective action decision-making.

This EAL is focused on a selected subset of plant parameters associated with the key safety functions of reactivity control, core cooling ~~[*PWR*] / RPV level [*BWR*]~~ and RCS heat removal. The loss of the ability to determine one or more of these parameters from within the Control Room is considered to be more significant than simply a reportable condition. In addition, if all indication sources for one or more of the listed parameters are lost, then the ability to determine the values of other SAFETY SYSTEM parameters may be impacted as well. For example, if the value for reactor vessel level ~~[PWR] / RPV water level [BWR]~~ cannot be determined from the indications and recorders on a main control board, the SPDS or the plant computer, the availability of other parameter values may be compromised as well.

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

Escalation of the emergency classification level would be via ~~IC~~ EAL SA3.1~~SA2~~.

Reference(s):

1. 1SAR 7.5 Safety-Related Display Instrumentation
2. 2SAR 7.5 Safety-Related Display Instrumentation
3. NEI 99-01 SU2

Category: S – System Malfunction

Subcategory: 3 – Loss of Control Room Indications

Initiating Condition: UNPLANNED loss of Control Room indications for 15 minutes or longer with a significant transient in progress

EAL:

SA3.1 Alert

An UNPLANNED event results in the inability to monitor **one or more** Table 1[2]S-2 parameters from within the Control Room for ≥ 15 min. (Note 1)

AND

Any significant transient is in progress, Table 1[2]S-3

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1[2]S-2 Safety System Parameters
• Reactor power • RCS level • RCS pressure • CET temperature • Level in at least one S/G • EFW flow to at least one S/G

Table 1[2]S-3 Significant Transients
• Reactor trip • Runback > 25% thermal power • Electrical load rejection > 25% electrical load • Safety injection actuation

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

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 (as defined in 10 CFR 50.2):

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

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.

Basis:

This IC addresses the difficulty associated with monitoring rapidly changing plant conditions during a transient without the ability to obtain SAFETY SYSTEM parameters from within the Control Room. During this condition, the margin to a potential fission product barrier challenge is reduced. It thus represents a potential substantial degradation in the level of safety of the plant.

As used in this EAL, an "inability to monitor" means that values for one or more of the listed parameters cannot be determined from within the Control Room. This situation would require a loss of all of the Control Room sources for the given parameter(s). For example, the reactor power level cannot be determined from any analog, digital and recorder source within the Control Room.

An event involving a loss of plant indications, annunciators and/or display systems is evaluated in accordance with 10 CFR 50.72 (and associated guidance in NUREG-1022) to determine if an NRC event report is required. The event would be reported if it significantly impaired the capability to perform emergency assessments. In particular, emergency assessments necessary to implement abnormal operating procedures, emergency operating procedures, and emergency plan implementing procedures addressing emergency classification, accident assessment, or protective action decision-making.

This EAL is focused on a selected subset of plant parameters associated with the key safety functions of reactivity control, core cooling ~~[*PWR*] / RPV level [*BWR*]~~ and RCS heat removal. The loss of the ability to determine one or more of these parameters from within the Control Room is considered to be more significant than simply a reportable condition. In addition, if all indication sources for one or more of the listed parameters are lost, then the ability to determine the values of other SAFETY SYSTEM parameters may be impacted as well. For example, if the value for reactor vessel level ~~[*PWR*] / RPV water level [*BWR*]~~ cannot be determined from the

indications and recorders on a main control board, the SPDS or the plant computer, the availability of other parameter values may be compromised as well.

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

Escalation of the emergency classification level would be via ICs FS1 or ~~IC~~ AS1.

Reference(s):

1. 1SAR 7.1.3 Engineered Safeguards Actuation System
2. 2SAR 7.3 Engineered Safety Features Systems
3. NEI 99-01 SA2

Category: S – System Malfunction

Subcategory: 4 – RCS Activity

Initiating Condition: RCS activity greater than Technical Specification allowable limits

EAL:

SU4.1 Unusual Event
Failed Fuel Iodine radiation monitor RI-1237S [2RITS-4806B] > 9.0 E5 cpm

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

This IC addresses a reactor coolant activity value that exceeds an allowable limit specified in Technical Specifications. This condition is a precursor to a more significant event and represents a potential degradation of the level of safety of the plant.

Escalation of the emergency classification level would be via IC~~s~~ FA1 or the Recognition Category A ICs.

Unit 1 RE-1237S, Failed Fuel Monitor, is in the letdown system to monitor the letdown line for evidence of fuel damage.

Unit 2 specific activity monitor 2RITS-4806B monitors the Letdown fluid for the presence of Iodine-131.

A monitor reading corresponding to the instantaneous dose equivalent I-131 value of 60 uCi/gm is determined by multiplying by 30 the monitor reading listed in the table in OP-1203.019[OP-2203.020] that represents a projected 2.0 uCi/gm I-131 RCS activity ~~in order to correlate to a Tech Spec instantaneous limit of 60 uCi/gm dose equivalent I-131 for the EAL~~ (ref. 2, 5). This yields values of 3.1E6 cpm for Unit 1 and 3.9E6 cpm for Unit 2. The top of scale of the monitor is 1E6. The EAL value is set at 9.0 E5 cpm for both units which is 90% of the top of the scale.

Reference(s):

1. 1SAR Table 11-7
2. OP-1203-019 High Activity in Reactor Coolant
3. Unit 1 Technical Specifications LCO 3.4.12 RCS Specific Activity
4. 2SAR 9.3.5 Failed Fuel Detection System
5. OP-2203.020 High Activity in RCS
6. OP- 2203.012L ANNUNCIATOR 2K12 CORRECTIVE ACTION, A-1
7. Unit 2 Technical Specifications LCO 3.4.8 Reactor Coolant System Specific Activity
8. NEI 99-01 SU3

Category: S – System Malfunction

Subcategory: 4 – RCS Activity

Initiating Condition: RCS activity greater than Technical Specification allowable limits

EAL:

SU4.2 Unusual Event
RCS sample activity > 1.0 µCi/gm dose equivalent I-131 for > 48 hours (Note 1)
OR
RCS sample activity > 60 µCi/gm dose equivalent I-131
OR
RCS sample activity > 2200[3100] µCi/gm dose equivalent Xe-133 for > 48 hours (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

This IC addresses a reactor coolant activity value that exceeds an allowable limit specified in Technical Specifications. This condition is a precursor to a more significant event and represents a potential degradation of the level of safety of the plant.

Escalation of the emergency classification level would be via IC~~s~~ FA1 or the Recognition Category A ICs.

Reference(s):

1. Unit 1 Technical Specifications LCO 3.4.12 RCS Specific Activity
2. Unit 2 Technical Specifications LCO 3.4.8 Reactor Coolant System Specific Activity
3. NEI 99-01 SU3

Category: S – System Malfunction

Subcategory: 5 – RCS Leakage

Initiating Condition: RCS leakage for 15 minutes or longer

EAL:

SU5.1 Unusual Event

RCS unidentified or pressure boundary leakage > 10 gpm for ≥ 15 min. (Note 1)

OR

RCS identified leakage > 25 gpm for ≥ 15 min. (Note 1)

OR

Reactor coolant leakage to a location outside containment > 25 gpm for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

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

Basis:

Failure to isolate the leak (from the Control Room or locally) within 15 minutes, or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification.

Steam generator tube leakage is identified RCS leakage.

This IC addresses RCS leakage which may be a precursor to a more significant event. In this case, RCS leakage has been detected and operators, following applicable procedures, have been unable to promptly isolate the leak. This condition is considered to be a potential degradation of the level of safety of the plant.

The first and second EAL conditions ~~EAL #1 and EAL #2~~ are focused on a loss of mass from the RCS due to “unidentified leakage", "pressure boundary leakage" or "identified leakage” (as these leakage types are defined in the plant Technical Specifications). The third condition ~~EAL #3~~ addresses an RCS mass loss caused by an UNISOLABLE leak through an interfacing

system. These conditions ~~EALs~~ thus apply to leakage into the containment, a secondary-side system (e.g., steam generator tube leakage ~~in a PWR~~) or a location outside of containment.

The leak rate values for each condition ~~EAL~~ were selected because they are usually observable with normal Control Room indications. Lesser values typically require time-consuming calculations to determine (e.g., a mass balance calculation). The first condition ~~EAL #1~~ uses a lower value that reflects the greater significance of unidentified or pressure boundary leakage.

The release of mass from the RCS due to the as-designed/expected operation of a relief valve does not warrant an emergency classification. ~~For PWRs, a~~An emergency classification would be required if a mass loss is caused by a relief valve that is not functioning as designed/expected (e.g., a relief valve sticks open and the line flow cannot be isolated). ~~For BWRs, a stuck-open Safety Relief Valve (SRV) or SRV leakage is not considered either identified or unidentified leakage by Technical Specifications and, therefore, is not applicable to this EAL.~~

The 15-minute threshold duration allows sufficient time for prompt operator actions to isolate the leakage, if possible.

Escalation of the emergency classification level would be via ICs of Recognition Category A or F.

Reference(s):

1. Unit 1 and Unit 2 Technical Specifications Section 1.1 Definitions
2. NEI 99-01 SU4

Category: S – System Malfunction

Subcategory: 6 – RPS Failure

Initiating Condition: Automatic or manual trip fails to shut down the reactor

EAL:

SU6.1 Unusual Event
An automatic trip did **not** shut down the reactor as indicated by reactor power > 5% after **any** RPS setpoint is exceeded **AND** A subsequent automatic trip or manual trip action taken at the reactor control console (C03 [2C03/2C14]) (manual reactor trip pushbuttons or DROPS[DSS]) is successful in shutting down the reactor as indicated by reactor power ≤ 5% (Note 8)

Note 8: A manual action is **any** operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does **not** include manually driving in control rods or implementation of boron injection strategies.

Mode Applicability:

1 - Power Operation

Definition(s):

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

Basis:

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor ~~(~~trip ~~[*PWR*] / scram [*BWR*])~~ that results in a reactor shutdown, and either a subsequent operator manual action taken at the reactor control consoles or an automatic ~~(~~trip ~~[*PWR*] / scram [*BWR*])~~ is successful in shutting down the reactor. This event is a precursor to a more significant condition and thus represents a potential degradation of the level of safety of the plant.

In the event that the operator identifies a reactor trip is IMMINENT and initiates a successful manual reactor trip before the automatic trip setpoint is reached, no declaration is required. The successful manual trip of the reactor before it reaches its automatic trip setpoint or reactor trip signals caused by instrumentation channel failures do not lead to a potential fission product barrier loss.

Following the failure o~~n~~f an automatic reactor ~~(~~trip~~[*PWR*] / scram [*BWR*])~~, operators will promptly initiate manual actions at the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor ~~(~~trip~~[*PWR*] / scram [*BWR*])~~). If these manual actions are successful in shutting

down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

If an initial manual reactor ~~(~~trip ~~[PWR] / scram [BWR])~~ is unsuccessful, operators will promptly take manual action at another location(s) on the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor ~~(~~trip~~[PWR] / scram [BWR])~~ using a different switch). Depending upon several factors, the initial or subsequent effort to manually ~~(~~trip ~~[*PWR*] / scram [*BWR*])~~ the reactor, or a concurrent plant condition, may lead to the generation of an automatic reactor ~~(~~trip ~~[PWR] / scram [BWR])~~ signal. If a subsequent manual or automatic ~~(~~trip ~~[*PWR*] / scram [*BWR*])~~ is successful in shutting down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

A manual action at the reactor control consoles is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core (e.g., initiating a manual reactor ~~(~~trip~~[*PWR*] / scram [*BWR*])~~). This action does not include manually driving in control rods or implementation of boron injection strategies. Actions taken at back-panels or other locations within the Control Room, or any location outside the Control Room, are not considered to be "at the reactor control consoles".~~Taking the Reactor Mode Switch to SHUTDOWN is considered to be a manual scram action. [*BWR*]~~

The plant response to the failure of an automatic or manual reactor ~~(~~trip ~~[*PWR*] / scram [*BWR*])~~ will vary based upon several factors including the reactor power level prior to the event, availability of the condenser, performance of mitigation equipment and actions, other concurrent plant conditions, etc. If subsequent operator manual actions taken at the reactor control consoles are also unsuccessful in shutting down the reactor, then the emergency classification level will escalate to an Alert via IC ~~SA5~~SA6. Depending upon the plant response, escalation is also possible via IC FA1. Absent the plant conditions needed to meet either IC ~~SA5~~ SA6 or FA1, an Unusual Event declaration is appropriate for this event.

~~A reactor shutdown is determined in accordance with applicable Emergency Operating Procedure criteria.~~

Should a reactor ~~(~~trip ~~[PWR] / scram [BWR])~~ signal be generated as a result of plant work (e.g., RPS setpoint testing), the following classification guidance should be applied.

- If the signal generated as a result of plant work causes a plant transient that results in a condition that should have included an automatic reactor trip ~~[PWR] / scram [BWR])~~ and the RPS fails to automatically shutdown the reactor, then this IC and associated ~~the~~ EALs are applicable, and should be evaluated.

- If the signal generated as a result of plant work does not cause a plant transient and the ~~(~~trip ~~[PWR] / scram [BWR])~~ failure is determined through other means (e.g., assessment of test results), then this IC and associated ~~the~~ EALs are not applicable and no classification is warranted.

Reference(s):

1. Unit 1 Technical Specifications Table 3.3.1-1 Reactor Protection System Instrumentation
2. Unit 2 Technical Specifications Table 3.3-1 Reactor Protective Instrumentation
3. Unit 1 and Unit 2 Technical Specifications Table 1.1-1 Modes
4. OP-1202.001 Reactor Trip
5. OP-2202.001 Standard Post Trip Actions
6. NEI 99-01 SU5

Category: S – System Malfunction

Subcategory: 6 – RPS Failure

Initiating Condition: Automatic or manual trip fails to shut down the reactor

EAL:

SU6.2 Unusual Event

A manual trip did **not** shut down the reactor as indicated by reactor power > 5% after **any** manual trip action was initiated

AND

A subsequent automatic trip or manual trip action taken at the reactor control console (C03 [2C03/2C14]) (manual reactor trip pushbuttons or DROPS[DSS]) is successful in shutting down the reactor as indicated by reactor power ≤ 5% (Note 8)

Note 8: A manual scram action is **any** operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does **not** include manually driving in control rods or implementation of boron injection strategies.

Mode Applicability:

1 - Power Operation

Definition(s):

None

Basis:

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor ~~(~~trip ~~[PWR] / scram [BWR])~~ that results in a reactor shutdown, and either a subsequent operator manual action taken at the reactor control consoles or an automatic ~~(~~trip ~~[PWR] / scram [BWR])~~ is successful in shutting down the reactor. This event is a precursor to a more significant condition and thus represents a potential degradation of the level of safety of the plant.

This EAL addresses a failure of a manually initiated trip in the absence of having exceeded an automatic RPS trip setpoint and a subsequent automatic or manual trip is successful in shutting down the reactor.

Following the failure on an automatic reactor ~~(~~trip ~~[PWR] / scram [BWR])~~, operators will promptly initiate manual actions at the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor ~~(~~trip ~~[PWR] / scram [BWR])~~). If these manual actions are successful in shutting down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

If an initial manual reactor ~~(~~trip ~~[PWR] / scram [BWR])~~ is unsuccessful, operators will promptly take manual action at another location(s) on the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor ~~(~~trip ~~[PWR] / scram [BWR])~~ using a different switch). Depending upon several factors, the initial or subsequent effort to manually ~~(trip [PWR] / scram [BWR])~~ the reactor, or a concurrent plant condition, may lead to the generation of an automatic reactor ~~(~~trip ~~[PWR] / scram [BWR])~~ signal. If a subsequent manual or automatic ~~(~~trip ~~[PWR] / scram [BWR])~~ is successful in shutting down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

A manual action at the reactor control consoles is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core (e.g., initiating a manual reactor ~~(~~trip ~~[PWR] / scram [BWR])~~). This action does not include manually driving in control rods or implementation of boron injection strategies. Actions taken at back-panels or other locations within the Control Room, or any location outside the Control Room, are not considered to be "at the reactor control consoles."

~~Taking the Reactor Mode Switch to SHUTDOWN is considered to be a manual scram action. [BWR]~~

The plant response to the failure of an automatic or manual reactor ~~(~~trip ~~[PWR] / scram [BWR])~~ will vary based upon several factors including the reactor power level prior to the event, availability of the condenser, performance of mitigation equipment and actions, other concurrent plant conditions, etc. If subsequent operator manual actions taken at the reactor control consoles are also unsuccessful in shutting down the reactor, then the emergency classification level will escalate to an Alert via IC ~~SA5~~SA6. Depending upon the plant response, escalation is also possible via IC FA1. Absent the plant conditions needed to meet either IC ~~SA5~~ SA6 or FA1, an Unusual Event declaration is appropriate for this event.

~~A reactor shutdown is determined in accordance with applicable Emergency Operating Procedure criteria.~~

Should a reactor ~~(~~trip ~~[PWR] / scram [BWR])~~ signal be generated as a result of plant work (e.g., RPS setpoint testing), the following classification guidance should be applied.

- If the signal generated as a result of plant work causes a plant transient that results in a condition that should have included an automatic reactor ~~(~~trip ~~[PWR] / scram [BWR])~~ and the RPS fails to automatically shutdown the reactor, then this IC and associated ~~the~~ EALs are applicable, and should be evaluated.

- If the signal generated as a result of plant work does not cause a plant transient and the ~~(~~trip ~~[PWR] / scram [BWR])~~ failure is determined through other means (e.g., assessment of test results), then this IC and associated ~~the~~ EALs are not applicable and no classification is warranted.

Reference(s):

1. Unit 1 Technical Specifications Table 3.3.1-1 Reactor Protection System Instrumentation
2. Unit 2 Technical Specifications Table 3.3-1 Reactor Protective Instrumentation
3. Unit 1 and Unit 2 Technical Specifications Table 1.1-1 Modes
4. OP-1202.001 Reactor Trip
5. OP-2202.001 Standard Post Trip Actions
6. NEI 99-01 SU5

Category: S – System Malfunction

Subcategory: 6 – RPS Failure

Initiating Condition: Automatic or manual trip fails to shut down the reactor and subsequent manual actions taken at the reactor control consoles are **not** successful in shutting down the reactor

EAL:

SA6.1 Alert

An automatic or manual trip fails to shut down the reactor as indicated by reactor power > 5%

AND

Manual trip actions taken at the reactor control console (C03 [2C03/2C14]) (manual reactor trip pushbuttons or DROPS[DSS]) are **not** successful in shutting down the reactor as indicated by reactor power > 5% (Note 8)

Note 8: A manual action is **any** operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does **not** include manually driving in control rods or implementation of boron injection strategies.

Mode Applicability:

1 - Power Operation

Definition(s):

None

Basis:

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor ~~(~~trip ~~[*PWR*] / scram [*BWR*])~~ that results in a reactor shutdown, and subsequent operator manual actions taken at the reactor control consoles to shutdown the reactor are also unsuccessful. This condition represents an actual or potential substantial degradation of the level of safety of the plant. An emergency declaration is required even if the reactor is subsequently shutdown by an action taken away from the reactor control consoles since this event entails a significant failure of the RPS.

A manual action at the reactor control console is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core (e.g., initiating a manual reactor ~~(~~trip ~~[PWR] / scram [BWR])~~). This action does not include manually driving in control rods or implementation of boron injection strategies. If this action(s) is unsuccessful, operators would immediately pursue additional manual actions at locations away from the reactor control console~~s~~ (e.g., locally opening breakers). Actions taken at back panels or other locations within

the Control Room, or any location outside the Control Room, are not considered to be “at the reactor control console~~s~~.”

~~Taking the Reactor Mode Switch to SHUTDOWN is considered to be a manual scram action. [BWR]~~

The plant response to the failure of an automatic or manual reactor ~~(~~trip ~~[*PWR*] / scram [*BWR*])~~ will vary based upon several factors including the reactor power level prior to the event, availability of the condenser, performance of mitigation equipment and actions, other concurrent plant conditions, etc. If the failure to shut down the reactor is prolonged enough to cause a challenge to the core cooling ~~[PWR] / RPV water level [BWR]~~ or ~~RCS~~ RCS heat removal safety functions, the emergency classification level will escalate to a Site Area Emergency via IC SS6~~5~~. Depending upon plant responses and symptoms, escalation is also possible via IC FS1. Absent the plant conditions needed to meet either IC SS6~~5~~ or FS1, an Alert declaration is appropriate for this event.

It is recognized that plant responses or symptoms may also require an Alert declaration in accordance with the Recognition Category F ICs; however, this IC and EAL are included to ensure a timely emergency declaration.

~~A reactor shutdown is determined in accordance with applicable Emergency Operating Procedure criteria.~~

Reference(s):

1. Unit 1 Technical Specifications Table 3.3.1-1 Reactor Protection System Instrumentation
2. Unit 2 Technical Specifications Table 3.3-1 Reactor Protective Instrumentation
3. Unit 1 and Unit 2 Technical Specifications Table 1.1-1 Modes
4. OP-1202.001 Reactor Trip
5. OP-2202.001 Standard Post Trip Actions
6. NEI 99-01 SA5

Category: S – System Malfunction

Subcategory: 6 – RPS Failure

Initiating Condition: Inability to shut down the reactor causing a challenge to core cooling or RCS heat removal

EAL:

SS6.1 Site Area Emergency
An automatic or manual trip fails to shut down the reactor as indicated by reactor power > 5%
AND
All actions to shut down the reactor are **not** successful as indicated by reactor power > 5%
AND EITHER:
• CETs >1200°F
• RCS heat removal **cannot** be established using steam generators and an on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling.

Mode Applicability:

1 - Power Operation

Definition(s):

None

Basis:

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor ~~(~~trip ~~[*PWR*] / scram [*BWR*])~~ that results in a reactor shutdown, all subsequent operator actions to manually shutdown the reactor are unsuccessful, and continued power generation is challenging the capability to adequately remove heat from the core and/or the RCS. This condition will lead to fuel damage if additional mitigation actions are unsuccessful and thus warrants the declaration of a Site Area Emergency.

In some instances, the emergency classification resulting from this IC/EAL may be higher than that resulting from an assessment of the plant responses and symptoms against the Recognition Category F ICs/EALs. This is appropriate in that the Recognition Category F ICs/EALs do not address the additional threat posed by a failure to shut down the reactor. The inclusion of this IC and EAL ensures the timely declaration of a Site Area Emergency in response to prolonged failure to shutdown the reactor.

~~A reactor shutdown is determined in accordance with applicable Emergency Operating Procedure criteria.~~

Escalation of the emergency classification level would be via IC AG1 or FG1.

Reference(s):

1. Unit 1 Technical Specifications Table 3.3.1-1 Reactor Protection System Instrumentation
2. Unit 2 Technical Specifications Table 3.3-1 Reactor Protective Instrumentation
3. Unit 1 and Unit 2 Technical Specifications Table 1.1-1 Modes
4. OP-1202.001 Reactor Trip
5. OP-2202.001 Standard Post Trip Actions
6. OP-1202.004 Overheating
7. OP-2202.006 Loss of Feedwater
8. OP-1202.013 Figure 1, Saturation and Adequate SCM
9. Calculation 90-E-0116-07 Unit 1 EOP Setpoint Document, Setpoint B.19
10. OP-2202.009 Functional Recovery
11. Calculation 90-E-0116-01 Unit 2 EOP Setpoint Document
12. NEI 99-01 SS5

Category: S – System Malfunction

Subcategory: 7 – Loss of Communications

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

EAL:

SU7.1 Unusual Event

Loss of **all** Table 1[2]S-4 onsite communication methods

OR

Loss of **all** Table 1[2]S-4 State and local agency communication methods

OR

Loss of **all** Table 1[2]S-4 NRC communication methods

Table 1[2]S-4 Communication Methods			
System	**Onsite**	**State / Local**	**NRC**
Station radio system	X		
ANO plant phone system	X		
Gaitronics	X		
Telephone Systems: • Commercial • Microwave • Satellite • VOIP		X	X
Emergency Notification System (ENS)			X

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

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~~ State and local agencies and the NRC.

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

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

~~EAL #2~~The second EAL condition addresses a total loss of the communications methods used to notify all ~~OROs~~ State and local agencies of an emergency declaration. The ~~OROs~~ State and local agencies referred to here are the Arkansas Department of Health, Arkansas Department of Emergency Management, Pope, Yell, Johnson, and Logan County agencies.~~(see Developer Notes)~~

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

This EAL is the hot condition equivalent of the cold condition EAL CU5.1.

Reference(s):

1. OP-1903.062 Communications System Operating Procedure
2. NEI 99-01 SU6

Category: S – System Malfunction

Subcategory: 8 – Containment Failure

Initiating Condition: Failure to isolate containment or loss of containment pressure control

EAL:

SU8.1 Unusual Event
Any penetration is **not** closed within 15 min. of an ESAS [CIAS] actuation signal
OR
Containment pressure > 44.7 psia [23.3 psia] with < one full train of containment heat removal systems (Note 9) operating per design for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 9: One full train of containment heat removal systems consists of one train of RB [Containment] Spray and one train of RB [Containment] Cooling System.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

A penetration is closed for this EAL if either side of the penetration has a closed valve or a check valve is intact (for penetrations that only have one automatic valve and a check valve).

This ~~IC~~ EAL addresses a failure of one or more containment penetrations to automatically isolate (close) when required by an actuation signal. It also addresses an event that results in high containment pressure with a concurrent failure of containment pressure control systems. Absent challenges to another fission product barrier, either condition represents potential degradation of the level of safety of the plant.

For ~~EAL #1~~the first condition, the containment isolation signal must be generated as the result on an off-normal/accident condition (e.g., a safety injection or high containment pressure); a failure resulting from testing or maintenance does not warrant classification. The determination of containment and penetration status – isolated or not isolated – should be made in accordance with the appropriate criteria contained in the plant AOPs and EOPs. The 15-minute

criterion is included to allow operators time to manually isolate the required penetrations, if possible.

~~EAL #2~~The second condition addresses a condition where containment pressure is greater than the setpoint at which containment energy (heat) removal systems are designed to automatically actuate, and less than one full train of equipment is capable of operating per design. The 15-minute criterion is included to allow operators time to manually start equipment that may not have automatically started, if possible. The inability to start the required equipment indicates that containment heat removal/depressurization systems (e.g., containment sprays~~ or ice condenser fans~~) are either lost or performing in a degraded manner.

This event would escalate to a Site Area Emergency in accordance with IC FS1 if there were a concurrent loss or potential loss of either the Fuel Clad or RCS fission product barriers.

Reference(s):

1. OP-1202.010 ESAS
2. 1SAR 6.2 Reactor Building Spray System
3. 1SAR 6.3 Reactor Building Cooling System
4. OP-2202.003 Loss of Coolant Accident
5. OP-2202.010 Standard Attachments, Attachment 22
6. 2SAR 6.2.2 Containment Heat Removal Systems
7. 2SAR 7.3.1.1.11.2 Containment Spray System
8. NEI 99-01 SU7

Category: S – System Malfunction

Subcategory: 9 – Hazardous Event Affecting Safety Systems

Initiating Condition: Hazardous event affecting SAFETY SYSTEMS needed for the current operating mode

EAL:

SA9.1 Alert

The occurrence of **any** Table 1[2]S-5 hazardous event

AND

Event damage has caused indications of degraded performance on one train of a SAFETY SYSTEM needed for the current operating mode

AND EITHER:

- Event damage has caused indications of degraded performance to the second train of the SAFETY SYSTEM needed for the current operating mode
- Event damage has resulted in VISIBLE DAMAGE to the second train of the SAFETY SYSTEM needed for the current operating mode

(Notes 10, 11)

Note 10: If the affected SAFETY SYSTEM train was already inoperable or out of service before the hazardous event occurred, then emergency classification is **not** warranted.

Note 11: If the hazardous event **only** resulted in VISIBLE DAMAGE, with **no** indications of degraded performance to at least one train of a SAFETY SYSTEM, then this emergency classification is **not** warranted.

Table 1[2]S-5 Hazardous Events
• Seismic event (earthquake) • Internal or external FLOODING event • High winds or tornado strike • FIRE • EXPLOSION • Other events with similar hazard characteristics as determined by the Shift Manager

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

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 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.

FLOODING - A condition where water is entering a room or area faster than installed equipment is capable of removal, resulting in a rise of water level within the room or area.

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

VISIBLE DAMAGE - Damage to a SAFETY SYSTEM train 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 SAFETY SYSTEM train.

Basis:

This IC addresses a hazardous event that causes damage to SAFETY SYSTEMS needed for the current operating mode. In order to provide the appropriate context for consideration of an ALERT classification, the hazardous event must have caused indications of degraded SAFETY SYSTEM performance in one train, and there must be either indications of performance issues with the second SAFETY SYSTEM train or VISIBLE DAMAGE to the second train such that the potential exists for this second SAFETY SYSTEM train to have performance issues. In other words, in order for this EAL to be classified, the hazardous event must occur, at least one SAFETY SYSTEM train must have indications of degraded performance, and the second SAFETY SYSTEM train must have indications of degraded performance or VISIBLE DAMAGE such that the potential exists for performance issues.

Note that this second SAFETY SYSTEM train is from the same SAFETY SYSTEM that has indications of degraded performance; commercial nuclear power plants are designed to be able to support single system issues without compromising public health and safety from radiological events.

Indications of degraded performance 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.

VISIBLE DAMAGE addresses damage to a SAFETY SYSTEM train that is not in service/operation and that potentially could cause performance issues. Operators will make a determination of VISIBLE DAMAGE based on the totality of available event and damage report information. This is intended to be a brief assessment not requiring lengthy analysis or quantification of the damage. This VISIBLE DAMAGE should be significant enough to cause concern regarding the operability or reliability of the SAFETY SYSTEM train.

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

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

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

Escalation of the emergency classification level would be via IC FS1 or AS1.

This EAL is the hot condition equivalent of the cold condition EAL CA6.1.

Reference(s):

1. EP FAQ 2016-002
2. NEI 99-01 SA9

Attachment 2 – Safe Operation & Shutdown Areas Tables 1[2]A-3 & 1[2]H-2 Bases

Background

NEI 99-01 Revision 6 ICs AA3 and HA5 prescribe declaration of an Alert based on impeded access to rooms or areas (due to either area radiation levels or hazardous gas concentrations) where equipment necessary for normal plant operations, cooldown or shutdown is located. These areas are intended to be plant operating mode dependent. Specifically the Developers Notes for AA3 and HA5 states:

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).

Further, as specified in IC HA5:

The list need not include the Control Room if adequate engineered safety/design features are in place to preclude a Control Room evacuation due to the release of a hazardous gas. Such features may include, but are not limited to, capability to draw air from multiple air intakes at different and separate locations, inner and outer atmospheric boundaries, or the capability to acquire and maintain positive pressure within the Control Room envelope.

ANO Table 1[2]A-3 and 1[2]H-2 Bases

A review of station operating procedures identified the following mode dependent in-plant actions and associated areas that are required for normal plant operation, cooldown or shutdown:

Unit 1

AREA	MODES	PURPOSE	REFERENCE
A-4 Switchgear Room	3, 4	Core flood tank valves, decay heat removal (DHR)	OP-1102.010 OP-1104.004
Upper North Electrical Penetration Room	3, 4	DHR alignment	OP-1104.004
Lower South Electrical Equipment Room	3, 4	DHR alignment	OP-1104.004

Unit 2

AREA	MODES	PURPOSE	REFERENCE
Aux Building 317' Emergency Core Cooling Rooms	3, 4	Shutdown Cooling (SDC) venting and alignment	OP-2104.004
Aux Building 317' Tendon Gallery Access	3, 4	SDC alignment	OP-2104.004
Aux Building 335' Charging Pumps / Motor Control Center (MCC) 2B-52	3, 4	Charging low pressure operation, T-Hot injection valves, and SDC alignment	OP-2102.010 OP-2104.004
Auxiliary Building 354' MCC 2B-62 Area	3, 4	SDC alignment and T-Hot injection valves at MCC 2B-62	OP-2102.010 OP-2104.004
Emergency Diesel Generator Corridor	3, 4	Close Safety Injection Tank (SIT) valves and SDC / Low Temperature Overpressure (LTOP) valve alignment at MCC 2B-51	OP-2102.010
Lower South Piping Penetration Room	3, 4	SDC alignment	OP-2104.004
Aux Building 386' Containment Hatch	3, 4	Close SIT valves at MCC 2B-61	OP-2102.010

Mode 3 is included above for DHR- and SDC-related activities because the procedures begin alignment in Mode 3; however, these actions could be delayed until Mode 4, if necessary. In order to ensure adequate guidance to emergency response personnel, the above areas are added to the EAL in order to provide prompt operator guidance for EAL declaration.

Attachment 2 – Safe Operation & Shutdown Areas Tables 1[2]A-3 & 1[2]H-2 Bases

Both ANO-1 and ANO-2 Control Room ventilation systems have adequate engineered safety/design features in place to preclude a Control Room evacuation due to the release of a hazardous gas. Therefore the Control Room is not included in this assessment or in Tables 1[2]H-2.

Table 1[2]A-3 & 1[2]H-2 Results

Table 1[2]A-3 & 1[2]H-2 Safe Operation & Shutdown Rooms/Areas	
Unit 1	
Room/Area	**Mode Applicability**
A-4 Switchgear Room	3, 4
Upper North Electrical Penetration Room	3, 4
Lower South Electrical Equipment Room	3, 4
Unit 2	
Room/Area	**Mode Applicability**
Aux Building 317’ Emergency Core Cooling Rooms	3, 4
Aux Building 317’ Tendon Gallery Access	3, 4
Aux Building 335’ Charging Pumps / MCC 2B-52	3, 4
Auxiliary Building 354’ MCC 2B-62 Area	3, 4
Emergency Diesel Generator Corridor	3, 4
Lower South Piping Penetration Room	3, 4
Aux Building 386’ Containment Hatch	3, 4

Enclosure 3 to

0CAN091801

Proposed EAL Technical Basis Document (Clean)

Table of Contents

1.0 INTRODUCTION

This document provides an explanation and rationale for each Emergency Action Level (EAL) included in the EAL Upgrade Project for Arkansas Nuclear One (ANO). It should be used to facilitate review of the ANO EALs and provide historical documentation for future reference. Decision-makers responsible for implementation of 1903.010, Emergency Action Level Classification, may use this document as a technical reference in support of EAL interpretation. This information may assist the Emergency Director in making classifications, particularly those involving judgment or multiple events. The basis information may also be useful in training and for explaining event classifications to off-site officials.

The expectation is that emergency classifications are to be made as soon as conditions are present and recognizable for the classification, but within 15 minutes or less in all cases when conditions are present and have been recognized. Use of this document for assistance is not intended to delay the emergency classification.

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

2.0 DISCUSSION

2.1 Background

EALs are the plant-specific indications, conditions or instrument readings that are utilized to classify emergency conditions defined in the ANO Emergency Plan.

In 1992, the NRC endorsed NUMARC/NESP-007 “Methodology for Development of Emergency Action Levels” as an alternative to NUREG-0654 EAL guidance.

NEI 99-01 (NUMARC/NESP-007) Revisions 4 and 5 were subsequently issued for industry implementation. Enhancements over earlier revisions included:

- Consolidating the system malfunction initiating conditions and example emergency action levels which address conditions that may be postulated to occur during plant shutdown conditions.
- Initiating conditions and example emergency action levels that fully address conditions that may be postulated to occur at permanently Defueled Stations and Independent Spent Fuel Storage Installations (ISFSIs).
- Simplifying the fission product barrier EAL threshold for a Site Area Emergency.

Subsequently, Revision 6 of NEI 99-01 has been issued which incorporates resolutions to numerous implementation issues including the NRC EAL Frequently Asked Questions (FAQs). Using NEI 99-01 Revision 6, "Methodology for the Development of Emergency Action Levels for Non-Passive Reactors,” November 2012 (ref. 4.1.1), ANO conducted an EAL implementation upgrade project that produced the EALs discussed herein.

2.2 Fission Product Barriers

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

Many of the EALs derived from the NEI methodology are fission product barrier threshold based. That is, the conditions that define the EALs are based upon thresholds that represent the loss or potential loss of one or more of the three fission product barriers. “Loss” and “Potential Loss” signify the relative damage and threat of damage to the barrier. A “Loss” threshold means the barrier no longer assures containment of radioactive materials.
A “Potential Loss” threshold implies a greater probability of barrier loss and reduced certainty of maintaining the barrier.

The primary fission product barriers are:

A. <u>Fuel Clad Barrier (FCB):</u> The Fuel Clad Barrier consists of the cladding material that contains the fuel pellets.

B. <u>Reactor Coolant System Barrier (RCB):</u> The Reactor Coolant System Barrier includes the RCS primary side and its connections up to and including the pressurizer safety and relief valves, and other connections up to and including the primary isolation valves.

C. <u>Containment Barrier (CNB):</u> The Containment Barrier includes the Reactor Building and connections up to and including the outermost containment isolation valves. This barrier also includes the main steam, feedwater, and blowdown line extensions outside the Reactor Building up to and including the outermost secondary side isolation valve. Containment Barrier thresholds are used as criteria for escalation of the Emergency Classification Level (ECL) from an Alert to a Site Area Emergency or a General Emergency.

2.3 Fission Product Barrier Classification Criteria

The following criteria are the bases for event classification related to fission product barrier loss or potential loss:

<u>Alert:</u>

Any loss or any potential loss of either Fuel Clad or RCS Barrier

<u>Site Area Emergency:</u>

Loss or potential loss of any two barriers

<u>General Emergency:</u>

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

2.4 EAL Organization

The ANO EAL scheme includes the following features:

- Division of the EAL set into three broad groups:
  - EALs applicable under <u>any</u> plant operating modes – This group would be reviewed by the EAL-user any time emergency classification is considered.
  - EALs applicable only under <u>hot</u> operating modes – This group would only be reviewed by the EAL-user when the plant is in Hot Shutdown, Hot Standby, Startup, or Power Operation mode.
  - EALs applicable only under <u>cold</u> operating modes – This group would only be reviewed by the EAL-user when the plant is in Cold Shutdown, Refueling or Defueled mode.

  The purpose of the groups is to avoid review of hot condition EALs when the plant is in a cold condition and avoid review of cold condition EALs when the plant is in a hot condition. This approach significantly minimizes the total number of EALs that must be reviewed by the EAL-user for a given plant condition, reduces EAL-user reading burden and, thereby, speeds identification of the EAL that applies to the emergency.

- Within each group, assignment of EALs to categories and subcategories:

Category and subcategory titles are selected to represent conditions that are operationally significant to the EAL-user. The ANO EAL categories are aligned to and represent the NEI 99-01, "Recognition Categories." Subcategories are used in the ANO scheme as necessary to further divide the EALs of a category into logical sets of possible emergency classification thresholds. The ANO EAL categories and subcategories are listed below.

The primary tool for determining the emergency classification level is the EAL Classification Matrix. The user of the EAL Classification Matrix may (but is not required to) consult the EAL technical bases in order to obtain additional information concerning the EALs under classification consideration. The user should consult Section 3.0 and Attachment 1 of this document for such information.

EAL Groups, Categories and Subcategories

EAL Group/Category	EAL Subcategory
Any Operating Mode:	
A – **A**bnormal Rad Levels / Rad Effluent	1 – Radiological Effluent 2 – Irradiated Fuel Event 3 – Area Radiation Levels
H – **H**azards and Other Conditions Affecting Plant Safety	1 – Security 2 – Seismic Event 3 – Natural or Technological Hazard 4 – Fire 5 – Hazardous Gas 6 – Control Room Evacuation 7 – Emergency Director Judgment
E – **I**ndependent Spent Fuel Storage Installation (**I**SFSI)	1 – Confinement Boundary
Hot Conditions:	
S – **S**ystem Malfunction	1 – Loss of Essential AC Power 2 – Loss of Vital DC Power 3 – Loss of Control Room Indications 4 – RCS Activity 5 – RCS Leakage 6 – RPS Failure 7 – Loss of Communications 8 – Containment Failure 9 – Hazardous Event Affecting Safety Systems
F – **F**ission Product Barrier Degradation	None
Cold Conditions:	
C – **C**old Shutdown / Refueling System Malfunction	1 – RCS Level 2 – Loss of Essential AC Power 3 – RCS Temperature 4 – Loss of Vital DC Power 5 – Loss of Communications 6 – Hazardous Event Affecting Safety Systems

2.5 Technical Bases Information

EAL technical bases are provided in Attachment 1 for each EAL according to EAL group (Any, Hot, Cold), EAL category (A, C, E, F, H and S) and EAL subcategory. A summary explanation of each category and subcategory is given at the beginning of the technical bases discussions of the EALs included in the category. For each EAL, the following information is provided:

Category Letter & Title

Subcategory Number & Title

Initiating Condition (IC)

Site-specific description of the generic IC given in NEI 99-01 Rev. 6.

EAL Identifier (enclosed in rectangle)

Each EAL is assigned a unique identifier to support accurate communication of the emergency classification to onsite and offsite personnel. Four characters define each EAL identifier:

1. First character (letter): Corresponds to the EAL category as described above (A, C, E, F, H or S)
2. Second character (letter): The emergency classification (G, S, A or U)

   G = General Emergency

   S = Site Area Emergency

   A = Alert

   U = Unusual Event
3. Third character (number): Subcategory number within the given category. Subcategories are sequentially numbered beginning with the number one (1). If a category does not have a subcategory, this character is assigned the number one (1).
4. Fourth character (number): The numerical sequence of the EAL within the EAL subcategory. If the subcategory has only one EAL, it is given the number one (1).

Classification (enclosed in rectangle):

Unusual Event (U), Alert (A), Site Area Emergency (S) or General Emergency (G)

EAL (enclosed in rectangle)

Exact wording of the EAL as it appears in the EAL Classification Matrix. If an ANO Unit 2 EAL threshold value differs from Unit 1, the Unit 2 threshold is enclosed in brackets. For example, in the EAL threshold “RVLMS Levels 1 through 8 indicate DRY [RVLMS Levels 1 through 5 indicate DRY]”, “RVLMS Levels 1 through 5 indicate DRY” apply only to Unit 2.

Mode Applicability

One or more of the following plant operating conditions comprise the mode to which each EAL is applicable: 1 - Power Operation, 2 - Startup, 3 – Hot Standby, 4 - Hot Shutdown, 5 - Cold Shutdown, 6 - Refueling, DEF - Defueled, or All. (See Section 2.6 for operating mode definitions).

Definitions:

If the EAL wording contains a defined term, the definition of the term is included in this section. These definitions can also be found in Section 5.1.

Basis:

An EAL basis section that provides ANO-relevant information concerning the EAL as well as a description of the rationale for the EAL as provided in NEI 99-01 Rev. 6.

Reference(s):

Source documentation from which the EAL is derived.

2.6 Operating Mode Applicability

Unit 1 (ref. 4.1.6):

1 Power Operation

$K_{eff} \geq 0.99$, reactor power > 5%

2 Startup

$K_{eff} \geq 0.99$, reactor power $\leq$ 5%

3 Hot Standby

$K_{eff} < 0.99$, reactor coolant temperature ≥ 280°F

4 Hot Shutdown

$K_{eff} < 0.99$, reactor coolant temperature 280°F > T_{avg} > 200°F and all reactor vessel head closure bolts fully tensioned

5 Cold Shutdown

$K_{eff} < 0.99$, reactor coolant temperature ≤ 200°F and all reactor vessel head closure bolts fully tensioned

6 Refueling

One or more reactor vessel head closure bolts less than fully tensioned

DEF Defueled

All fuel assemblies have been removed from Containment and placed in the spent fuel pool.

Unit 2 (ref. 4.1.6):

1 Power Operation

$K_{eff} \geq 0.99$, reactor power > 5%, average coolant temperature ≥ 300°F

2 Startup

$K_{eff} \geq 0.99$, reactor power ≤ 5%, average coolant temperature ≥ 300°F

3 Hot Standby

$K_{eff} < 0.99$, average coolant temperature ≥ 300°F

4 Hot Shutdown

$K_{eff} < 0.99$, average coolant temperature 300°F > T_{avg} > 200°F

5 Cold Shutdown

$K_{eff} < 0.99$, average coolant temperature ≤ 200°F

6 Refueling

$K_{eff} \leq 0.95$, average coolant temperature ≤ 140°F, reactor vessel head unbolted or removed, and fuel in the vessel.

DEF Defueled

All fuel assemblies have been removed from Containment and placed in the spent fuel pool.

The plant operating mode that exists at the time that the event occurs (prior to any protective system or operator action being initiated in response to the condition) should be compared to the mode applicability of the EALs. If a lower or higher plant operating mode is reached before the emergency classification is made, the declaration shall be based on the mode that existed at the time the event occurred.

3.0 GUIDANCE ON MAKING EMERGENCY CLASSIFICATIONS

3.1 General Considerations

When making an emergency classification, the Emergency Director must consider all information having a bearing on the proper assessment of an Initiating Condition (IC). This includes the Emergency Action Level (EAL) plus the associated Operating Mode Applicability, Notes, and the informing basis information. In the Recognition Category F matrices, EALs are based on loss or potential loss of Fission Product Barrier Thresholds.

EAL matrices should be read from left to right, from General Emergency to Unusual Event, and top to bottom. Declaration decisions should be independently verified before declaration is made except when gaining this verification would exceed the 15 minute declaration requirement. Place keeping should be used on all EAL matrices.

3.1.1 Classification Timeliness

NRC regulations require the licensee to establish and maintain the capability to assess, classify, and declare an emergency condition within 15 minutes after the availability of indications to plant operators that an emergency action level has been exceeded and to promptly declare the emergency condition as soon as possible following identification of the appropriate emergency classification level. The NRC staff has provided guidance on implementing this requirement in NSIR/DPR-ISG-01, "Interim Staff Guidance, Emergency Planning for Nuclear Power Plants" (ref. 4.1.8).

3.1.2 Valid Indications

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

An indication, report, or condition is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

3.1.3 Imminent Conditions

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

3.1.4 Planned vs. Unplanned Events

A planned work activity that results in an expected event or condition which meets or exceeds an EAL does not warrant an emergency declaration provided that: 1) the activity proceeds as planned, and 2) the plant remains within the limits imposed by the operating license. Such activities include planned work to test, manipulate, repair, maintain or modify a system or component. In these cases, the controls associated with the planning, preparation and execution of the work will ensure that compliance is maintained with all aspects of the operating license provided that the activity proceeds and concludes as expected. Events or conditions of this type may be subject to the reporting requirements of 10 CFR 50.72 (ref. 4.1.4).

3.1.5 Classification Based on Analysis

The assessment of some EALs is based on the results of analyses that are necessary to ascertain whether a specific EAL threshold has been exceeded (e.g., dose assessments, chemistry sampling, RCS leak rate calculation, etc.). For these EALs, the EAL wording or the

associated basis discussion will identify the necessary analysis. In these cases, the 15-minute declaration period starts with the availability of the analysis results that show the threshold to be exceeded (i.e., this is the time that the EAL information is first available). The NRC expects licensees to establish the capability to initiate and complete EAL-related analyses within a reasonable period of time (e.g., maintain the necessary expertise on-shift).

3.1.6 Emergency Director Judgment

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

3.2 Classification Methodology

To make an emergency classification, the user will compare an event or condition (i.e., the relevant plant indications and reports) to an EAL(s) and determine if the EAL has been met or exceeded. The evaluation of an EAL must be consistent with the related Operating Mode Applicability and Notes. If an EAL has been met or exceeded, the associated IC is likewise met, the emergency classification process “clock” starts, and the ECL must be declared in accordance with plant procedures no later than fifteen minutes after the process “clock” started.

When assessing an EAL that specifies a time duration for the off-normal condition, the “clock” for the EAL time duration runs concurrently with the emergency classification process “clock.” For a full discussion of this timing requirement, refer to NSIR/DPR-ISG-01 (ref. 4.1.8).

3.2.1 Classification of Multiple Events and Conditions

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

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

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

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

3.2.2 Consideration of Mode Changes During Classification

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

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

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

3.2.3 Classification of Imminent Conditions

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

3.2.4 Emergency Classification Level Upgrading and Termination

An ECL may be terminated when the event or condition that meets the classified IC and EAL no longer exists, and other site-specific termination requirements are met.

3.2.5 Classification of Short-Lived Events

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

3.2.6 Classification of Transient Conditions

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

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

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

> An ATWS occurs and the high pressure ECCS systems fail to automatically start. The plant enters an inadequate core cooling condition (a potential loss of both the Fuel Clad and RCS Barriers). If an operator manually starts a high pressure ECCS system in accordance with an EOP step and clears the inadequate core cooling condition prior to an emergency declaration, then the classification should be based on the ATWS only.

It is important to stress that the 15-minute emergency classification assessment period (process clock) is not a "grace period" during which a classification may be delayed to allow the performance of a corrective action that would obviate the need to classify the event. Emergency classification assessments must be deliberate and timely, with no undue delays. The provision discussed above addresses only those rapidly evolving situations when an operator is able to take a successful corrective action prior to the Emergency Director completing the review and steps necessary to make the emergency declaration. This provision is included to ensure that any public protective actions resulting from the emergency classification are truly warranted by the plant conditions.

3.2.7 After-the-Fact Discovery of an Emergency Event or Condition

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

In these cases, no emergency declaration is warranted; however, the guidance contained in NUREG-1022 (ref. 4.1.3) is applicable. Specifically, the event should be reported to the NRC in accordance with 10 CFR § 50.72 (ref. 4.1.4) within one hour of the discovery of the undeclared event or condition. The licensee should also notify appropriate State and local agencies in accordance with the agreed upon arrangements.

3.2.8 Retraction of an Emergency Declaration

Guidance on the retraction of an emergency declaration reported to the NRC is discussed in NUREG-1022 (ref. 4.1.3).

4.0 REFERENCES

4.1 Developmental

4.1.1 NEI 99-01 Revision 6, Methodology for the Development of Emergency Action Levels for Non-Passive Reactors, ADAMS Accession Number ML12326A805

4.1.2 RIS 2007-02 Clarification of NRC Guidance for Emergency Notifications During Quickly Changing Events, February 2, 2007.

4.1.3 NUREG-1022 Event Reporting Guidelines: 10CFR50.72 and 50.73

4.1.4 10 § CFR 50.72 Immediate Notification Requirements for Operating Nuclear Power Reactors

4.1.5 10 § CFR 50.73 License Event Report System

4.1.6 Unit 1[2] Technical Specifications Table 1.1-1[1.1], Modes[Operational Modes]

4.1.7 Arkansas Nuclear One Offsite Dose Calculation Manual (ODCM)

4.1.8 NSIR/DPR-ISG-01 Interim Staff Guidance, Emergency Planning for Nuclear Power Plants

4.1.9 Arkansas Nuclear One Emergency Plan

4.1.10 1015.008 Unit 2 SDC Control

4.2 Implementing

4.2.1 1903.010 Emergency Action Level Classification

4.2.2 NEI 99-01 Rev. 6 to ANO EAL Comparison Matrix

4.2.3 ANO EAL Matrix

5.0 DEFINITIONS, ACRONYMS & ABBREVIATIONS

5.1 Definitions (ref. 4.1.1 except as noted)

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

Alert

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

Confinement Boundary

The barrier(s) between spent fuel and the environment once the spent fuel is processed for dry storage. As related to the ANO ISFSI, the Confinement Boundary is comprised of either the Multi-assembly Sealed Basket (MSB) (SNC System) or Multi-Purpose Canister (MPC) (Holtec System).

Containment Closure

The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions (ref. 4.1.10).

As applied to ANO, Containment Closure must be capable of being set within 30 minutes. Containment Closure is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

Emergency Action Level (EAL)

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

Emergency Classification Level (ECL)

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

Unusual Event (UE)

Alert

Site Area Emergency (SAE)

General Emergency (GE)

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 require a post-event inspection to determine if the attributes of an explosion are present.

Faulted

The term applied to a steam generator that has a steam leak on the secondary side of sufficient size to cause an uncontrolled drop in steam generator pressure or the steam generator to become completely depressurized.

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.

Fission Product Barrier Threshold

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

Flooding

A condition where water is entering a room or area faster than installed equipment is capable of removal, resulting in a rise of water level within the room or area.

General Emergency

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

Hostage

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

Hostile Action

An act toward ANO or its personnel that includes the use of violent force to destroy equipment, take HOSTAGES, and/or intimidate the licensee to achieve an end. This includes attack by air, land, or water using guns, explosives, PROJECTILEs, vehicles, or other devices used to deliver destructive force. Other acts that satisfy the overall intent may be included. Hostile action should **not** be construed to include acts of civil disobedience or felonious acts that are **not** part of a concerted attack on ANO. Non-terrorism-based EALs should be used to address such activities (i.e., this may include violent acts between individuals in the SECURITY OWNER CONTROLLED AREA).

Hostile Force

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

Imminent

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

Impede(d)

Personnel access to a room or area is hindered to an extent that extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is **not** routinely employed).

Independent Spent Fuel Storage Installation (ISFSI)

A complex that is designed and constructed for the interim storage of spent nuclear fuel and other radioactive materials associated with spent fuel storage.

Initiating Condition (IC)

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

Projectile

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

Protected Area

An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access (ref. 4.1.9).

RCS Intact

The RCS should be considered intact when the RCS pressure boundary is in its normal condition for the cold shutdown mode of operation (e.g., no freeze seals or nozzle dams).

Refueling Pathway

All the cavities, tubes, canals and pools through which irradiated fuel may be moved, but **not** including the reactor vessel.

Ruptured

The condition of a steam generator in which primary-to-secondary leakage is of sufficient magnitude to require a safety injection (automatic or manual).

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 (as defined in 10 CFR 50.2):

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Security Condition

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

Security Owner Controlled Area (SOCA)

The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary (ref. 4.1.9).

Site Area Emergency

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

Site Boundary

That boundary defined by a 1046 meter (0.65 mile) radius around the plant (ref. 4.1.7).

Unisolable

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

Unplanned

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

Unusual Event

Events are in progress or have occurred which indicate a potential degradation in the level of safety of the plant or indicate a security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of SAFETY SYSTEMS occurs.

Valid

An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Visible Damage

Damage to a SAFETY SYSTEM train 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 SAFETY SYSTEM train.

5.2 Abbreviations/Acronyms

°F .... Degrees Fahrenheit

° .... Degrees

AC .... Alternating Current

ANO .... Arkansas Nuclear One

AOP .... Abnormal Operating Procedure

ATWS .... Anticipated Transient Without Scram

BMS .... Boron Management System

BWST .... Borated Water Storage Tank

CDE .... Committed Dose Equivalent

CET .... Core Exit Thermocouple

CFR .... Code of Federal Regulations

CIAS .... Containment Isolation Actuation Signal

CMT, CNTMT, CTMT .... Containment

CNB .... Containment Barrier

DBA .... Design Basis Accident

DBE .... Design Basis Earthquake

DC .... Direct Current

DEF .... Defueled

D/G .... Diesel Generator

DHR .... Decay Heat Removal

DROPS .... Diverse Reactor Overpressure Protection System

DSC .... Dry Shielded Canister

DSS .... Diverse Scram System

EAL .... Emergency Action Level

ECCS .... Emergency Core Cooling System

ECL .... Emergency Classification Level

DEF .... Defueled

ENS .... Emergency Notification System

EOF .... Emergency Operations Facility

EOP .... Emergency Operating Procedure

EPA .... Environmental Protection Agency

ERG .... Emergency Response Guideline

EPIP .... Emergency Plan Implementing Procedure

ESAS .... Engineered Safeguards Actuation System

ESF .... Engineered Safety Feature

ESFAS .... Engineered Safety Features Actuation System

FAA .... Federal Aviation Administration

FBI .... Federal Bureau of Investigation

FCB .... Fuel Clad Barrier

FEMA .... Federal Emergency Management Agency

GE .... General Emergency

HPI .... High Pressure Injection

IC .... Initiating Condition

IPEEE .... Individual Plant Examination of External Events (Generic Letter 88-20)

ISFSI .... Independent Spent Fuel Storage Installation

K_{eff} .... Effective Neutron Multiplication Factor

LCO .... Limiting Condition of Operation

LER .... Licensee Event Report

LOCA .... Loss of Coolant Accident

LRW .... Liquid Rad Waste

LTOP .... Low Temperature Overpressure

LWR .... Light Water Reactor

MCC .... Motor Control Center
MPC .... Maximum Permissible Concentration/Multi-Purpose Canister
mR, mRem, mrem, mREM .... milli-Roentgen Equivalent Man
MSL .... Main Steam Line
MTS .... Margin to Saturation
MW .... Megawatt
NDTT .... Nil Ductility Transition Temperature
NEI .... Nuclear Energy Institute
NEIC .... National Earthquake Information Center
NESP .... National Environmental Studies Project
NORAD .... North American Aerospace Defense Command
NOT .... Normal Operating Temperature
(NO)UE .... Notification of Unusual Event
NPP .... Nuclear Power Plant
NRC .... Nuclear Regulatory Commission
NSSS .... Nuclear Steam Supply System
OBE .... Operating Basis Earthquake
ODCM .... Off-site Dose Calculation Manual
ORO .... Offsite Response Organization
PA .... Protected Area
PAG .... Protective Action Guideline
PRA/PSA .... Probabilistic Risk Assessment / Probabilistic Safety Assessment
P-T .... Pressure-Temperature
PTS .... Pressurized Thermal Shock
PWR .... Pressurized Water Reactor
PSIG .... Pounds per Square Inch Gauge
R .... Roentgen
RB .... Reactor Building
RCC .... Reactor Control Console
RCB .... Reactor Coolant System Barrier
RCP .... Reactor Coolant Pump
RCS .... Reactor Coolant System
Rem, rem, REM .... Roentgen Equivalent Man
Rep CET .... Representative Core Exit Thermocouples

RETS .... Radiological Effluent Technical Specifications

RPS .... Reactor Protection System

RV .... Reactor Vessel

RVLMS .... Reactor Vessel Level Monitoring System

RWT .... Refueling Water Tank

SAR .... Safety Analysis Report

SBO .... Station Blackout

SCBA .... Self-Contained Breathing Apparatus

SDC .... Shutdown Cooling

SOCA .... Security Owner Controlled Area

SG .... Steam Generator

SI .... Safety Injection

SPDS .... Safety Parameter Display System

SPING .... Super Particulate Iodine Noble Gas

SRO .... Senior Reactor Operator

TEDE .... Total Effective Dose Equivalent

TOAF .... Top of Active Fuel

TSC .... Technical Support Center

USGS .... United States Geological Survey

VBS .... Vehicle Barrier System

6.0 ANO-TO-NEI 99-01 REV. 6 EAL CROSS-REFERENCE

This cross-reference is provided to facilitate association and location of an ANO EAL within the NEI 99-01 IC/EAL identification scheme. Further information regarding the development of the ANO EALs based on the NEI guidance can be found in the EAL Comparison Matrix.

ANO	NEI 99-01 Rev. 6	
EAL	**IC**	**Example EAL**
AU1.1	AU1	1, 2
AU1.2	AU1	3
AU2.1	AU2	1
AA1.1	AA1	1
AA1.2	AA1	2

ANO	NEI 99-01 Rev. 6	
EAL	IC	Example EAL
AA1.3	AA1	3
AA1.4	AA1	4
AA2.1	AA2	1
AA2.2	AA2	2
AA2.3	AA2	3
AA3.1	AA3	1
AA3.2	AA3	2
AS1.1	AS1	1
AS1.2	AS1	2
AS1.3	AS1	3
AS2.1	AS2	1
AG1.1	AG1	1
AG1.2	AG1	2
AG1.3	AG1	3
AG2.1	AG2	1
CU1.1	CU1	1
CU1.2	CU1	2
CU2.1	CU2	1
CU3.1	CU3	1
CU3.2	CU3	2
CU4.1	CU4	1
CU5.1	CU5	1, 2, 3
CA1.1	CA1	1
CA1.2	CA1	2
CA2.1	CA2	1
CA3.1	CA3	1, 2
CA6.1	CA6	1
CS1.1	CS1	1
CS1.2	CS1	2
CS1.3	CS1	3
CG1.1	CG1	1

ANO	NEI 99-01 Rev. 6	
EAL	**IC**	**Example EAL**
CG1.2	CG1	2
EU1.1	EU1	1
FA1.1	FA1	1
FS1.1	FS1	1
FG1.1	FG1	1
HU1.1	HU1	1, 2, 3
HU2.1	HU2	1
HU3.1	HU3	1
HU3.2	HU3	2
HU3.3	HU3	3
HU3.4	HU3	4
HU4.1	HU4	1
HU4.2	HU4	2
HU4.3	HU4	3
HU4.4	HU4	4
HU7.1	HU7	1
HA1.1	HA1	1, 2
HA5.1	HA5	1
HA6.1	HA6	1
HA7.1	HA7	1
HS1.1	HS1	1
HS6.1	HS6	1
HS7.1	HS7	1
HG7.1	HG7	1
SU1.1	SU1	1
SU3.1	SU2	1
SU4.1	SU3	1
SU4.2	SU3	2
SU5.1	SU4	1, 2, 3
SU6.1	SU5	1
SU6.2	SU5	2

ANO	NEI 99-01 Rev. 6	
EAL	**IC**	**Example EAL**
SU7.1	SU6	1, 2, 3
SU8.1	SU7	1, 2
SA1.1	SA1	1
SA3.1	SA2	1
SA6.1	SA5	1
SA9.1	SA9	1
SS1.1	SS1	1
SS2.1	SS8	1
SS6.1	SS5	1
SG1.1	SG1	1
SG1.2	SG8	1

7.0 ATTACHMENTS

7.1 Attachment 1, Emergency Action Level Technical Bases

7.2 Attachment 2, Safe Operation & Shutdown Areas Tables 1[2]A-3 & 1[2]H-2 Bases

Category A – Abnormal Rad Levels / Rad Effluent

EAL Group: ANY (EALs in this category are applicable to any plant condition, hot or cold.)

Many EALs are based on actual or potential degradation of fission product barriers because of the elevated potential for offsite radioactivity release. Degradation of fission product barriers though is not always apparent via non-radiological symptoms. Therefore, direct indication of elevated radiological effluents or area radiation levels are appropriate symptoms for emergency classification.

At lower levels, abnormal radioactivity releases may be indicative of a failure of containment systems or precursors to more significant releases. At higher release rates, offsite radiological conditions may result which require offsite protective actions. Elevated area radiation levels in plant may also be indicative of the failure of containment systems or preclude access to plant vital equipment necessary to ensure plant safety.

Events of this category pertain to the following subcategories:

1. Radiological Effluent

Direct indication of effluent radiation monitoring systems provides a rapid assessment mechanism to determine releases in excess of classifiable limits. Projected offsite doses, actual offsite field measurements or measured release rates via sampling indicate doses or dose rates above classifiable limits.

2. Irradiated Fuel Event

Conditions indicative of a loss of adequate shielding or damage to irradiated fuel may preclude access to vital plant areas or result in radiological releases that warrant emergency classification.

3. Area Radiation Levels

Sustained general area radiation levels which may preclude access to areas requiring continuous occupancy also warrant emergency classification.

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

Initiating Condition: Release of gaseous or liquid radioactivity greater than 2 times the ODCM limits for 60 minutes or longer

EAL:

AU1.1 Unusual Event

Reading on **any** Table 1[2]A-1 effluent radiation monitor > column "UE" for ≥ 60 min. (Notes 1, 2, 3)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Note 3: 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.

Table 1A-1 Unit 1 Effluent Monitor Classification Thresholds (2 min. avg reading)

Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	RX-9820 (SPING 1)	4.15E+01 μCi/cc	4.15E+00 μCi/cc	4.15E-01 μCi/cc	1.21E-03 μCi/cc
Gaseous	Radwaste Area	RX-9825 (SPING 2)	2.67E+01 μCi/cc	2.67E+00 μCi/cc	2.67E-01 μCi/cc	4.94E-04 μCi/cc
Gaseous	Fuel Handling Area	RX-9830 (SPING 3)	6.20E+02 μCi/cc	6.20E+01 μCi/cc	6.20E+00 μCi/cc	5.44E-04 μCi/cc
Gaseous	Emergency Penetration Room	RX-9835 (SPING 4)	6.55E+02 μCi/cc	6.55E+01 μCi/cc	6.55E+00 μCi/cc	1.21E-02 μCi/cc
Liquid	Liquid Radwaste	RE-4642	----	----	----	2.46E+05 cpm

Table 2A-1 Unit 2 Effluent Monitor Classification Thresholds (2 min. avg reading)							
Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	2RX-9820 (SPING 5)	1.88E+01 µCi/cc	1.88E+00 µCi/cc	1.88E-01 µCi/cc	5.48E-04 µCi/cc
Gaseous	Radwaste Area	2RX-9825 (SPING 6)	2.35E+01 µCi/cc	2.35E+00 µCi/cc	2.35E-01 µCi/cc	4.35E-04 µCi/cc
Gaseous	Fuel Handling Area	2RX-9830 (SPING 7)	6.86E+02 µCi/cc	6.86E+01 µCi/cc	6.86E+00 µCi/cc	6.04E-04 µCi/cc
Gaseous	Emergency Penetration Room	2RX-9835 (SPING 8)	5.88E+02 µCi/cc	5.88E+01 µCi/cc	5.88E+00 µCi/cc	1.09E-02 µCi/cc
Liquid	BMS Liquid Discharge	2RE-2330	----	----	----	2.45E+04 cpm
Liquid	Regenerative Waste Discharge	2RE-4423	----	----	----	2.45E+05 cpm

Mode Applicability:

All

Definition(s):

VALID - An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Basis:

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

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

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

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

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

This EAL addresses normally occurring continuous radioactivity releases from monitored gaseous or liquid effluent pathways as well as radioactivity releases that cause effluent radiation monitor readings to exceed 2 times the limit established by a radioactivity discharge permit. Such releases are typically associated with planned batch releases from non-continuous release pathways (e.g., radwaste, waste gas).

Escalation of the emergency classification level would be via IC AA1.

Reference(s):

1. OP-1604.051 Eberline Radiation Monitor System
2. Offsite Dose Calculation Manual
3. EP-CALC-ANO-1701 Radiological Effluent EAL Values
4. NEI 99-01 AU1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

Initiating Condition: Release of gaseous or liquid radioactivity greater than 2 times the ODCM limits for 60 minutes or longer

EAL:

AU1.2 Unusual Event
Sample analysis for a gaseous or liquid release indicates a concentration or release rate $>$ 2 x ODCM limits for ≥ 60 min. (Notes 1, 2)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Mode Applicability:

All

Definition(s):

None

Basis:

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

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

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

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

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

Escalation of the emergency classification level would be via IC AA1.

Reference(s):

1. Offsite Dose Calculation Manual
2. NEI 99-01 AU1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AA1.1 Alert

Reading on **any** Table 1[2]A-1 effluent radiation monitor > column "ALERT" for ≥ 15 min. (Notes 1, 2, 3, 4)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Note 3: 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.

Note 4 The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Table 1A-1 Unit 1 Effluent Monitor Classification Thresholds (2 min. avg reading)

Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	RX-9820 (SPING 1)	4.15E+01 µCi/cc	4.15E+00 µCi/cc	4.15E-01 µCi/cc	1.21E-03 µCi/cc
Gaseous	Radwaste Area	RX-9825 (SPING 2)	2.67E+01 µCi/cc	2.67E+00 µCi/cc	2.67E-01 µCi/cc	4.94E-04 µCi/cc
Gaseous	Fuel Handling Area	RX-9830 (SPING 3)	6.20E+02 µCi/cc	6.20E+01 µCi/cc	6.20E+00 µCi/cc	5.44E-04 µCi/cc
Gaseous	Emergency Penetration Room	RX-9835 (SPING 4)	6.55E+02 µCi/cc	6.55E+01 µCi/cc	6.55E+00 µCi/cc	1.21E-02 µCi/cc
Liquid	Liquid Radwaste	RE-4642	----	----	----	2.46E+05 cpm

Table 2A-1 Unit 2 Effluent Monitor Classification Thresholds (2 min. avg reading)

Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	2RX-9820 (SPING 5)	1.88E+01 µCi/cc	1.88E+00 µCi/cc	1.88E-01 µCi/cc	5.48E-04 µCi/cc
Gaseous	Radwaste Area	2RX-9825 (SPING 6)	2.35E+01 µCi/cc	2.35E+00 µCi/cc	2.35E-01 µCi/cc	4.35E-04 µCi/cc
Gaseous	Fuel Handling Area	2RX-9830 (SPING 7)	6.86E+02 µCi/cc	6.86E+01 µCi/cc	6.86E+00 µCi/cc	6.04E-04 µCi/cc
Gaseous	Emergency Penetration Room	2RX-9835 (SPING 8)	5.88E+02 µCi/cc	5.88E+01 µCi/cc	5.88E+00 µCi/cc	1.09E-02 µCi/cc
Liquid	BMS Liquid Discharge	2RE-2330	----	----	----	2.45E+04 cpm
Liquid	Regenerative Waste Discharge	2RE-4423	----	----	----	2.45E+05 cpm

Mode Applicability:

All

Definition(s):

VALID - An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Basis:

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

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

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

Escalation of the emergency classification level would be via IC AS1.

Reference(s):

1. OP-1604.051 Eberline Radiation Monitor System
2. EP-CALC-ANO-1701 Radiological Effluent EAL Values
3. NEI 99-01 AA1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AA1.2 Alert
Dose assessment using actual meteorology indicates doses > 10 mrem TEDE or 50 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

Note 4: The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

Basis:

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

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

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

Escalation of the emergency classification level would be via IC AS1.

Reference(s):

1. OP-1904.002 Offsite Dose Projections
2. NEI 99-01 AA1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AA1.3 Alert
Analysis of a liquid effluent sample indicates a concentration or release rate that would result in doses > 10 mrem TEDE or 50 mrem thyroid CDE at or beyond the SITE BOUNDARY for 60 min. of exposure (Notes 1, 2)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

Basis:

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

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

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

This EAL is assessed per the ODCM (ref. 2).

Escalation of the emergency classification level would be via IC AS1.

Reference(s):

1. OP-1904.002 Offsite Dose Projections
2. Offsite Dose Calculation Manual
3. NEI 99-01 AA1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AA1.4 Alert

Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:

- Closed window dose rates > 10 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 50 mrem for 60 min. of inhalation

(Notes 1, 2)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

Basis:

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

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

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

Escalation of the emergency classification level would be via IC AS1.

Reference(s):

1. OP-1905.002 Offsite Emergency Monitoring
2. NEI 99-01 AA1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AS1.1 Site Area Emergency

Reading on **any** Table 1[2]A-1 effluent radiation monitor > column "SAE" for ≥ 15 min. (Notes 1, 2, 3, 4)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Note 3: 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.

Note 4: The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Table 1A-1 Unit 1 Effluent Monitor Classification Thresholds (2 min. avg reading)

Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	RX-9820 (SPING 1)	4.15E+01 µCi/cc	4.15E+00 µCi/cc	4.15E-01 µCi/cc	1.21E-03 µCi/cc
Gaseous	Radwaste Area	RX-9825 (SPING 2)	2.67E+01 µCi/cc	2.67E+00 µCi/cc	2.67E-01 µCi/cc	4.94E-04 µCi/cc
Gaseous	Fuel Handling Area	RX-9830 (SPING 3)	6.20E+02 µCi/cc	6.20E+01 µCi/cc	6.20E+00 µCi/cc	5.44E-04 µCi/cc
Gaseous	Emergency Penetration Room	RX-9835 (SPING 4)	6.55E+02 µCi/cc	6.55E+01 µCi/cc	6.55E+00 µCi/cc	1.21E-02 µCi/cc
Liquid	Liquid Radwaste	RE-4642	----	----	----	2.46E+05 cpm

Table 2A-1 Unit 2 Effluent Monitor Classification Thresholds (2 min. avg reading)							
Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	2RX-9820 (SPING 5)	1.88E+01 µCi/cc	1.88E+00 µCi/cc	1.88E-01 µCi/cc	5.48E-04 µCi/cc
Gaseous	Radwaste Area	2RX-9825 (SPING 6)	2.35E+01 µCi/cc	2.35E+00 µCi/cc	2.35E-01 µCi/cc	4.35E-04 µCi/cc
Gaseous	Fuel Handling Area	2RX-9830 (SPING 7)	6.86E+02 µCi/cc	6.86E+01 µCi/cc	6.86E+00 µCi/cc	6.04E-04 µCi/cc
Gaseous	Emergency Penetration Room	2RX-9835 (SPING 8)	5.88E+02 µCi/cc	5.88E+01 µCi/cc	5.88E+00 µCi/cc	1.09E-02 µCi/cc
Liquid	BMS Liquid Discharge	2RE-2330	----	----	----	2.45E+04 cpm
Liquid	Regenerative Waste Discharge	2RE-4423	----	----	----	2.45E+05 cpm

Mode Applicability:

All

Definition(s):

VALID - An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Basis:

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

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

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

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

Escalation of the emergency classification level would be via IC AG1.

Reference(s):

1. OP-1604.051 Eberline Radiation Monitor System
2. EP-CALC-ANO-1701 Radiological Effluent EAL Values
3. NEI 99-01 AS1

Attachment 1 – Emergency Action Level Technical Bases

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AS1.2 Site Area Emergency
Dose assessment using actual meteorology indicates doses > 100 mrem TEDE or 500 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

Note 4 The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - That boundary defined by a 1046 meter (0.65 mile) radius around the plant).

Basis:

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

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

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

Escalation of the emergency classification level would be via IC AG1.

Reference(s):

1. OP-1904.002 Offsite Dose Projections
2. NEI 99-01 AS1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AS1.3 Site Area Emergency

Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:

- Closed window dose rates > 100 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 500 mrem for 60 min. of inhalation

(Notes 1, 2)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

Basis:

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

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

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

Escalation of the emergency classification level would be via IC AG1.

Reference(s):

1. OP-1905.002 Offsite Emergency Monitoring
2. NEI 99-01 AS1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AG1.1 General Emergency

Reading on **any** Table 1[2]A-1 effluent radiation monitor > column "GE" for ≥ 15 min.
(Notes 1, 2, 3, 4)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Note 3: 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.

Note 4: The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Table 1A-1 Unit 1 Effluent Monitor Classification Thresholds (2 min. avg reading)

Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	RX-9820 (SPING 1)	4.15E+01 µCi/cc	4.15E+00 µCi/cc	4.15E-01 µCi/cc	1.21E-03 µCi/cc
Gaseous	Radwaste Area	RX-9825 (SPING 2)	2.67E+01 µCi/cc	2.67E+00 µCi/cc	2.67E-01 µCi/cc	4.94E-04 µCi/cc
Gaseous	Fuel Handling Area	RX-9830 (SPING 3)	6.20E+02 µCi/cc	6.20E+01 µCi/cc	6.20E+00 µCi/cc	5.44E-04 µCi/cc
Gaseous	Emergency Penetration Room	RX-9835 (SPING 4)	6.55E+02 µCi/cc	6.55E+01 µCi/cc	6.55E+00 µCi/cc	1.21E-02 µCi/cc
Liquid	Liquid Radwaste	RE-4642	----	----	----	2.46E+05 cpm

Table 2A-1 Unit 2 Effluent Monitor Classification Thresholds (2 min. avg reading)							
Release Point		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	2RX-9820 (SPING 5)	1.88E+01 µCi/cc	1.88E+00 µCi/cc	1.88E-01 µCi/cc	5.48E-04 µCi/cc
	Radwaste Area	2RX-9825 (SPING 6)	2.35E+01 µCi/cc	2.35E+00 µCi/cc	2.35E-01 µCi/cc	4.35E-04 µCi/cc
	Fuel Handling Area	2RX-9830 (SPING 7)	6.86E+02 µCi/cc	6.86E+01 µCi/cc	6.86E+00 µCi/cc	6.04E-04 µCi/cc
	Emergency Penetration Room	2RX-9835 (SPING 8)	5.88E+02 µCi/cc	5.88E+01 µCi/cc	5.88E+00 µCi/cc	1.09E-02 µCi/cc
Liquid	BMS Liquid Discharge	2RE-2330	----	----	----	2.45E+04 cpm
	Regenerative Waste Discharge	2RE-4423	----	----	----	2.45E+05 cpm

Mode Applicability:

All

Definition(s):

VALID - An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Basis:

This IC addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to the EPA Protective Action Guides (PAGs). It includes both monitored and un-monitored releases. Releases of this magnitude will require implementation of protective actions for the public.

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

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

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

Reference(s):

1. OP-1604.051 Eberline Radiation Monitor System
2. EP-CALC-ANO-1701 Radiological Effluent EAL Values
3. NEI 99-01 AG1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AG1.2 General Emergency
Dose assessment using actual meteorology indicates doses > 1,000 mrem TEDE or 5,000 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

Note 4 The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - That boundary defined by a 1046 meter (0.65 mile) radius around the plant).

Basis:

This IC addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to the EPA Protective Action Guides (PAGs). It includes both monitored and un-monitored releases. Releases of this magnitude will require implementation of protective actions for the public.

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

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

Reference(s):

1. OP-1904.002 Offsite Dose Projections
2. NEI 99-01 AG1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 1 – Radiological Effluent

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

EAL:

AG1.3 General Emergency

Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:

- Closed window dose rates > 1,000 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 5,000 mrem for 60 min. of inhalation

(Notes 1, 2)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Mode Applicability:

All

Definition(s):

SITE BOUNDARY - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

Basis:

This IC addresses a release of gaseous radioactivity that results in projected or actual offsite doses greater than or equal to the EPA Protective Action Guides (PAGs). It includes both monitored and un-monitored releases. Releases of this magnitude will require implementation of protective actions for the public.

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

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

Reference(s):

1. OP-1905.002 Offsite Emergency Monitoring
2. NEI 99-01 AG1

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

Initiating Condition: UNPLANNED loss of water level above irradiated fuel

EAL:

AU2.1 Unusual Event

UNPLANNED water level drop in the REFUELING PATHWAY as indicated by low water level alarm, visual observation, or BWST[RWT] level drop due to makeup demands

AND

UNPLANNED rise in corresponding area radiation levels as indicated by **any** of the following radiation monitors:

- **Unit 1**
  - RE-8009 Spent Fuel Area
  - RE-8017 Fuel Handling Area
- **Unit 2**
  - 2RE-8914 Spent Fuel Area
  - 2RE-8915 Spent Fuel Area
  - 2RE-8916 Spent Fuel Area
  - 2RE-8912 Containment Incore Instrumentation

Mode Applicability:

All

Definition(s):

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

REFUELING PATHWAY – All the cavities, tubes, canals and pools through which irradiated fuel may be moved, but **not** including the reactor vessel.

Basis:

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

A water level drop 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 a rise 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 rise due to planned evolutions such as lifting of the reactor vessel head or movement of a fuel assembly. Note that this EAL is applicable only in cases where the elevated reading is due to an UNPLANNED loss of water level.

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

Escalation of the emergency classification level would be via IC AA2.

Reference(s):

1. OP-1203.050 Unit 1 Spent Fuel Pool Emergencies
2. OP-2203.002 Spent Fuel Pool Emergencies
3. 1SAR 11.2.5 Area Radiation Monitoring Systems Table 11-15 Area Radiation Monitors
4. 2SAR 12.1.4 Area Radiation Monitoring System
5. NEI 99-01 AU2

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

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

EAL:

AA2.1 Alert
IMMINENT uncovery of irradiated fuel in the REFUELING PATHWAY.

Mode Applicability:

All

Definition(s):

CONFINEMENT BOUNDARY – The barrier(s) between spent fuel and the environment once the spent fuel is processed for dry storage. As related to the ANO ISFSI, the Confinement Boundary is comprised of either the Multi-assembly Sealed Basket (MSB) (SNC System) or Multi-Purpose Canister (MPC) (Holtec System).

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

REFUELING PATHWAY – All the cavities, tubes, canals and pools through which irradiated fuel may be moved, but **not** including the reactor vessel.

Basis:

This IC addresses events that have caused IMMINENT or actual damage to an irradiated fuel assembly, or a significant lowering of water level within the REFUELING PATHWAY. These events present radiological safety challenges to plant personnel and are precursors to a release of radioactivity to the environment. As such, they represent an actual or potential substantial degradation of the level of safety of the plant. This IC applies to irradiated fuel that is licensed for dry storage up to the point that the loaded storage cask is sealed. Once sealed, damage to a loaded cask causing loss of the CONFINEMENT BOUNDARY is classified in accordance with IC EU1.

This EAL escalates from AU2.1 in that the loss of level, in the affected portion of the REFUELING PATHWAY, is of sufficient magnitude to have resulted in uncovery of irradiated fuel. Indications of irradiated fuel uncovery may include direct or indirect visual observation (e.g., reports from personnel or camera images), as well as significant changes in water and radiation levels, or other plant parameters. Computational aids may also be used (e.g., a boil-off curve). Classification of an event using this EAL should be based on the totality of available indications, reports and observations.

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

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

Escalation of the emergency classification level would be via IC AS1.

Reference(s):

1. NEI 99-01 AA2

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

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

EAL:

AA2.2 Alert
Damage to irradiated fuel resulting in a release of radioactivity
AND
High alarm on **any** Table 1[2]A-2 radiation monitor.

Table 1A-2 Unit 1 Fuel Damage Radiation Monitors
• RE-8009 Spent Fuel Area • RE-8017 Fuel Handling • RE-8060 Containment High Range Radiation Monitor • RE-8061 Containment High Range Radiation Monitor • RX-9820 (SPING 1) Containment Purge • RX-9825 (SPING 2) Radwaste Area • RX-9830 (SPING 3) Fuel Handling Area

Table 2A-2 Unit 2 Fuel Damage Radiation Monitors
• 2RE-8905 Containment Equipment Hatch Area • 2RE-8909 Containment Personnel Access Area • 2RE-8912 Containment Incore Inst. • 2RE-8914 Spent Fuel Area • 2RE-8915 Spent Fuel Area • 2RE-8916 Spent Fuel Area • 2RE-8925-1 Containment High Range Radiation Monitor • 2RE-8925-2 Containment High Range Radiation Monitor • 2RX-9820 (SPING 5) Containment Purge • 2RX-9825 (SPING 6) Radwaste Area • 2RX-9830 (SPING 7) Fuel Handling Area

Mode Applicability:

All

Definition(s):

CONFINEMENT BOUNDARY – The barrier(s) between spent fuel and the environment once the spent fuel is processed for dry storage. As related to the ANO ISFSI, the Confinement Boundary is comprised of either the Multi-assembly Sealed Basket (MSB) (SNC System) or Multi-Purpose Canister (MPC) (Holtec System).

VALID – An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Basis:

This EAL addresses events that have caused actual damage to an irradiated fuel assembly. These events present radiological safety challenges to plant personnel and are precursors to a release of radioactivity to the environment. As such, they represent an actual or potential substantial degradation of the level of safety of the plant.

This EAL 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 EU1.

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

Escalation of the emergency classification level would be via IC AS1.

Reference(s):

1. OP-1203.050 Unit 1 Spent Fuel Pool Emergencies
2. OP-1305.001 Radiation Monitoring System Check and Test
3. OP-2203.002 Spent Fuel Pool Emergencies
4. OP-1604.051 Eberline Radiation Monitoring System
5. OP-2304.133 Containment High Range Radiation Monitor Calibration
6. Offsite Dose Calculation Manual
7. NEI 99-01 AA2

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

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

EAL:

AA2.3 Alert
Lowering of spent fuel pool level to 387.0 ft.[389.5 ft.] (Alarm 2) on LIT-2020-3(4) [2LIT-2020-1(2)]

Mode Applicability:

All

Definition(s):

None

Basis:

This EAL addresses events that have caused a significant lowering of water level within the spent fuel pool. These events present radiological safety challenges to plant personnel and are precursors to a release of radioactivity to the environment. As such, they represent an actual or potential substantial degradation of the level of safety of the plant.

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

Escalation of the emergency classification level would be via IC AS1 or AS2.

Post-Fukushima order EA-12-051 required the installation of reliable SFP level indication capable of identifying normal level (Level 1), SFP level 10 ft. above the top of the fuel racks (Level 2) and SFP level at the top of the fuel racks (Level 3) (ref. 1, 2).

Reference(s):

1. MOHR-ANO-1, ANO-1 SFPI (Level) Configuration, Sheet 1, Revision 0
2. MOHR-ANO-2, ANO-2 SFPI (Level) Configuration, Sheet 1, Revision 0
3. NEI 99-01 AA2

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

Initiating Condition: Spent fuel pool level at the top of the fuel racks

EAL:

AS2.1 Site Area Emergency
Lowering of spent fuel pool level to 377.0 ft.[379.5 ft.] (Alarm 3) on LIT-2020-3(4) [2LIT-2020-1(2)]

Mode Applicability:

All

Definition(s):

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

Basis:

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

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

Escalation of the emergency classification level would be via IC AG1 or AG2.

Post-Fukushima order EA-12-051 required the installation of reliable SFP level indication capable of identifying normal level (Level 1), SFP level 10 ft. above the top of the fuel racks (Level 2) and SFP level at the top of the fuel racks (Level 3) (ref. 1, 2).

Reference(s):

1. MOHR-ANO-1, ANO-1 SFPI (Level) Configuration, Sheet 1, Revision 0
2. MOHR-ANO-2, ANO-2 SFPI (Level) Configuration, Sheet 1, Revision 0
3. NEI 99-01 AS2

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 2 – Irradiated Fuel Event

Initiating Condition: Spent fuel pool level **cannot** be restored to at least the top of the fuel racks for 60 minutes or longer

EAL:

AG2.1 General Emergency

Spent fuel pool level **cannot** be restored to at least 377.0 ft.[379.5 ft.] (Alarm 3) on LIT-2020-3(4)[2LIT-2020-1(2)] for ≥ 60 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

All

Definition(s):

None

Basis:

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

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

Post-Fukushima order EA-12-051 required the installation of reliable SFP level indication capable of identifying normal level (Level 1), SFP level 10 ft. above the top of the fuel racks (Level 2) and SFP level at the top of the fuel racks (Level 3) (ref. 1, 2).

Reference(s):

1. MOHR-ANO-1, ANO-1 SFPI (Level) Configuration, Sheet 1, Revision 0
2. MOHR-ANO-2, ANO-2 SFPI (Level) Configuration, Sheet 1, Revision 0
3. NEI 99-01 AG2

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 3 – Area Radiation Levels

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

EAL:

AA3.1 Alert

Dose rate > 15 mR/hr in **EITHER** of the following areas:

- Control Room
- Central Alarm Station (by survey)

Mode Applicability:

All

Definition(s):

IMPEDE(D) - Personnel access to a room or area is hindered to an extent that extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is **not** routinely employed).

Basis:

Areas that meet this threshold include the Control Room (CR) and the Central Alarm Station (CAS). The Control Room envelope (Unit 1 and Unit 2) is monitored for excessive radiation by five detectors. These radiation detectors are RE-8001, 2RE-8001A, 2RE-8001B, 2RE-8750-1A, and 2RE-8750-1B (ref. 1). The CAS is included in this EAL because of its importance to permitting access to areas required to assure safe plant operations. There are no permanently installed area radiation monitors in CAS that may be used to assess this EAL threshold. Therefore, this threshold is evaluated using local radiation survey for this area.

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

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

Reference(s):

1. STM 1-62 Radiation Monitoring
2. NEI 99-01 AA3

Category: A – Abnormal Rad Levels / Rad Effluent

Subcategory: 3 – Area Radiation Levels

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

EAL:

AA3.2 Alert

An UNPLANNED event results in radiation levels that prohibit or IMPEDE access to **any** Table 1[2]A-3 room or area (Note 5)

Note 5: 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.

Table 1A-3 Unit 1 Safe Operation & Shutdown Rooms/Areas	
Room/Area	**Mode**
A-4 Switchgear Room	3, 4
Upper North Electrical Penetration Room	3, 4
Lower South Electrical Equipment Room	3, 4

Table 2A-3 Unit 2 Safe Operation & Shutdown Rooms/Areas	
Room/Area	**Mode**
Aux Building 317’ Emergency Core Cooling Rooms	3, 4
Aux Building 317’ Tendon Gallery Access	3, 4
Aux Building 335’ Charging Pumps / MCC 2B-52	3, 4
Aux Building 354’ MCC 2B-62 Area	3, 4
Emergency Diesel Generator Corridor	3, 4
Lower South Piping Penetration Room	3, 4
Aux Building 386’ Containment Hatch	3, 4

Mode Applicability:

3 – Hot Standby, 4 – Hot Shutdown

Definition(s):

IMPEDE(D) – Personnel access to a room or area is hindered to an extent that extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is **not** routinely employed).

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.

Basis:

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

For AA3.2, 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 higher radiation levels. Access should be considered as IMPEDED if extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., installing temporary shielding, requiring use of non-routine protective equipment, requesting an extension in dose limits beyond normal administrative limits).

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

- The plant is in an operating mode different than the mode specified for the affected room/area (i.e., entry is not required during the operating mode in effect at the time of the elevated radiation levels). For example, the plant is in Mode 1 when the radiation rise occurs, and the procedures used for normal operation, cooldown and shutdown do not require entry into the affected room until Mode 3.
- The higher 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 access control measures are of a conservative or precautionary nature, and would not actually prevent or IMPEDE a required action.

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

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.

The list of plant rooms or areas with entry-related mode applicability identified 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. 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) are not included. In addition, the list specifies the plant mode(s) during which entry would be required for each room or area (ref. 1).

EAL AA3.2 mode applicability has been limited to the mode limitations of Table 1[2]A-3 (Modes 3 and 4 **only**).

Reference(s):

1. Attachment 2 Safe Operation & Shutdown Areas Tables 1[2]A-3 & 1[2]H-2 Bases
2. NEI 99-01 AA3

Category C – Cold Shutdown / Refueling System Malfunction

EAL Group: Cold Conditions (RCS temperature ≤ 200°F); EALs in this category are applicable only in one or more cold operating modes.

Category C EALs are directly associated with cold shutdown or refueling system safety functions. Given the variability of plant configurations (e.g., systems out-of-service for maintenance, containment open, reduced AC power redundancy, time since shutdown) during these periods, the consequences of any given initiating event can vary greatly. For example, a loss of decay heat removal capability that occurs at the end of an extended outage has less significance than a similar loss occurring during the first week after shutdown. Compounding these events is the likelihood that instrumentation necessary for assessment may also be inoperable. The cold shutdown and refueling system malfunction EALs are based on performance capability to the extent possible with consideration given to RCS integrity, CONTAINMENT CLOSURE, and fuel clad integrity for the applicable operating modes (5 - Cold Shutdown, 6 - Refueling, DEF – Defueled).

The events of this category pertain to the following subcategories:

1. RCS Level

RCS water level is directly related to the status of adequate core cooling and, therefore, fuel clad integrity.

2. Loss of Vital AC Power

Loss of vital plant electrical power can compromise plant SAFETY SYSTEM operability including decay heat removal and emergency core cooling systems which may be necessary to ensure fission product barrier integrity. This category includes loss of onsite and offsite power sources for 4.16 KV vital buses.

3. RCS Temperature

Uncontrolled or inadvertent temperature or pressure rises are indicative of a potential loss of safety functions.

4. Loss of Vital DC Power

Loss of emergency plant electrical power can compromise plant SAFETY SYSTEM operability including decay heat removal and emergency core cooling systems which may be necessary to ensure fission product barrier integrity. This category includes loss of power to or degraded voltage on the 125V DC vital buses.

5. Loss of Communications

Certain events that degrade plant operator ability to effectively communicate with essential personnel within or external to the plant warrant emergency classification.

6. Hazardous Event Affecting Safety Systems

Certain hazardous natural and technological events may result in VISIBLE DAMAGE to or degraded performance of safety systems warranting classification.

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: UNPLANNED loss of RCS inventory

EAL:

CU1.1 Unusual Event
UNPLANNED loss of reactor coolant results in RCS water level less than a required lower limit for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

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.

Basis:

This EAL 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 RCS level concurrent with indications of coolant leakage. Either of these conditions is considered to be a potential degradation of the level of safety of the plant.

Refueling evolutions that lower RCS water inventory are carefully planned and controlled. An UNPLANNED event that results in water level lowering 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.

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

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

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

Reference(s):

1. OP-1015.002 Decay Heat Removal and LTOP System
2. OP-1015.008 Unit 2 SDC Control
3. NEI 99-01 CU1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: UNPLANNED loss of RCS inventory

EAL:

CU1.2 Unusual Event

RCS level **cannot** be monitored

AND EITHER:

- UNPLANNED rise in **any** Table 1[2]C-1 sump/tank level due to loss of RCS inventory
- Visual observation of UNISOLABLE RCS leakage

Table 1C-1 Unit 1 Sumps / Tanks
• Reactor Building Sump • Reactor Drain Tank • Aux. Building Equipment Drain Tank • Aux. Building Sump • Quench Tank

Table 2C-1 Unit 2 Sumps / Tanks
• CNTMT Sump • Reactor Drain Tank • LRW Waste Tank (2T-20) • Holdup Tank • Aux. Building Sump • Quench Tank

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

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

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

Basis:

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 RCS level concurrent with indications of coolant leakage. Either of these conditions is considered to be a potential degradation of the level of safety of the plant.

Refueling evolutions that lower RCS water inventory are carefully planned and controlled. An UNPLANNED event that results in water level lowering 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.

This EAL addresses a condition where all means to determine RCS level have been lost. In this condition, operators may determine that an inventory loss is occurring by observing changes in sump and/or tank levels (Table C-1). 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 RCS.

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

Reference(s):

1. OP-1203.039 Excess RCS Leakage
2. OP-2203.016 Excess RCS Leakage
3. NEI 99-01 CU1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Significant Loss of RCS inventory

EAL:

CA1.1 Alert
Loss of RCS inventory as indicated by **EITHER**: • RVLMS Levels 1 through 8[1 through 5] indicate DRY • Reactor vessel level < 370.2 ft. (LT-1195/LT-1196)[< 24 in. (L4791/L4792)] (minimum level for DHR operation @ 1000 gpm)[(minimum level for SDC operation)]

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

None

Basis:

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 this EAL, a lowering of RPV water level below the specified level indicates that operator actions have not been successful in restoring and maintaining RCS water level. The heat-up rate of the coolant will rise as the available water inventory is reduced. A continuing drop in water level will lead to core uncovery.

Although related, this EAL is concerned with the loss of RPV inventory and not the potential concurrent effects on systems needed for decay heat removal (e.g., loss of a Decay Heat Removal suction point). A rise in RCS temperature caused by a loss of decay heat removal capability is evaluated under IC CA3.

If water level continues to lower, then escalation to Site Area Emergency would be via IC CS1.

A loss of DHR/SDC will occur at approximately RLVMS Level 8 (Unit 1) or RVLMS Level 5 (Unit 2). However, RVLMS may not be available in the cold shutdown modes. Redundant means of level indication is provided in these modes and included in this EAL. The point at which a loss of DHR/SDC is likely to occur is 370.2 ft. (Unit 1) or 24 in. (Unit 2) as indicated in the respective Control Rooms. The value selected for ANO-1 is based on 1000 gpm DHR flow

which is the flow rate at which the low flow alarm is received. The ANO-2 value is the proceduralized minimum value. Below these levels, a loss of suction to decay heat removal systems will occur (ref. 1, 2, 3). The inability to restore and maintain level after reaching this value would be indicative of a failure of the RCS barrier.

Reference(s):

1. OP-1104.004 Decay Heat Removal Operating Procedure
2. OP-1105.008 Inadequate Core Cooling Monitor and Display
3. OP-2105.003 Reactor Vessel Level Monitoring System Operations
4. OP-2203.029 Loss of Shutdown Cooling
5. Calculation No. 90-E-0116-01 ANO-2 EOP Setpoint Basis Document, Setpoints R.3 and R.9
6. NEI 99-01 CA1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Significant Loss of RCS inventory

EAL:

CA1.2 Alert

RCS level **cannot** be monitored for ≥ 15 min. (Note 1)

AND EITHER:

- UNPLANNED rise in **any** Table 1[2]C-1 sump/tank level due to a loss of RCS inventory
- Visual observation of UNISOLABLE RCS leakage

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1C-1 Unit 1 Sumps / Tanks
• Reactor Building Sump • Reactor Drain Tank • Aux. Building Equipment Drain Tank • Aux. Building Sump • Quench Tank

Table 2C-1 Unit 2 Sumps / Tanks
• CNTMT Sump • Reactor Drain Tank • LRW Waste Tank (2T-20) • Holdup Tank • Aux. Building Sump • Quench Tank

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

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

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

Basis:

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

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 RCS inventory level continues to lower, then escalation to Site Area Emergency would be via IC CS1.

Reference(s):

1. OP-1203.039 Excess RCS Leakage
2. OP-2203.016 Excess RCS Leakage
3. NEI 99-01 CA1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Loss of RCS inventory affecting core decay heat removal capability

EAL:

CS1.1 Site Area Emergency
CONTAINMENT CLOSURE **not** established
AND
RVLMS Levels 1 through 9[1 through 6] indicate DRY

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE - The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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

Basis:

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

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

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

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

Escalation of the emergency classification level would be via IC CG1 or AG1.

Reference(s):

1. OP-1105.008 Inadequate Core Cooling Monitor and Display
2. OP-2105.003 Reactor Vessel Level Monitoring System Operations
3. NEI 99-01 CS1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Loss of RCS inventory affecting core decay heat removal capability

EAL:

CS1.2 Site Area Emergency

[RVLMS Levels 1 through 7 indicate DRY

OR]

RCS level **cannot** be monitored for ≥ 30 min. (Note 1)

AND

Core uncovery is indicated by **any** of the following:

- UNPLANNED rise in **any** Table 1[2]C-1 sump/tank level of sufficient magnitude to indicate core uncovery
- Containment high range radiation monitor RE-8060/8061[2RE-8925-1/8925-2] reading > 10 R/hr
- Erratic Source Range Monitor indication

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1C-1 Unit 1 Sumps / Tanks
• Reactor Building Sump • Reactor Drain Tank • Aux. Building Equipment Drain Tank • Aux. Building Sump • Quench Tank

Table 2C-1 Unit 2 Sumps / Tanks
• CNTMT Sump • Reactor Drain Tank • LRW Waste Tank (2T-20) • Holdup Tank • Aux. Building Sump • Quench Tank

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE - The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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

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.

Basis:

When in service, the Unit 2 RVLMS can measure RCS level below the top of active fuel. Level 7 DRY on this system is an indication of core uncovery.

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

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

Outage/shutdown contingency plans typically provide for re-establishing or verifying CONTAINMENT CLOSURE following a loss of heat removal or RCS inventory control functions. The difference in the specified RCS levels of EALs CS1.1 and CS1.2 reflect the fact that with CONTAINMENT CLOSURE established, there is a lower probability of a fission product release to the environment.

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

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

This EAL addresses 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*.

Containment High Range Radiation Monitors RE-8060/8061 [2RE-8925-1/8925-2] are the site-specific radiation monitors that would be indicative of possible core uncovery in the Refueling mode. The dose rate due to core shine when the top of the core becomes uncovered should result in dose rates > 10 R/hr.

Escalation of the emergency classification level would be via IC CG1 or AG1.

Reference(s):

1. OP-1203.039 Excess RCS Leakage
2. OP-2203.016 Excess RCS Leakage
3. OP-2105.003 Reactor Vessel Level Monitoring System Operations
4. 1SAR Table 7-11
5. 2SAR 12.1.4.2
6. NEI 99-01 CS1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Loss of RCS inventory affecting fuel clad integrity with containment challenged

EAL:

CG1.1 General Emergency – UNIT 2 ONLY
RVLMS Levels 1 through 7 indicate DRY
AND
Any Containment Challenge indication, Table 1[2]C-2

Note 6: If CONTAINMENT CLOSURE is re-established prior to exceeding the 30-minute time limit, declaration of a General Emergency is **not** required.

Table 1[2]C-2 Containment Challenge Indications
• CONTAINMENT CLOSURE **not** established (Note 6) • Containment hydrogen concentration > 4% • UNPLANNED rise in containment pressure

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE - The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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

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.

Basis:

When in service, the Unit 2 RVLMS can measure RCS level below the top of active fuel. Level 7 DRY on this system is an indication of core uncovery.

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

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

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

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

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

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

Reference(s):

1. OP-1203.039 Excess RCS Leakage
2. OP-2203.016 Excess RCS Leakage
3. OP-2105.003 Reactor Vessel Level Monitoring System Operations
4. 1SAR Table 7-11
5. 2SAR 12.1.4.2
6. Unit 1 SAMG Figure III-1B
7. Unit 2 SAMG Phase 1 Instructions, Containment Flowchart
8. NEI 99-01 CG1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 1 – RCS Level

Initiating Condition: Loss of RCS inventory affecting fuel clad integrity with containment challenged

EAL:

CG1.2 General Emergency

RCS level **cannot** be monitored for ≥ 30 min. (Note 1)

AND

Core uncovery is indicated by **any** of the following:

- UNPLANNED rise in **any** Table 1[2]C-1 sump/tank level of sufficient magnitude to indicate core uncovery
- Containment High Range Radiation Monitor RE-8060/8061[2RE-8925-1/8925-2] reading > 10 R/hr
- Erratic Source Range Monitor indication

AND

Any Containment Challenge indication, Table 1[2]C-2

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 6: If CONTAINMENT CLOSURE is re-established prior to exceeding the 30-minute time limit, declaration of a General Emergency is **not** required.

Table 1C-1 Unit 1 Sumps / Tanks
• Reactor Building Sump • Reactor Drain Tank • Aux. Building Equipment Drain Tank • Aux. Building Sump • Quench Tank

Table 2C-1 Unit 2 Sumps / Tanks
• CNTMT Sump • Reactor Drain Tank • LRW Waste Tank (2T-20) • Holdup Tank • Aux. Building Sump • Quench Tank

Table 1[2]C-2 Containment Challenge Indications
• CONTAINMENT CLOSURE **not** established (Note 6) • Containment hydrogen concentration > 4% • UNPLANNED rise in containment pressure

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE - The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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

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.

Basis:

When in service, the Unit 2 RVLMS can measure RCS level below the top of active fuel. Level 7 DRY on this system is an indication of core uncovery.

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

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

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

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

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

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

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

Containment High Range Radiation Monitor RE-8060/8061 [2RE-8925-1/8925-2] are the site-specific radiation monitors that would be indicative of possible core uncovery in the Refueling mode. The dose rate due to core shine when the top of the core becomes uncovered should result in dose rates > 10 R/hr.

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

Reference(s):

1. OP-1203.039 Excess RCS Leakage
2. OP-2203.016 Excess RCS Leakage
3. OP-2105.003 Reactor Vessel Level Monitoring System Operations
4. 1SAR Table 7-11
5. 2SAR 12.1.4.2
6. Unit 1 SAMG Figure III-1B
7. Unit 2 SAMG Phase 1 Instructions, Containment Flowchart
8. NEI 99-01 CG1

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 2 – Loss of Vital AC Power

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

EAL:

CU2.1 Unusual Event

AC power capability, Table 1[2]C-3, to vital 4.16 KV buses A3[2A3] and A4[2A4] reduced to a single power source for ≥ 15 min. (Note 1)

AND

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

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1C-3 Unit 1 AC Power Sources
Offsite • Startup Transformer No. 1 • Startup Transformer No. 2 • Unit Auxiliary Transformer (from 22 KV switchyard) **Onsite** • DG1 • DG2 • AAC Gen

Table 2C-3 Unit 2 AC Power Sources
Offsite • Startup Transformer No. 3 • Startup Transformer No. 2 • Unit Auxiliary Transformer (backfed from main transformer) **Onsite** • 2DG1 • 2DG2 • AAC Gen

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling, DEF - Defueled

Definition(s):

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 (as defined in 10 CFR 50.2):

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

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

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

An “AC power source” is a source recognized in AOPs and EOPs, and capable of supplying required power to a vital bus. Some examples of this condition are presented below.

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

Fifteen minutes was selected as a 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.

This EAL is the cold condition equivalent of the hot condition EAL SA1.1.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations
5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. NEI 99-01 CU2

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 2 – Loss of Vital AC Power

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

EAL:

CA2.1 Alert
Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3[2A3] and A4[2A4] for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling, DEF - Defueled

Definition(s):

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 (as defined in 10 CFR 50.2):

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

Although the AAC may be considered available, it will not prevent declaration of this EAL unless it is powering a vital bus within the 15-minute time period of the EAL.

This IC addresses a total loss of AC power that compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink. Mitigative strategies using non-safety related power sources (FLEX generators, etc.) may be effective in supplying power to these buses. These power sources must be controlled in

accordance with abnormal or emergency operating procedures, or beyond design basis accident response guidelines (e.g., FLEX support guidelines) and must be capable (alone or in combination) of supplying power for long term decay heat removal systems.

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

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

Escalation of the emergency classification level would be via IC CS1 or AS1.

This EAL is the cold condition equivalent of the hot condition EAL SS1.1.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations
5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. NEI 99-01 CU2

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 3 – RCS Temperature

Initiating Condition: UNPLANNED rise in RCS temperature

EAL:

CU3.1 Unusual Event
UNPLANNED rise in RCS temperature to > 200°F

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE – The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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.

Basis:

This IC addresses an UNPLANNED rise in RCS temperature above the Technical Specification cold shutdown temperature limit and represents a potential degradation of the level of safety of the plant. If the RCS is not intact and CONTAINMENT CLOSURE is not established during this event, the Emergency Director should also refer to EAL CA3.1.

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

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

During an outage, the level in the reactor vessel will normally be maintained at or 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 lowered inventory may result in a rapid rise in reactor coolant temperature depending on the time after shutdown.

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

Reference(s):

1. Unit 1 and Unit 2 Technical Specifications Table 1.1-1
2. NEI 99-01 CU3

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 3 – RCS Temperature

Initiating Condition: UNPLANNED rise in RCS temperature

EAL:

CU3.2 Unusual Event
Loss of **all** RCS temperature and RCS level indication for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE – The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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.

Basis:

This EAL addresses the inability to determine RCS temperature and level, and represents a potential degradation of the level of safety of the plant. If the RCS is not intact and CONTAINMENT CLOSURE is not established during this event, the Emergency Director should also refer to EAL CA3.1.

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

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

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

Reference(s):

1. NEI 99-01 CU3

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 3 – RCS Temperature

Initiating Condition: Inability to maintain plant in cold shutdown

EAL:

CA3.1 Alert

UNPLANNED rise in RCS temperature to > 200°F for > Table 1[2]C-4 duration (Note 1)

OR

UNPLANNED RCS pressure rise > 10 psig (this EAL does not apply during water-solid plant conditions)

Note 1: The Emergency Director should declare the event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1[2]C-4 RCS Heat-up Duration Thresholds

RCS Status	CONTAINMENT CLOSURE Status	Heat-up Duration
Intact (but **not** lowered inventory)	N/A	60 min.*
Not intact **OR** lowered inventory	established	20 min.*
	not established	0 min.

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

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

CONTAINMENT CLOSURE – The action to secure primary containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions.

As applied to ANO, CONTAINMENT CLOSURE must be capable of being set within 30 minutes. CONTAINMENT CLOSURE is set when the penetrations are isolated by manual or automatic isolation valve, blind flange, or equivalent.

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.

Basis:

In the absence of reliable RCS temperature indication, classification should be based on the RCS pressure rise criteria when the RCS is intact in Mode 5 or based on time to boil data when in Mode 6 or the RCS is not intact in Mode 5.

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

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

The RCS Heat-up Duration Thresholds table addresses a rise in RCS temperature when CONTAINMENT CLOSURE is established but the RCS is not intact, or RCS inventory is reduced (e.g., lowered inventory operation). The 20-minute criterion was included to allow time for operator action to address the temperature rise.

The RCS Heat-up Duration Thresholds table also addresses a rise in RCS temperature with the RCS intact. The status of CONTAINMENT CLOSURE 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 rise without a substantial degradation in plant safety.

Finally, in the case where there is a rise in RCS temperature, the RCS is not intact or is at lowered inventory and CONTAINMENT CLOSURE 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.

The RCS pressure rise threshold provides a pressure-based indication of RCS heat-up in the absence of RCS temperature monitoring capability.

Escalation of the emergency classification level would be via IC CS1 or AS1.

Reference(s):

1. Unit 1 and Unit 2 Technical Specifications Table 1.1-1
2. NEI 99-01 CA3

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 4 – Loss of Vital DC Power

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

EAL:

CU4.1 Unusual Event
Indicated voltage is < 105 VDC on vital 125 VDC buses for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

Unit 1 batteries D06 and D07 and Unit 2 batteries 2D11 and 2D12 contain 58 cells each with a minimum cell voltage of 1.81 V or 105 VDC.

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 raise the time available to restore a vital DC bus to service. Thus, this condition is considered to be a potential degradation of the level of safety of the plant.

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

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

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

This EAL is the cold condition equivalent of the hot condition EAL SS2.1.

Reference(s):

1. 1SAR 8.3.2.1.1 Batteries
2. 2SAR 8.3.2.1.1 Batteries
3. NEI 99-01 CU4

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 5 – Loss of Communications

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

EAL:

CU5.1 Unusual Event

Loss of **all** Table 1[2]C-5 onsite communication methods

OR

Loss of **all** Table 1[2]C-5 State and local agency communication methods

OR

Loss of **all** Table 1[2]C-5 NRC communication methods

Table 1[2]C-5 Communication Methods			
System	**Onsite**	**ORO**	**NRC**
Station radio system	X		
ANO plant phone system	X		
Gaitronics	X		
Telephone Systems: • Commercial • Microwave • Satellite • VOIP		X	X
Emergency Notification System (ENS)			X

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling, DEF – Defueled

Definition(s):

None

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 State and local agencies and the NRC.

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

The first EAL condition addresses a total loss of the communications methods used in support of routine plant operations.

The second EAL condition addresses a total loss of the communications methods used to notify all State and local agencies of an emergency declaration. The State and local agencies referred to here are the Arkansas Department of Health, Arkansas Department of Emergency Management, Pope, Yell, Johnson, and Logan County offsite agencies.

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

This EAL is the cold condition equivalent of the hot condition EAL SU7.1.

Reference(s):

1. OP-1903.062 Communications System Operating Procedure
2. NEI 99-01 CU5

Category: C – Cold Shutdown / Refueling System Malfunction

Subcategory: 6 – Hazardous Event Affecting Safety Systems

Initiating Condition: Hazardous event affecting SAFETY SYSTEMS needed for the current operating mode

EAL:

CA6.1 Alert

The occurrence of **any** Table 1[2]C-6 hazardous event

AND

Event damage has caused indications of degraded performance on one train of a SAFETY SYSTEM needed for the current operating mode

AND EITHER:

- Event damage has caused indications of degraded performance to the second train of the SAFETY SYSTEM needed for the current operating mode
- Event damage has resulted in VISIBLE DAMAGE to the second train of the SAFETY SYSTEM needed for the current operating mode

(Notes 10, 11)

Note 10: If the affected SAFETY SYSTEM train was already inoperable or out of service before the hazardous event occurred, then emergency classification is **not** warranted.

Note 11: If the hazardous event **only** resulted in VISIBLE DAMAGE, with **no** indications of degraded performance to at least one train of a SAFETY SYSTEM, then this emergency classification is **not** warranted.

Table 1[2]C-6 Hazardous Events
• Seismic event (earthquake) • Internal or external FLOODING event • High winds or tornado strike • FIRE • EXPLOSION • Other events with similar hazard characteristics as determined by the Shift Manager

Mode Applicability:

5 - Cold Shutdown, 6 - Refueling

Definition(s):

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 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.

FLOODING - A condition where water is entering a room or area faster than installed equipment is capable of removal, resulting in a rise of water level within the room or area.

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

VISIBLE DAMAGE - Damage to a SAFETY SYSTEM train 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 SAFETY SYSTEM train.

Basis:

This IC addresses a hazardous event that causes damage to SAFETY SYSTEMS needed for the current operating mode. In order to provide the appropriate context for consideration of an ALERT classification, the hazardous event must have caused indications of degraded SAFETY SYSTEM performance in one train, and there must be either indications of performance issues with the second SAFETY SYSTEM train or VISIBLE DAMAGE to the second train such that the potential exists for this second SAFETY SYSTEM train to have performance issues. In other words, in order for this EAL to be classified, the hazardous event must occur, at least one SAFETY SYSTEM train must have indications of degraded performance, and the second SAFETY SYSTEM train must have indications of degraded performance or VISIBLE DAMAGE such that the potential exists for performance issues. Note that this second SAFETY SYSTEM

train is from the same SAFETY SYSTEM that has indications of degraded performance; commercial nuclear power plants are designed to be able to support single system issues without compromising public health and safety from radiological events.

Indications of degraded performance 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.

VISIBLE DAMAGE addresses damage to a SAFETY SYSTEM train that is not in service/operation and that potentially could cause performance issues. Operators will make this determination based on the totality of available event and damage report information. This is intended to be a brief assessment not requiring lengthy analysis or quantification of the damage. This VISIBLE DAMAGE should be significant enough to cause concern regarding the operability or reliability of the SAFETY SYSTEM train.

Escalation of the emergency classification level would be via IC CS1 or AS1.

This EAL is the cold condition equivalent of the hot condition EAL SA9.1.

Reference(s):

1. EP FAQ 2016-002
2. NEI 99-01 CA6

Category E – Independent Spent Fuel Storage Installation (ISFSI)

EAL Group: ANY (EALs in this category are applicable to any plant condition, hot or cold.)

An independent spent fuel storage installation (ISFSI) is a complex that is designed and constructed for the interim storage of spent nuclear fuel and other radioactive materials associated with spent fuel storage. A significant amount of the radioactive material contained within a canister must escape its packaging and enter the biosphere for there to be a significant environmental effect resulting from an accident involving the dry storage of spent nuclear fuel.

An Unusual Event is declared on the basis of the occurrence of an event of sufficient magnitude that a loaded cask CONFINEMENT BOUNDARY is damaged or violated.

The ANO ISFSI is located wholly within the plant PROTECTED AREA. Therefore any security event related to the ISFSI is classified under Category H1 security event related EALs.

Category: E – ISFSI

Subcategory: Confinement Boundary

Initiating Condition: Damage to a loaded cask CONFINEMENT BOUNDARY

EAL:

EU1.1 Unusual Event
Damage to a loaded cask CONFINEMENT BOUNDARY as indicated by an on-contact radiation reading on the surface of a loaded spent fuel cask (VSC-24 VCC or HI-STORM overpack) > **any** Table 1[2]E-1 value

Table 1[2]E-1 ISFSI Dose Rates	
VSC-24 VCC	**HI-STORM**
• 200 mrem/hr on the sides • 400 mrem/hr on the top • 700 mrem/hr at the air inlet • 200 mrem/hr at the air outlet	• 60 mrem/hr (gamma + neutron) on the top or outlet vent • 600 mrem/hr (gamma + neutron) on the side of the overpack (excluding inlet and outlet ducts)

Mode Applicability:

All

Definition(s):

CONFINEMENT BOUNDARY – The barrier(s) between spent fuel and the environment once the spent fuel is processed for dry storage. As related to the ANO ISFSI, the Confinement Boundary is comprised of either the Multi-assembly Sealed Basket (MSB) (SNC System) or Multi-Purpose Canister (MPC) (Holtec System).

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

Basis:

This IC addresses an event that results in damage to the CONFINEMENT BOUNDARY of a storage cask containing spent fuel. It applies to irradiated fuel that is licensed for dry storage beginning at the point that the loaded storage cask is sealed. The issues of concern are the

creation of a potential or actual release path to the environment, degradation of one or more fuel assemblies due to environmental factors, and configuration changes which could cause challenges in removing the cask or fuel from storage.

The existence of “damage” is determined by radiological survey. The specified EAL threshold values correspond to 2 times the cask technical specification values (ref. 1, 2). The technical specification (licensing bases document) multiple of “2 times”, which is also used in Recognition Category A IC AU1, is used here to distinguish between non-emergency and emergency conditions. The emphasis for this classification is the degradation in the level of safety of the spent fuel cask and not the magnitude of the associated dose or dose rate. It is recognized that in the case of extreme damage to a loaded cask, the fact that the “on-contact” dose rate limit is exceeded may be determined based on measurement of a dose rate at some distance from the cask.

Security-related events for ISFSIs are covered under ICs HU1 and HA1.

Reference(s):

1. Certificate of Compliance Appendix A Technical Specifications for the HI-STORM 100 Cask System Section 5.7.4
2. VSC-24 Storage Cask Final Safety Analysis Report Section 1.2.4 Maximum External Surface Dose Rate
3. NEI 99-01 E-HU1

Category F – Fission Product Barrier Degradation

EAL Group: Hot Conditions (RCS temperature > 200°F); EALs in this category are applicable only in one or more hot operating modes.

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

A. Fuel Clad Barrier (FCB): The Fuel Clad Barrier consists of the cladding material that contains the fuel pellets.

B. Reactor Coolant System Barrier (RCB): The RCS Barrier includes the RCS primary side and its connections up to and including the pressurizer safety and relief valves, and other connections up to and including the primary isolation valves.

C. Containment Barrier (CNB): The Containment Barrier includes the Reactor Building and connections up to and including the outermost containment isolation valves. This barrier also includes the main steam, feedwater, and blowdown line extensions outside the Reactor Building up to and including the outermost secondary side isolation valve. Containment Barrier thresholds are used as criteria for escalation of the Emergency Classification Level (ECL) from an Alert to a Site Area Emergency or a General Emergency.

The EALs in this category require evaluation of the loss and potential loss thresholds listed in the fission product barrier matrix of Table F-1. “Loss” and “Potential Loss” signify the relative damage and threat of damage to the barrier. “Loss” means the barrier no longer assures containment of radioactive materials. “Potential Loss” means integrity of the barrier is threatened and could be lost if conditions continue to degrade. The number of barriers that are lost or potentially lost and the following criteria determine the appropriate emergency classification level:

Alert:

Any loss or any potential loss of either Fuel Clad or RCS Barrier

Site Area Emergency:

Loss or potential loss of any two barriers

General Emergency:

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

The logic used for emergency classification based on fission product barrier monitoring should reflect the following considerations:

- The Fuel Clad Barrier and the RCS Barrier are weighted more heavily than the Containment Barrier.
- Unusual Event ICs associated with RCS and Fuel Clad Barriers are addressed under System Malfunction ICs.
- For accident conditions involving a radiological release, evaluation of the fission product barrier thresholds will need to be performed in conjunction with dose assessments to ensure correct and timely escalation of the emergency classification. For example, an evaluation of the fission product barrier thresholds may result in a Site Area Emergency classification while a dose assessment may indicate that an EAL for General Emergency IC AG1 has been exceeded.
- The fission product barrier thresholds specified within a scheme reflect plant-specific ANO design and operating characteristics.
- As used in this category, the term RCS leakage encompasses not just those types defined in Technical Specifications but also includes the loss of RCS mass to any location – inside the containment, an interfacing system, or outside of the containment. The release of liquid or steam mass from the RCS due to the as-designed/expected operation of a relief valve is not considered to be RCS leakage.
- At the Site Area Emergency level, EAL users should maintain cognizance of how far present conditions are from meeting a threshold that would require a General Emergency declaration. For example, if the Fuel Clad and RCS fission product barriers were both lost, then there should be frequent assessments of containment radioactive inventory and integrity. Alternatively, if both the Fuel Clad and RCS fission product barriers were potentially lost, the Emergency Director would have more assurance that there was no immediate need to escalate to a General Emergency.

Category: F – Fission Product Barrier Degradation

Subcategory: N/A

Initiating Condition: **Any** loss or **any** potential loss of either Fuel Clad or RCS

EAL:

FA1.1 Alert
Any loss or **any** potential loss of either Fuel Clad or RCS barrier (Table 1[2]F-1)

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

Fuel Clad, RCS and Containment comprise the fission product barriers. Table 1[2]F-1 lists the fission product barrier thresholds, bases and references.

At the Alert classification level, Fuel Clad and RCS barriers are weighted more heavily than the Containment barrier. Unlike the Containment barrier, loss or potential loss of either the Fuel Clad or RCS barrier may result in the relocation of radioactive materials or degradation of core cooling capability. Note that the loss or potential loss of Containment barrier in combination with loss or potential loss of either Fuel Clad or RCS barrier results in declaration of a Site Area Emergency under EAL FS1.1.

Reference(s):

1. NEI 99-01 FA1

Category: F – Fission Product Barrier Degradation

Subcategory: N/A

Initiating Condition: Loss or potential loss of **any** two barriers

EAL:

FS1.1 Site Area Emergency
Loss or potential loss of **any** two barriers (Table 1[2]F-1)

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

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

Basis:

Fuel Clad, RCS and Containment comprise the fission product barriers. Table 1[2]F-1 lists the fission product barrier thresholds, bases and references.

At the Site Area Emergency classification level, each barrier is weighted equally. A Site Area Emergency is therefore appropriate for any combination of the following conditions:

- One barrier loss and a second barrier loss (i.e., loss - loss)
- One barrier loss and a second barrier potential loss (i.e., loss - potential loss)
- One barrier potential loss and a second barrier potential loss (i.e., potential loss - potential loss)

At the Site Area Emergency classification level, the ability to dynamically assess the proximity of present conditions with respect to the threshold for a General Emergency is important. For example, the existence of Fuel Clad and RCS Barrier loss thresholds in addition to offsite dose assessments would require continual assessments of radioactive inventory and Containment integrity in anticipation of reaching a General Emergency classification. Alternatively, if both Fuel Clad and RCS potential loss thresholds existed, the Emergency Director would have greater assurance that escalation to a General Emergency is less IMMINENT.

Reference(s):

1. NEI 99-01 FS1

Category: F – Fission Product Barrier Degradation

Subcategory: N/A

Initiating Condition: Loss of **any** two barriers and loss or potential loss of third barrier

EAL:

FG1.1 General Emergency
Loss of **any** two barriers
AND
Loss or potential loss of the third barrier (Table 1[2]F-1)

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

Fuel Clad, RCS and Containment comprise the fission product barriers. Table 1[2]F-1 lists the fission product barrier thresholds, bases and references.

At the General Emergency classification level each barrier is weighted equally. A General Emergency is therefore appropriate for any combination of the following conditions:

- Loss of Fuel Clad, RCS and Containment Barriers
- Loss of Fuel Clad and RCS Barriers with potential loss of Containment Barrier
- Loss of RCS and Containment Barriers with potential loss of Fuel Clad Barrier
- Loss of Fuel Clad and Containment Barriers with potential loss of RCS Barrier

Reference(s):

1. NEI 99-01 FG1

Table 1[2]F-1 Fission Product Barrier Threshold Matrix & Bases

Table 1[2]F-1 lists the threshold conditions that define the Loss and Potential Loss of the three fission product barriers (Fuel Clad, Reactor Coolant System, and Containment). The table is structured so that each of the three barriers occupies adjacent columns. Each fission product barrier column is further divided into two columns; one for Loss thresholds and one for Potential Loss thresholds.

The first column of the table (to the left of the Fuel Clad Loss column) lists the categories (types) of fission product barrier thresholds. The fission product barrier categories are:

A. RCS or S/G Tube Leakage

B. Inadequate Heat removal

C. Containment Radiation / RCS Activity

D. Containment Integrity or Bypass

E. Emergency Director Judgment

Each category occupies a row in Table 1[2]F-1 thus forming a matrix defined by the categories. The intersection of each row with each Loss/Potential Loss column forms a cell in which one or more fission product barrier thresholds appear. If NEI 99-01 does not define a threshold for a barrier Loss/Potential Loss, the word "None" is entered in the cell.

Thresholds are assigned sequential numbers within each barrier column beginning with number one (ex., FCB1, FCB2…FCB9).

If a cell in Table 1[2]F-1 contains more than one numbered threshold, each of the numbered thresholds, if exceeded, signifies a Loss or Potential Loss of the barrier. It is not necessary to exceed all of the thresholds in a category before declaring a barrier Loss/Potential Loss.

Subdivision of Table 1[2]F-1 by category facilitates association of plant conditions to the applicable fission product barrier Loss and Potential Loss thresholds. This structure promotes a systematic approach to assessing the classification status of the fission product barriers.

When equipped with knowledge of plant conditions related to the fission product barriers, the EAL-user first scans down the category column of Table 1[2]F-1, locates the likely category and then reads across the fission product barrier Loss and Potential Loss thresholds in that category to determine if a threshold has been exceeded. If a threshold has not been exceeded, the EAL-user proceeds to the next likely category and continues review of the thresholds in the new category.

If the EAL-user determines that any threshold has been exceeded, by definition, the barrier is lost or potentially lost – even if multiple thresholds in the same barrier column are exceeded, only that one barrier is lost or potentially lost. The EAL-user must examine each of the three fission product barriers to determine if other barrier thresholds in the category are lost or potentially lost. For example, if containment radiation is sufficiently high, a Loss of the Fuel

Clad and RCS Barriers and a Potential Loss of the Containment Barrier can occur. Barrier Losses and Potential Losses are then applied to the algorithms given in EALs FG1.1, FS1.1, and FA1.1 to determine the appropriate emergency classification.

In the remainder of this Attachment, the Fuel Clad Barrier threshold bases appear first, followed by the RCS Barrier and finally the Containment Barrier threshold bases. In each barrier, the bases are given according category Loss followed by category Potential Loss beginning with Category A, then B,…, E.

<table>
<tr><th colspan="7">Table 1[2]F-1 Fission Product Barrier Threshold Matrix</th></tr>
<tr><th></th><th colspan="2">Fuel Clad Barrier (FCB)</th><th colspan="2">Reactor Coolant System Barrier (RCB)</th><th colspan="2">Containment Barrier (CNB)</th></tr>
<tr><th>Category</th><th>Loss</th><th>Potential Loss</th><th>Loss</th><th>Potential Loss</th><th>Loss</th><th>Potential Loss</th></tr>
<tr><td>A
RCS or S/G Tube Leakage</td><td>None</td><td>FCB1
RVLMS Levels 1 through 9 [1 through 7] indicate DRY</td><td>RCB1
An automatic or manual ESAS [ESFAS] actuation required by EITHER:
• UNISOLABLE RCS leakage
• S/G tube RUPTURE</td><td>RCB2
• UNISOLABLE RCS leakage or S/G tube leakage > 50[44] gpm excluding normal reductions in RCS inventory (e.g., letdown, RCP seal leakoff)
RCB3
Unit 1: PTS limits apply (RT14)
AND
RCS pressure and temperature are left of the NDTT/LTOP limit lines on EOP Figure 3 (Note 12)
Unit 2: Uncontrolled RCS cooldown (> 50 °F step change or > 100 °F change in less than a one-hour period)
AND
RCS pressure and temperature are to the left of line B (200 degrees MTS), Standard Attachment 1, P-T Limits (Note 12)</td><td>CNB1
A S/G that is leaking > 50[44] gpm (excluding normal reductions in RCS inventory) or that is RUPTURED is also FAULTED outside of containment</td><td>None</td></tr>
<tr><td>B
Inadequate Heat Removal</td><td>FCB2
CETs > 1200°F</td><td>FCB3
CETs > 700°F
FCB4
RCS heat removal cannot be established using steam generators
AND
An on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling</td><td>None</td><td>RCB4
RCS heat removal cannot be established using steam generators
AND
An on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling</td><td>None</td><td>CNB2
CETs > 1200°F
AND
Restoration procedures not effective within 15 min. (Note 1)</td></tr>
<tr><td>C
CTMT Radiation / RCS Activity</td><td>FCB5
Containment High Range Radiation Monitor RE-8060/8061 [2RE-8925-1/ 8925-2] > 750 [700] R/hr
FCB6
Coolant activity > 300 μCi/gm dose equivalent I-131</td><td>None</td><td>RCB5
Containment High Range Radiation Monitor RE-8060/8061 [2RE-8925-1/ 8925-2] > 40[50] R/hr</td><td>None</td><td>None</td><td>CNB3
Containment High Range Radiation Monitor RE-8060/8061 [2RE-8925-1/ 8925-2] > 10,000[12,000] R/hr</td></tr>
</table>

Attachment 1 – Emergency Action Level Technical Bases

Table 1[2]F-1 Fission Product Barrier Threshold Matrix						
	Fuel Clad Barrier (FCB)		Reactor Coolant System Barrier (RCB)		Containment Barrier (CNB)	
Category	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**
D **CTMT Integrity or Bypass**	None	None	None	None	CNB4 Containment isolation is required **AND EITHER:** • Containment integrity has been lost based on Emergency Director judgment • UNISOLABLE pathway from Containment to the environment exists CNB5 Indications of RCS leakage outside of Containment	CNB6 Containment pressure > 73.7 psia CNB7 Containment hydrogen concentration > 4% CNB8 Containment pressure > 44.7 psia [23.3 psia] with < one full train of containment heat removal systems (Note 9) operating per design for ≥ 15 min. (Note 1)
E **Emergency Director Judgment**	FCB7 **Any** condition in the opinion of the Emergency Director that indicates loss of the Fuel Clad barrier	FCB8 **Any** condition in the opinion of the Emergency Director that indicates potential loss of the Fuel Clad barrier	RCB6 **Any** condition in the opinion of the Emergency Director that indicates loss of the RCS barrier	RCB7 **Any** condition in the opinion of the Emergency Director that indicates potential loss of the RCS barrier	CNB9 **Any** condition in the opinion of the Emergency Director that indicates loss of the Containment barrier	CNB10 **Any** condition in the opinion of the Emergency Director that indicates potential loss of the Containment barrier

Barrier: Fuel Clad

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Loss

Threshold:

None

Barrier: Fuel Clad

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Potential Loss

Threshold:

FCB1
RVLMS Levels 1 through 9[1 through 7] indicate DRY

Definition(s):

None

Basis:

This reading indicates a reduction in reactor vessel water level sufficient to allow the onset of heat-induced cladding damage.

There is no Fuel Clad Barrier Loss threshold associated with RCS or S/G Tube Leakage.

Reference(s):

1. ULD-1-SYS-24 Unit 1 Inadequate Core Cooling System
2. Calculation 84-EQ-0080-02 Loop Error Analysis for Reactor Vessel Level Monitoring System
3. ULD-2-SYS-24 Unit 2 Inadequate Core Cooling Monitoring System
4. Calculation 90-E-0116-01 Unit 2 EOP Setpoint Document, Setpoint R.3
5. NEI 99-01 RCS or SG Tube Leakage Potential Loss 1.A

Barrier: Fuel Clad

Category: B – Inadequate Heat Removal

Degradation Threat: Loss

Threshold:

FCB2
CETs > 1200°F

Definition(s):

None

Basis:

This reading indicates temperatures within the core are sufficient to cause significant superheating of reactor coolant.

Reference(s):

1. NEI 99-01 Inadequate Heat Removal Loss 2.A

Barrier: Fuel Clad

Category: B – Inadequate Heat Removal

Degradation Threat: Potential Loss

Threshold:

FCB3
CETs > 700°F

Definition(s):

None

Basis:

This reading indicates a reduction in reactor vessel water level sufficient to allow the onset of heat-induced cladding damage.

Reference(s):

1. NEI 99-01 Inadequate Heat Removal Potential Loss 2.A

Barrier: Fuel Clad

Category: B – Inadequate Heat Removal

Degradation Threat: Potential Loss

Threshold:

FCB4 RCS heat removal **cannot** be established using steam generators **AND** An on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling

Definition(s):

None

Basis:

This condition indicates an extreme challenge to the ability to remove RCS heat using the steam generators (i.e., loss of an effective secondary-side heat sink). This condition represents a potential loss of the Fuel Clad Barrier. In accordance with EOPs, there may be unusual accident conditions during which operators intentionally reduce the heat removal capability of the steam generators; during these conditions, classification using this threshold is not warranted.

In combination with Potential Loss RCB4, meeting this threshold results in a Site Area Emergency.

Reference(s):

1. OP-1202.004 Overheating
2. OP-1202.013 Figure 4, Core Exit Thermocouple for Inadequate Core Cooling
3. OP-2202.006 Loss of Feedwater
4. OP-2202.009 Functional Recovery, Safety Function Status Check 5
5. NEI 99-01 Inadequate Heat Removal Potential Loss 2.B

Barrier: Fuel Clad

Category: C – CTMT Radiation / RCS Activity

Degradation Threat: Loss

Threshold:

FCB5
Containment High Range Radiation Monitor RE-8060/8061[2RE-8925-1/8925-2] > 750[700] R/hr

Definition(s):

None

Basis:

The containment radiation monitor reading (768[682] R/hr rounded to 750[700] R/hr for readability) corresponds to an instantaneous release of all reactor coolant mass into the containment, assuming that reactor coolant activity equals 300 μCi/gm dose equivalent I-131. Reactor coolant activity above this level is greater than that expected for iodine spikes and corresponds to 1.49[1.13]% fuel clad damage. Since this condition indicates that a significant amount of fuel clad damage has occurred, it represents a loss of the Fuel Clad Barrier.

The radiation monitor reading in this threshold is higher than that specified for RCS Barrier Loss threshold RCB5 since it indicates a loss of both the Fuel Clad Barrier and the RCS Barrier. Note that a combination of the two monitor readings appropriately escalates the ECL to a Site Area Emergency.

There is no Potential Loss threshold associated with CTMT Radiation/RCS Activity.

Reference(s):

1. EP-CALC-ANO-1702 Containment High Range Radiation Monitor EAL Values
2. NEI 99-01 RCS Activity/Containment Radiation FC Loss 3.A

Barrier: Fuel Clad

Category: C – CTMT Radiation / RCS Activity

Degradation Threat: Loss

Threshold:

FCB6
Coolant activity > 300 µCi/gm dose equivalent I-131

Definition(s):

None

Basis:

This threshold indicates that RCS radioactivity concentration is greater than 300 µCi/gm dose equivalent I-131. Reactor coolant activity above this level is greater than that expected for iodine spikes and corresponds to an approximate range of 2% to 5% fuel clad damage. Since this condition indicates that a significant amount of fuel clad damage has occurred, it represents a loss of the Fuel Clad Barrier.

It is recognized that sample collection and analysis of reactor coolant with highly elevated activity levels could require several hours to complete. Nonetheless, a sample-related threshold is included as a backup to other indications.

There is no Potential Loss threshold associated with CTMT Radiation/RCS Activity.

Reference(s):

1. NEI 99-01 RCS Activity/Containment Radiation Fuel Clad Loss 3.B

Barrier: Fuel Clad

Category: C – CTMT Radiation / RCS Activity

Degradation Threat: Potential Loss

Threshold:

None

Barrier: Fuel Clad

Category: D – CTMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

None

Barrier: Fuel Clad

Category: D – CTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

None

Barrier: Fuel Clad

Category: E – Emergency Director Judgment

Degradation Threat: Loss

Threshold:

FCB7
Any condition in the opinion of the Emergency Director that indicates loss of the Fuel Clad barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that are to be used by the Emergency Director in determining whether the Fuel Clad barrier is lost.

Reference(s):

1. NEI 99-01 Emergency Director Judgment Fuel Clad Loss 6.A

Barrier: Fuel Clad

Category: E – Emergency Director Judgment

Degradation Threat: Potential Loss

Threshold:

FCB8 **Any** condition in the opinion of the Emergency Director that indicates potential loss of the Fuel Clad barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that are to be used by the Emergency Director in determining whether the Fuel Clad barrier is potentially lost. The Emergency Director should also consider whether or not to declare the barrier potentially lost in the event that barrier status cannot be monitored.

Reference(s):

1. NEI 99-01 Emergency Director Judgment Potential Fuel Clad Loss 6.A

Barrier: Reactor Coolant System

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Loss

Threshold:

RCB1

An automatic or manual ESAS[ESFAS] actuation required by **EITHER:**

- UNISOLABLE RCS leakage
- S/G tube RUPTURE

Definition(s):

FAULTED - The term applied to a steam generator that has a steam leak on the secondary side of sufficient size to cause an uncontrolled drop in steam generator pressure or the steam generator to become completely depressurized.

RUPTURED - The condition of a steam generator in which primary-to-secondary leakage is of sufficient magnitude to require a safety injection (automatic or manual).

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

Basis:

Failure to isolate the leak (from the Control Room or locally), within 15 minutes or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification.

This threshold is based on an UNISOLABLE RCS leak of sufficient size to require an automatic or manual actuation of the Emergency Core Cooling System (ECCS). This condition clearly represents a loss of the RCS Barrier.

This threshold is applicable to unidentified and pressure boundary leakage, as well as identified leakage. It is also applicable to UNISOLABLE RCS leakage through an interfacing system. The mass loss may be into any location – inside containment, to the secondary-side (i.e., steam generator tube leakage) or outside of containment.

A steam generator with primary-to-secondary leakage of sufficient magnitude to require a safety injection is considered to be RUPTURED. If a RUPTURED steam generator is also FAULTED outside of containment, the declaration escalates to a Site Area Emergency since the Containment Barrier Loss threshold CNB1 will also be met.

Reference(s):

1. OP-1202.010 ESAS
2. OP-2202.003 Loss of Coolant Accident
3. NEI 99-01 RCS or SG Tube Leakage Reactor Coolant System Loss 1.A

Barrier: Reactor Coolant System

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Potential Loss

Threshold:

RCB2
UNISOLABLE RCS leakage or S/G tube leakage > 50[44] gpm excluding normal reductions in RCS inventory (e.g., letdown, RCP seal leakoff)

Definition(s):

FAULTED - The term applied to a steam generator that has a steam leak on the secondary side of sufficient size to cause an uncontrolled drop in steam generator pressure or the steam generator to become completely depressurized.

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

Basis:

Failure to isolate the leak (from the Control Room or locally), within 15 minutes or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification.

This threshold is based on an UNISOLABLE RCS leak that results in the inability to maintain pressurizer level within specified limits by operation of a normally used makeup [charging] pump, but an ESAS [ESFAS] actuation has not occurred.

This threshold is applicable to unidentified and pressure boundary leakage, as well as identified leakage. It is also applicable to UNISOLABLE RCS leakage through an interfacing system. The mass loss may be into any location – inside containment, to the secondary-side (i.e., steam generator tube leakage) or outside of containment.

If a leaking steam generator is also FAULTED outside of containment, the declaration escalates to a Site Area Emergency since the Containment Barrier Loss threshold CNB1 will also be met.

Reference(s):

1. 1SAR 9.1 Makeup and Purification System
2. 2SAR 9.3.4 Chemical and Volume Control System
3. NEI 99-01 RCS or SG Tube Leakage Reactor Coolant System Potential Loss 1.A

Barrier: Reactor Coolant System

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Potential Loss

Threshold:

RCB3

Unit 1:

PTS limits apply (RT14)

AND

RCS pressure and temperature are left of the NDTT/LTOP limit lines, on EOP Figure 3 (Note 12)

Unit 2:

Uncontrolled RCS cooldown (> 50 °F step change or > 100 °F change in less than a one-hour period)

AND

RCS pressure and temperature are to the left of line B (200 degrees MTS), Standard Attachment 1, P-T Limits (Note 12)

Note 12: Once PTS limits are first invoked, if RCS temperature and pressure are not brought within the limits within 15 minutes, this threshold is met and an immediate declaration is warranted. This threshold is met immediately upon exceeding the limits after this initial 15 minute period until PTS limits no longer apply.

Definition(s):

None

Basis:

This condition indicates an extreme challenge to the integrity of the RCS pressure boundary due to pressurized thermal shock – a transient that causes rapid RCS cooldown while the RCS is in Mode 3 or higher (i.e., hot and pressurized).

Reference(s):

1. OP-1202.012 Repetitive Task 14 Control RCS Pressure
2. OP-1202.013 EOP Figures, Figure 3 RCS Pressure vs Temperature Limits
3. OP-1202.011 HPI Cooldown
4. Calculation No: 90-E-0116-01 ANO- EOP Setpoint Basis Document OP Setpoint P.2, RCS Pressure-Temperature
5. OP-2202.010 Standard Attachments, Attachment 1, P-T Limits
6. NEI 99-01 RCS or SG Tube Leakage Reactor Coolant System Potential Loss 1.B

Barrier: Reactor Coolant System

Category: B – Inadequate Heat Removal

Degradation Threat: Loss

Threshold:

None

Barrier: Reactor Coolant System

Category: B – Inadequate Heat Removal

Degradation Threat: Potential Loss

Threshold:

RCB4
RCS heat removal **cannot** be established using steam generators
AND
An on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling

Definition(s):

None

Basis:

This condition indicates an extreme challenge to the ability to remove RCS heat using the steam generators (i.e., loss of an effective secondary-side heat sink). This condition represents a potential loss of the RCS Barrier. In accordance with EOPs, there may be unusual accident conditions during which operators intentionally reduce the heat removal capability of the steam generators; during these conditions, classification using this threshold is not warranted.

In combination with Potential Loss FCB4, meeting this threshold results in a Site Area Emergency.

This condition warrants a Site Area Emergency declaration because inadequate RCS heat removal may result in fuel heat-up sufficient to damage the cladding and raise RCS pressure to the point where mass will be lost from the system.

There is no RCS barrier Loss threshold associated with Inadequate Heat Removal.

Reference(s):

1. OP-1202.004 Overheating
2. OP-1202.013 Figure 4, Core Exit Thermocouple for Inadequate Core Cooling
3. OP-2202.006 Loss of Feedwater
4. OP-2202.009 Functional Recovery, Safety Function Status Check 5
5. NEI 99-01 Inadequate Heat Removal RCS Potential Loss 2.B

Barrier: Reactor Coolant System

Category: C – CTMT Radiation/ RCS Activity

Degradation Threat: Loss

Threshold:

RCB5
Containment High Range Radiation Monitor RE-8060/8061[2RE-8925-1/8925-2] > 40[50] R/hr

Definition(s):

None

Basis:

NRC Information Notice 97-045, Supplement 1, identifies the potential for erratic indications from the high range radiation monitors (HRRMs) as a result of thermally induced currents (TIC) which may cause the HRRM to read falsely high (for approximately 15 minutes) on a rapid temperature rise, and fail low intermittently on a rapid temperature fall. Because of this phenomenon, any trends or alarms on the HRRM's should be validated by comparison to the containment low range/area radiation monitors and Air Monitoring Systems trends before actions are taken.

The containment radiation monitor reading (42.8[50.4] R/hr rounded to 40[50] R/hr for readability) corresponds to an instantaneous release of all reactor coolant mass into the containment, assuming that reactor coolant activity equals Technical Specification allowable limits. This value is lower than that specified for Fuel Clad Barrier Loss threshold FCB5 since it indicates a loss of the RCS Barrier only.

There is no Potential Loss threshold associated with CTMT Radiation/RCS Activity.

Reference(s):

1. EP-CALC-ANO-1702 Containment High Range Radiation Monitor EAL Values
2. NEI 99-01 CMT Radiation / RCS Activity RCS Loss 3.A

Barrier: Reactor Coolant System

Category: B – CTMT Radiation/ RCS Activity

Degradation Threat: Potential Loss

Threshold:

None

Barrier: Reactor Coolant System

Category: D – CTMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

None

Barrier: Reactor Coolant System

Category: D – CTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

None

Barrier: Reactor Coolant System

Category: E – Emergency Director Judgment

Degradation Threat: Loss

Threshold:

RCB6
Any condition in the opinion of the Emergency Director that indicates loss of the RCS barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the RCS Barrier is lost.

Reference(s):

1. NEI 99-01 Emergency Director Judgment RCS Loss 6.A

Barrier: Reactor Coolant System

Category: E – Emergency Director Judgment

Degradation Threat: Potential Loss

Threshold:

RCB7
Any condition in the opinion of the Emergency Director that indicates potential loss of the RCS barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the RCS Barrier is potentially lost. The Emergency Director should also consider whether or not to declare the barrier potentially lost in the event that barrier status cannot be monitored.

Reference(s):

1. NEI 99-01 Emergency Director Judgment RCS Potential Loss 6.A

Barrier: Containment

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Loss

Threshold:

CNB1
A S/G that is leaking > 50[44] gpm (excluding normal reductions in RCS inventory) or that is RUPTURED is also FAULTED outside of containment

Definition(s):

FAULTED - The term applied to a steam generator that has a steam leak on the secondary side of sufficient size to cause an uncontrolled drop in steam generator pressure or the steam generator to become completely depressurized.

RUPTURED - The condition of a steam generator in which primary-to-secondary leakage is of sufficient magnitude to require a safety injection (automatic or manual).

Basis:

This threshold addresses a leaking or RUPTURED Steam Generator (SG) that is also FAULTED outside of containment. The condition of the SG, whether leaking or RUPTURED, is determined in accordance with the thresholds for RCS Barrier Potential Loss RCB2 and Loss RCB1, respectively. This condition represents a bypass of the containment barrier.

FAULTED is a defined term within the NEI 99-01 methodology; this determination is not necessarily dependent upon entry into, or diagnostic steps within, an EOP. For example, if the pressure in a steam generator is dropping uncontrollably (part of the FAULTED definition) and the FAULTED steam generator isolation procedure is not entered because EOP user rules are dictating implementation of another procedure to address a higher priority condition, the steam generator is still considered FAULTED for emergency classification purposes.

The FAULTED criterion establishes an appropriate lower bound on the size of a steam release that may require an emergency classification. Steam releases of this size are readily observable with normal Control Room indications. The lower bound for this aspect of the containment barrier is analogous to the lower bound criteria specified in IC SU4 for the fuel clad barrier (i.e., RCS activity values) and IC SU5 for the RCS barrier (i.e., RCS leak rate values).

This threshold also applies to prolonged steam releases necessitated by operational considerations such as the forced steaming of a leaking or RUPTURED steam generator directly to atmosphere to cooldown the plant. These types of conditions will result in a significant and sustained release of radioactive steam to the environment (and are thus similar to a FAULTED condition). The inability to isolate the steam flow without an adverse effect on plant cooldown meets the intent of a loss of containment.

Steam releases associated with the expected operation of a SG power operated relief valve or safety relief valve do not meet the intent of this threshold. Such releases may occur intermittently for a short period of time following a reactor trip as operators process through emergency operating procedures to bring the plant to a stable condition and prepare to initiate a plant cooldown. Steam releases associated with the unexpected operation of a valve (e.g., a stuck-open safety valve) do meet this threshold.

Following a SG tube leak or rupture, there may be minor radiological releases through a secondary-side system component (e.g., air ejectors, glad seal exhausters, valve packing, etc.). These types of releases do not constitute a loss or potential loss of containment but should be evaluated using the Recognition Category A ICs.

The ECLs resulting from primary-to-secondary leakage, with or without a steam release from the FAULTED SG, are summarized below.

	Affected SG is FAULTED Outside of Containment?	
P-to-S Leak Rate	**Yes**	**No**
Less than or equal to 25 gpm	No classification	No classification
Greater than 25 gpm	Unusual Event per SU5.1	Unusual Event per SU5.1
Greater than 50[44] gpm (*RCS Barrier Potential Loss*)	Site Area Emergency per FS1.1	Alert per FA1.1
Requires an automatic or manual ESAS[ESFAS] actuation (*RCS Barrier Loss*)	Site Area Emergency per FS1.1	Alert per FA1.1

There is no Potential Loss threshold associated with RCS or S/G Tube Leakage.

Reference(s):

1. NEI 99-01 RCS or SG Tube Leakage Containment Loss 1.A

Barrier: Containment

Category: A – RCS or S/G Tube Leakage

Degradation Threat: Potential Loss

Threshold:

None

Barrier: Containment

Category: B – Inadequate Heat Removal

Degradation Threat: Loss

Threshold:

None

Barrier: Containment

Category: B – Inadequate Heat Removal

Degradation Threat: Potential Loss

Threshold:

CNB2
CETs > 1200°F
AND
Restoration procedures **not** effective within 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Definition(s):

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

Basis:

The restoration procedure is considered "effective" if core exit thermocouple readings are dropping and/or if reactor vessel level is rising. Whether or not the procedure(s) will be effective should be apparent within 15 minutes. The Emergency Director should escalate the emergency classification level as soon as it is determined that the procedure(s) will not be effective.

This condition represents an IMMINENT core melt sequence which, if not corrected, could lead to vessel failure and an increased potential for containment failure. For this condition to occur, there must already have been a loss of the RCS Barrier and the Fuel Clad Barrier. If implementation of a procedure(s) to restore adequate core cooling is not effective (successful) within 15 minutes, it is assumed that the event trajectory will likely lead to core melting and a subsequent challenge of the Containment Barrier.

Severe accident analyses (e.g., NUREG-1150) have concluded that function restoration procedures can arrest core degradation in a significant fraction of core damage scenarios, and that the likelihood of containment failure is very small in these events. Given this, it is appropriate to provide 15 minutes beyond the required entry point to determine if procedural actions can reverse the core melt sequence.

Reference(s):

1. NEI 99-01 Inadequate Heat Removal Containment Potential Loss 2.A

Barrier: Containment

Category: C – CTMT Radiation/RCS Activity

Degradation Threat: Loss

Threshold:

None

Barrier: Containment

Category: C – CTMT Radiation/RCS Activity

Degradation Threat: Potential Loss

Threshold:

CNB3
Containment High Range Radiation Monitor RE-8060/8061[2RE-8925-1/8925-2] > 10,000[12,000] R/hr

Definition(s):

None

Basis:

The containment radiation monitor reading (10,300[12,100] R/hr rounded to 10,000[12,000] R/hr for readability) corresponds to an instantaneous release of all reactor coolant mass into the containment, assuming that 20% of the fuel cladding has failed. This level of fuel clad failure is well above that used to determine the analogous Fuel Clad Barrier Loss and RCS Barrier Loss thresholds.

NUREG-1228, Source Estimations During Incident Response to Severe Nuclear Power Plant Accidents, indicates the fuel clad failure must be greater than approximately 20% in order for there to be a major release of radioactivity requiring offsite protective actions. For this condition to exist, there must already have been a loss of the RCS Barrier and the Fuel Clad Barrier. It is therefore prudent to treat this condition as a potential loss of containment which would then escalate the ECL to a General Emergency.

There is no Loss threshold associated with CTMT Radiation/RCS Activity.

Reference(s):

1. EP-CALC-ANO-1702 Containment High Range Radiation Monitor EAL Values
2. NEI 99-01 CTMT Radiation / RCS Activity Containment Potential Loss 3.A

Barrier: Containment

Category: D – CTMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

CNB4

Containment isolation is required

AND EITHER:

- Containment integrity has been lost based on Emergency Director judgment
- UNISOLABLE pathway from Containment to the environment exists

Definition(s):

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

Basis:

Failure to isolate the leak (from the Control Room or locally), within 15 minutes or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification.

The status of the containment barrier during an event involving steam generator tube leakage is assessed using Loss Threshold CNB1.

These thresholds address a situation where containment isolation is required and one of two conditions exists as discussed below. Users are reminded that there may be accident and release conditions that simultaneously meet both bulleted thresholds.

<u>First Threshold</u> – Containment integrity has been lost, i.e., the actual containment atmospheric leak rate likely exceeds that associated with allowable leakage (or sometimes referred to as design leakage). Following the release of RCS mass into containment, containment pressure will fluctuate based on a variety of factors; a loss of containment integrity condition may (or may not) be accompanied by a noticeable drop in containment pressure. Recognizing the inherent difficulties in determining a containment leak rate during accident conditions, it is expected that the Emergency Director will assess this threshold using judgment, and with due consideration given to current plant conditions, and available operational and radiological data (e.g., containment pressure, readings on radiation monitors outside containment, operating status of containment pressure control equipment, etc.).

Refer to the middle piping run of Figure 1. Two simplified examples are provided. One is leakage from a penetration and the other is leakage from an in-service system valve. Depending upon radiation monitor locations and sensitivities, the leakage could be detected by any of the four monitors depicted in the figure.

Another example would be a loss or potential loss of the RCS barrier, and the simultaneous occurrence of two FAULTED locations on a steam generator where one fault is located inside containment (e.g., on a steam or feedwater line) and the other outside of containment. In this case, the associated steam line provides a pathway for the containment atmosphere to escape to an area outside the containment.

Following the leakage of RCS mass into containment and a rise in containment pressure, there may be minor radiological releases associated with allowable (design) containment leakage through various penetrations or system components. These releases do not constitute a loss or potential loss of containment but should be evaluated using the Recognition Category A ICs.

Second Threshold – Conditions are such that there is an UNISOLABLE pathway for the migration of radioactive material from the containment atmosphere to the environment. As used here, the term “environment” includes the atmosphere of a room or area, outside the containment, that may, in turn, communicate with the outside-the-plant atmosphere (e.g., through discharge of a ventilation system or atmospheric leakage). Depending upon a variety of factors, this condition may or may not be accompanied by a noticeable drop in containment pressure.

Refer to the top piping run of Figure 1. In this simplified example, the inboard and outboard isolation valves remained open after a containment isolation was required (i.e., containment isolation was not successful). There is now an UNISOLABLE pathway from the containment to the environment.

The existence of a filter is not considered in the threshold assessment. Filters do not remove fission product noble gases. In addition, a filter could become ineffective due to iodine and/or particulate loading beyond design limits (i.e., retention ability has been exceeded) or water saturation from steam/high humidity in the release stream.

Leakage between two interfacing liquid systems, by itself, does not meet this threshold.

Refer to the bottom piping run of Figure 1. In this simplified example, leakage in an RCP seal cooler is allowing radioactive material to enter the Auxiliary Building. The radioactivity would be detected by the Process Monitor. If there is no leakage from the closed water cooling system to the Auxiliary Building, then no threshold has been met. If the pump developed a leak that allowed steam/water to enter the Auxiliary Building, then second threshold would be met. Depending upon radiation monitor locations and sensitivities, this leakage could be detected by any of the four monitors depicted in the figure and cause the first threshold to be met as well.

Following the leakage of RCS mass into containment and a rise in containment pressure, there may be minor radiological releases associated with allowable containment leakage through various penetrations or system components. Minor releases may also occur if a containment isolation valve(s) fails to close but the containment atmosphere escapes to an enclosed system. These releases do not constitute a loss or potential loss of containment but should be evaluated using the Recognition Category A ICs.

Reference(s):

1. NEI 99-01 CTMT Integrity or Bypass Containment Loss 4.A

Barrier: Containment

Category: D – CTMT Integrity or Bypass

Degradation Threat: Loss

Threshold:

CNB5
Indications of RCS leakage outside of Containment

Definition(s):

None

Basis:

To ensure proper escalation of the emergency classification, the RCS leakage outside of containment must be related to the mass loss that is causing the RCS Loss RCB1 and/or Potential Loss RCB2 threshold to be met.

The status of the containment barrier during an event involving steam generator tube leakage is assessed using Containment Loss Threshold CNB1.

Containment sump, temperature, pressure and/or radiation levels will rise if reactor coolant mass is leaking into the containment. If these parameters have not risen, then the reactor coolant mass may be leaking outside of containment (i.e., a containment bypass sequence). Rises in sump, temperature, pressure, flow and/or radiation level readings outside of the containment may indicate that the RCS mass is being lost outside of containment.

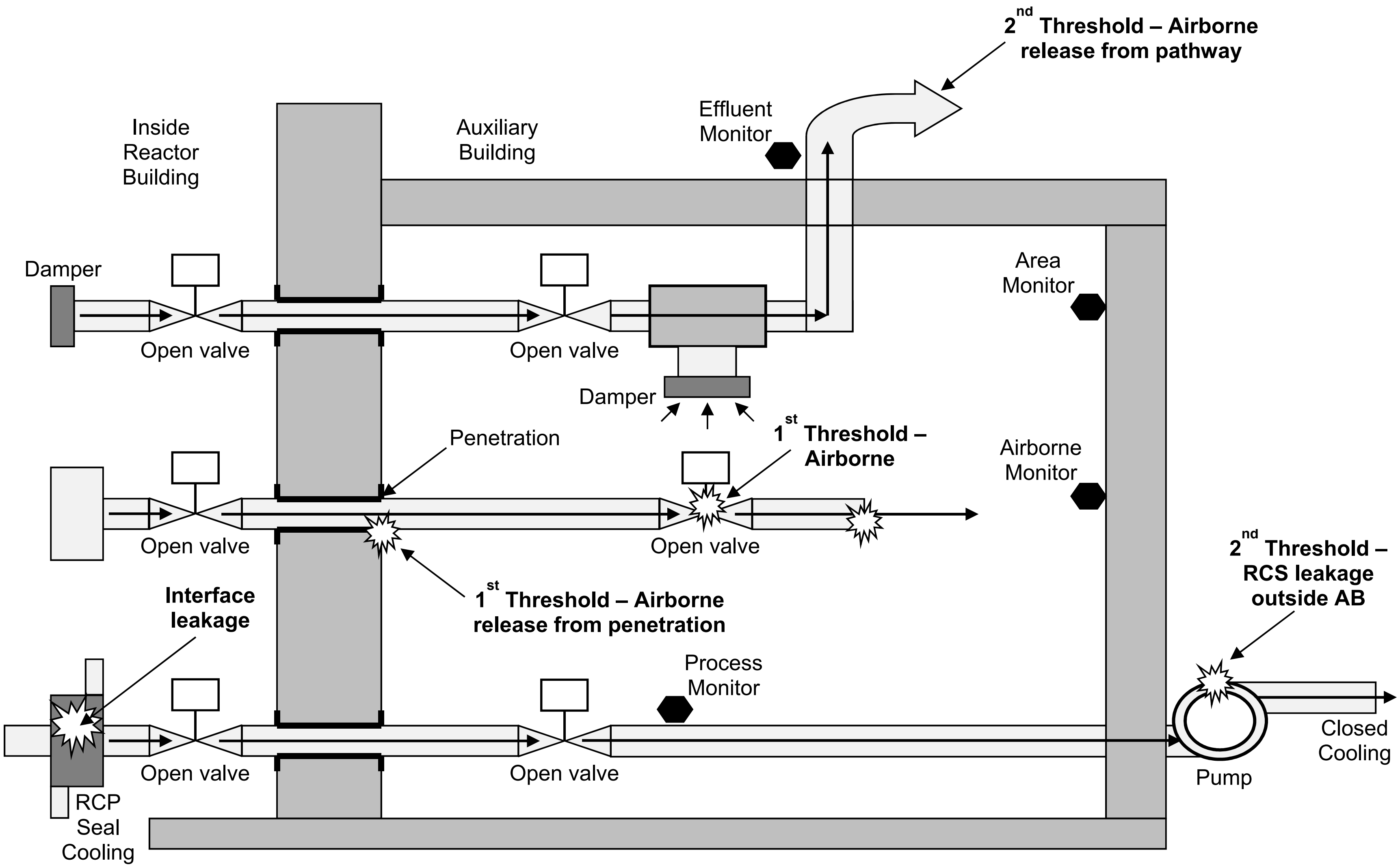
Unexpected elevated readings and alarms on radiation monitors with detectors outside containment should be corroborated with other available indications to confirm that the source is a loss of RCS mass outside of containment. If the fuel clad barrier has not been lost, radiation monitor readings outside of containment may not rise significantly; however, other unexpected changes in sump levels, area temperatures or pressures, flow rates, etc. should be sufficient to determine if RCS mass is being lost outside of the containment.

Refer to the middle piping run of Figure 1. In this simplified example, a leak has occurred at a reducer on a pipe carrying reactor coolant in the Auxiliary Building. Depending upon radiation monitor locations and sensitivities, the leakage could be detected by any of the four monitors depicted in the figure and cause threshold CNB4 to be met as well.

Reference(s):

1. NEI 99-01 CTMT Integrity or Bypass Containment Loss 4.B

Figure 1: Containment Integrity or Bypass Examples



Barrier: Containment

Category: D – CTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

CNB6
Containment pressure > 73.7 psia

Definition(s):

None

Basis:

If containment pressure exceeds the design pressure, there exists a potential to lose the Containment Barrier. To reach this level, there must be an inadequate core cooling condition for an extended period of time; therefore, the RCS and Fuel Clad barriers would already be lost. Thus, this threshold is a discriminator between a Site Area Emergency and General Emergency since there is now a potential to lose the third barrier.

Reference(s):

1. 1SAR 1.4.43 Criterion 50 - Containment Design Basis
2. 2SAR Table 6.2-7 Principle Containment Design Parameters
3. NEI 99-01 CTMT Integrity or Bypass Containment Potential Loss 4.A

Barrier: Containment

Category: D – CTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

CNB7
Containment hydrogen concentration > 4%

Definition(s):

None

Basis:

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). The 4% hydrogen concentration is generally considered the lower limit for hydrogen deflagrations. 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 potential loss of the Containment Barrier.

Reference(s):

1. Unit 1 SAMG Figure III-1B
2. Unit 2 SAMG Phase 1 Instructions, Containment Flowchart
3. NEI 99-01 CTMT Integrity or Bypass Containment Potential Loss 4.B

Barrier: Containment

Category: D – CTMT Integrity or Bypass

Degradation Threat: Potential Loss

Threshold:

CNB8
Containment pressure > 44.7 psia[23.3 psia] with < one full train of containment heat removal systems (Note 9) operating per design for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 9: One full train of containment heat removal systems consists of one train of RB [Containment] Spray and one train of RB [Containment] Cooling System.

Definition(s):

None

Basis:

This threshold describes a condition where containment pressure is greater than the setpoint at which containment energy (heat) removal systems are designed to automatically actuate, and less than one full train of equipment is capable of operating per design. The 15-minute criterion is included to allow operators time to manually start equipment that may not have automatically started, if possible. This threshold represents a potential loss of containment in that containment heat removal/depressurization systems (e.g., containment sprays but not including containment venting strategies) are either lost or performing in a degraded manner.

Reference(s):

1. 1SAR 6.2 Reactor Building Spray System
2. 1SAR 6.3 Reactor Building Cooling System
3. OP-2202.003 Loss of Coolant Accident
4. OP-2202.010 Standard Attachments, Attachment 22
5. 2SAR 6.2.2 Containment Heat Removal Systems
6. 2SAR 7.3.1.1.11.2 Containment Spray System
7. NEI 99-01 CTMT Integrity or Bypass Containment Potential Loss 4.C

Barrier: Containment

Category: E – Emergency Director Judgment

Degradation Threat: Loss

Threshold:

CNB9 **Any** condition in the opinion of the Emergency Director that indicates loss of the Containment barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the Containment Barrier is lost.

Reference(s):

1. NEI 99-01 Emergency Director Judgment Containment Loss 6.A

Barrier: Containment

Category: E – Emergency Director Judgment

Degradation Threat: Potential Loss

Threshold:

CNB10
Any condition in the opinion of the Emergency Director that indicates potential loss of the Containment barrier

Definition(s):

None

Basis:

This threshold addresses any other factors that may be used by the Emergency Director in determining whether the Containment Barrier is potentially lost. The Emergency Director should also consider whether or not to declare the barrier potentially lost in the event that barrier status cannot be monitored.

Reference(s):

1. NEI 99-01 Emergency Director Judgment Containment Potential Loss 6.A

Category H – Hazards and Other Conditions Affecting Plant Safety

EAL Group: ANY (EALs in this category are applicable to any plant condition, hot or cold.)

Hazards are non-plant, system-related events that can directly or indirectly affect plant operation, reactor plant safety or personnel safety.

1. Security

Unauthorized entry attempts into the PROTECTED AREA, bomb threats, sabotage attempts, and actual security compromises threatening loss of physical control of the plant.

2. Seismic Event

Natural events such as earthquakes have potential to cause plant structure or equipment damage of sufficient magnitude to threaten personnel or plant safety.

3. Natural or Technological Hazard

Other natural and non-naturally occurring events that can cause damage to plant facilities include tornados, FLOODING, hazardous material releases and events restricting site access warranting classification.

4. Fire

FIRES can pose significant hazards to personnel and reactor safety. Appropriate for classification are FIRES within the plant PROTECTED AREA or which may affect operability of equipment needed for safe shutdown.

5. Hazardous Gas

Toxic, corrosive, asphyxiant or flammable gas leaks can affect normal plant operations or preclude access to plant areas required to safely shutdown the plant.

6. Control Room Evacuation

Events that are indicative of loss of Control Room habitability. If the Control Room must be evacuated, additional support for monitoring and controlling plant functions is necessary through the emergency response facilities.

7. Emergency Director Judgment

The EALs defined in other categories specify the predetermined symptoms or events that are indicative of emergency or potential emergency conditions and thus warrant classification. While these EALs have been developed to address the full spectrum of possible emergency conditions which may warrant classification and subsequent implementation of the Emergency Plan, a provision for classification of emergencies based on operator/management experience and judgment is still necessary. The EALs of this category provide the Emergency Director the latitude to classify emergency conditions consistent with the established classification criteria based upon Emergency Director judgment.

Category: H – Hazards

Subcategory: 1 – Security

Initiating Condition: Confirmed SECURITY CONDITION or threat

EAL:

HU1.1 Unusual Event
A SECURITY CONDITION that does **not** involve a HOSTILE ACTION as reported by ANO Security Shift Supervision
OR
Notification of a credible security threat directed at the site
OR
A validated notification from the NRC providing information of an aircraft threat

Mode Applicability:

All

Definition(s):

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

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

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

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

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

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

Basis:

This IC addresses events that pose a threat to plant personnel or SAFETY SYSTEM equipment, and thus represent a potential degradation in the level of plant safety. Security events which do not meet one of these EALs are adequately addressed by the requirements of 10 CFR 73.71 or 10 CFR 50.72. Security events assessed as HOSTILE ACTIONS are classifiable under ICs HA1 and HS1.

Timely and accurate communications between Security Shift Supervision and the Control Room is essential for proper classification of a security-related event. Classification of these events will initiate appropriate threat-related notifications to plant personnel and Offsite Response Organizations.

Security plans and terminology are based on the guidance provided by NEI 03-12, *Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan [and Independent Spent Fuel Storage Installation Security Program]*.

The first threshold references the Security Shift Supervision because these are the individuals trained to confirm that a security event is occurring or has occurred. Training on security event confirmation and classification is controlled due to the nature of Safeguards and 10 CFR 2.39 information.

The second threshold addresses the receipt of a credible security threat. The credibility of the threat is assessed in accordance with OP-1203.048 Security Event .

The third threshold addresses the threat from the impact of an aircraft on the plant. The NRC Headquarters Operations Officer (HOO) will communicate to the licensee if the threat involves an aircraft. The status and size of the plane may also be provided by NORAD through the NRC. Validation of the threat is performed in accordance with 11-S-82-1 Security Contingency Events (ref. 2).

Emergency plans and implementing procedures are public documents; therefore, EALs should not incorporate Security-sensitive information. This includes information that may be advantageous to a potential adversary, such as the particulars concerning a specific threat or threat location. Security-sensitive information should be contained in non-public documents such as the Security Plan for ANO (ref. 1).

Escalation of the emergency classification level would be via IC HA1.

Reference(s):

1. ANO Security Plan
2. OP-1203.048 Security Event
3. NEI 99-01 HU1

Category: H – Hazards

Subcategory: 1 – Security

Initiating Condition: HOSTILE ACTION within the SECURITY OWNER CONTROLLED AREA or airborne attack threat within 30 minutes

EAL:

HA1.1 Alert
A HOSTILE ACTION is occurring or has occurred within the SECURITY OWNER CONTROLLED AREA as reported by ANO Security Shift Supervision
OR
A validated notification from NRC of an aircraft attack threat within 30 min. of the site

Mode Applicability:

All

Definition(s):

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

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

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

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

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

Basis:

This IC addresses the occurrence of a HOSTILE ACTION within the SECURITY OWNER CONTROLLED AREA or notification of an aircraft attack threat. This event will require rapid response and assistance due to the possibility of the attack progressing to the PROTECTED AREA, or the need to prepare the plant and staff for a potential aircraft impact.

Timely and accurate communications between Security Shift Supervision and the Control Room is essential for proper classification of a security-related event.

Security plans and terminology are based on the guidance provided by NEI 03-12, *Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan [and Independent Spent Fuel Storage Installation Security Program]*.

As time and conditions allow, these events require a heightened state of readiness by the plant staff and implementation of onsite protective measures (e.g., evacuation, dispersal or sheltering). The Alert declaration will also heighten the awareness of Offsite Response Organizations (OROs), allowing them to be better prepared should it be necessary to consider further actions.

This EAL does not apply to incidents that are accidental events, acts of civil disobedience, or otherwise are not a HOSTILE ACTION perpetrated by a HOSTILE FORCE. Examples include the crash of a small aircraft, shots from hunters, physical disputes between employees, etc. Reporting of these types of events is adequately addressed by other EALs, or the requirements of 10 CFR 73.71 or 10 CFR 50.72.

The first threshold is applicable for any HOSTILE ACTION occurring, or that has occurred, in the SECURITY OWNER CONTROLLED AREA.

The second threshold addresses the threat from the impact of an aircraft on the plant, and the anticipated arrival time is within 30 minutes. The intent of this EAL is to ensure that threat-related notifications are made in a timely manner so that plant personnel and OROs are in a heightened state of readiness. This EAL is met when the threat-related information has been validated in accordance with OP-1203.048 Security Event (ref. 2).

The NRC Headquarters Operations Officer (HOO) will communicate to the licensee if the threat involves an aircraft. The status and size of the plane may be provided by NORAD through the NRC.

In some cases, it may not be readily apparent if an aircraft impact within the SECURITY OWNER CONTROLLED AREA was intentional (i.e., a HOSTILE ACTION). It is expected, although not certain, that notification by an appropriate Federal agency to the site would clarify this point. In this case, the appropriate federal agency is intended to be NORAD, FBI, FAA or NRC. The emergency declaration, including one based on other ICs/EALs, should not be unduly delayed while awaiting notification by a Federal agency.

Emergency plans and implementing procedures are public documents; therefore, EALs should not incorporate Security-sensitive information. This includes information that may be advantageous to a potential adversary, such as the particulars concerning a specific threat or threat location. Security-sensitive information should be contained in non-public documents such as the Security Plan for ANO (ref. 1).

Escalation of the emergency classification level would be via IC HS1.

Reference(s):

1. ANO Security Plan
2. OP-1203.048 Security Event
3. NEI 99-01 HA1

Category: H – Hazards

Subcategory: 1 – Security

Initiating Condition: HOSTILE ACTION within the PROTECTED AREA

EAL:

HS1.1 Site Area Emergency
A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by ANO Security Shift Supervision

Mode Applicability:

All

Definition(s):

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

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

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

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

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

Basis:

This IC addresses the occurrence of a HOSTILE ACTION within the PROTECTED AREA. This event will require rapid response and assistance due to the possibility for damage to plant equipment.

Timely and accurate communications between Security Shift Supervision and the Control Room is essential for proper classification of a security-related event (ref. 1, 2).

Security plans and terminology are based on the guidance provided by NEI 03-12, *Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan [and Independent Spent Fuel Storage Installation Security Program]*.

As time and conditions allow, these events require a heightened state of readiness by the plant staff and implementation of onsite protective measures (e.g., evacuation, dispersal or sheltering). The Site Area Emergency declaration will mobilize Offsite Response Organization (ORO) resources and have them available to develop and implement public protective actions in the unlikely event that the attack is successful in impairing multiple safety functions.

This EAL does not apply to incidents that are accidental events, acts of civil disobedience, or otherwise are not a HOSTILE ACTION perpetrated by a HOSTILE FORCE. Examples include the crash of a small aircraft, shots from hunters, physical disputes between employees, etc. Reporting of these types of events is adequately addressed by other EALs, or the requirements of 10 CFR 73.71 or 10 CFR 50.72.

Emergency plans and implementing procedures are public documents; therefore, EALs should not incorporate Security-sensitive information. This includes information that may be advantageous to a potential adversary, such as the particulars concerning a specific threat or threat location. Security-sensitive information should be contained in non-public documents such as the Security Plan for ANO (ref. 1).

Reference(s):

1. ANO Security Plan
2. OP-1203.048 Security Event
3. NEI 99-01 HS1

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 2 – Seismic Event

Initiating Condition: Seismic event greater than OBE levels

EAL:

HU2.1 Unusual Event
Seismic event > OBE as indicated by annunciation of the 0.10 g acceleration alarm

Mode Applicability:

All

Definition(s):

None

Basis:

This IC addresses a seismic event that results in accelerations at the plant site greater than those specified for an Operating Basis Earthquake (OBE). An earthquake greater than an OBE but less than a Design Basis Earthquake (DBE) should have no significant impact on safety-related systems, structures and components; however, some time may be required for the plant staff to ascertain the actual post-event condition of the plant (e.g., performs walk-downs and post-event inspections). Given the time necessary to perform walk-downs and inspections, and fully understand any impacts, this event represents a potential degradation of the level of safety of the plant.

Event verification with external sources should not be necessary during or following an OBE. Earthquakes of this magnitude should be readily felt by on-site personnel and recognized as a seismic event (e.g., lateral accelerations in excess of 0.1g). The Shift Manager or Emergency Director may seek external verification if deemed appropriate (e.g., a call to the USGS, check internet news sources, etc.); however, the verification action must not preclude a timely emergency declaration.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA9.

Two strong motion triaxial accelerometers, ACS-8001 and ACS-8003, located at the base slab provide alarms to the Unit 1 control room via the seismic network control center, C529-NCC. One alarm from C529-NCC is triggered when a setpoint of 0.01g has been exceeded. This alarm indicates that an earthquake has occurred and the seismic monitoring system is recording seismic data. Another alarm from C529-NCC is triggered when the pre-determined value of 0.1g, indicating the OBE has been exceeded (ref. 2, 3).

To avoid inappropriate emergency classification resulting from spurious actuation of the seismic instrumentation or felt motion not attributable to seismic activity, an offsite agency (USGS, National Earthquake Information Center (NEIC)) can confirm that an earthquake has occurred in the area of the plant. Such confirmation should not, however, preclude a timely emergency declaration based on receipt of the OBE alarm. If requested, provide the analyst with the following ANO coordinates: **35º 18' 36" north latitude, 93º 13' 53" west longitude** (ref. 4). Alternatively, near real-time seismic activity can be accessed via the NEIC website:

Reference(s):

1. 1SAR 2.2.1 Location
2. 1SAR 2.7.2 Site Seismic Evaluation
3. 1SAR 2.7.6 Time-History Accelerograph
4. OP-1203.025 Natural Emergencies
5. OP-2203.008 Natural Emergencies
6. NEI 99-01 HU2

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 3 – Natural or Technological Hazard

Initiating Condition: Hazardous event

EAL:

HU3.1 Unusual Event
A tornado strike within the PROTECTED AREA

Mode Applicability:

All

Definition(s):

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

Basis:

This IC addresses hazardous events that are considered to represent a potential degradation of the level of safety of the plant.

This EAL addresses a tornado striking (touching down) within the PROTECTED AREA.

Escalation of the emergency classification level would be based on ICs in Recognition Categories A, F, S or C.

If damage is confirmed visually or by other in-plant indications, the event may be escalated to an Alert under EAL CA6.1 or SA9.1.

A tornado striking (touching down) within the PROTECTED AREA warrants declaration of an Unusual Event regardless of the measured wind speed at the meteorological tower. A tornado is defined as a violently rotating column of air in contact with the ground and extending from the base of a thunderstorm.

Reference(s):

1. OP-1203.025 Natural Emergencies
2. OP-2203.008 Natural Emergencies
3. NEI 99-01 HU3

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 3 – Natural or Technological Hazard

Initiating Condition: Hazardous event

EAL:

HU3.2 Unusual Event
Internal room or area FLOODING of a magnitude sufficient to require manual or automatic electrical isolation of a SAFETY SYSTEM component required by Technical Specifications for the current operating mode

Mode Applicability:

All

Definition(s):

FLOODING - A condition where water is entering a room or area faster than installed equipment is capable of removal, resulting in a rise of water level within the room or area.

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

This IC addresses hazardous events that are considered to represent a potential degradation of the level of safety of the plant.

This EAL addresses FLOODING of a building room or area that results in operators isolating power to a SAFETY SYSTEM component due to water level or other wetting concerns. Classification is also required if the water level or related wetting causes an automatic isolation of a SAFETY SYSTEM component from its power source (e.g., a breaker or relay trip). To warrant classification, operability of the affected component must be required by Technical Specifications for the current operating mode.

Escalation of the emergency classification level would be based on ICs in Recognition Categories A, F, S or C.

Refer to EAL CA6.1 or SA9.1 for internal FLOODING affecting more than one SAFETY SYSTEM train.

Reference(s):

1. OP-1203.025 Natural Emergencies
2. OP-2203.008 Natural Emergencies
3. NEI 99-01 HU3

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 3 – Natural or Technological Hazard

Initiating Condition: Hazardous event

EAL:

HU3.3 Unusual Event
Movement of personnel within the PROTECTED AREA is IMPEDED due to an event external to the PROTECTED AREA involving hazardous materials (e.g., an offsite chemical spill or toxic gas release)

Mode Applicability:

All

Definition(s):

IMPEDE(D) - Personnel access to a room or area is hindered to an extent that extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is **not** routinely employed).

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

Basis:

This IC addresses hazardous events that are considered to represent a potential degradation of the level of safety of the plant.

This EAL addresses a hazardous materials event originating at a location outside the PROTECTED AREA and of sufficient magnitude to IMPEDE the movement of personnel within the PROTECTED AREA.

Escalation of the emergency classification level would be based on ICs in Recognition Categories A, F, S or C.

Reference(s):

1. NEI 99-01 HU3

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 3 – Natural or Technological Hazard

Initiating Condition: Hazardous event

EAL:

HU3.4 Unusual Event
A hazardous event that results in on-site conditions sufficient to prohibit the plant staff from accessing the site via personal vehicles (Note 7)

Note 7: This EAL does **not** apply to routine traffic impediments such as fog, snow, ice, or vehicle breakdowns or accidents.

Mode Applicability:

All

Definition(s):

FLOODING - A condition where water is entering a room or area faster than installed equipment is capable of removal, resulting in a rise of water level within the room or area.

Basis:

This IC addresses hazardous events that are considered to represent a potential degradation of the level of safety of the plant.

This EAL addresses a hazardous event that causes an on-site impediment to vehicle movement and significant enough to prohibit the plant staff from accessing the site using personal vehicles. Examples of such an event include site FLOODING caused by a hurricane, heavy rains, up-river water releases, dam failure, etc., or an on-site train derailment blocking the access road.

This EAL is not intended to apply to routine impediments such as fog, snow, ice, or vehicle breakdowns or accidents, but rather to more significant conditions such as the Hurricane Andrew strike on Turkey Point in 1992, the FLOODING around the Cooper Station during the Midwest floods of 1993, or the FLOODING around Ft. Calhoun Station in 2011.

Escalation of the emergency classification level would be based on ICs in Recognition Categories A, F, S or C.

Reference(s):

1. NEI 99-01 HU3

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 4 – Fire

Initiating Condition: FIRE potentially degrading the level of safety of the plant

EAL:

HU4.1 Unusual Event
A FIRE is **not** extinguished within 15 min. of **any** of the following FIRE detection indications (Note 1):
• Report from the field (i.e., visual observation)
• Receipt of multiple (more than 1) fire alarms or indications (Note 13)
• Field verification of a single fire alarm
AND
The FIRE is located within **any** Table 1[2]H-1 area

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 13 Bullet 2 of this EAL (multiple fire alarm indications) is not applicable for LOCAs or MSL breaks in containment.

Table 1H-1 Unit 1 Fire Areas

Reactor Building

All elevations

Auxiliary Building

All elevations including: Penthouse/MSIV Room

Exceptions:

Boric Acid Mix Tank Room (Chem Add Area), 404’ (157-B), EDG Exhaust Fan area on 386’ (1-E and 2-E)

Turbine Building

All elevations on the west side of Turbine Building and including: Pipechase under ICW Coolers, CRD Pump Pit/T-28 Room/Area under ICW Pumps

372’ Elevation from non-vital switchgear area to Auxiliary Building wall at DR 56

Outside Areas

Manholes adjacent to Startup #2 XFMR (MH-03/MH-04)

Manholes adjacent to Intake Structure (MH-05/MH-06)

Intake Structure (354’ and 366’)

Diesel Fuel Vault

Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

Table 2H-1 Unit 2 Fire Areas

Reactor Building

All elevations

Auxiliary Building

All elevations including: MG Set Room, UNEPR, LNEPR, 2B-53 Room

Auxiliary Building Extension

MSIV Room

Turbine Building

All elevations on the west side of Turbine Building and 372’ Elevation from non-vital switchgear area to Auxiliary Building wall at DR 340

Outside Areas

Intake Structure (354’ and 366’)

Concrete Manhole East, NE of intake (2MH-01)

Concrete Manhole East of Turbine Building next to train bay (2MH-03)

Diesel Fuel Vault

Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

Mode Applicability:

All

Definition(s):

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.

VALID - An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Basis:

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

The intent of the 15-minute duration is to size the FIRE and to discriminate against small FIRES that are readily extinguished (e.g., smoldering waste paper basket). In addition to alarms, other indications of a FIRE could be a drop in fire main pressure, automatic activation of a suppression system, etc.

Upon receipt, operators will take prompt actions to confirm the validity of an initial fire alarm, indication, or report. For EAL assessment purposes, the emergency declaration clock starts at the time that the initial alarm, indication, or report was received, and not the time that a subsequent verification action was performed. Similarly, the fire duration clock also starts at the time of receipt of the initial alarm, indication or report.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via EAL CA6.1 or SA9.1.

The 15 minute requirement begins with a credible notification that a FIRE is occurring, or receipt of multiple VALID fire detection system alarms or field validation of a single fire alarm. The alarm is to be validated using available Control Room indications or alarms to prove that it is not spurious, or by reports from the field.

Table 1[2]H-1 Fire Areas are those areas that contain equipment necessary for safe operation and shutdown of the plant (ref. 1, 2).

Reference(s):

1. OP-1203.049 Fires in Areas Affecting Safe Shutdown
2. OP- 2203.049 Fires in Areas Affecting Safe Shutdown
3. NEI 99-01 HU4

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 4 – Fire

Initiating Condition: FIRE potentially degrading the level of safety of the plant

EAL:

HU4.2 Unusual Event
Receipt of a single fire alarm (i.e., **no** other indications of a FIRE) (Note 14)
AND
The fire alarm is indicating a FIRE within **any** Table 1[2]H-1 area
AND
The existence of a FIRE is **not** verified (i.e., proved or disproved) within 30 min. of alarm receipt (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 14: During Modes 1 and 2, HU4.2 is not applicable to a single fire alarm in the Reactor Building.

Table 1H-1 Unit 1 Fire Areas
Reactor Building
All elevations
Auxiliary Building
All elevations including: Penthouse/MSIV Room
Exceptions:
Boric Acid Mix Tank Room (Chem Add Area), 404’ (157-B), EDG Exhaust Fan area on 386’ (1-E and 2-E)
Turbine Building
All elevations on the west side of Turbine Building and including: Pipechase under ICW Coolers, CRD Pump Pit/T-28 Room/Area under ICW Pumps
372’ Elevation from non-vital switchgear area to Auxiliary Building wall at DR 56
Outside Areas
Manholes adjacent to Startup #2 XFMR (MH-03/MH-04)
Manholes adjacent to Intake Structure (MH-05/MH-06)
Intake Structure (354’ and 366’)
Diesel Fuel Vault
Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

Table 2H-1 Unit 2 Fire Areas
<u>Reactor Building</u> **All** elevations
<u>Auxiliary Building</u> **All** elevations including: MG Set Room, UNEPR, LNEPR, 2B-53 Room
<u>Auxiliary Building Extension</u> MSIV Room
<u>Turbine Building</u> All elevations on the west side of Turbine Building and 372' Elevation from non-vital switchgear area to Auxiliary Building wall at DR 340
<u>Outside Areas</u> Intake Structure (354' and 366') Concrete Manhole East, NE of intake (2MH-01) Concrete Manhole East of Turbine Building next to train bay (2MH-03) Diesel Fuel Vault Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

Mode Applicability:

All

Definition(s):

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.

VALID - An indication, report, or condition, is considered to be valid when it is verified by (1) an instrument channel check, or (2) indications on related or redundant indicators, or (3) by direct observation by plant personnel, such that doubt related to the indicator's operability, the condition's existence, or the report's accuracy is removed. Implicit in this definition is the need for timely assessment.

Basis:

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

This EAL addresses receipt of a single fire alarm, and the existence of a FIRE is not verified (i.e., proved or disproved) within 30-minutes of the alarm. Upon receipt, operators will take prompt actions to confirm the validity of a single fire alarm. For EAL assessment purposes, the 30-minute clock starts at the time that the initial alarm was received, and not the time that a subsequent verification action was performed.

A single fire alarm, absent other indication(s) of a FIRE, may be indicative of equipment failure or a spurious activation, and not an actual FIRE. For this reason, additional time is allowed to verify the validity of the alarm. The 30-minute period is a reasonable amount of time to determine if an actual FIRE exists; however, after that time, and absent information to the contrary, it is assumed that an actual FIRE is in progress.

This EAL is not applicable for the Reactor Building in Modes 1 and 2. The Reactor Building air flow design and Technical Specification requirements for operation of Reactor Building Fan Coolers are such that multiple smoke detectors would be expected to alarm for a fire in the Reactor Building. A fire in the Reactor Building in these modes would therefore be classified under EAL HU4.1.

If an actual FIRE is verified by a report from the field, then HU4.1 is immediately applicable, and the emergency must be declared if the FIRE is not extinguished within 15-minutes of the report. If the alarm is verified to be due to an equipment failure or a spurious activation, and this verification occurs within 30-minutes of the receipt of the alarm, then this EAL is not applicable and no emergency declaration is warranted.

<u>Basis-Related Fire Protection Requirements</u>

Criterion 3 of 10 CFR 50, Appendix A, states, in part:

> "Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions."

In this respect, noncombustible and heat resistant materials are used wherever practical throughout the unit, particularly in locations such as the containment and Control Room. Fire detection and fighting systems of appropriate capacity and capability are provided and designed to minimize the adverse effects of fires on SSCs important to safety. Firefighting systems are designed to assure that the rupture or inadvertent operation of a fire system does not significantly impair the safety capability of these structures, systems, and components.

In addition, the use of 1-hour fire barriers for the enclosure of cable and equipment and associated non-safety circuits of one redundant train is employed. As used in HU4.2, the 30-minutes to verify a single alarm is well within this worst-case 1-hour time period.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via EAL CA6.1 or SA9.1.

The 30-minute requirement begins upon receipt of a single VALID fire detection system alarm. The alarm is to be validated using available Control Room indications or alarms to prove that it is not spurious, or by reports from the field. Actual field reports must be made within the 30-minute time limit or a classification must be made. If a fire is verified to be occurring by field report, classification shall be made based on EAL HU4.1, with the 15-minute requirement beginning with the verification of the fire by field report.

Table 1[2]H-1 Fire Areas are those areas that contain equipment necessary for safe operation and shutdown of the plant (ref. 1, 2).

Reference(s):

1. OP-1203.049 Fires in Areas Affecting Safe Shutdown
2. OP- 2203.049 Fires in Areas Affecting Safe Shutdown
3. NEI 99-01 HU4

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 4 – Fire

Initiating Condition: FIRE potentially degrading the level of safety of the plant

EAL:

HU4.3 Unusual Event

A FIRE within the PROTECTED AREA **not** extinguished within 60 min. of the initial report, alarm or indication (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

All

Definition(s):

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.

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

Basis:

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

In addition to a FIRE addressed by EAL HU4.1 or HU4.2, a FIRE within the plant PROTECTED AREA not extinguished within 60-minutes may also potentially degrade the level of plant safety.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via EAL CA6.1 or SA8.1.

Reference(s):

1. NEI 99-01 HU4

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 4 – Fire

Initiating Condition: FIRE potentially degrading the level of safety of the plant

EAL:

HU4.4 Unusual Event
A FIRE within the PROTECTED AREA that requires firefighting support by an offsite fire response agency to extinguish

Mode Applicability:

All

Definition(s):

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.

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

Basis:

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

If a FIRE within the plant PROTECTED AREA is of sufficient size to require a response by an offsite firefighting agency (e.g., a local town Fire Department), then the level of plant safety is potentially degraded. The dispatch of an offsite firefighting agency to the site requires an emergency declaration only if it is needed to actively support firefighting efforts because the fire is beyond the capability of the Fire Brigade to extinguish. Declaration is not necessary if the agency resources are placed on stand-by, or supporting post-extinguishment recovery or investigation actions.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via EAL CA6.1 or SA9.1.

Reference(s):

1. NEI 99-01 HU4

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 5 – Hazardous Gas

Initiating Condition: Gaseous release IMPEDING access to equipment necessary for normal plant operations, cooldown or shutdown

EAL:

HA5.1 Alert

Release of a toxic, corrosive, asphyxiant or flammable gas into **any** Table 1[2]H-2 room or area

AND

Entry into the room or area is prohibited or IMPEDED (Note 5)

Note 5: 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.

Table 1H-2 Unit 1 Safe Operation & Shutdown Rooms/Areas	
Room/Area	**Mode**
A-4 Switchgear Room	3, 4
Upper North Electrical Penetration Room	3, 4
Lower South Electrical Equipment Room	3, 4

Table 2H-2 Unit 2 Safe Operation & Shutdown Rooms/Areas	
Room/Area	**Mode**
Aux Building 317’ Emergency Core Cooling Rooms	3, 4
Aux Building 317’ Tendon Gallery Access	3, 4
Aux Building 335’ Charging Pumps / MCC 2B-52	3, 4
Aux Building 354’ MCC 2B-62 Area	3, 4
Emergency Diesel Generator Corridor	3, 4
Lower South Piping Penetration Room	3, 4
Aux Building 386’ Containment Hatch	3, 4

Mode Applicability:

3 – Hot Standby, 4 – Hot Shutdown

Definition(s):

IMPEDE(D) - Personnel access to a room or area is hindered to an extent that extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is **not** routinely employed).

Basis:

This IC addresses an event involving a release of a hazardous gas that precludes or IMPEDES access to equipment necessary to maintain normal plant operation, or required for a normal plant cooldown and shutdown. This condition represents an actual or potential substantial degradation of the level of safety of the plant.

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 gaseous release. The emergency classification is not contingent upon whether entry is actually necessary at the time of the release.

Evaluation of the IC and EAL do not require atmospheric sampling; it only requires the Emergency Director's judgment that the gas concentration in the affected room/area is sufficient to preclude or significantly IMPEDE procedurally required access. This judgment may be based on a variety of factors including an existing job hazard analysis, report of ill effects on personnel, advice from a subject matter expert or operating experience with the same or similar hazards. Access should be considered as IMPEDED if extraordinary measures are necessary to facilitate entry of personnel into the affected room/area (e.g., requiring use of protective equipment, such as SCBAs, that is not routinely employed).

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 gaseous release). For example, the plant is in Mode 1 when the gaseous release occurs, and the procedures used for normal operation, cooldown and shutdown do not require entry into the affected room until Mode 4.

- The gas release is a planned activity that includes compensatory measures which address the temporary inaccessibility of a room or area (e.g., fire suppression system testing).

- The access control measures are of a conservative or precautionary nature, and would not actually prevent or IMPEDE a required action.

- 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.

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

This EAL does not apply to firefighting activities that generate smoke and that automatically or manually activate a fire suppression system in an area.

The list of plant rooms or areas with entry-related mode applicability identified 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. 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) are not included. In addition, the list specifies the plant mode(s) during which entry would be required for each room or area (ref. 1).

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

EAL HA5.1 mode applicability has been limited to the mode limitations of Table 1[2]H-2 (Modes 3 and 4 **only**).

Reference(s):

1. Attachment 2 Safe Operation & Shutdown Areas Tables 1[2]A-3 & 1[2]H-2 Bases
2. NEI 99-01 HA5

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 6 – Control Room Evacuation

Initiating Condition: Control Room evacuation resulting in transfer of plant control to alternate locations

EAL:

HA6.1 Alert
An event has resulted in plant control being transferred from the Control Room to alternate locations

Mode Applicability:

All

Definition(s):

None

Basis:

This IC addresses an evacuation of the Control Room that results in transfer of plant control to alternate locations outside the Control Room. The loss of the ability to control the plant from the Control Room is considered to be a potential substantial degradation in the level of plant safety.

Following a Control Room evacuation, control of the plant will be transferred to alternate shutdown locations. The necessity to control a plant shutdown from outside the Control Room, in addition to responding to the event that required the evacuation of the Control Room, will present challenges to plant operators and other on-shift personnel. Activation of the ERO and emergency response facilities will assist in responding to these challenges.

Transfer of plant control begins when the last licensed operator leaves the Control Room.

Escalation of the emergency classification level would be via IC HS6.

Reference(s):

1. OP-1203.002 Alternate Shutdown
2. OP-2203.014 Alternate Shutdown
3. NEI 99-01 HA6

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 6 – Control Room Evacuation

Initiating Condition: Inability to control a key safety function from outside the Control Room

EAL:

HS6.1 Site Area Emergency

An event has resulted in plant control being transferred from the Control Room to alternate locations

AND

Control of **any** of the following key safety functions is **not** re-established within 15 min. (Note 1):

- Reactivity (Modes 1, 2 and 3 **only**)
- Core cooling
- RCS heat removal

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 – Power Operation, 2 – Startup, 3 – Hot Standby, 4 – Hot Shutdown, 5 – Cold Shutdown, 6 - Refueling

Definition(s):

None

Basis:

This IC addresses an evacuation of the Control Room that results in transfer of plant control to alternate locations, and the control of a key safety function cannot be reestablished in a timely manner. The failure to gain control of a key safety function following a transfer of plant control to alternate locations is a precursor to a challenge to one or more fission product barriers within a relatively short period of time.

The determination of whether or not "control" is established at the remote safe shutdown location(s) is based on Emergency Director judgment. The Emergency Director is expected to make a reasonable, informed judgment within 15 minutes whether or not the operating staff has control of key safety functions from the remote safe shutdown location(s).

Transfer of plant control and the time period to establish control begins when the last licensed operator leaves the Control Room.

Escalation of the emergency classification level would be via IC FG1 or CG1

Reference(s):

1. OP-1203.002 Alternate Shutdown
2. OP-2203.014 Alternate Shutdown
3. NEI 99-01 HS6

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Director Judgment

Initiating Condition: Other conditions exist that in the judgment of the Emergency Director warrant declaration of a UE

EAL:

HU7.1 Unusual Event

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

Mode Applicability:

All

Definition(s):

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for an UNUSUAL EVENT.

Reference(s):

1. NEI 99-01 HU7

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Director Judgment

Initiating Condition: Other conditions exist that in the judgment of the Emergency Director warrant declaration of an ALERT

EAL:

HA7.1 Alert
Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. **Any** releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.

Mode Applicability:

All

Definition(s):

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

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

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

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

Basis:

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

Reference(s):

1. NEI 99-01 HA7

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Director Judgment

Initiating Condition: Other conditions exist that in the judgment of the Emergency Director warrant declaration of a SITE AREA EMERGENCY

EAL:

HS7.1 Site Area Emergency
Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or HOSTILE ACTION that results in intentional damage or malicious acts, (1) toward site personnel or equipment that could lead to the likely failure of or, (2) that prevent effective access to equipment needed for the protection of the public. **Any** releases are **not** expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels beyond the SITE BOUNDARY.

Mode Applicability:

All

Definition(s):

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

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

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

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

SITE BOUNDARY - That boundary defined by a 1046 meter (0.65 mile) radius around the plant.

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

Basis:

This IC addresses unanticipated conditions not addressed explicitly elsewhere but that warrant declaration of an emergency because conditions exist which are believed by the Emergency Director to fall under the emergency classification level description for a SITE AREA EMERGENCY.

Reference(s):

1. NEI 99-01 HS7

Category: H – Hazards and Other Conditions Affecting Plant Safety

Subcategory: 7 – Emergency Director Judgment

Initiating Condition: Other conditions exist that in the judgment of the Emergency Director warrant declaration of a GENERAL EMERGENCY

EAL:

HG7.1 General Emergency
Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.

Mode Applicability:

All

Definition(s):

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

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

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

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

PROTECTED AREA - An area clearly demarcated by a fence or building wall with an entrance portal that is regulated by Security Personnel to control access.

SECURITY OWNER CONTROLLED AREA - The SOCA is the area demarcated as a Vehicle Barrier System (VBS) consisting of passive elements including a series of large concrete blocks on the inside of a delay fence with early warning capabilities. The SOCA is the area between the SOCA Fence and the PROTECTED AREA Boundary.

Basis:

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

Reference(s):

1. NEI 99-01 HG7

Category S – System Malfunction

EAL Group: Hot Conditions (RCS temperature > 200°F); EALs in this category are applicable only in one or more hot operating modes.

Numerous system-related equipment failure events that warrant emergency classification have been identified in this category. They may pose actual or potential threats to plant safety.

The events of this category pertain to the following subcategories:

1. Loss of Vital AC Power

Loss of vital electrical power can compromise plant SAFETY SYSTEM operability including decay heat removal and emergency core cooling systems which may be necessary to ensure fission product barrier integrity. This category includes loss of onsite and offsite sources for vital 4.16 KV buses.

2. Loss of Vital DC Power

Loss of emergency electrical power can compromise plant SAFETY SYSTEM operability including decay heat removal and emergency core cooling systems which may be necessary to ensure fission product barrier integrity. This category includes loss of vital plant 125V DC power sources.

3. Loss of Control Room Indications

Certain events that degrade plant operator ability to effectively assess plant conditions within the plant warrant emergency classification. Losses of indicators are in this subcategory.

4. RCS Activity

During normal operation, reactor coolant fission product activity is very low. Small concentrations of fission products in the coolant are primarily from the fission of tramp uranium in the fuel clad or minor perforations in the clad itself. Any significant rise from these base-line levels (2% - 5% clad failures) is indicative of fuel failures and is covered under the Fission Product Barrier Degradation category. However, lesser amounts of clad damage may result in coolant activity exceeding Technical Specification limits. These fission products will be circulated with the reactor coolant and can be detected by coolant sampling.

5. RCS Leakage

The reactor vessel provides a volume for the coolant that covers the reactor core. The reactor pressure vessel and associated pressure piping (reactor coolant system) together provide a barrier to limit the release of radioactive material should the reactor fuel clad integrity fail. Excessive RCS leakage greater than Technical Specification limits indicates potential pipe cracks that may propagate to an extent threatening fuel clad, RCS and containment integrity.

6. RPS Failure

This subcategory includes events related to failure of the Reactor Protection System (RPS) to initiate and complete reactor trips. In the plant licensing basis, postulated failures of the RPS to complete a reactor trip comprise a specific set of analyzed events referred to as Anticipated Transient Without Scram (ATWS) events. For EAL classification, however, ATWS is intended to mean any trip failure event that does not achieve reactor shutdown. If RPS actuation fails to assure reactor shutdown, positive control of reactivity is at risk and could cause a threat to fuel clad, RCS and containment integrity.

7. Loss of Communications

Certain events that degrade plant operator ability to effectively communicate with essential personnel within or external to the plant warrant emergency classification.

8. Containment Failure

Failure of containment isolation capability (under conditions in which the containment is not currently challenged) warrants emergency classification. Failure of containment pressure control capability also warrants emergency classification.

9. Hazardous Event Affecting Safety Systems

Various natural and technological events that result in degraded plant safety system performance or significant VISIBLE DAMAGE warrant emergency classification under this subcategory.

Category: S – System Malfunction

Subcategory: 1 – Loss of Vital AC Power

Initiating Condition: Loss of **all** offsite AC power capability to vital buses for 15 minutes or longer

EAL:

SU1.1 Unusual Event
Loss of **all** offsite AC power capability, Table 1[2]S-1, to vital 4.16 KV buses A3[2A3] and A4[2A4] for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1S-1 Unit 1 AC Power Sources
Offsite • Startup Transformer No. 1 • Startup Transformer No. 2 • Unit Auxiliary Transformer (from 22 KV switchyard) **Onsite** • Unit Auxiliary Transformer (main generator via main transformer) • DG1 • DG2 • AAC Gen

Table 2S-1 Unit 2 AC Power Sources
Offsite • Startup Transformer No. 3 • Startup Transformer No. 2 • Unit Auxiliary Transformer (backfed from main transformer) **Onsite** • Unit Auxiliary Transformer (main generator via main transformer) • 2DG1 • 2DG2 • AAC Gen

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 – Hot Shutdown

Definition(s):

None

Basis:

This IC addresses a prolonged loss of offsite power. The loss of offsite power sources renders the plant more vulnerable to a complete loss of power to AC vital buses. This condition represents a potential reduction in the level of safety of the plant.

For emergency classification purposes, "capability" means that an offsite AC power source(s) is available to the vital buses, whether or not the buses are powered from it.

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

Escalation of the emergency classification level would be via IC SA1.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations

5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. NEI 99-01 SU1

Category: S – System Malfunction

Subcategory: 1 – Loss of Vital AC Power

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

EAL:

SA1.1 Alert

AC power capability, Table 1[2]S-1, to vital 4.16 KV buses A3[2A3] and A4[2A4] reduced to a single power source for ≥ 15 min. (Note 1)

AND

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

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1S-1 Unit 1 AC Power Sources
Offsite • Startup Transformer No. 1 • Startup Transformer No. 2 • Unit Auxiliary Transformer (from 22 KV switchyard) **Onsite** • Unit Auxiliary Transformer (main generator via main transformer) • DG1 • DG2 • AAC Gen

Table 2S-1 Unit 2 AC Power Sources
Offsite • Startup Transformer No. 3 • Startup Transformer No. 2 • Unit Auxiliary Transformer (backfed from main transformer) **Onsite** • Unit Auxiliary Transformer (main generator via main transformer) • 2DG1 • 2DG2 • AAC Gen

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 – Hot Shutdown

Definition(s):

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

This IC describes a significant degradation of offsite and onsite AC power sources such that any additional single failure would result in a loss of all AC power to SAFETY SYSTEMS. In this condition, the sole AC power source may be powering one, or more than one, train of safety-related equipment. This IC provides an escalation path from IC SU1.

An “AC power source” is a source recognized in AOPs and EOPs, and capable of supplying required power to a vital bus. Some examples of this condition are presented below.

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

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

Escalation of the emergency classification level would be via IC SS1.

This EAL is the hot condition equivalent of the cold condition EAL CU2.1.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations
5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. NEI 99-01 SA1

Category: S – System Malfunction

Subcategory: 1 – Loss of Vital AC Power

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

EAL:

SS1.1 Site Area Emergency
Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3[2A3] and A4[2A4] for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 – Hot Shutdown

Definition(s):

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

Although the AAC may be considered available, it will not prevent declaration of this EAL unless it is powering a vital bus within the 15 minute time period of the EAL.

This IC addresses a total loss of AC power that compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink. Mitigative strategies using non-safety related power sources (FLEX generators, etc.) may be effective in supplying power to these buses. These power sources must be controlled in accordance with abnormal or emergency operating procedures, or beyond design basis

accident response guidelines (e.g., FLEX support guidelines) and must be capable (alone or in combination) of supplying power for long term decay heat removal systems. In addition, fission product barrier monitoring capabilities may be degraded under these conditions. This IC represents a condition that involves actual or likely major failures of plant functions needed for the protection of the public.

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

Escalation of the emergency classification level would be via IC AG1, FG1 or SG1.

This EAL is the hot condition equivalent of the cold condition EAL CA2.1.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations
5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. NEI 99-01 SS1

Category: S – System Malfunction

Subcategory: 1 – Loss of Vital AC Power

Initiating Condition: Prolonged loss of **all** offsite and **all** onsite AC power to vital buses

EAL:

SG1.1 General Emergency

Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3[2A3] and A4[2A4]

AND EITHER:

- Restoration of at least one vital 4.16 KV bus in < 4 hours is **not** likely (Note 1)
- CETs > 1200°F

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 – Hot Shutdown

Definition(s):

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

This IC addresses a prolonged loss of all power sources to AC vital buses. A loss of all AC power compromises the performance of all SAFETY SYSTEMS requiring electric power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink. Mitigative strategies using non-safety related power sources (FLEX generators, etc.) may be effective in supplying power to these buses. These power sources must be controlled in accordance with abnormal or

emergency operating procedures, or beyond design basis accident response guidelines (e.g., FLEX support guidelines) and must be capable (alone or in combination) of supplying power for long term decay heat removal systems. A prolonged loss of these buses will lead to a loss of one or more fission product barriers. In addition, fission product barrier monitoring capabilities may be degraded under these conditions.

The EAL should require declaration of a General Emergency prior to meeting the thresholds for IC FG1. This will allow additional time for implementation of offsite protective actions.

Escalation of the emergency classification from Site Area Emergency will occur if it is projected that power cannot be restored to at least one AC vital bus by the end of the analyzed station blackout coping period. Beyond this time, plant responses and event trajectory are subject to greater uncertainty, and there is a greater likelihood of challenges to multiple fission product barriers. 4 hours is the site-specific SBO coping analysis time (ref. 4, 5).

The estimate for restoring at least one vital bus should be based on a realistic appraisal of the situation. Mitigation actions with a low probability of success should not be used as a basis for delaying a classification upgrade. The goal is to maximize the time available to prepare for, and implement, protective actions for the public.

The EAL will also require a General Emergency declaration if the loss of AC power results in parameters that indicate an inability to adequately remove decay heat from the core.

Reference(s):

1. OP-1202.005 Inadequate Core Cooling
2. OP-2202.009 Functional Recovery
3. OP-2202.011 Lower Mode Functional Recovery
4. Unit 1 Calculation 85-E-0072-02 Time from Loss of All AC Power to Loss of Subcooling
5. Unit 2 Calculation 85-E-0072-01 Time from Loss of All AC Power to Loss of Subcooling
6. 1SAR Figure 8-1 Station Single Line Diagram
7. OP-1202.007 Degraded Power
8. OP-1202.008 Blackout
9. OP-2104.037 Alternate AC Diesel Generator Operations
10. 2SAR Figure 8.3-1 Station Single Line Diagram
11. OP-2202.007 Loss of Off-Site Power
12. OP-2202.008 Station Blackout
13. OP-2107.006 Backfeed of Unit Auxiliary Transformer
14. NEI 99-01 SG1

Category: S – System Malfunction

Subcategory: 1 – Loss of Vital AC Power

Initiating Condition: Loss of **all** vital AC and vital DC power sources for 15 minutes or longer

EAL:

SG1.2 General Emergency
Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3[2A3] and A4[2A4] for ≥ 15 min. (Note 1)
AND
Indicated voltage is < 105 VDC on D01[2D01] and D02[2D02] vital 125 VDC buses for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 – Hot Shutdown

Definition(s):

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

Unit 1 batteries D06 and D07 and Unit 2 batteries 2D11 and 2D12 contain 58 cells each with a minimum cell voltage of 1.81 V or 105 VDC (ref. 9, 10).

This IC addresses a concurrent and prolonged loss of both vital AC and Vital DC power. A loss of all vital AC power compromises the performance of all SAFETY SYSTEMS requiring electric

power including those necessary for emergency core cooling, containment heat removal/pressure control, spent fuel heat removal and the ultimate heat sink. Mitigative strategies using non-safety related power sources (FLEX generators, etc.) may be effective in supplying power to these buses. These power sources must be controlled in accordance with abnormal or emergency operating procedures, or beyond design basis accident response guidelines (e.g., FLEX support guidelines) and must be capable (alone or in combination) of supplying power for long term decay heat removal systems. A loss of vital DC power compromises the ability to monitor and control SAFETY SYSTEMS. A sustained loss of both vital AC and vital DC power will lead to multiple challenges to fission product barriers.

Fifteen minutes was selected as a threshold to exclude transient or momentary power losses. The 15-minute emergency declaration clock begins at the point when both EAL thresholds are met.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. OP-1202.007 Degraded Power
3. OP-1202.008 Blackout
4. OP-2104.037 Alternate AC Diesel Generator Operations
5. 2SAR Figure 8.3-1 Station Single Line Diagram
6. OP-2202.007 Loss of Off-Site Power
7. OP-2202.008 Station Blackout
8. OP-2107.006 Backfeed of Unit Auxiliary Transformer
9. 1SAR 8.3.2.1.1 Batteries
10. 2SAR 8.3.2.1.1 Batteries
11. OP-1203.036 Loss of 125V DC
12. OP-2203.037 Loss of 125V DC
13. 2SAR Figure 8.3-6 Low Voltage Safety System Power Supplies
14. NEI 99-01 SG8

Category: S – System Malfunction

Subcategory: 2 – Loss of Vital DC Power

Initiating Condition: Loss of **all** vital DC power for 15 minutes or longer

EAL:

SS2.1 Site Area Emergency
Indicated voltage is < 105 VDC on D01[2D01] and D02[2D02] vital 125 VDC buses for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

Basis:

Unit 1 batteries D06 and D07 and Unit 2 batteries 2D11 and 2D12 contain 58 cells each with a minimum cell voltage of 1.81 V or 105 VDC (ref. 2, 3).

This IC addresses a loss of vital DC power which compromises the ability to monitor and control SAFETY SYSTEMS. In modes above Cold Shutdown, this condition involves a major failure of plant functions needed for the protection of the public.

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

Escalation of the emergency classification level would be via IC AG1, FG1 or SG1.

This EAL is the hot condition equivalent of the cold condition EAL CU4.1.

Reference(s):

1. 1SAR Figure 8-1 Station Single Line Diagram
2. 1SAR 8.3.2.1.1 Batteries
3. 2SAR 8.3.2.1.1 Batteries
4. OP-1203.036 Loss of 125V DC
5. OP-2203.037 Loss of 125V DC
6. 2SAR Figure 8.3-6 Low Voltage Safety System Power Supplies
7. NEI 99-01 SS8

Category: S – System Malfunction

Subcategory: 3 – Loss of Control Room Indications

Initiating Condition: UNPLANNED loss of Control Room indications for 15 minutes or longer

EAL:

SU3.1 Unusual Event
An UNPLANNED event results in the inability to monitor one or more Table 1[2]S-2 parameters from within the Control Room for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1[2]S-2 Safety System Parameters
• Reactor power
• RCS level
• RCS pressure
• CET temperature
• Level in at least one S/G
• EFW flow to at least one S/G

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

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.

Basis:

This IC addresses the difficulty associated with monitoring normal plant conditions without the ability to obtain SAFETY SYSTEM parameters from within the Control Room. This condition is a precursor to a more significant event and represents a potential degradation in the level of safety of the plant.

As used in this EAL, an “inability to monitor” means that values for one or more of the listed parameters cannot be determined from within the Control Room. This situation would require a loss of all of the Control Room sources for the given parameter(s). For example, the reactor power level cannot be determined from any analog, digital and recorder source within the Control Room.

An event involving a loss of plant indications, annunciators and/or display systems is evaluated in accordance with 10 CFR 50.72 (and associated guidance in NUREG-1022) to determine if an NRC event report is required. The event would be reported if it significantly impaired the capability to perform emergency assessments. In particular, emergency assessments necessary to implement abnormal operating procedures, emergency operating procedures, and emergency plan implementing procedures addressing emergency classification, accident assessment, or protective action decision-making.

This EAL is focused on a selected subset of plant parameters associated with the key safety functions of reactivity control, core cooling and RCS heat removal. The loss of the ability to determine one or more of these parameters from within the Control Room is considered to be more significant than simply a reportable condition. In addition, if all indication sources for one or more of the listed parameters are lost, then the ability to determine the values of other SAFETY SYSTEM parameters may be impacted as well. For example, if the value for reactor vessel level cannot be determined from the indications and recorders on a main control board, the SPDS or the plant computer, the availability of other parameter values may be compromised as well.

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

Escalation of the emergency classification level would be via EAL SA3.1.

Reference(s):

1. 1SAR 7.5 Safety-Related Display Instrumentation
2. 2SAR 7.5 Safety-Related Display Instrumentation
3. NEI 99-01 SU2

Category: S – System Malfunction

Subcategory: 3 – Loss of Control Room Indications

Initiating Condition: UNPLANNED loss of Control Room indications for 15 minutes or longer with a significant transient in progress

EAL:

SA3.1 Alert

An UNPLANNED event results in the inability to monitor **one or more** Table 1[2]S-2 parameters from within the Control Room for ≥ 15 min. (Note 1)

AND

Any significant transient is in progress, Table 1[2]S-3

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Table 1[2]S-2 Safety System Parameters
• Reactor power • RCS level • RCS pressure • CET temperature • Level in at least one S/G • EFW flow to at least one S/G

Table 1[2]S-3 Significant Transients
• Reactor trip • Runback > 25% thermal power • Electrical load rejection > 25% electrical load • Safety injection actuation

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

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 (as defined in 10 CFR 50.2):

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

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.

Basis:

This IC addresses the difficulty associated with monitoring rapidly changing plant conditions during a transient without the ability to obtain SAFETY SYSTEM parameters from within the Control Room. During this condition, the margin to a potential fission product barrier challenge is reduced. It thus represents a potential substantial degradation in the level of safety of the plant.

As used in this EAL, an “inability to monitor” means that values for one or more of the listed parameters cannot be determined from within the Control Room. This situation would require a loss of all of the Control Room sources for the given parameter(s). For example, the reactor power level cannot be determined from any analog, digital and recorder source within the Control Room.

An event involving a loss of plant indications, annunciators and/or display systems is evaluated in accordance with 10 CFR 50.72 (and associated guidance in NUREG-1022) to determine if an NRC event report is required. The event would be reported if it significantly impaired the capability to perform emergency assessments. In particular, emergency assessments necessary to implement abnormal operating procedures, emergency operating procedures, and emergency plan implementing procedures addressing emergency classification, accident assessment, or protective action decision-making.

This EAL is focused on a selected subset of plant parameters associated with the key safety functions of reactivity control, core cooling and RCS heat removal. The loss of the ability to determine one or more of these parameters from within the Control Room is considered to be

more significant than simply a reportable condition. In addition, if all indication sources for one or more of the listed parameters are lost, then the ability to determine the values of other SAFETY SYSTEM parameters may be impacted as well. For example, if the value for reactor vessel level cannot be determined from the indications and recorders on a main control board, the SPDS or the plant computer, the availability of other parameter values may be compromised as well.

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

Escalation of the emergency classification level would be via IC FS1 or AS1.

Reference(s):

1. 1SAR 7.1.3 Engineered Safeguards Actuation System
2. 2SAR 7.3 Engineered Safety Features Systems
3. NEI 99-01 SA2

Category: S – System Malfunction

Subcategory: 4 – RCS Activity

Initiating Condition: RCS activity greater than Technical Specification allowable limits

EAL:

SU4.1 Unusual Event
Failed Fuel Iodine radiation monitor RI-1237S[2RITS-4806B] > 9.0 E5 cpm

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

This IC addresses a reactor coolant activity value that exceeds an allowable limit specified in Technical Specifications. This condition is a precursor to a more significant event and represents a potential degradation of the level of safety of the plant.

Escalation of the emergency classification level would be via IC FA1 or the Recognition Category A ICs.

Unit 1 RE-1237S, Failed Fuel Monitor, is in the letdown system to monitor the letdown line for evidence of fuel damage.

Unit 2 specific activity monitor 2RITS-4806B monitors the Letdown fluid for the presence of Iodine-131.

A monitor reading corresponding to the instantaneous dose equivalent I-131 value of 60 uCi/gm is determined by multiplying by 30 the monitor reading listed in the table in OP-1203.019[OP-2203.020] that represents a projected 2.0 uCi/gm I-131 RCS activity(ref. 2, 5). This yields values of 3.1E6 cpm for Unit 1 and 3.9E6 cpm for Unit 2. The top of scale of the monitor is 1E6. The EAL value is set at 9.0 E5 cpm for both units which is 90% of the top of the scale.

Reference(s):

1. 1SAR Table 11-7
2. OP-1203-019 High Activity in Reactor Coolant
3. Unit 1 Technical Specifications LCO 3.4.12 RCS Specific Activity
4. 2SAR 9.3.5 Failed Fuel Detection System
5. OP-2203.020 High Activity in RCS
6. OP- 2203.012L ANNUNCIATOR 2K12 CORRECTIVE ACTION, A-1
7. Unit 2 Technical Specifications LCO 3.4.8 Reactor Coolant System Specific Activity
8. NEI 99-01 SU3

Category: S – System Malfunction

Subcategory: 4 – RCS Activity

Initiating Condition: RCS activity greater than Technical Specification allowable limits

EAL:

SU4.2 Unusual Event
RCS sample activity > 1.0 μCi/gm dose equivalent I-131 for > 48 hours (Note 1)
OR
RCS sample activity > 60 μCi/gm dose equivalent I-131
OR
RCS sample activity > 2200[3100] μCi/gm dose equivalent Xe-133 for > 48 hours (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

This IC addresses a reactor coolant activity value that exceeds an allowable limit specified in Technical Specifications. This condition is a precursor to a more significant event and represents a potential degradation of the level of safety of the plant.

Escalation of the emergency classification level would be via IC FA1 or the Recognition Category A ICs.

Reference(s):

1. Unit 1 Technical Specifications LCO 3.4.12 RCS Specific Activity
2. Unit 2 Technical Specifications LCO 3.4.8 Reactor Coolant System Specific Activity
3. NEI 99-01 SU3

Category: S – System Malfunction

Subcategory: 5 – RCS Leakage

Initiating Condition: RCS leakage for 15 minutes or longer

EAL:

SU5.1 Unusual Event
RCS unidentified or pressure boundary leakage > 10 gpm for ≥ 15 min. (Note 1)
OR
RCS identified leakage > 25 gpm for ≥ 15 min. (Note 1)
OR
Reactor coolant leakage to a location outside containment > 25 gpm for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

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

Basis:

Failure to isolate the leak (from the Control Room or locally) within 15 minutes, or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification.

Steam generator tube leakage is identified RCS leakage.

This IC addresses RCS leakage which may be a precursor to a more significant event. In this case, RCS leakage has been detected and operators, following applicable procedures, have been unable to promptly isolate the leak. This condition is considered to be a potential degradation of the level of safety of the plant.

The first and second EAL conditions are focused on a loss of mass from the RCS due to “unidentified leakage", "pressure boundary leakage" or "identified leakage” (as these leakage types are defined in the plant Technical Specifications). The third condition addresses an RCS mass loss caused by an UNISOLABLE leak through an interfacing system. These conditions thus apply to leakage into the containment, a secondary-side system (e.g., steam generator tube leakage) or a location outside of containment.

The leak rate values for each condition were selected because they are usually observable with normal Control Room indications. Lesser values typically require time-consuming calculations to determine (e.g., a mass balance calculation). The first condition uses a lower value that reflects the greater significance of unidentified or pressure boundary leakage.

The release of mass from the RCS due to the as-designed/expected operation of a relief valve does not warrant an emergency classification. An emergency classification would be required if a mass loss is caused by a relief valve that is not functioning as designed/expected (e.g., a relief valve sticks open and the line flow cannot be isolated).

The 15-minute threshold duration allows sufficient time for prompt operator actions to isolate the leakage, if possible.

Escalation of the emergency classification level would be via ICs of Recognition Category A or F.

Reference(s):

1. Unit 1 and Unit 2 Technical Specifications Section 1.1 Definitions
2. NEI 99-01 SU4

Category: S – System Malfunction

Subcategory: 6 – RPS Failure

Initiating Condition: Automatic or manual trip fails to shut down the reactor

EAL:

SU6.1 Unusual Event

An automatic trip did **not** shut down the reactor as indicated by reactor power > 5% after **any** RPS setpoint is exceeded

AND

A subsequent automatic trip or manual trip action taken at the reactor control console (C03 [2C03/2C14]) (manual reactor trip pushbuttons or DROPS[DSS]) is successful in shutting down the reactor as indicated by reactor power ≤ 5% (Note 8)

Note 8: A manual action is **any** operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does **not** include manually driving in control rods or implementation of boron injection strategies.

Mode Applicability:

1 - Power Operation

Definition(s):

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

Basis:

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, and either a subsequent operator manual action taken at the reactor control consoles or an automatic trip is successful in shutting down the reactor. This event is a precursor to a more significant condition and thus represents a potential degradation of the level of safety of the plant.

In the event that the operator identifies a reactor trip is IMMINENT and initiates a successful manual reactor trip before the automatic trip setpoint is reached, no declaration is required. The successful manual trip of the reactor before it reaches its automatic trip setpoint or reactor trip signals caused by instrumentation channel failures do not lead to a potential fission product barrier loss.

Following the failure of an automatic reactor trip, operators will promptly initiate manual actions at the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor trip). If these manual actions are successful in shutting down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

If an initial manual reactor trip is unsuccessful, operators will promptly take manual action at another location(s) on the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor trip using a different switch). Depending upon several factors, the initial or subsequent effort to manually trip the reactor, or a concurrent plant condition, may lead to the generation of an automatic reactor trip signal. If a subsequent manual or automatic trip is successful in shutting down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

A manual action at the reactor control consoles is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core (e.g., initiating a manual reactor trip). This action does not include manually driving in control rods or implementation of boron injection strategies. Actions taken at back-panels or other locations within the Control Room, or any location outside the Control Room, are not considered to be "at the reactor control consoles."

The plant response to the failure of an automatic or manual reactor trip will vary based upon several factors including the reactor power level prior to the event, availability of the condenser, performance of mitigation equipment and actions, other concurrent plant conditions, etc. If subsequent operator manual actions taken at the reactor control consoles are also unsuccessful in shutting down the reactor, then the emergency classification level will escalate to an Alert via IC SA6. Depending upon the plant response, escalation is also possible via IC FA1. Absent the plant conditions needed to meet either IC SA6 or FA1, an Unusual Event declaration is appropriate for this event.

Should a reactor trip signal be generated as a result of plant work (e.g., RPS setpoint testing), the following classification guidance should be applied.

- If the signal generated as a result of plant work causes a plant transient that results in a condition that should have included an automatic reactor trip and the RPS fails to automatically shutdown the reactor, then this IC and associated EALs are applicable, and should be evaluated.

- If the signal generated as a result of plant work does not cause a plant transient and the trip failure is determined through other means (e.g., assessment of test results), then this IC and associated EALs are not applicable and no classification is warranted.

Reference(s):

1. Unit 1 Technical Specifications Table 3.3.1-1 Reactor Protection System Instrumentation
2. Unit 2 Technical Specifications Table 3.3-1 Reactor Protective Instrumentation
3. Unit 1 and Unit 2 Technical Specifications Table 1.1-1 Modes
4. OP-1202.001 Reactor Trip
5. OP-2202.001 Standard Post Trip Actions
6. NEI 99-01 SU5

Category: S – System Malfunction

Subcategory: 6 – RPS Failure

Initiating Condition: Automatic or manual trip fails to shut down the reactor

EAL:

SU6.2 Unusual Event

A manual trip did **not** shut down the reactor as indicated by reactor power > 5% after **any** manual trip action was initiated

AND

A subsequent automatic trip or manual trip action taken at the reactor control console (C03 [2C03/2C14]) (manual reactor trip pushbuttons or DROPS[DSS]) is successful in shutting down the reactor as indicated by reactor power ≤ 5% (Note 8)

Note 8: A manual scram action is **any** operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does **not** include manually driving in control rods or implementation of boron injection strategies.

Mode Applicability:

1 - Power Operation

Definition(s):

None

Basis:

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, and either a subsequent operator manual action taken at the reactor control consoles or an automatic trip is successful in shutting down the reactor. This event is a precursor to a more significant condition and thus represents a potential degradation of the level of safety of the plant.

This EAL addresses a failure of a manually initiated trip in the absence of having exceeded an automatic RPS trip setpoint and a subsequent automatic or manual trip is successful in shutting down the reactor.

Following the failure on an automatic reactor trip, operators will promptly initiate manual actions at the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor trip). If these manual actions are successful in shutting down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

If an initial manual reactor trip is unsuccessful, operators will promptly take manual action at another location(s) on the reactor control consoles to shutdown the reactor (e.g., initiate a manual reactor trip using a different switch). Depending upon several factors, the initial or subsequent effort to manually the reactor, or a concurrent plant condition, may lead to the generation of an automatic reactor trip signal. If a subsequent manual or automatic trip is successful in shutting down the reactor, core heat generation will quickly fall to a level within the capabilities of the plant's decay heat removal systems.

A manual action at the reactor control consoles is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core (e.g., initiating a manual reactor trip). This action does not include manually driving in control rods or implementation of boron injection strategies. Actions taken at back-panels or other locations within the Control Room, or any location outside the Control Room, are not considered to be "at the reactor control consoles."

The plant response to the failure of an automatic or manual reactor trip will vary based upon several factors including the reactor power level prior to the event, availability of the condenser, performance of mitigation equipment and actions, other concurrent plant conditions, etc. If subsequent operator manual actions taken at the reactor control consoles are also unsuccessful in shutting down the reactor, then the emergency classification level will escalate to an Alert via IC SA6. Depending upon the plant response, escalation is also possible via IC FA1. Absent the plant conditions needed to meet either IC SA6 or FA1, an Unusual Event declaration is appropriate for this event.

Should a reactor trip signal be generated as a result of plant work (e.g., RPS setpoint testing), the following classification guidance should be applied.

- If the signal generated as a result of plant work causes a plant transient that results in a condition that should have included an automatic reactor trip and the RPS fails to automatically shutdown the reactor, then this IC and associated EALs are applicable, and should be evaluated.

- If the signal generated as a result of plant work does not cause a plant transient and the trip failure is determined through other means (e.g., assessment of test results), then this IC and associated EALs are not applicable and no classification is warranted.

Reference(s):

1. Unit 1 Technical Specifications Table 3.3.1-1 Reactor Protection System Instrumentation
2. Unit 2 Technical Specifications Table 3.3-1 Reactor Protective Instrumentation
3. Unit 1 and Unit 2 Technical Specifications Table 1.1-1 Modes
4. OP-1202.001 Reactor Trip
5. OP-2202.001 Standard Post Trip Actions
6. NEI 99-01 SU5

Category: S – System Malfunction

Subcategory: 6 – RPS Failure

Initiating Condition: Automatic or manual trip fails to shut down the reactor and subsequent manual actions taken at the reactor control consoles are **not** successful in shutting down the reactor

EAL:

SA6.1 Alert

An automatic or manual trip fails to shut down the reactor as indicated by reactor power > 5%

AND

Manual trip actions taken at the reactor control console (C03[2C03/2C14]) (manual reactor trip pushbuttons or DROPS[DSS]) are **not** successful in shutting down the reactor as indicated by reactor power > 5% (Note 8)

Note 8: A manual action is **any** operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does **not** include manually driving in control rods or implementation of boron injection strategies.

Mode Applicability:

1 - Power Operation

Definition(s):

None

Basis:

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, and subsequent operator manual actions taken at the reactor control consoles to shutdown the reactor are also unsuccessful. This condition represents an actual or potential substantial degradation of the level of safety of the plant. An emergency declaration is required even if the reactor is subsequently shutdown by an action taken away from the reactor control consoles since this event entails a significant failure of the RPS.

A manual action at the reactor control console is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core (e.g., initiating a manual reactor trip). This action does not include manually driving in control rods or implementation of boron injection strategies. If this action(s) is unsuccessful, operators would immediately pursue additional manual actions at locations away from the reactor control console (e.g., locally opening breakers). Actions taken at back panels or other locations within the Control Room, or any location outside the Control Room, are not considered to be “at the reactor control console.”

The plant response to the failure of an automatic or manual reactor trip will vary based upon several factors including the reactor power level prior to the event, availability of the condenser, performance of mitigation equipment and actions, other concurrent plant conditions, etc. If the failure to shut down the reactor is prolonged enough to cause a challenge to the core cooling or RCS heat removal safety functions, the emergency classification level will escalate to a Site Area Emergency via IC SS6. Depending upon plant responses and symptoms, escalation is also possible via IC FS1. Absent the plant conditions needed to meet either IC SS6 or FS1, an Alert declaration is appropriate for this event.

It is recognized that plant responses or symptoms may also require an Alert declaration in accordance with the Recognition Category F ICs; however, this IC and EAL are included to ensure a timely emergency declaration.

Reference(s):

1. Unit 1 Technical Specifications Table 3.3.1-1 Reactor Protection System Instrumentation
2. Unit 2 Technical Specifications Table 3.3-1 Reactor Protective Instrumentation
3. Unit 1 and Unit 2 Technical Specifications Table 1.1-1 Modes
4. OP-1202.001 Reactor Trip
5. OP-2202.001 Standard Post Trip Actions
6. NEI 99-01 SA5

Category: S – System Malfunction

Subcategory: 6 – RPS Failure

Initiating Condition: Inability to shut down the reactor causing a challenge to core cooling or RCS heat removal

EAL:

SS6.1 Site Area Emergency

An automatic or manual trip fails to shut down the reactor as indicated by reactor power > 5%

AND

All actions to shut down the reactor are **not** successful as indicated by reactor power > 5%

AND EITHER:

- CETs > 1200°F
- RCS heat removal **cannot** be established using steam generators and an on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling.

Mode Applicability:

1 - Power Operation

Definition(s):

None

Basis:

This IC addresses a failure of the RPS to initiate or complete an automatic or manual reactor trip that results in a reactor shutdown, all subsequent operator actions to manually shutdown the reactor are unsuccessful, and continued power generation is challenging the capability to adequately remove heat from the core and/or the RCS. This condition will lead to fuel damage if additional mitigation actions are unsuccessful and thus warrants the declaration of a Site Area Emergency.

In some instances, the emergency classification resulting from this IC/EAL may be higher than that resulting from an assessment of the plant responses and symptoms against the Recognition Category F ICs/EALs. This is appropriate in that the Recognition Category F ICs/EALs do not address the additional threat posed by a failure to shutdown the reactor. The inclusion of this IC and EAL ensures the timely declaration of a Site Area Emergency in response to prolonged failure to shutdown the reactor.

Escalation of the emergency classification level would be via IC AG1 or FG1.

Reference(s):

1. Unit 1 Technical Specifications Table 3.3.1-1 Reactor Protection System Instrumentation
2. Unit 2 Technical Specifications Table 3.3-1 Reactor Protective Instrumentation
3. Unit 1 and Unit 2 Technical Specifications Table 1.1-1 Modes
4. OP-1202.001 Reactor Trip
5. OP-2202.001 Standard Post Trip Actions
6. OP-1202.004 Overheating
7. OP-2202.006 Loss of Feedwater
8. OP-1202.013 Figure 1, Saturation and Adequate SCM
9. Calculation 90-E-0116-07 Unit 1 EOP Setpoint Document, Setpoint B.19
10. OP-2202.009 Functional Recovery
11. Calculation 90-E-0116-01 Unit 2 EOP Setpoint Document
12. NEI 99-01 SS5

Category: S – System Malfunction

Subcategory: 7 – Loss of Communications

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

EAL:

SU7.1 Unusual Event

Loss of **all** Table 1[2]S-4 onsite communication methods

OR

Loss of **all** Table 1[2]S-4 State and local agency communication methods

OR

Loss of **all** Table 1[2]S-4 NRC communication methods

Table 1[2]S-4 Communication Methods

System	Onsite	State / Local	NRC
Station radio system	X		
ANO plant phone system	X		
Gaitronics	X		
Telephone Systems: • Commercial • Microwave • Satellite • VOIP		X	X
Emergency Notification System (ENS)			X

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

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 State and local agencies and the NRC.

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

The first EAL condition addresses a total loss of the communications methods used in support of routine plant operations.

The second EAL condition addresses a total loss of the communications methods used to notify all State and local agencies of an emergency declaration. The State and local agencies referred to here are the Arkansas Department of Health, Arkansas Department of Emergency Management, Pope, Yell, Johnson, and Logan County agencies.

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

This EAL is the hot condition equivalent of the cold condition EAL CU5.1.

Reference(s):

1. OP-1903.062 Communications System Operating Procedure
2. NEI 99-01 SU6

Category: S – System Malfunction

Subcategory: 8 – Containment Failure

Initiating Condition: Failure to isolate containment or loss of containment pressure control

EAL:

SU8.1 Unusual Event
Any penetration is **not** closed within 15 min. of an ESAS[CIAS] actuation signal
OR
Containment pressure > 44.7 psia[23.3 psia] with < one full train of containment heat removal systems (Note 9) operating per design for ≥ 15 min. (Note 1)

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 9: One full train of containment heat removal systems consists of one train of RB [Containment] Spray and one train of RB [Containment] Cooling System.

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

None

Basis:

A penetration is closed for this EAL if either side of the penetration has a closed valve or a check valve is intact (for penetrations that only have one automatic valve and a check valve).

This EAL addresses a failure of one or more containment penetrations to automatically isolate (close) when required by an actuation signal. It also addresses an event that results in high containment pressure with a concurrent failure of containment pressure control systems. Absent challenges to another fission product barrier, either condition represents potential degradation of the level of safety of the plant.

For the first condition, the containment isolation signal must be generated as the result on an off-normal/accident condition (e.g., a safety injection or high containment pressure); a failure resulting from testing or maintenance does not warrant classification. The determination of containment and penetration status – isolated or not isolated – should be made in accordance with the appropriate criteria contained in the plant AOPs and EOPs. The 15-minute criterion is included to allow operators time to manually isolate the required penetrations, if possible.

The second condition addresses a condition where containment pressure is greater than the setpoint at which containment energy (heat) removal systems are designed to automatically actuate, and less than one full train of equipment is capable of operating per design. The 15-minute criterion is included to allow operators time to manually start equipment that may not have automatically started, if possible. The inability to start the required equipment indicates that containment heat removal/depressurization systems (e.g., containment sprays) are either lost or performing in a degraded manner.

This event would escalate to a Site Area Emergency in accordance with IC FS1 if there were a concurrent loss or potential loss of either the Fuel Clad or RCS fission product barriers.

Reference(s):

1. OP-1202.010 ESAS
2. 1SAR 6.2 Reactor Building Spray System
3. 1SAR 6.3 Reactor Building Cooling System
4. OP-2202.003 Loss of Coolant Accident
5. OP-2202.010 Standard Attachments, Attachment 22
6. 2SAR 6.2.2 Containment Heat Removal Systems
7. 2SAR 7.3.1.1.11.2 Containment Spray System
8. NEI 99-01 SU7

Category: S – System Malfunction

Subcategory: 9 – Hazardous Event Affecting Safety Systems

Initiating Condition: Hazardous event affecting SAFETY SYSTEMS needed for the current operating mode

EAL:

SA9.1 Alert

The occurrence of **any** Table 1[2]S-5 hazardous event

AND

Event damage has caused indications of degraded performance on one train of a SAFETY SYSTEM needed for the current operating mode

AND EITHER:

- Event damage has caused indications of degraded performance to the second train of the SAFETY SYSTEM needed for the current operating mode
- Event damage has resulted in VISIBLE DAMAGE to the second train of the SAFETY SYSTEM needed for the current operating mode

(Notes 10, 11)

Note 10: If the affected SAFETY SYSTEM train was already inoperable or out of service before the hazardous event occurred, then emergency classification is **not** warranted.

Note 11: If the hazardous event **only** resulted in VISIBLE DAMAGE, with **no** indications of degraded performance to at least one train of a SAFETY SYSTEM, then this emergency classification is **not** warranted.

Table 1[2]S-5 Hazardous Events
• Seismic event (earthquake) • Internal or external FLOODING event • High winds or tornado strike • FIRE • EXPLOSION • Other events with similar hazard characteristics as determined by the Shift Manager

Mode Applicability:

1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown

Definition(s):

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 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.

FLOODING - A condition where water is entering a room or area faster than installed equipment is capable of removal, resulting in a rise of water level within the room or area.

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 (as defined in 10 CFR 50.2).

Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition;

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures.

VISIBLE DAMAGE - Damage to a SAFETY SYSTEM train 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 SAFETY SYSTEM train.

Basis:

This IC addresses a hazardous event that causes damage to SAFETY SYSTEMS needed for the current operating mode. In order to provide the appropriate context for consideration of an ALERT classification, the hazardous event must have caused indications of degraded SAFETY SYSTEM performance in one train, and there must be either indications of performance issues with the second SAFETY SYSTEM train or VISIBLE DAMAGE to the second train such that the potential exists for this second SAFETY SYSTEM train to have performance issues. In other words, in order for this EAL to be classified, the hazardous event must occur, at least one SAFETY SYSTEM train must have indications of degraded performance, and the second SAFETY SYSTEM train must have indications of degraded performance or VISIBLE DAMAGE such that the potential exists for performance issues.

Note that this second SAFETY SYSTEM train is from the same SAFETY SYSTEM that has indications of degraded performance; commercial nuclear power plants are designed to be able to support single system issues without compromising public health and safety from radiological events.

Indications of degraded performance 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.

VISIBLE DAMAGE addresses damage to a SAFETY SYSTEM train that is not in service/operation and that potentially could cause performance issues. Operators will make a determination of VISIBLE DAMAGE based on the totality of available event and damage report information. This is intended to be a brief assessment not requiring lengthy analysis or quantification of the damage. This VISIBLE DAMAGE should be significant enough to cause concern regarding the operability or reliability of the SAFETY SYSTEM train.

Escalation of the emergency classification level would be via IC FS1 or AS1.

This EAL is the hot condition equivalent of the cold condition EAL CA6.1.

Reference(s):

1. EP FAQ 2016-002
2. NEI 99-01 SA9

Attachment 2 – Safe Operation & Shutdown Areas Tables 1[2]A-3 & 1[2]H-2 Bases

Background

NEI 99-01 Revision 6 ICs AA3 and HA5 prescribe declaration of an Alert based on impeded access to rooms or areas (due to either area radiation levels or hazardous gas concentrations) where equipment necessary for normal plant operations, cooldown or shutdown is located. These areas are intended to be plant operating mode dependent. Specifically the Developers Notes for AA3 and HA5 states:

> *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).*

Further, as specified in IC HA5:

> *The list need not include the Control Room if adequate engineered safety/design features are in place to preclude a Control Room evacuation due to the release of a hazardous gas. Such features may include, but are not limited to, capability to draw air from multiple air intakes at different and separate locations, inner and outer atmospheric boundaries, or the capability to acquire and maintain positive pressure within the Control Room envelope.*

Attachment 2 – Safe Operation & Shutdown Areas Tables 1[2]A-3 & 1[2]H-2 Bases

ANO Table 1[2]A-3 and 1[2]H-2 Bases

A review of station operating procedures identified the following mode dependent in-plant actions and associated areas that are required for normal plant operation, cooldown or shutdown:

Unit 1

AREA	MODES	PURPOSE	REFERENCE
A-4 Switchgear Room	3, 4	Core flood tank valves, decay heat removal (DHR)	OP-1102.010 OP-1104.004
Upper North Electrical Penetration Room	3, 4	DHR alignment	OP-1104.004
Lower South Electrical Equipment Room	3, 4	DHR alignment	OP-1104.004

Unit 2

AREA	MODES	PURPOSE	REFERENCE
Aux Building 317' Emergency Core Cooling Rooms	3, 4	Shutdown Cooling (SDC) venting and alignment	OP-2104.004
Aux Building 317' Tendon Gallery Access	3, 4	SDC alignment	OP-2104.004
Aux Building 335' Charging Pumps / Motor Control Center (MCC) 2B-52	3, 4	Charging low pressure operation, T-Hot injection valves, and SDC alignment	OP-2102.010 OP-2104.004
Auxiliary Building 354' MCC 2B-62 Area	3, 4	SDC alignment and T-Hot injection valves at MCC 2B-62	OP-2102.010 OP-2104.004
Emergency Diesel Generator Corridor	3, 4	Close Safety Injection Tank (SIT) valves and SDC / Low Temperature Overpressure (LTOP) valve alignment at MCC 2B-51	OP-2102.010
Lower South Piping Penetration Room	3, 4	SDC alignment	OP-2104.004
Aux Building 386' Containment Hatch	3, 4	Close SIT valves at MCC 2B-61	OP-2102.010

Mode 3 is included above for DHR- and SDC-related activities because the procedures begin alignment in Mode 3; however, these actions could be delayed until Mode 4, if necessary. In order to ensure adequate guidance to emergency response personnel, the above areas are added to the EAL in order to provide prompt operator guidance for EAL declaration.

Both ANO-1 and ANO-2 Control Room ventilation systems have adequate engineered safety/design features in place to preclude a Control Room evacuation due to the release of a hazardous gas. Therefore the Control Room is not included in this assessment or in Tables 1[2]H-2.

Table 1[2]A-3 & 1[2]H-2 Results

Table 1[2]A-3 & 1[2]H-2 Safe Operation & Shutdown Rooms/Areas	
Unit 1	
Room/Area	**Mode Applicability**
A-4 Switchgear Room	3, 4
Upper North Electrical Penetration Room	3, 4
Lower South Electrical Equipment Room	3, 4
Unit 2	
Room/Area	**Mode Applicability**
Aux Building 317’ Emergency Core Cooling Rooms	3, 4
Aux Building 317’ Tendon Gallery Access	3, 4
Aux Building 335’ Charging Pumps / MCC 2B-52	3, 4
Auxiliary Building 354’ MCC 2B-62 Area	3, 4
Emergency Diesel Generator Corridor	3, 4
Lower South Piping Penetration Room	3, 4
Aux Building 386’ Containment Hatch	3, 4

Enclosure 4 to

0CAN091801

NEI 99-01, Rev. 6, Deviations and Differences, ANO Units 1 and 2

Table of Contents

Introduction

This document provides a line-by-line comparison of the Initiating Conditions (ICs), Mode Applicability, and Emergency Action Levels (EALs) in NEI 99-01, Rev. 6, “Final, Development of Emergency Action Levels for Non-Passive Reactors,” ADAMS Accession Number ML12326A805, and Arkansas Nuclear One (ANO) Initiating Conditions (ICs), Mode Applicability, and EALs. This document provides a means of assessing ANO differences and deviations from the NRC endorsed guidance given in NEI 99-01. Discussion of ANO EAL bases and lists of source document references are given in the EAL Technical Bases Document. It is, therefore, advisable to reference the EAL Technical Bases Document for background information while using this document.

Comparison Matrix Format

The ICs and EALs discussed in this document are grouped according to NEI 99-01 Recognition Categories. Within each Recognition Category, the ICs and EALs are listed in tabular format according to the order in which they are given in NEI 99-01. Generally, each row of the comparison matrix provides the following information:

- NEI EAL/IC identifier
- NEI EAL/IC wording
- ANO EAL/IC identifier
- ANO EAL/IC wording
- Description of any differences or deviations

EAL Wording

In Section 4.1, NEI recommends the following: “The guidance in NEI 99-01 is not intended to be applied to plants “as-is”; however, developers should attempt to keep their site-specific schemes as close to the generic guidance as possible. The goal is to meet the intent of the generic Initiating Conditions (ICs) and Emergency Action Levels (EALs) within the context of site-specific characteristics – locale, plant design, operating features, terminology, etc. Meeting this goal will result in a shorter and less cumbersome NRC review and approval process, closer alignment with the schemes of other nuclear power plant sites and better positioning to adopt future industry-wide scheme enhancements.”

To assist the Emergency Director (ED), the ANO EALs have been written in a clear and concise style (to the extent that the differences from the NEI EAL wording could be reasonably documented and justified). This supports timely and accurate classification in the tense atmosphere of an emergency event. The EAL differences introduced to reduce reading burden comprise almost all of the differences justified in this document.

EAL Emphasis Techniques

Due to the width of the table columns and table formatting constraints in this document, line breaks and indentation may differ slightly from the appearance of comparable wording in the source documents. NEI 99-01 is the source document for the NEI EALs; the ANO EAL Technical Bases Document for the ANO EALs.

Development of the ANO IC/EAL wording has attempted to minimize inconsistencies and apply sound human factors principles. As a result, differences occur between NEI and ANO ICs/EALs for these reasons alone. When such difference may infer a technical difference in the associated NEI IC/EAL, the difference is identified and a justification provided.

The print and paragraph formatting conventions summarized below guide presentation of the ANO EALs in accordance with the EAL writing criteria. Space restrictions in the EAL table of this document sometimes override this criteria in cases when following the criteria would introduce undesirable complications in the EAL layout.

- Upper case-bold print is used for the logic terms **AND**, **OR,** and **EITHER**.
- Bold font is used for certain logic terms, negative terms (**not**, **cannot**, etc.), **any**, **all**.
- Upper case print is reserved for defined terms, acronyms, system abbreviations, logic terms (and, or, etc. when not used as a conjunction), annunciator window engravings.
- Three or more items in a list are normally introduced with "**Any** of the following..." or "**All** of the following..." Items of the list begin with bullets when a priority or sequence is not inferred.
- The use of **AND**/**OR** logic within the same EAL has been avoided when possible. When such logic cannot be avoided, indentation and separation of subordinate contingent phrases is employed.

Global Differences

The differences listed below generally apply throughout the set of EALs and are not repeated in the Justification sections of this document. The global differences do not decrease the effectiveness of the intent of NEI 99-01.

1. The NEI phrase "Notification of Unusual Event" has been changed to "Unusual Event" or abbreviated "UE" to reduce EAL-user reading burden.
2. NEI 99-01 IC Example EALs are implemented in separate plant EALs to improve clarity and readability. For example, NEI lists all IC HU3 Example EALs under one IC. The corresponding ANO EALs appear as unique EALs (e.g., HU3.1 through HU3.4).
3. Mode applicability identifiers (numbers/letter) modify the NEI 99-01 mode applicability names as follows: 1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown, 5 - Cold Shutdown, 6 - Refueling, DEF – Defueled. NEI 99-01defines Defueled as follows: "Reactor Vessel contains no irradiated fuel (full core off-load during refueling or extended outage)."
4. NEI 99-01 uses the terms greater than, less than, greater than or equal to, etc., in the wording of some example EALs. For consistency and to reduce EAL-user reading burden, ANO has adopted use of boolean symbols in place of the NEI 99-01 text modifiers within the EAL wording.

5. "min." is the standard abbreviation for "minutes" and is used to reduce EAL user reading burden.

6. Wherever the generic bracketed PWR term "reactor vessel/RCS" is provided, ANO uses the term "RCS" as the site-specific nomenclature.

7. IC/EAL identification:

   - NEI 99-01 defines the thresholds requiring emergency classification (example EALs) and assigns them to ICs which, in turn, are grouped in "Recognition Categories." ANO endeavors to optimize the NEI EAL organization and identification scheme to enhance usability of the plant-specific EAL set. To this end, the ANO IC/EAL scheme includes the following features:

     a. Division of the NEI EAL set into three groups:

        - EALs applicable under <u>all</u> plant operating modes – This group would be reviewed by the EAL-user any time emergency classification is considered.

        - EALs applicable only under <u>hot</u> operating modes – This group would only be reviewed by the EAL-user when the plant is in Hot Shutdown, Hot Standby, Startup, or Power Operation mode.

        - EALs applicable only under <u>cold</u> operating modes – This group would only be reviewed by the EAL-user when the plant is in Cold Shutdown, Refueling, or Defueled mode.

        The purpose of the groups is to avoid review of hot condition EALs when the plant is in a cold condition and avoid review of cold condition EALs when the plant is in a hot condition. This approach significantly minimizes the total number of EALs that must be reviewed by the EAL-user for a given plant condition, reduces EAL-user reading burden and, thereby, speeds identification of the EAL that applies to the emergency.

     b. Within each of the above three groups, EALs are assigned to categories and subcategories. Category and subcategory titles are selected to represent conditions that are operationally significant to the EAL-user. Subcategories are used as necessary to further divide the EALs of a category into logical sets of possible emergency classification thresholds. The ANO EAL categories/subcategories and their relationship to NEI Recognition Categories are listed in Table 1.

c. Unique identification of each EAL – Four characters comprise the EAL identifier as illustrated in Figure 1.

Figure 1 – EAL Identifier

EAL Identifier
XXX.X

Category (A, H, E, S, F, C) — Sequential number within subcategory/classification
Emergency classification (G, S, A, U) — Subcategory number (1 if no subcategory)

The first character is a letter associated with the category in which the EAL is located. The second character is a letter associated with the emergency classification level (G for General Emergency, S for Site Area Emergency, A for Alert, and U for Notification of Unusual Event). The third character is a number associated with one or more subcategories within a given category. Subcategories are sequentially numbered beginning with the number "1". If a category does not have a subcategory, this character is assigned the number "1". The fourth character is a number preceded by a period for each EAL within a subcategory. EALs are sequentially numbered within the emergency classification level of a subcategory beginning with the number "1".

The EAL identifier is designed to fulfill the following objectives:

- Uniqueness – The EAL identifier ensures that there can be no confusion over which EAL is driving the need for emergency classification.

- Speed in locating the EAL of concern – When the EALs are displayed in a matrix format, knowledge of the EAL identifier alone can lead the EAL-user to the location of the EAL within the classification matrix. The identifier conveys the category, subcategory and classification level. This assists Emergency Response Organization (ERO) responders (who may not be in the same facility as the ED) to find the EAL of concern in a timely manner without the need for a word description of the classification threshold.

- Possible classification upgrade – The category/subcategory/identifier scheme helps the EAL-user find higher emergency classification EALs that may become active if plant conditions worsen.

Table 2 lists the ANO ICs and EALs that correspond to the NEI ICs/Example EALs when the above EAL/IC organization and identification scheme is implemented.

Differences and Deviations

In accordance NRC Regulatory Issue Summary (RIS) 2003-18 "Use of Nuclear Energy Institute (NEI) 99-01, Methodology for Development of Emergency Action Levels" Supplements 1 and 2, a difference is an EAL change in which the basis scheme guidance differs in wording but agrees in meaning and intent, such that classification of an event would be the same, whether using the basis scheme guidance or the ANO EAL. A deviation is an EAL change in which the basis

scheme guidance differs in wording and is altered in meaning or intent, such that classification of the event could be different between the basis scheme guidance and the ANO proposed EAL.

Administrative changes that do not actually change the textual content are neither differences nor deviations. Likewise, any format change that does not alter the wording of the IC or EAL is considered neither a difference nor a deviation.

The following are examples of differences:

- Choosing the applicable EAL based upon plant type (i.e., BWR vs. PWR).

- Using a numbering scheme other than that provided in NEI 99-01 that does not change the intent of the overall scheme.

- Where the NEI 99-01 guidance specifically provides an option to not include an EAL, if equipment for the EAL does not exist at ANO (e.g., automatic real-time dose assessment capability).

- Pulling information from the bases section up to the actual EAL that does not change the intent of the EAL.

- Choosing to state ALL Operating Modes are applicable instead of stating N/A, or listing each mode individually under the Abnormal Rad Level/Radiological Effluent and Hazard and Other Conditions Affecting Plant Safety sections.

- Using synonymous wording (e.g., greater than or equal to vs. at or above, less than or equal vs. at or below, greater than or less than vs. above or below, etc.)

- Adding ANO equipment/instrument identification and/or noun names to EALs.

- Combining like ICs that are exactly the same, but have different operating modes as long as the intent of each IC is maintained and the overall progression of the EAL scheme is not affected.

- Any change to the IC and/or EAL, and/or basis wording, as stated in NEI 99-01, that does not alter the intent of the IC and/or EAL, i.e., the IC and/or EAL continues to:
    - Classify at the correct classification level.
    - Logically integrate with other EALs in the EAL scheme.
    - Ensure that the resulting EAL scheme is complete (i.e., classifies all potential emergency conditions).

The following are examples of deviations:

- Use of altered mode applicability.

- Altering key words or time limits.

- Changing words of physical reference (protected area, safety-related equipment, etc.).

- Eliminating an IC. This includes the removal of an IC from the Fission Product Barrier Degradation category as this impacts the logic of Fission Product Barrier ICs.

- Changing a Fission Product Barrier from a Loss to a Potential Loss or vice-versa.

- Not using NEI 99-01definitions as the intent is for all NEI 99-01 users to have a standard set of defined terms as defined in NEI 99-01. Differences due to plant types are permissible (BWR or PWR). Verbatim compliance to the wording in NEI 99-01 is not necessary as long as the intent of the defined word is maintained. Use of the wording provided in NEI 99-01 is encouraged since the intent is for all users to have a standard set of defined terms as defined in NEI 99-01.

- Any change to the IC and/or EAL, and/or basis wording as stated in NEI 99-01 that does alter the intent of the IC and/or EAL, i.e., the IC and/or EAL:

    - Does not classify at the classification level consistent with NEI 99-01.
    - Is not logically integrated with other EALs in the EAL scheme.
    - Results in an incomplete EAL scheme (i.e., does not classify all potential emergency conditions).

The “Difference/Deviation Justification” columns in the remaining sections of this document identify each difference between the NEI 99-01 IC/EAL wording and the ANO IC/EAL wording. An explanation that justifies the reason for each difference is then provided. If the difference is determined to be a deviation, a statement is made to that affect and explanation is given that states why classification may be different from the NEI 99-01 IC/EAL and the reason for its acceptability. In all cases, however, the differences and deviations do not decrease the effectiveness of the intent of NEI 99-01. A summary list of ANO EAL deviations from NEI 99-01 is given in Table 3.

Table 1 – ANO EAL Categories/Subcategories

ANO EALs		NEI Recognition Category
Category	**Subcategory**	
Group: Any Operating Mode:		
A – Abnormal Rad Levels/Rad Effluent	1 – Radiological Effluent 2 – Irradiated Fuel Event 3 – Area Radiation Levels	Abnormal **R**ad Levels/Radiological Effluent ICs/EALs
H – Hazards and Other Conditions Affecting Plant Safety	1 – Security 2 – Seismic Event 3 – Natural or Technological Hazard 4 – Fire 5 – Hazardous Gas 6 – Control Room Evacuation 7 – Emergency Director Judgment	**H**azards and Other Conditions Affecting Plant Safety ICs/EALs
E - ISFSI	1 – Confinement Boundary	ISFSI ICs/EALs
Group: Hot Conditions:		
S – System Malfunction	1 – Loss of Vital AC Power 2 – Loss of Vital DC Power 3 – Loss of Control Room Indications 4 – RCS Activity 5 – RCS Leakage 6 – RPS Failure 7 – Loss of Communications 8 – Containment Failure 9 – Hazardous Event Affecting Safety Systems	**S**ystem Malfunction ICs/EALs
F – Fission Product Barrier	None	**F**ission Product Barrier ICs/EALs
Group: Cold Conditions:		
C – Cold Shutdown/Refueling System Malfunction	1 – RCS Level 2 – Loss of Vital AC Power 3 – RCS Temperature 4 – Loss of Vital DC Power 5 – Loss of Communications 6 - Hazardous Event Affecting Safety Systems	**C**old Shutdown./ Refueling System Malfunction ICs/EALs

Table 2 – NEI / ANO EAL Identification Cross-Reference

NEI		ANO	
IC	**Example EAL**	**Category and Subcategory**	**EAL**
AU1	1	A – Abnormal Rad Levels / Rad Effluent, 1 – Radiological Effluent	AU1.1
AU1	2	A – Abnormal Rad Levels / Rad Effluent, 1 – Radiological Effluent	AU1.1
AU1	3	A – Abnormal Rad Levels / Rad Effluent, 1 – Radiological Effluent	AU1.2
AU2	1	A – Abnormal Rad Levels / Rad Effluent, 2 – Irradiated Fuel Event	AU2.1
AA1	1	A – Abnormal Rad Levels / Rad Effluent, 1 – Radiological Effluent	AA1.1
AA1	2	A – Abnormal Rad Levels / Rad Effluent, 1 – Radiological Effluent	AA1.2
AA1	3	A – Abnormal Rad Levels / Rad Effluent, 1 – Radiological Effluent	AA1.3
AA1	4	A – Abnormal Rad Levels / Rad Effluent, 1 – Radiological Effluent	AA1.4
AA2	1	A – Abnormal Rad Levels / Rad Effluent, 2 – Irradiated Fuel Event	AA2.1
AA2	2	A – Abnormal Rad Levels / Rad Effluent, 2 – Irradiated Fuel Event	AA2.2
AA2	3	A – Abnormal Rad Levels / Rad Effluent, 2 – Irradiated Fuel Event	AA2.3
AA3	1	A – Abnormal Rad Levels / Rad Effluent, 3 – Area Radiation Levels	AA3.1
AA3	2	A – Abnormal Rad Levels / Rad Effluent, 3 – Area Radiation Levels	AA3.2
AS1	1	A – Abnormal Rad Levels / Rad Effluent, 1 – Radiological Effluent	AS1.1
AS1	2	A – Abnormal Rad Levels / Rad Effluent, 1 – Radiological Effluent	AS1.2
AS1	3	A – Abnormal Rad Levels / Rad Effluent, 1 – Radiological Effluent	AS1.3

NEI		ANO	
IC	Example EAL	Category and Subcategory	EAL
AS2	1	A – Abnormal Rad Levels / Rad Effluent, 2 – Irradiated Fuel Event	AS2.1
AG1	1	A – Abnormal Rad Levels / Rad Effluent, 1 – Radiological Effluent	AG1.1
AG1	2	A – Abnormal Rad Levels / Rad Effluent, 1 – Radiological Effluent	AG1.2
AG1	3	A – Abnormal Rad Levels / Rad Effluent, 1 – Radiological Effluent	AG1.3
AG2	1	A – Abnormal Rad Levels / Rad Effluent, 2 – Irradiated Fuel Event	AG2.1
CU1	1	C – Cold SD/ Refueling System Malfunction, 1 – RCS Level	CU1.1
CU1	2	C – Cold SD/ Refueling System Malfunction, 1 – RCS Level	CU1.2
CU2	1	C – Cold SD/ Refueling System Malfunction, 2 – Loss of Vital AC Power	CU2.1
CU3	1	C – Cold SD/ Refueling System Malfunction, 3 – RCS Temperature	CU3.1
CU3	2	C – Cold SD/ Refueling System Malfunction, 3 – RCS Temperature	CU3.2
CU4	1	C – Cold SD/ Refueling System Malfunction, 4 – Loss of Vital DC Power	CU4.1
CU5	1, 2, 3	C – Cold SD/ Refueling System Malfunction, 5 – Loss of Communications	CU5.1
CA1	1	C – Cold SD/ Refueling System Malfunction, 1 – RCS Level	CA1.1
CA1	2	C – Cold SD/ Refueling System Malfunction, 1 – RCS Level	CA1.2
CA2	1	C – Cold SD/ Refueling System Malfunction, 1 – Loss of Vital AC Power	CA2.1
CA3	1, 2	C – Cold SD/ Refueling System Malfunction, 3 – RCS Temperature	CA3.1
CA6	1	C – Cold SD/ Refueling System Malfunction, 6 – Hazardous Event Affecting Safety Systems	HA4.1
CS1	1	C – Cold SD/ Refueling System Malfunction, 1 – RCS Level	CS1.1

NEI		ANO	
IC	Example EAL	Category and Subcategory	EAL
CS1	2	N/A	N/A
CS1	3	C – Cold SD/ Refueling System Malfunction, 1 – RCS Level	CS1.2
CG1	1	C – Cold SD/ Refueling System Malfunction, 1 – RCS Level	CG1.1
CG1	2	C – Cold SD/ Refueling System Malfunction, 1 – RCS Level	CG1.2
E-HU1	1	E - ISFSI	EU1.1
FA1	1	F – Fission Product Barrier Degradation	FA1.1
FS1	1	F – Fission Product Barrier Degradation	FS1.1
FG1	1	F – Fission Product Barrier Degradation	FG1.1
HU1	1, 2, 3	H – Hazards and Other Conditions Affecting Plant Safety, 1 – Security	HU1.1
HU2	1	H – Hazards and Other Conditions Affecting Plant Safety, 2 – Seismic Event	HU2.1
HU3	1	H – Hazards and Other Conditions Affecting Plant Safety, 3 – Natural or Technological Hazard	HU3.1
HU3	2	H – Hazards and Other Conditions Affecting Plant Safety, 3 – Natural or Technological Hazard	HU3.2
HU3	3	H – Hazards and Other Conditions Affecting Plant Safety, 3 – Natural or Technological Hazard	HU3.3
HU3	4	H – Hazards and Other Conditions Affecting Plant Safety, 3 – Natural or Technological Hazard	HU3.4
HU3	5	H – Hazards and Other Conditions Affecting Plant Safety, 3 – Natural or Technological Hazard	N/A
HU4	1	H – Hazards and Other Conditions Affecting Plant Safety, 4 – Fire or Explosion	HU4.1
HU4	2	H – Hazards and Other Conditions Affecting Plant Safety, 4 – Fire or Explosion	HU4.2
HU4	3	H – Hazards and Other Conditions Affecting Plant Safety, 4 – Fire or Explosion	HU4.3

NEI		ANO	
IC	**Example EAL**	**Category and Subcategory**	**EAL**
HU4	4	H – Hazards and Other Conditions Affecting Plant Safety, 4 – Fire or Explosion	HU4.4
HU7	1	H – Hazards and Other Conditions Affecting Plant Safety, 7 – Judgment	HU7.1
HA1	1, 2	H – Hazards and Other Conditions Affecting Plant Safety, 1 – Security	HA1.1
HA5	1	H – Hazards and Other Conditions Affecting Plant Safety, 5 – Hazardous Gases	HA5.1
HA6	1	H – Hazards and Other Conditions Affecting Plant Safety, 6 – Control Room Evacuation	HA6.1
HA7	1	H – Hazards and Other Conditions Affecting Plant Safety, 7 – Judgment	HA7.1
HS1	1	H – Hazards and Other Conditions Affecting Plant Safety, 1 – Security	HS1.1
HS6	1	H – Hazards and Other Conditions Affecting Plant Safety, 6 – Control Room Evacuation	HS6.1
HS7	1	H – Hazards and Other Conditions Affecting Plant Safety, 7 – Judgment	HS7.1
HG1	1	N/A	N/A
HG7	2	H – Hazards and Other Conditions Affecting Plant Safety, 7 – Judgment	HG7.1
SU1	1	S – System Malfunction, 1 – Loss of Emergency AC Power	SU1.1
SU2	1	S – System Malfunction, 3 – Loss of Control Room Indications	SU3.1
SU3	1	S – System Malfunction, 4 – RCS Activity	SU4.1
SU3	2	S – System Malfunction, 4 – RCS Activity	SU4.2
SU4	1, 2, 3	S – System Malfunction, 5 – RCS Leakage	SU5.1
SU5	1	S – System Malfunction, 6 – RPS Failure	SU6.1
SU5	2	S – System Malfunction, 6 – RPS Failure	SU6.2

NEI		ANO	
IC	**Example EAL**	**Category and Subcategory**	**EAL**
SU6	1, 2, 3	S – System Malfunction, 7 – Loss of Communications	SU7.1
SU7	1, 2	S – System Malfunction, 8 – Containment Failure	SU8.1
SA1	1	S – System Malfunction, 1 – Loss of Emergency AC Power	SA1.1
SA2	1	S – System Malfunction, 3 – Loss of Control Room Indications	SA3.1
SA5	1	S – System Malfunction, 6 – RPS Failure	SA6.1
SA9	1	S – Hazardous Event Affecting Safety Systems	SA9.1
SS1	1	S – System Malfunction, 1 – Loss of Emergency AC Power	SS1.1
SS5	1	S – System Malfunction, 6 – RPS Failure	SS6.1
SS8	1	S – System Malfunction, 2 – Loss of Vital DC Power	SS2.1
SG1	1	S – System Malfunction, 1 – Loss of Emergency AC Power	SG1.1
SG8	2	S – System Malfunction, 1 – Loss of Emergency AC Power	SG1.2

Table 3 – Summary of Deviations

<table>
<tr><th colspan="2">NEI</th><th rowspan="2">ANO EAL</th><th rowspan="2">Description</th></tr>
<tr><th>IC</th><th>Example EAL</th></tr>
<tr><td>HG1</td><td>1</td><td>N/A</td><td>IC HG1 and associated example EAL not implemented in the ANO scheme.

There are several other ICs that are redundant with this IC, and are better suited to ensure timely and effective emergency declarations. In addition, the development of new spent fuel pool level EALs, as a result of NRC Order EA-12-051, clarified the intended emergency classification level for spent fuel pool level events. This deviation is justified because:

1. Hostile Action in the Protected Area is bounded by ICs HS1 and HS7. Hostile Action resulting in a loss of physical control is bound by EAL HG7, as well as any event that may lead to radiological releases to the public in excess of Environmental Protection Agency (EPA) Protective Action Guides (PAGs).
a. If, for whatever reason, the Control Room must be evacuated, and control of safety functions (e.g., reactivity control, core cooling, and RCS heat removal) cannot be reestablished, then IC HS6 would apply, as well as IC HS7 if desired by the EAL decision-maker.
b. Also, as stated above, any event (including Hostile Action) that could reasonably be expected to have a release exceeding EPA PAGs would be bound by IC HG7.
c. From a Hostile Action perspective, ICs HS1, HS7 and HG7 are appropriate, and therefore, make this part of HG1 redundant and unnecessary.
d. From a loss of physical control perspective, ICs HS6, HS7 and HG7 are appropriate, and therefore, make this part of HG1 redundant and unnecessary.
2. Any event which causes a loss of spent fuel pool level will be bounded by ICs AA2, AS2 and AG2, regardless of whether it was based upon a Hostile Action or not, thus making this part of HG1 redundant and unnecessary.
a. An event that leads to a radiological release will be bounded by ICs AU1, AA1, AS1 and AG1. Events that lead to radiological releases in excess of EPA PAGs will be bounded by EALs AG1 and HG7, thus making this part of HG1 redundant and unnecessary.

ICs AA2, AS2, AG2, AS1, AG1, HS1, HS6, HS7 and HG7 have been implemented consistent with NEI 99-01, Revision 6, and thus HG1 is adequately bounded as described above.

Therefore, this is an acceptable deviation from the generic NEI 99-01, Revision 6, guidance and is consistent with NRC approved EP FAQ 2015-013.</td></tr>
</table>

NEI		ANO EAL	Description
IC	Example EAL		
HU4	2	HU4.2	EAL HU4.2 addresses receipt of a single fire detector without a corresponding verification. Entergy proposes an exception in EAL HU4.2 to exclude the Reactor Building in Modes 1 and 2. Personnel safety concerns preclude entry into certain areas of the Reactor Building during these modes. In addition, there are areas within the Reactor Building where fire detectors are located that would be inaccessible during these modes due to elevated radiation levels. Verification of a single containment fire alarm that is likely to be spurious does not warrant the potential elevated exposure risks and industrial safety risks associated with an emergency entry of the Reactor Building in Modes 1 and 2. Therefore, ANO has revised EAL HU4.2 to be applicable to a single fire alarm in the Reactor Building in Modes 3, 4, 5 and 6. Modes 1 and 2 are excluded through the application of Note 14. The structure of the HU4 IC/EAL is modelled after Seabrook Station's adoption of NEI 99-01, Revision 6, EALs containing a similar exception, which was approved by the NRC in Amendment 152 to the Seabrook Station Facility Operating License No. NPF-86 on February 10, 2017 (ML16358A411). **Based on the information above, this is an acceptable deviation from the generic NEI 99-01, Revision 6, guidance. This deviation is consistent with proposed EP FAQ 2018-03 (ML18081A309).**
HS6	1	HS6.1	Deleted defueled mode applicability. Control of the cited safety functions is not critical for a defueled reactor as there is no energy source in the reactor vessel or RCS. The Mode applicability for the reactivity control safety function has been limited to Modes 1, 2, and 3 (hot operating conditions). In the cold operating modes adequate shutdown margin exists under all conditions. **Therefore, this is an acceptable deviation from the generic NEI 99-01, Revision 6, guidance and is consistent with NRC approved EP FAQ 2015-014.**
CA6 SA9	1 1	CA6.1 SA9.1	The proposed ANO CA6.1 and SA9.1 wording is intended to ensure that an Alert should be declared only when actual or potential performance issues with SAFETY SYSTEMS have occurred as a result of a hazardous event. The occurrence of a hazardous event will result in an Unusual Event classification at a minimum. In order to warrant escalation to the Alert classification, the hazardous event should cause indications of degraded performance to one train of a SAFETY SYSTEM with either indications of degraded performance on the second SAFETY SYSTEM train or VISIBLE DAMAGE to the second SAFETY SYSTEM train, such that the operability or reliability of the second train is a concern. In addition, escalation to the Alert classification should not occur if the damage

NEI		ANO EAL	Description
IC	Example EAL		
			from the hazardous event is limited to a SAFETY SYSTEM that was inoperable, or out of service, prior to the event occurring. As such, the proposed EALs will reduce the potential of declaring an Alert when events are in progress that do not involve an actual or potential substantial degradation of the level of safety of the plant, i.e., does not cause significant concern with shutting down or cooling down the plant. EALs CA6.1 and SA9.1 do not directly escalate to a Site Area Emergency or a General Emergency due to a hazardous event. The Fission Product Barrier and/or Abnormal Radiation Levels/Radiological Effluent recognition categories would provide an escalation path to a Site Area Emergency or a General Emergency. The EALs and the Basis sections have been revised to ensure potential escalations from an Unusual Event to an Alert, due to a hazardous event, is appropriate as the concern with these EALs is: (1) a hazardous event has occurred, (2) one SAFETY SYSTEM train is having performance issues as a result of the hazardous event, and (3) either the second SAFETY SYSTEM train is having performance issues or the VISIBLE DAMAGE is enough to be concerned that the second SAFETY SYSTEM train may have operability or reliability issues. The definition for VISIBLE DAMAGE has been revised to reflect the fact that the EALs are based upon SAFETY SYSTEM trains rather than individual components or structures.
CA6 SA9	1 1	CA6.1 SA9.1	*(continued)* Note 10 has been added to CA6.1 and SA9.1 as it meets the intent of the EALs, is consistent with other EALs (e.g., EAL HA5.1 which was previously endorsed by the NRC), and ensures that declared emergencies are based upon unplanned events with the potential to pose a radiological risk to the public. Note 11 has been added to CA6.1 and SA9.1 to help reinforce and succinctly capture the more detailed information from the revised basis section related to when conditions would require the declaration of an Alert. CA6.1 and SA9.1 are consistent with NRC FAQ 2016-002 addressing degraded performance or visible damage to more than one safety system train caused by the specified events. **Based on the above information, this revised wording is an acceptable deviation from the generic NEI 99-01, Revision 6, guidance and is consistent with NRC-approved EP FAQ 2016-002.**

Category A

Abnormal Rad Levels / Radiological Effluent

NEI IC#	NEI IC Wording and Mode Applicability	ANO IC#(s)	ANO IC Wording and Mode Applicability	Difference/Deviation Justification
AU1	Release of gaseous or liquid radioactivity greater than 2 times the (site-specific effluent release controlling document) limits for 60 minutes or longer. MODE: All	AU1	Release of gaseous or liquid radioactivity greater than 2 times the ODCM limits for 60 minutes or longer MODE: All	The ANO ODCM is the site-specific effluent release controlling document.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Reading on **ANY** effluent radiation monitor greater than 2 times the (site-specific effluent release controlling document) limits for 60 minutes or longer: (site-specific monitor list and threshold values corresponding to 2 times the controlling document limits)	AU1.1	Reading on **any** Table 1[2]A-1 effluent radiation monitor > column "UE" for ≥ 60 min. (Notes 1, 2, 3)	Example EALs #1 and #2 have been combined into a single EAL to simplify presentation. The NEI phrase "…effluent radiation monitor greater than 2 times the (site-specific effluent release controlling document)" and "effluent radiation monitor greater than 2 times the alarm setpoint established by a current radioactivity discharge permit " have been replaced with "…**any** Table 1[2]A-1 effluent radiation monitor > column "UE". UE thresholds for all ANO continuously monitored gaseous and liquid release pathways are listed in Tables 1[2]A-1 to consolidate the information in a single location and, thereby, simplify identification of the thresholds by the EAL user. The values shown in Table 1[2]A-1 column "UE", consistent with the NEI bases, represent two times the ODCM release limits for gaseous and liquid releases.
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.			

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
3	Sample analysis for a gaseous or liquid release indicates a concentration or release rate greater than 2 times the (site-specific effluent release controlling document) limits for 60 minutes or longer.	AU1.2	Sample analysis for a gaseous or liquid release indicates a concentration or release rate > 2 x ODCM limits for ≥ 60 min. (Notes 1, 2)	The ANO ODCM is the site-specific effluent release controlling document.
Notes	• The Emergency Director should declare the Unusual Event promptly upon determining that 60 minutes has been exceeded, or will likely be exceeded. • If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 60 minutes. • If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded. Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit. Note 3: 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 classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added “The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.” To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock. The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. None

Table 1A-1 Unit 1 Effluent Monitor Classification Thresholds (2 min. avg reading)						
	Release Point	Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	RX-9820 (SPING 1)	4.15E+01 µCi/cc	4.15E+00 µCi/cc	4.15E-01 µCi/cc	1.21E-03 µCi/cc
Gaseous	Radwaste Area	RX-9825 (SPING 2)	2.67E+01 µCi/cc	2.67E+00 µCi/cc	2.67E-01 µCi/cc	4.94E-04 µCi/cc
Gaseous	Fuel Handling Area	RX-9830 (SPING 3)	6.20E+02 µCi/cc	6.20E+01 µCi/cc	6.20E+00 µCi/cc	5.44E-04 µCi/cc
Gaseous	Emergency Penetration Room	RX-9835 (SPING 4)	6.55E+02 µCi/cc	6.55E+01 µCi/cc	6.55E+00 µCi/cc	1.21E-02 µCi/cc
Liquid	Liquid Radwaste	RE-4642	----	----	----	2.46E+05 cpm

Table 2A-1 Unit 2 Effluent Monitor Classification Thresholds (2 min. avg reading)

	Release Point	Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	2RX-9820 (SPING 5)	1.88E+01 µCi/cc	1.88E+00 µCi/cc	1.88E-01 µCi/cc	5.48E-04 µCi/cc
Gaseous	Radwaste Area	2RX-9825 (SPING 6)	2.35E+01 µCi/cc	2.35E+00 µCi/cc	2.35E-01 µCi/cc	4.35E-04 µCi/cc
Gaseous	Fuel Handling Area	2RX-9830 (SPING 7)	6.86E+02 µCi/cc	6.86E+01 µCi/cc	6.86E+00 µCi/cc	6.04E-04 µCi/cc
Gaseous	Emergency Penetration Room	2RX-9835 (SPING 8)	5.88E+02 µCi/cc	5.88E+01 µCi/cc	5.88E+00 µCi/cc	1.09E-02 µCi/cc
Liquid	BMS Liquid Discharge	2RE-2330	----	----	----	2.45E+04 cpm
Liquid	Regenerative Waste Discharge	2RE-4423	----	----	----	2.45E+05 cpm

NEI IC#	NEI IC Wording and Mode Applicability	ANO IC#(s)	ANO IC Wording and Mode Applicability	Difference/Deviation Justification
AU2	UNPLANNED loss of water level above irradiated fuel. MODE: All	AU2	UNPLANNED loss of water level above irradiated fuel. MODE: All	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	a. UNPLANNED water level drop in the REFUELING PATHWAY as indicated by **ANY** of the following: (site-specific level indications). **AND** b. UNPLANNED rise in area radiation levels as indicated by **ANY** of the following radiation monitors. (site-specific list of area radiation monitors)	AU2.1	UNPLANNED water level drop in the REFUELING PATHWAY as indicated by low water level alarm, visual observation, or BWST[RWT] level drop due to makeup demands **AND** UNPLANNED rise in corresponding area radiation levels as indicated by **any** of the following radiation monitors: • **Unit 1** ○ RE-8009 Spent Fuel Area ○ RE-8017 Fuel Handling Area • **Unit 2** ○ 2RE-8914 Spent Fuel Area ○ 2RE-8915 Spent Fuel Area ○ 2RE-8916 Spent Fuel Area ○ 2RE-8912 Containment Incore Instrumentation	Site-specific level indications incorporated. Site-specific area radiation monitors incorporated.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
AA1	Release of gaseous or liquid radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE. MODE: All	AA1	Release of gaseous or liquid radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE. MODE: All	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Reading on ANY of the following radiation monitors greater than the reading shown for 15 minutes or longer: (site-specific monitor list and threshold values)	AA1.1	Reading on **any** Table 1[2]A-1 effluent radiation monitor > column "ALERT" for ≥ 15 min. (Notes 1, 2, 3, 4)	The ANO radiation monitors that detect radioactivity effluent release to the environment are listed in Table 1[2]A-1. UE, Alert, SAE and GE thresholds for all ANO continuously monitored gaseous and liquid release pathways are listed in Table 1[2]A-1 to consolidate the information in a single location and, thereby, simplify identification of the thresholds by the EAL-user.
2	Dose assessment using actual meteorology indicates doses greater than 10 mrem TEDE or 50 mrem thyroid CDE at or beyond (site-specific dose receptor point).	AA1.2	Dose assessment using actual meteorology indicates doses > 10 mrem TEDE or 50 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)	The site boundary is the site-specific 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.	AA1.3	Analysis of a liquid effluent sample indicates a concentration or release rate that would result in doses > 10 mrem TEDE or 50 mrem thyroid CDE at or beyond the SITE BOUNDARY for 60 min. of exposure (Notes 1, 2)	The site boundary is the site-specific receptor point.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
4	Field survey results indicate **EITHER** of the following at or beyond (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.	AA1.4	Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY: • Closed window dose rates > 10 mR/hr expected to continue for ≥ 60 min. • Analyses of field survey samples indicate thyroid CDE > 50 mrem for 60 min. of inhalation. (Notes 1, 2)	The site boundary is the site-specific receptor point.
Notes	• The Emergency Director should declare the Alert promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. • If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 15 minutes.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded. Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added "The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded." To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock. The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
Notes (cont.)	• 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.	N/A	Note 3: 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.	None
	• 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.		Note 4 The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.	Incorporated site-specific EAL numbers associated with generic EAL#1.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
AA2	Significant lowering of water level above, or damage to, irradiated fuel. MODE: All	AA2	Significant lowering of water level above, or damage to, irradiated fuel. MODE: All	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Uncovery of irradiated fuel in the REFUELING PATHWAY.	AA2.1	IMMINENT uncovery of irradiated fuel in the REFUELING PATHWAY.	Added the defined term “IMMINENT.” Determination of irradiated fuel uncovery in the refueling pathway will always be an anticipatory determination as no direct indication is available to determine when the irradiated fuel has become uncovered.
2	Damage to irradiated fuel resulting in a release of radioactivity from the fuel as indicated by **ANY** of the following radiation monitors: (site-specific listing of radiation monitors, and the associated readings, setpoints and/or alarms)	AA2.2	Damage to irradiated fuel resulting in a release of radioactivity **AND** High alarm on **any** Table 1[2]A-2 radiation monitor.	The EAL is clarified to refer to “mechanical” damage to irradiated fuel in alignment with the basis description. Site-specific list of radiation monitors incorporated. Radiation monitor high alarms specified.
3	Lowering of spent fuel pool level to (site-specific Level 2 value). [See Developer Notes]	AA2.3	Lowering of spent fuel pool level to 387.0 ft. [389.5 ft.] (Alarm 2) on LIT-2020-3(4) [2LIT-2020-1(2)]	For ANO, Level 2, which corresponds to ~10 ft. above the top of the fuel racks in the SFP, is an indicated level of: Unit 1: 387.0 ft. (Alarm 2) on LIT-2020-3(4) Unit 2: 389.5 ft. (Alarm 2) on 2LIT-2020-1(2)

Table 1A-2 Unit 1 Fuel Damage Radiation Monitors
• RE-8009 Spent Fuel Area • RE-8017 Fuel Handling • RE-8060 Containment High Range Radiation Monitor • RE-8061 Containment High Range Radiation Monitor • RX-9820 (SPING 1) Containment Purge • RX-9825 (SPING 2) Radwaste Area • RX-9830 (SPING 3) Fuel Handling Area

Table 2A-2 Unit 2 Fuel Damage Radiation Monitors
• 2RE-8905 Containment Equipment Hatch Area • 2RE-8909 Containment Personnel Access Area • 2RE-8912 Containment Incore Inst. • 2RE-8914 Spent Fuel Area • 2RE-8915 Spent Fuel Area • 2RE-8916 Spent Fuel Area • 2RE-8925-1 Containment High Range Radiation Monitor • 2RE-8925-2 Containment High Range Radiation Monitor • 2RX-9820 (SPING 5) Containment Purge • 2RX-9825 (SPING 6) Radwaste Area • 2RX-9830 (SPING 7) Fuel Handling Area

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
AA3	Radiation levels that impede access to equipment necessary for normal plant operations, cooldown or shutdown MODE: All	AA3	Radiation levels that IMPEDE access to equipment necessary for normal plant operations, cooldown or shutdown. MODE: All (AA3.2 Modes 3 and 4 only)	EAL AA3.2 mode applicability has been limited to the applicable mode of Table 1[2]A-3 (Modes 3 and 4).

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Dose rate greater than 15 mR/hr in **ANY** of the following areas: • Control Room • Central Alarm Station • (other site-specific areas/rooms)	AA3.1	Dose rate > 15 mR/hr in **EITHER** of the following areas: • Control Room • Central Alarm Station (by survey)	No other site-specific areas requiring continuous occupancy exist at ANO. The Control Room envelope (Unit 1 and Unit 2) is monitored for excessive radiation by five detectors. These radiation detectors are RE-8001, 2RE-8001A, 2RE-8001B, 2RE-8750-1A, and 2RE-8750-1B. There are no permanently installed area radiation monitors in CAS that may be used to assess this EAL threshold. Therefore, this threshold is evaluated using local radiation survey for this area.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
2	An UNPLANNED event results in radiation levels that prohibit or impede access to any of the following plant rooms or areas: (site-specific list of plant rooms or areas with entry-related mode applicability identified)	AA3.2	An UNPLANNED event results in radiation levels that prohibit or IMPEDE access to **any** Table 1[2]A-3 room or area. (Note 5)	The site-specific list of plant rooms or areas with entry-related mode applicability are tabularized in Tables 1[2]A-3. The bulleted bases item “the action for which room/area entry is required is of an administrative or record keeping nature (e.g., normal rounds or routine inspections)” was removed from the list of exceptions to classification in the basis information. These actions are a consideration when the site-specific list was developed. Rooms requiring entry for these types of actions are already excluded from the list when it was developed.
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.	N/A	Note 5 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.	None

Table 1A-3 Unit 1 Safe Operation & Shutdown Rooms/Areas	
Room/Area	**Mode**
A-4 Switchgear Room	3, 4
Upper North Electrical Penetration Room	3, 4
Lower South Electrical Equipment Room	3, 4

Table 2A-3 Unit 2 Safe Operation & Shutdown Rooms/Areas	
Room/Area	**Mode**
Aux Building 317' Emergency Core Cooling Rooms	3, 4
Aux Building 317' Tendon Gallery Access	3, 4
Aux Building 335' Charging Pumps / MCC 2B-52	3, 4
Aux Building 354' MCC 2B-62 Area	3, 4
Emergency Diesel Generator Corridor	3, 4
Lower South Piping Penetration Room	3, 4
Aux Building 386' Containment Hatch	3, 4

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
AS1	Release of gaseous radioactivity resulting in offsite dose greater than 100 mrem TEDE or 500 mrem thyroid CDE. MODE: All MODE: All	AS1	Release of gaseous radioactivity resulting in offsite dose greater than 100 mrem TEDE or 500 mrem thyroid CDE. MODE: All	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Reading on ANY of the following radiation monitors greater than the reading shown for 15 minutes or longer: (site-specific monitor list and threshold values)	AS1.1	Reading on **any** Table 1[2]A-1 effluent radiation monitor > column "SAE" for ≥ 15 min. (Notes 1, 2, 3, 4)	The ANO radiation monitors that detect radioactivity effluent release to the environment are listed in Tables 1[2]A-1. UE, Alert, SAE and GE thresholds for all ANO continuously monitored gaseous and liquid release pathways are listed in Table 1[2]A-1 to consolidate the information in a single location and, thereby, simplify identification of the thresholds by the EAL-user.
2	Dose assessment using actual meteorology indicates doses greater than 100 mrem TEDE or 500 mrem thyroid CDE at or beyond (site-specific dose receptor point)	AS1.2	Dose assessment using actual meteorology indicates doses > 100 mrem TEDE or 500 mrem thyroid CDE at or beyond the SITE BOUNDARY. (Note 4)	The site boundary is the site-specific receptor point.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
3	Field survey results indicate **EITHER** of the following at or beyond (site-specific dose receptor point): • Closed window dose rates greater than 100 mR/hr expected to continue for 60 minutes or longer. • Analyses of field survey samples indicate thyroid CDE greater than 500 mrem for one hour of inhalation.	AS1.3	Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY: • Closed window dose rates > 100 mR/hr expected to continue for ≥ 60 min. • Analyses of field survey samples indicate thyroid CDE > 500 mrem for 60 min. of inhalation. (Notes 1, 2)	The site boundary is the site-specific receptor point.
Notes	• The Emergency Director should declare the Site Area Emergency promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. • If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 15 minutes.		Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added “The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.” To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock. The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
Notes (cont.)	• 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.		Note 3: 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. Note 4 The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.	None Incorporated site-specific EAL numbers associated with generic EAL#1.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
AS2	Spent fuel pool level at (site-specific Level 3 description). MODE: All	AS2	Spent fuel pool level at the top of the fuel racks. MODE: All	Top of the fuel racks is the site-specific Level 3 description.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Lowering of spent fuel pool level to (site-specific Level 3 value)	AS2.1	Lowering of spent fuel pool level to 377.0 ft.[379.5 ft.] (Alarm 3) on LIT-2020-3(4)[2LIT-2020-1(2)].	For ANO, Level 3, which corresponds to the top of the fuel racks in the SFP, is an indicated level of: Unit 1: 377.0 ft. (Alarm 3) on LIT-2020-3(4) Unit 2: 379.5 ft. (Alarm 3) on 2LIT-2020-1(2)

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
AG1	Release of gaseous radioactivity resulting in offsite dose greater than 1,000 mrem TEDE or 5,000 mrem thyroid CDE. MODE: All	AG1	Release of gaseous radioactivity resulting in offsite dose greater than 1,000 mrem TEDE or 5,000 mrem thyroid CDE MODE: All	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Reading on ANY of the following radiation monitors greater than the reading shown for 15 minutes or longer: (site-specific monitor list and threshold values)	AG1.1	Reading on **any** Table 1[2]A-1 effluent radiation monitor > column "GE" for ≥ 15 min. (Notes 1, 2, 3, 4)	The ANO radiation monitors that detect radioactivity effluent release to the environment are listed in Tables 1[2]A-1. UE, Alert, SAE and GE thresholds for all ANO continuously monitored gaseous and liquid release pathways are listed in Tables 1[2]A-1 to consolidate the information in a single location and, thereby, simplify identification of the thresholds by the EAL-user.
2	Dose assessment using actual meteorology indicates doses greater than 1,000 mrem TEDE or 5,000 mrem thyroid CDE at or beyond (site-specific dose receptor point).	AG1.2	Dose assessment using actual meteorology indicates doses > 1000 mrem TEDE or 5000 mrem thyroid CDE at or beyond the SITE BOUNDARY. (Note 4)	The site boundary is the site-specific receptor point.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
3	Field survey results indicate **EITHER** of the following at or beyond (site-specific dose receptor point): • Closed window dose rates greater than 1,000 mR/hr expected to continue for 60 minutes or longer. • Analyses of field survey samples indicate thyroid CDE greater than 5,000 mrem for one hour of inhalation.	AG1.3	Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY: • Closed window dose rates > 1000 mR/hr expected to continue for ≥ 60 min. • Analyses of field survey samples indicate thyroid CDE > 5000 mrem for 60 min. of inhalation. (Notes 1, 2)	The site boundary is the site-specific receptor point.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
Notes	• The Emergency Director should declare the Site Area Emergency promptly upon determining that the applicable time has been exceeded, or will likely be exceeded. • If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded 15 minutes. • If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes. • The pre-calculated effluent monitor values presented in EAL #1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.		Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded. Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit. Note 3: 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 for classification purposes. Note 4 The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added “The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.” To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock. The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. None Incorporated site-specific EAL numbers associated with generic EAL#1.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
AG2	Spent fuel pool level cannot be restored to at least (site-specific Level 3 description) for 60 minutes or longer. MODE: All	AG2	Spent fuel pool level cannot be restored to at least the top of the fuel racks for 60 minutes or longer. MODE: All	Top of the fuel racks is the site-specific Level 3 description.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Spent fuel pool level cannot be restored to at least (site-specific Level 3 value) for 60 minutes or longer.	AG2.1	Spent fuel pool level **cannot** be restored to at least 377.0 ft.[379.5 ft.] (Alarm 3) on LIT-2020-3(4) [2LIT-2020-1(2)] for ≥ 60 min. (Note 1)	For ANO, Level 3, which corresponds to the top of the fuel racks in the SFP, is an indicated level of: Unit 1: 377.0 ft. (Alarm 3) on LIT-2020-3(4) Unit 2: 379.5 ft. (Alarm 3) on 2LIT-2020-1(2)
Note	The Emergency Director should declare the General Emergency promptly upon determining that 60 minutes has been exceeded, or will likely be exceeded.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added "The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded." To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

Category C

Cold Shutdown / Refueling System Malfunction

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
CU1	UNPLANNED loss of (reactor vessel/RCS [PWR] or RPV [BWR]) inventory for 15 minutes or longer. MODE: Cold Shutdown, Refueling	CU1	UNPLANNED loss of RCS inventory. MODE: 5 - Cold Shutdown, 6 - Refueling	Deleted the words "…for 15 minutes or longer" as the 15 minute criteria only applies to EAL #1.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	UNPLANNED loss of reactor coolant results in (reactor vessel/RCS [PWR] or RPV [BWR]) level less than a required lower limit for 15 minutes or longer.	CU1.1	UNPLANNED loss of reactor coolant results in RCS water level less than a required lower limit for ≥ 15 min. (Note 1)	None
2	a. (Reactor vessel/RCS [PWR] or RPV [BWR]) level cannot be monitored. **AND** b. UNPLANNED increase in (site-specific sump and/or tank) levels.	CU1.2	RCS level **cannot** be monitored **AND EITHER:** • UNPLANNED rise in **any** Table 1[2]C-1 sump/tank level due to loss of RCS inventory • Visual observation of UNISOLABLE RCS leakage	Added the words "…due to loss of RCS inventory" to be consistent with the IC wording. Replaced the term "increase" with the word "rise" consistent with allowed usage. Site-specific applicable sumps and tanks are listed in Table 1[2]C-1 to improve the readability of the EAL. Added bulleted criteria "Visual observation" to include direct observation of significant RCS unisolable leakage.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
Note	The Emergency Director should declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added “The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.” To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

Table 1C-1 Unit 1 Sumps / Tanks
• Reactor Building Sump • Reactor Drain Tank • Aux. Building Equipment Drain Tank • Aux. Building Sump • Quench Tank

Table 2C-1 Unit 2 Sumps / Tanks
• CNTMT Sump • Reactor Drain Tank • LRW Waste Tank (2T-20) • Holdup Tank • Aux. Building Sump • Quench Tank

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
CU2	Loss of all but one AC power source to emergency buses for 15 minutes or longer. MODE: Cold Shutdown, Refueling, Defueled	CU2	Loss of **all but one** AC power source to vital buses for 15 minutes or longer. MODE: 5 - Cold Shutdown, 6 - Refueling, DEF - Defueled	"vital buses" is the ANO-specific terminology for "emergency buses".

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	a. AC power capability to (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.	CU2.1	AC power capability, Table 1[2]C-3, to vital 4.16 KV buses A3[2A3] and A4[2A4] reduced to a single power source for ≥ 15 min. (Note 1) **AND** **Any** additional single power source failure will result in loss of **all** AC power to SAFETY SYSTEMS	4.16KV buses A3[2A3] and A4[2A4] are the emergency (vital) buses. Site-specific AC power sources are tabularized in Table 1[2]C-3.
Note	The Emergency Director should declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added "The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded." To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

Table 1C-3 Unit 1 AC Power Sources
Offsite • Startup Transformer No. 1 • Startup Transformer No. 2 • Unit Auxiliary Transformer (from 22 KV switchyard) **Onsite** • DG1 • DG2 • AAC Gen

Table 2C-3 Unit 2 AC Power Sources
Offsite • Startup Transformer No. 3 • Startup Transformer No. 2 • Unit Auxiliary Transformer (backfed from main transformer) **Onsite** • 2DG1 • 2DG2 • AAC Gen

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
CU3	Unplanned increase in RCS temperature. MODE: Cold Shutdown, Refueling	CU3	Unplanned rise in RCS temperature MODE: 5 - Cold Shutdown, 6 - Refueling	Replaced the term "increase" with the word "rise" consistent with allowed usage.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	UNPLANNED increase in RCS temperature to greater than (site-specific Technical Specification cold shutdown temperature limit)	CU3.1	UNPLANNED rise in RCS temperature to > 200°F	Replaced the term "increase" with the word "rise" consistent with allowed usage. 200°F is the site-specific Tech. Spec. cold shutdown temperature limit.
2	Loss of **ALL** RCS temperature and (reactor vessel/RCS [PWR] or RPV [BWR]) level indication for 15 minutes or longer.	CU3.2	Loss of **all** RCS temperature and RCS level indication for ≥ 15 min. (Note 1)	None
Note	The Emergency Director should declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added "The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded." To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

NEI	NEI IC Wording	ANO	ANO IC Wording	Difference/Deviation Justification

IC#		IC#(s)		
CU4	Loss of Vital DC power for 15 minutes or longer. MODE: Cold Shutdown, Refueling	CU4	Loss of Vital DC power for 15 minutes or longer. MODE: 5 - Cold Shutdown, 6 - Refueling	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Indicated voltage is less than (site-specific bus voltage value) on required Vital DC buses for 15 minutes or longer.	CU4.1	Indicated voltage is < 105 VDC on required vital 125 VDC buses for ≥ 15 min. (Note 1)	105 VDC is the site-specific minimum vital DC bus voltage. Safety-related DC bus operability requirements are specified in Technical Specifications.
Note	The Emergency Director should declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added "The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded." To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
CU5	Loss of all onsite or offsite communications capabilities. MODE: Cold Shutdown, Refueling, Defueled	CU5	Loss of **all** onsite or offsite communications capabilities. MODE: 5 - Cold Shutdown, 6 - Refueling, DEF - Defueled	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Loss of **ALL** of the following onsite communication methods: (site specific list of communications methods)	CU5.1	Loss of **all** Table 1[2]C-5 onsite communication methods **OR** Loss of **all** Table 1[2]C-5 State and local agency communication methods **OR** Loss of **all** Table 1[2]C-5 NRC communication methods	Example EALs #1, 2 and 3 have been combined into a single EAL for simplification of presentation. Replaced “ORO” with “State and local agency” for clarification. Table 1[2]C-5 provides a site-specific list of onsite, State and local agency (ORO) and NRC communications methods.
2	Loss of **ALL** of the following ORO communications methods: (site specific list of communications methods)			
3	Loss of **ALL** of the following NRC communications methods: (site specific list of communications methods)			

Table 1[2]C-5 Communication Methods			
System	**Onsite**	**State/Local**	**NRC**
Station radio system	X		
ANO plant phone system	X		
Gaitronics	X		
Telephone Systems: • Commercial • Microwave • Satellite • VOIP		X	X
Emergency Notification System (ENS)			X

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
CA1	Loss of (reactor vessel/RCS [PWR] or RPV [BWR]) inventory MODE: Cold Shutdown, Refueling	CA1	Significant loss of RCS inventory MODE: 5 - Cold Shutdown, 6 - Refueling	Added the word "Significant…" to differentiate the Alert loss of RCS inventory IC from the Unusual Event IC which is "Unplanned loss of RCS inventory."

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Loss of (reactor vessel/RCS [PWR] or RPV [BWR]) inventory as indicated by level less than (site-specific level).	CA1.1	Loss of RCS inventory as indicated by **EITHER**: • RVLMS Levels 1 through 8 [1 through 5] indicate DRY • Reactor vessel level < 370.2 ft. (LT-1195/LT-1196)[< 24 in. (L4791/L4792)] (minimum level for DHR operation @ 1000 gpm)[(minimum level for SDC operation)]	RVLMS Levels 1 through 8 [RVLMS Levels 1 through 5] indicating DRY is the site-specific reactor vessel level corresponding to lowest RVLMS indicated level that can support operation of the DHR/SDC system. Reactor vessel level 370.2 ft.[24 in.] corresponds to the minimum level for DHR/SDC system operation.
2	a. (Reactor vessel/RCS [PWR] or RPV [BWR]) level cannot be monitored for 15 minutes or longer **AND** b. UNPLANNED increase in (site-specific sump and/or tank) levels due to a loss of (reactor vessel/RCS [PWR] or RPV [BWR]) inventory.	CA1.2	RCS level **cannot** be monitored for ≥ 15 min. (Note 1) **AND EITHER:** • UNPLANNED rise in **any** Table 1[2]C-1 sump/tank level due to a loss of RCS inventory • Visual observation of UNISOLABLE RCS leakage	Site-specific applicable sumps and tanks are listed in Table 1[2]C-1 to improve the readability of the EAL. Replaced the term "increase" with the word "rise" consistent with allowed usage. Added bulleted criteria "Visual observation" to include direct observation of significant RCS leakage.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
Note	The Emergency Director should declare the Alert promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added “The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.” To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
CA2	Loss of all offsite and all onsite AC power to emergency buses for 15 minutes or longer. MODE: Cold Shutdown, Refueling, Defueled	CA2	Loss of **all** offsite and **all** onsite AC power to vital buses for 15 minutes or longer. MODE: 5 - Cold Shutdown, 6 - Refueling, DEF - Defueled	“Vital buses” is the ANO-specific terminology for “emergency buses”.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Loss of **ALL** offsite and **ALL** onsite AC Power to (site-specific emergency buses) for 15 minutes or longer.	CA2.1	Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3[2A3] and A4[2A4] for ≥ 15 min. (Note 1)	4.16KV buses A3[2A3] and A4[2A4] are the site-specific emergency buses.
Note	The Emergency Director should declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added “The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.” To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
CA3	Inability to maintain the plant in cold shutdown. MODE: Cold Shutdown, Refueling	CA3	Inability to maintain plant in cold shutdown. MODE: 5 - Cold Shutdown, 6 - Refueling	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	UNPLANNED increase in RCS temperature to greater than (site-specific Technical Specification cold shutdown temperature limit) for greater than the duration specified in the following table.	CA3.1	UNPLANNED rise in RCS temperature to > 200°F for > Table 1[2]C-4 duration (Note 1) **OR** Unplanned RCS pressure rise > 10 psig (this EAL does not apply during water-solid plant conditions)	Example EALs #1 and #2 have been combined into a single EAL as EAL #2 is the alternative threshold based on a loss of RCS temperature indication. Replaced the term "increase" with the word "rise" consistent with allowed usage 200°F is the site-specific Tech. Spec. cold shutdown temperature limit. Table 1[2]C-3 is the site-specific implementation of the generic RCS Reheat Duration Threshold table. 10 psig is the site-specific pressure rise readable by Control Room indications.
2	UNPLANNED RCS pressure increase greater than (site-specific pressure reading). (This EAL does not apply during water-solid plant conditions. [PWR])			
Note	The Emergency Director should declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added "The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded." To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

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 1[2]C-4: RCS Heat-up Duration Thresholds		
RCS Status	**CONTAINMENT CLOSURE Status**	**Heat-up Duration**
Intact (but **not** lowered inventory)	N/A	60 min.*
Not intact **OR** lowered inventory	established	20 min.*
	not established	0 min.
* If an RCS heat removal system is in operation within this time frame and RCS temperature is being reduced, the EAL is **not** applicable.		

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
CA6	Hazardous event affecting a SAFETY SYSTEM needed for the current operating mode. MODE: Cold Shutdown, Refueling	CA6	Hazardous event affecting SAFETY SYSTEMS needed for the current operating mode. MODE: 5 - Cold Shutdown, 6 - Refueling	Pluralized safety systems to be consistent with NRC EP FAQ 2016-002 that specifies degraded performance or visible damage in more than one safety system train.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
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: 1. Event damage has caused indications of degraded performance in at least one train of a SAFETY SYSTEM needed for the current operating mode. **OR** 2. The event has caused VISIBLE DAMAGE to a SAFETY SYSTEM component or structure needed for the current operating mode.	CA6.1	The occurrence of **any** Table 1[2]C-6 hazardous event **AND** Event damage has caused indications of degraded performance on one train of a SAFETY SYSTEM needed for the current operating mode **AND EITHER**: • Event damage has caused indications of degraded performance to the second train of the SAFETY SYSTEM needed for the current operating mode • Event damage has resulted in VISIBLE DAMAGE to the second train of the SAFETY SYSTEM needed for the current operating mode (Notes 10, 11)	The hazardous events have been tabularized in Table 1[2]C-6. CA6.1 reflects NRC FAQ 2016-002 requiring degraded performance or visible damage to more than one train of a safety system caused by the specified events. **This wording is a deviation from NEI 99-01, Revision 6, CA6 generic wording and bases but is deemed acceptable in order to ensure that an Alert is declared only when a hazardous event causes actual or potential performance issues with safety systems. This is consistent with NRC-approved EP FAQ 2016-002.** The word “a” is replaced with “the” in the FAQ wording to provide agreement with the FAQ basis information indicating that the criteria is applicable to another train of the same safety system.

N/A	N/A	N/A	Note 10: If the affected SAFETY SYSTEM train was already inoperable or out of service before the hazardous event occurred, then emergency classification is **not** warranted	Added Note 10 consistent with the recommendation of NRC EP FAQ 2016-002.
N/A	N/A	N/A	Note 11: If the hazardous event **only** resulted in VISIBLE DAMAGE, with **no** indications of degraded performance to at least one train of a SAFETY SYSTEM, then this emergency classification is **not** warranted.	Added Note 11 consistent with the recommendation of NRC EP FAQ 2016-002.

Table 1[2]C-6 Hazardous Events
• Seismic event (earthquake) • Internal or external FLOODING event • High winds or tornado strike • FIRE • EXPLOSION • Other events with similar hazard characteristics as determined by the Shift Manager

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
CS1	Loss of (reactor vessel/RCS [PWR] or RPV [BWR]) inventory affecting core decay heat removal capability. MODE: Cold Shutdown, Refueling	CS1	Loss of RCS inventory affecting core decay heat removal capability MODE: 5 - Cold Shutdown, 6 - Refueling	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	a. CONTAINMENT CLOSURE not established. **AND** b. (Reactor vessel/RCS [PWR] or RPV [BWR]) level less than (site-specific level).	CS1.1	CONTAINMENT CLOSURE **not** established **AND** RVLMS Levels 1 through 9 [1 through 6] indicate DRY	Unit 1: RVLMS Level 9 is at elevation 367.69 ft. The bottom of the hotleg is at 368 ft. RVLMS Level 9 corresponds to approximately 6” below the bottom of the hotleg. Unit 2: The top of active fuel is 61.4 in. below the bottom of the hotleg. RVLMS Level 6 is 47 in. above the top of active fuel, which is 61.4 in. – 47 in. = 14.4 in. below the bottom ID of the hot leg.
2	a. CONTAINMENT CLOSURE established. **AND** b. (Reactor vessel/RCS [PWR] or RPV [BWR]) level less than (site-specific level).	N/A	N/A	Unit 1 cannot measure reactor vessel at or near the top of active fuel or below. The Unit 2 RVLMS does not provide a positive indication of level at or near the top of active fuel, but does provide an indication of core uncovery at Level 7. Consistent with the generic developers guidance: “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).” Unit 2 RVLMS levels 7 through 11 are indications of core uncovery.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
3	a. (Reactor vessel/RCS [PWR] or RPV [BWR]) level cannot be monitored for 30 minutes or longer. **AND** b. Core uncovery is indicated by **ANY** of the following: • (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 uncovery • (Other site-specific indications)	CS1.2	[1. RVLMS Levels 1 through 7 indicate DRY **OR]** [2] RCS level cannot be monitored for ≥ 30 min. (Note 1) **AND** Core uncovery is indicated by **any** of the following: • UNPLANNED rise in **any** Table 1[2]C-1 sump/tank level of sufficient magnitude to indicate core uncovery • Containment high range radiation monitor RE-8060/8061 [2RE-8925-1/8925-2] reading > 10 R/hr • Erratic Source Range Monitor indication	On Unit 2, RVLMS level 7 is an indication of core uncovery when the RVLMS system is in service. An ANO CS1.2 EAL threshold is provided for Unit 2 only where there is indication of core uncovery without applying the 30-minute time period because of the known core uncovery condition. Replaced the term “increase” with the word “rise” consistent with allowed usage. Table 1[2]C-1 provides a tabularized list of site-specific applicable sumps and tanks. Containment High Range Radiation Monitors RE-8060/8061[2RE-8925-1/8925-2] are the site-specific radiation monitors that would be indicative of likely core uncovery in the Refueling mode. The dose rate due to core shine when the top of the core becomes uncovered should result in dose rates > 10 R/hr.
Note	The Emergency Director should declare the Site Area Emergency promptly upon determining that 30 minutes has been exceeded, or will likely be exceeded	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added “The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.” To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
CG1	Loss of (reactor vessel/RCS [PWR] or RPV [BWR]) inventory affecting fuel clad integrity with containment challenged MODE: Cold Shutdown, Refueling	CG1	Loss of RCS inventory affecting fuel clad integrity with containment challenged MODE: 5 - Cold Shutdown, 6 - Refueling	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	a. (Reactor vessel/RCS [PWR] or RPV [BWR]) level less than (site-specific level) for 30 minutes or longer. **AND** b. **ANY** indication from the Containment Challenge Table (see below).	N/A	N/A	Unit 1 cannot measure reactor vessel at or near the top of active fuel or below. The Unit 2 RVLMS does not provide a positive indication of level at or near the top of active fuel, but does provide an indication of core uncovery at Level 7. Consistent with the generic developers guidance: "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)." Unit 2 RVLMS levels 7 through 11 are indications of core uncovery.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
2	a. (Reactor vessel/RCS [PWR] or RPV [BWR]) level cannot be monitored for 30 minutes or longer. **AND** b. Core uncovery is indicated by **ANY** of the following: • (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 uncovery • (Other site-specific indications) **AND** c. **ANY** indication from the Containment Challenge Table (see below).	CG1.1	RVLMS Levels 1 through 7 indicate DRY **AND** **Any** Containment Challenge indication, Table 1[2]C-2	On Unit 2, RVLMS level 7 is an indication of core uncovery when the RVLMS system is in service. An ANO CG1.1 EAL threshold is provided for Unit 2 only where there is indication of core uncovery without applying the 30-minute time period because of the known core uncovery condition. Entergy EAL CG1.2 is provided for both units. Replaced the term “increase” with the word “rise” consistent with allowed usage. Table 1[2]C-2 provides a tabularized list of containment challenge indications. Containment High Range Radiation Monitors RE-8060/8061 [2RE-8925-1/8925-2] are the site-specific radiation monitors that would be indicative of likely core uncovery in the Refueling mode. The dose rate due to core shine when the top of the core becomes uncovered should result in dose rates > 10 R/hr. 4% hydrogen concentration in the presence of oxygen represents an explosive mixture in containment.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
2	a. (Reactor vessel/RCS [PWR] or RPV [BWR]) level cannot be monitored for 30 minutes or longer. **AND** b. Core uncovery is indicated by **ANY** of the following: • (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 uncovery • (Other site-specific indications) **AND** c. **ANY** indication from the Containment Challenge Table (see below).	CG1.2	RCS level **cannot** be monitored for ≥ 30 min. (Note 1) **AND** Core uncovery is indicated by **any** of the following: • UNPLANNED rise in **any** Table 1[2]C-1 sump/tank level of sufficient magnitude to indicate core uncovery • Containment High Range Radiation Monitor RE-8060/8061 [2RE-8925-1/8925-2] reading > 10 R/hr • Erratic Source Range Monitor indication **AND** **Any** Containment Challenge indication, Table 1[2]C-2	On Unit 2, RVLMS level 7 is an indication of core uncovery when the RVLMS system is in service. Entergy EAL CG1.1 is provided for Unit 2. Entergy EAL CG1.2 is provided for both units. Replaced the term “increase” with the word “rise” consistent with allowed usage. Table 1[2]C-1 provides a tabularized list of site-specific applicable sumps and tanks. Table 1[2]C-2 provides a tabularized list of containment challenge indications. Containment High Range Radiation Monitors RE-8060/8061[2RE-8925-1/8925-2] are the site-specific radiation monitors that would be indicative of likely core uncovery in the Refueling mode. The dose rate due to core shine when the top of the core becomes uncovered should result in dose rates > 10 R/hr. 4% hydrogen concentration in the presence of oxygen represents an explosive mixture in containment.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
Note	The Emergency Director should declare the General Emergency promptly upon determining that 30 minutes has been exceeded, or will likely be exceeded. N/A	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded. Note 6: If CONTAINMENT CLOSURE is re-established prior to exceeding the 30-minute time limit, declaration of a General Emergency is not required.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added “The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.” To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock. Note 6 implements the asterisked note associated with the Containment Closure requirement.

Containment Challenge Table
• CONTAINMENT CLOSURE not established* • (Explosive mixture) exists inside containment • UNPLANNED increase in containment pressure • Secondary containment radiation monitor reading above (site-specific value) [*BWR*]

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

Table 1[2]C-2 Containment Challenge Indications
• CONTAINMENT CLOSURE **not** established (Note 6) • Containment hydrogen concentration > 4% • UNPLANNED rise in containment pressure

Category D

Permanently Defueled Station Malfunction

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
PD-AU1 PD-AU2 PD-SU1 PD-HU1 PD-HU2 PD-HU3 PD-AA1 PD-AA2 PD-HA1 PD-HA3	Recognition Category D Permanently Defueled Station	N/A	N/A	NEI Recognition Category PD ICs and EALs are applicable only to permanently defueled stations. ANO is not a defueled station.

Category E

Independent Spent Fuel Storage Installation (ISFSI)

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
E-HU1	Damage to a loaded cask confinement BOUNDARY. MODE: All	EU1	Damage to a loaded cask confinement BOUNDARY. MODE: All	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Damage to a loaded cask confinement BOUNDARY as indicated by an on-contact radiation reading greater than (2 times the site-specific cask specific technical specification allowable radiation level) on the surface of the spent fuel cask.	EU1.1	Damage to a loaded cask CONFINEMENT BOUNDARY as indicated by an on-contact radiation reading on the surface of a loaded spent fuel cask (VSC-24 VCC or HI-STORM overpack) > **any** Table 1[2]E-1 value	The specified dose rates represent 2 times the site-specific cask technical specification allowable levels per the ISFSI Technical Specifications (licensing document).

Table 1[2]E-1 ISFSI Dose Rates	
VSC-24 VCC	**HI-STORM**
• 200 mrem/hr on the sides • 400 mrem/hr on the top • 700 mrem/hr at the air inlet • 200 mrem/hr at the air outlet	• 60 mrem/hr (gamma + neutron) on the top or outlet vent • 600 mrem/hr (gamma + neutron) on the side of the side of the overpack (excluding inlet and outlet ducts)

Category F

Fission Product Barrier Degradation

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
FA1	Any Loss or any Potential Loss of either the Fuel Clad or RCS barrier. MODE: Power Operation, Hot Standby, Startup, Hot Shutdown	FA1	Any loss or **any** potential loss of either Fuel Clad or RCS barrier MODE: 1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Any Loss or any Potential Loss of either the Fuel Clad or RCS barrier.	FA1.1	**Any** loss or **any** potential loss of either Fuel Clad or RCS barrier (Table 1[2]F-1).	Table 1[2]F-1 provides the fission product barrier loss and potential loss thresholds.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
FS1	Loss or Potential Loss of any two barriers. MODE: Power Operation, Hot Standby, Startup, Hot Shutdown	FS1	Loss or potential loss of **any** two barriers. MODE: 1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Loss or Potential Loss of any two barriers.	FS1.1	Loss or potential loss of **any** two barriers (Table 1[2]F-1).	Table 1[2]F-1 provides the fission product barrier loss and potential loss thresholds.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
FG1	Loss of any two barriers and Loss or Potential Loss of third barrier. MODE: Power Operation, Hot Standby, Startup, Hot Shutdown	FG1	Loss of **any** two barriers and loss or potential loss of the third barrier. MODE: 1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Loss of any two barriers and Loss or Potential Loss of third barrier.	FG1.1	Loss of **any** two barriers **AND** Loss or potential loss of the third barrier (Table 1[2]F-1).	Table 1[2]F-1 provides the fission product barrier loss and potential loss thresholds.

PWR Fuel Clad Fission Product Barrier Degradation Thresholds

NEI FPB#	NEI Threshold Wording	ANO FPB #(s)	ANO FPB Wording	Difference/Deviation Justification
FC Loss 1	**RCS or SG Tube Leakage** Not Applicable	N/A	N/A	N/A
FC Loss 2	**Inadequate Heat Removal** A. Core exit thermocouple readings greater than (site-specific temperature value).	FCB2	CETs > 1200°F.	Consistent with the generic developers notes 1200°F CET temperature is used.
FC Loss 3	**RCS Activity/CMNT Rad** A. Containment radiation monitor reading greater than (site-specific value) **OR** B. (Site-specific indications that reactor coolant activity is greater than 300 μCi/gm dose equivalent I-131).	FCB5	Containment high range radiation monitor RE-8060/8061 [2RE-8925-1/8925-2] > 750[700] R/hr.	A 750[700] R/hr (768[682] R/hr rounded for readability) reading in the containment is used to indicate a loss of the Fuel Clad barrier and a release of reactor coolant, with elevated activity indicative of fuel damage, into the containment. This value assumes an instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory associated with a concentration of approximately 300 μCi/gm Dose Equivalent I-131 into the containment atmosphere.
		FCB6	Coolant activity > 300 μCi/gm dose equivalent I-131.	300 μCi/gm DEI-131 is the site-specific indication for this reactor coolant activity.
FC Loss 4	**CNMT Integrity or Bypass** Not Applicable	N/A	N/A	N/A
FC Loss 5	**Other Indications** A. (site-specific as applicable)	N/A	N/A	No other site-specific Fuel Clad Loss indication has been identified for ANO.
FC Loss 6	**ED Judgment** A. ANY condition in the opinion of the Emergency Director that indicates Loss of the Fuel Clad barrier.	FCB7	**Any** condition in the opinion of the Emergency Director that indicates loss of the fuel clad barrier.	None

NEI FPB#	NEI Threshold Wording	ANO FPB #(s)	ANO FPB Wording	Difference/Deviation Justification
FC P-Loss 1	**RCS or SG Tube Leakage** A. RCS/reactor vessel level less than (site-specific level)	FCB1	RVLMS Levels 1 through 9 [1 through 7] indicate DRY.	The above core level indication on Unit 1 is used to monitor the approach to and recovery from ICC conditions, but the CETs are used to identify core uncovery, and are the only positive indication of core uncovery. The reactor vessel level indicators installed in Unit 1 extend from the top of the reactor vessel to the fuel alignment plate and indicate that the lowest sensor is greater than 2 feet above the top of active fuel. For Unit 2, RVLMS level 7 is an indication of core uncovery.
FC P-Loss 2	**Inadequate Heat Removal** A. Core exit thermocouple readings greater than (site-specific temperature value) **OR** B. Inadequate RCS heat removal capability via steam generators as indicated by (site-specific indications).	FCB3	CETs > 700°F.	Consistent with the generic developers notes 700°F CET temperature is used.
		FCB4	RCS heat removal **cannot** be established using steam generators **AND** An on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling.	The initiation of HPI[Once Through] cooling is a readily identifiable procedurally driven action that is taken when steam generators are not functioning as an effective RCS heat removal source.
FC P-Loss 3	**RCS Activity/CMNT Rad** Not Applicable	N/A	N/A	N/A
FC P-Loss 4	**CNMT Integrity or Bypass** Not Applicable	N/A	N/A	N/A

NEI FPB#	NEI Threshold Wording	ANO FPB #(s)	ANO FPB Wording	Difference/Deviation Justification
FC P-Loss 5	**Other Indications** A. (site-specific as applicable)	N/A	N/A	No other site-specific Fuel Clad Potential Loss indication has been identified for ANO.
FC P-Loss 6	**Emergency Director Judgment** A. Any condition in the opinion of the Emergency Director that indicates Potential Loss of the Fuel Clad barrier.	FCB8	**Any** condition in the opinion of the Emergency Director that indicates potential loss of the Fuel Clad barrier	None

PWR RCS Fission Product Barrier Degradation Thresholds

NEI FPB#	NEI IC Wording	ANO FPB #(s)	ANO FPB Wording	Difference/Deviation Justification
RCS Loss 1	**RCS or SG Tube Leakage** A. An automatic or manual ECCS (SI) actuation is required by **EITHER** of the following: 1. UNISOLABLE RCS leakage **OR** 2. SG tube RUPTURE.	RCB1	An automatic or manual ESAS [ESFAS] actuation required by **EITHER**: • UNISOLABLE RCS leakage • SG tube RUPTURE	ESAS[ESFAS] is the site-specific nomenclature for ECCS (SI). Added "Failure to isolate the leak (from the Control Room or locally), within 15 minutes or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification" to the basis. This provides agreement with the definition of "Unisolable" and ensures isolation attempts, both locally and remotely, are achieved in a timely manner.
RCS Loss 2	**Inadequate Heat Removal** Not Applicable	N/A	N/A	N/A
RCS Loss 3	**RCS Activity/CMNT Rad** A. Containment radiation monitor reading greater than (site-specific value).	RCB5	Containment high range radiation monitor RE-8060/8061 [2RE-8925-1/8925-2] > 40[50] R/hr.	A 40[50] R/hr (42.8[50.4] R/hr rounded for readability) reading in containment is used to indicate a loss of the RCS barrier and a release of reactor coolant, at the T.S. coolant activity limit, into the containment. This value assumes an instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory associated T.S. coolant activity into the containment atmosphere. Site-specific information added to the basis on the phenomenon of thermally induced current and its potential effects on the radiation monitor indication.
RCS Loss 4	**CNMT Integrity or Bypass** Not Applicable	N/A	N/A	N/A
RCS Loss 5	**Other Indications** A. (site-specific as applicable).	N/A	N/A	No other site-specific RCS Loss indication has been identified for ANO.

NEI FPB#	NEI IC Wording	ANO FPB #(s)	ANO FPB Wording	Difference/Deviation Justification
RCS Loss 6	**Emergency Director Judgment** A. **ANY** condition in the opinion of the Emergency Director that indicates Loss of the RCS barrier.	RCB6	**Any** condition in the opinion of the Emergency Director that indicates loss of the RCS barrier.	None
RCS P-Loss 1	**RCS or SG Tube Leakage** A. Operation of a standby charging (makeup) pump is required by **EITHER** of the following: 1. UNISOLABLE RCS leakage **OR** 2. SG tube leakage. **OR**	RCB2	UNISOLABLE RCS leakage or S/G tube leakage > 50[44] gpm excluding normal reductions in RCS inventory (e.g., letdown, RCP seal leakoff)	ANO uses the alternative indication of the capacity of one pump for the threshold leakage value as described in the NEI guidance. Added “Failure to isolate the leak (from the Control Room or locally), within 15 minutes or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification” to the basis. This provides agreement with the definition of “Unisolable” and ensures isolation attempts, both locally and remotely, are achieved in a timely manner.

NEI FPB#	NEI IC Wording	ANO FPB #(s)	ANO FPB Wording	Difference/Deviation Justification
	B. RCS cooldown rate greater than (site-specific pressurized thermal shock criteria/limits defined by site-specific indications).	RCB3	UNISOLABLE RCS leakage or S/G tube leakage > 50[44] gpm excluding normal reductions in RCS inventory (e.g., letdown, RCP seal leakoff) **Unit 1:** PTS limits apply (RT14) **AND** RCS pressure and temperature are left of the NDTT/LTOP limit lines on EOP Figure 3 (Note 12) **Unit 2:** Uncontrolled RCS cooldown (> 50 °F step change or > 100 °F change in less than a one-hour period) **AND** RCS pressure and temperature are to the left of line B (200 degrees MTS), Standard Attachment 1, P-T Limits (Note 12)	Unit 1 and Unit 2 specific PTS criteria is specified. Note 12 – "Once PTS limits are first invoked, if RCS temperature and pressure are not brought within the limits within 15 minutes, this threshold is met and an immediate declaration is warranted. This threshold is met immediately upon exceeding the limits after this initial 15 minute period until PTS limits no longer apply" is added to allow RCS parameters to be brought within the limits in a timely manner when they are first outside the limits. RCS parameters must be maintained within afterward.
RCS P-Loss 2	**Inadequate Heat Removal** A. Inadequate RCS heat removal capability via steam generators as indicated by (site-specific indications).	RCB4	RCS heat removal cannot be established **AND** An on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling	The initiation of HPI[Once Through] cooling is a readily identifiable procedurally driven action that is taken when steam generators are not functioning as an effective RCS heat removal source.
RCS P-Loss 3	**CS Activity/CMNT Rad** Not Applicable	N/A	N/A	N/A

NEI FPB#	NEI IC Wording	ANO FPB #(s)	ANO FPB Wording	Difference/Deviation Justification
RCS P-Loss 4	**CNMT Integrity or Bypass** Not Applicable	N/A	N/A	N/A
RCS P-Loss 5	**Other Indications** A. (site-specific as applicable)	N/A	N/A	No other site-specific RCS Potential Loss indication has been identified for ANO.
RCS P-Loss 6	**Emergency Director Judgment** A. **ANY** condition in the opinion of the Emergency Director that indicates Potential Loss of the RCS barrier.	RCB7	**Any** condition in the opinion of the Emergency Director that indicates potential loss of the RCS barrier	None

PWR Containment Fission Product Barrier Degradation Thresholds

NEI FPB#	NEI IC Wording	ANO FPB #(s)	ANO FPB Wording	Difference/Deviation Justification
CNMT Loss 1	**RCS or SG Tube Leakage** A. A leaking or RUPTURED SG is FAULTED outside of containment.	CNB1	A S/G that is leaking > 50[44] gpm (excluding normal reductions in RCS inventory) or that is RUPTURED is also FAULTED outside of containment	The threshold is reworded to clarify that the steam generator leakage is that level of leakage associated with the related the NEI RCS barrier potential loss threshold 1.A (ANO RCB2). Revised the table on page 2 of the basis information to reflect pump capacity values to align with the change made to the EAL.
CNMT Loss 2	**Inadequate Heat Removal** Not Applicable	N/A	N/A	N/A
CNMT Loss 3	**RCS Activity/CMNT Rad** Not applicable	N/A	N/A	N/A
CNMT Loss 4	**CNMT Integrity or Bypass** A. Containment isolation is required **AND** **EITHER** of the following: 1. Containment integrity has been lost based on Emergency Director judgment. **OR** 2. UNISOLABLE pathway from the containment to the environment exists. **OR** B. Indications of RCS leakage outside of containment.	CNB4	Containment isolation is required **AND EITHER**: • Containment integrity has been lost based on Emergency Director judgment • UNISOLABLE pathway from Containment to the environment exists	Added “Failure to isolate the leak (from the Control Room or locally), within 15 minutes or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification” to the basis. This provides agreement with the definition of “Unisolable” and ensures isolation attempts, both locally and remotely, are achieved in a timely manner.
		CNB5	Indications of RCS leakage outside of containment	None

NEI FPB#	NEI IC Wording	ANO FPB #(s)	ANO FPB Wording	Difference/Deviation Justification
CNMT Loss 5	**Other Indications** A. (site-specific as applicable)	N/A	N/A	No other site-specific Containment Loss indication has been identified for ANO.
CNMT Loss 6	**Emergency Director Judgment** **ANY** condition in the opinion of the Emergency Director that indicates Loss of the Containment barrier.	CNB9	**Any** condition in the opinion of the Emergency Director that indicates loss of the containment barrier.	None
CNMT P-Loss 1	**RCS or SG Tube Leakage** Not Applicable	N/A	N/A	N/A
CNMT P-Loss 2	**Inadequate Heat Removal** A. 1. (Site-specific criteria for entry into core cooling restoration procedure) **AND** 2. Restoration procedure not effective within 15 minutes.	CNB2	CETs > 1200°F **AND** Restoration procedures **not** effective within 15 min. (Note 1)	Consistent with the generic developers notes 1200°F CET temperature is used. Added Note 1 consistent with other thresholds with a timing component.
CNMT P-Loss 3	**RCS Activity/CMNT Rad** A. Containment radiation monitor reading greater than (site-specific value).	CNB3	Containment high range radiation monitor RE-8060/8061 [2RE-8925-1/8925-2] reading > 10,000[12,000] R/hr	10,000[12,000] R/hr (10,300[12,100] R/hr rounded for readability) reading in the containment is used to indicate a potential loss of the containment barrier and a release of reactor coolant, with significant activity indicative of 20% fuel damage, into the containment. This value assumes an instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory associated with a concentration associated with 20% clad damage into the containment atmosphere.

NEI FPB#	NEI IC Wording	ANO FPB #(s)	ANO FPB Wording	Difference/Deviation Justification
CNMT P-Loss 4	**CNMT Integrity or Bypass** A. Containment pressure greater than (site-specific value) **OR** B. Explosive mixture exists inside containment **OR** C. 1. Containment pressure greater than (site-specific pressure setpoint) **AND** 2. Less than one full train of (site-specific system or equipment) is operating per design for 15 minutes or longer.	CNB6	Containment pressure > 73.7 psia.	73.7 psia is the site specific containment design pressure.
		CNB7	Containment hydrogen concentration > 4%.	4% hydrogen concentration in the presence of oxygen represents an explosive mixture in containment.
		CNB8	Containment pressure > 44.7 psia [23.3 psia] with < one full train of containment heat removal systems (Note 9) operating per design for ≥ 15 min. (Note 1)	The Containment pressure setpoint is the pressure at which the Containment Spray System should actuate and begin performing its function. Added Note 1 consistent with other thresholds with a timing component. Added Note 9 to clarify what constitutes a full train of containment heat removal systems.
CNMT P-Loss 5	**Other Indications** A. (site-specific as applicable)	N/A	N/A	No other site-specific Containment Potential Loss indication has been identified for ANO.
CNMT P-Loss 6	**Emergency Director Judgment** A. **ANY** condition in the opinion of the Emergency Director that indicates Potential Loss of the Containment barrier.	CNB10	**Any** condition in the opinion of the Emergency Director that indicates potential loss of the containment barrier.	None

Category H

Hazards and Other Conditions Affecting Plant Safety

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
HU1	Confirmed SECURITY CONDITION or threat MODE: All	HU1	Confirmed SECURITY CONDITION or threat. MODE: All	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	A SECURITY CONDITION that does not involve a HOSTILE ACTION as reported by the (site-specific security shift supervision).	HU1.1	A SECURITY CONDITION that does **not** involve a HOSTILE ACTION as reported by ANO Security Shift Supervision **OR** Notification of a credible security threat directed at the site **OR** A validated notification from the NRC providing information of an aircraft threat.	Example EALs #1, 2 and 3 have been combined into a single EAL for ease of presentation and use.
2	Notification of a credible security threat directed at the site.			
3	A validated notification from the NRC providing information of an aircraft threat.			

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
HU2	Seismic event greater than OBE levels. MODE: All	HU2	Seismic event greater than OBE levels. MODE: All	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Seismic event greater than Operating Basis Earthquake (OBE) as indicated by: (site-specific indication that a seismic event met or exceeded OBE limits)	HU2.1	Seismic event > OBE as indicated by annunciation of the 0.10 g acceleration alarm	The ANO OBE alarm is located on the seismic network control center, C529-NCC in the Unit 1 Control Room.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
HU3	Hazardous event. MODE: All	HU3	Hazardous event. MODE: All	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	A tornado strike within the PROTECTED AREA.	HU3.1	A tornado strike within the PROTECTED AREA.	None
2	Internal room or area flooding of a magnitude sufficient to require manual or automatic electrical isolation of a SAFETY SYSTEM component needed for the current operating mode.	HU3.2	Internal room or area FLOODING of a magnitude sufficient to require manual or automatic electrical isolation of a SAFETY SYSTEM component required by Technical Specifications for the current operating mode.	Replaced the word “needed” with “…required by Technical Specifications…” consistent with the generic bases.
3	Movement of personnel within the PROTECTED AREA is impeded due to an offsite event involving hazardous materials (e.g., an offsite chemical spill or toxic gas release).	HU3.3	Movement of personnel within the PROTECTED AREA is IMPEDED due to an event external to the PROTECTED AREA involving hazardous materials (e.g., an offsite chemical spill or toxic gas release).	Changed the term “offsite” to “external to the PROTECTED AREA” to address events located external to the PROTECTED AREA but not considered offsite.
4	A hazardous event that results in on-site conditions sufficient to prohibit the plant staff from accessing the site via personal vehicles.	HU3.4	A hazardous event that results in on-site conditions sufficient to prohibit the plant staff from accessing the site via personal vehicles. (Note 7)	Added reference to Note 7.
5	(Site-specific list of natural or technological hazard events)	N/A	N/A	No other site-specific hazard has been identified for ANO.
Note	EAL #3 does not apply to routine traffic impediments such as fog, snow, ice, or vehicle breakdowns or accidents.	N/A	Note 7: This EAL does **not** apply to routine traffic impediments such as fog, snow, ice, or vehicle breakdowns or accidents.	This note, designated Note #7, is intended to apply to generic example EAL #4, not #3 as specified in the generic guidance.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
HU4	FIRE potentially degrading the level of safety of the plant. MODE: All	HU4	FIRE potentially degrading the level of safety of the plant. MODE: All	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	a. A FIRE is NOT extinguished within 15-minutes of **ANY** of the following FIRE detection indications: • Report from the field (i.e., visual observation) • Receipt of multiple (more than 1) fire alarms or indications • Field verification of a single fire alarm **AND** b. The FIRE is located within **ANY** of the following plant rooms or areas: (site-specific list of plant rooms or areas)	HU4.1	A FIRE is **not** extinguished within 15 min. of **any** of the following FIRE detection indications (Note 1): • Report from the field (i.e., visual observation) • Receipt of multiple (more than 1) fire alarms or indications (Note 13) • Field verification of a single fire alarm **AND** The FIRE is located within **any** Table 1[2]H-1 area.	Table 1[2]H-1 provides a tabularized list of site-specific fire areas. Added reference to Note 13.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
2	a. Receipt of a single fire alarm (i.e., no other indications of a FIRE). **AND** b. The FIRE is located within **ANY** of the following plant rooms or areas: (site-specific list of plant rooms or areas) **AND** c. The existence of a FIRE is not verified within 30-minutes of alarm receipt.	HU4.2	Receipt of a single fire alarm (i.e., **no** other indications of a FIRE) (Note 14) **AND** The fire alarm is indicating a FIRE within **any** Table 1[2]H-1 area **AND** The existence of a FIRE is **not** verified (i.e., proved or disproved) within 30 min. of alarm receipt. (Note 1)	Table 1[2]H-1 provides a tabularized list of site-specific fire areas. Added reference to Note 14. To clarify the intent of the last bullet, the existing Basis wording “i.e., proved or disproved” is added as a parenthetical. This does not result in an intent change to the EAL. In addition, the wording in the Basis section supporting fire detection and response design is modified to remove specific reference to 10 CFR 50, Appendix R. The Basis statement relating to Criterion 3 of 10 CFR 50, Appendix A is maintained, along with generic statements that are applicable without regard to Appendix R. Both ANO units are NFPA 805 plants; therefore, the requirements of Appendix R are no longer applicable. **This wording is a difference from NEI 99-01, Revision 6, HU4 generic wording and bases. This difference is acceptable in order eliminate reference to an inappropriate licensing basis while maintaining sufficient information to address fire prevention and fire system functions**
3	A FIRE within the plant or ISFSI [for plants with an ISFSI outside the plant Protected Area] PROTECTED AREA not extinguished within 60-minutes of the initial report, alarm or indication.	HU4.3	A FIRE within the PROTECTED AREA **not** extinguished within 60 min. of the initial report, alarm or indication. (Note 1)	ANO has an ISFSI located inside the plant Protected Area.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
4	A FIRE within the plant or ISFSI [for plants with an ISFSI outside the plant Protected Area] PROTECTED AREA that requires firefighting support by an offsite fire response agency to extinguish.	HU4.4	A FIRE within the PROTECTED AREA that requires firefighting support by an offsite fire response agency to extinguish	ANO has an ISFSI located inside the plant Protected Area.
Note	The Emergency Director should declare the Unusual Event promptly upon determining that the applicable time has been exceeded, or will likely be exceeded.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added “The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.” To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.
Note	None.	HU4.1	Note 13: Bullet 2 of this EAL (multiple fire alarm indications) is not applicable for LOCAs or MSL breaks in containment.	Added Note 13 to read “Bullet 2 of this EAL (multiple fire alarm indications) is not applicable for LOCAs or MSL breaks in containment.” This Note is intended to prevent unnecessary EAL declaration when fire alarms are a result of steam environments such as those caused by LOCAs or MSL breaks. This is considered a difference because NEI 99-01 instructs developers and users that all EAL indications should be based on valid indications in Section 5.1. ANO has experienced false indication of these detectors in large steam environments.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
Note	None.	HU4.2	Note 14: During Modes 1 and 2, HU4.2 is not applicable to a single fire alarm in the Reactor Building.	Added Note 14 to read “During Modes 1 and 2, HU4.2 is not applicable to a single fire alarm in the Reactor Building.” Modes 1 and 2 are excluded from this EAL based on containment air flow design and Technical Specification requirements for operation of Containment Fan Coolers. ANO EAL HU4.1 is applicable in these modes. **This is an acceptable deviation from the generic NEI 99-01 Revision 6 guidance.**

Table 1H-1 Unit 1 Fire Areas

Reactor Building

All elevations

Auxiliary Building

All elevations including: Penthouse/MSIV Room

Exceptions:

Boric Acid Mix Tank Room (Chem Add Area), 404' (157-B), EDG Exhaust Fan area on 386' (1-E and 2-E)

Turbine Building

All elevations on the west side of Turbine Building and including: Pipechase under ICW Coolers, CRD Pump Pit/T-28 Room/Area under ICW Pumps

372' Elevation from non-vital switchgear area to Auxiliary Building wall at DR 56

Outside Areas

Manholes adjacent to Startup #2 XFMR (MH-03/MH-04)

Manholes adjacent to Intake Structure (MH-05/MH-06)

Intake Structure (354' and 366')

Diesel Fuel Vault

Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

Table 2H-1 Unit 2 Fire Areas
<u>Reactor Building</u> **All** elevations **<u>Auxiliary Building</u>** **All** elevations including: MG Set Room, UNEPR, LNEPR, 2B-53 Room **<u>Auxiliary Building Extension</u>** MSIV Room **<u>Turbine Building</u>** All elevations on the west side of Turbine Building and 372’ Elevation from non-vital switchgear area to Auxiliary Building wall at DR 340 **<u>Outside Areas</u>** Intake Structure (354’ and 366’) Concrete Manhole East, NE of intake (2MH-01) Concrete Manhole East of Turbine Building next to train bay (2MH-03) Diesel Fuel Vault Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
HU7	Other conditions exist which in the judgment of the Emergency Director warrant declaration of a (NO)UE. MODE: All	HU7	Other conditions exist that in the judgment of the Emergency Director warrant declaration of a UE. MODE: All	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Other conditions exist which in the judgment of the Emergency Director indicate that events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.	HU7.1	Other conditions exist which in the judgment of the Emergency Director indicate that events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. **No** releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of SAFETY SYSTEMS occurs.	None

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
HA1	HOSTILE ACTION within the OWNER CONTROLLED AREA or airborne attack threat within 30 minutes. MODE: All	HA1	HOSTILE ACTION within the SECURITY OWNER CONTROLLED AREA or airborne attack threat within 30 minutes. MODE: All	Entergy uses the Security Owner Controlled Area as allowed by the developer note in NEI 99-01, Revision 6, Appendix B, Definitions

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	A HOSTILE ACTION is occurring or has occurred within the OWNER CONTROLLED AREA as reported by the (site-specific security shift supervision).	HA1.1	A HOSTILE ACTION is occurring or has occurred within the SECURITY OWNER CONTROLLED AREA as reported by ANO Security Shift Supervision **OR** A validated notification from NRC of an aircraft attack threat within 30 min. of the site.	Entergy uses the Security Owner Controlled Area as allowed by the developer note in NEI 99-01, Revision 6, Appendix B, Definitions Example EALs #1 and #2 have been combined into a single EAL for ease of use.
2	A validated notification from NRC of an aircraft attack threat within 30 minutes of the site.			

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
HA5	Gaseous release impeding access to equipment necessary for normal plant operations, cooldown or shutdown. MODE: All	HA5	Gaseous release IMPEDING access to equipment necessary for normal plant operations, cooldown or shutdown. MODE: 3 – Hot Standby, 4 – Hot Shutdown	The mode applicability has been limited to the modes restrictions of Table H-2, Modes 3 and 4 only.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	a. Release of a toxic, corrosive, asphyxiant or flammable gas into any of the following plant rooms or areas: (site-specific list of plant rooms or areas with entry-related mode applicability identified) **AND** b. Entry into the room or area is prohibited or impeded.	HA5.1	Release of a toxic, corrosive, asphyxiant or flammable gas into **any** Table 1[2]H-2 room or area **AND** Entry into the room or area is prohibited or IMPEDED. (Note 5)	The site-specific list of plant rooms or areas with entry-related mode applicability are tabularized in Table 1[2]H-2. The bulleted bases item “the action for which room/area entry is required is of an administrative or record keeping nature (e.g., normal rounds or routine inspections)” was removed from the list of exceptions to classification in the basis information. These actions are a consideration when the site-specific list was developed. Rooms requiring entry for these types of actions are already excluded from the list when it was developed.
Note	**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.	N/A	Note 5: 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.	None

Table 1H-2 Unit 1 Safe Operation & Shutdown Rooms/Areas	
Room/Area	**Mode**
A-4 Switchgear Room	3, 4
Upper North Electrical Penetration Room	3, 4
Lower South Electrical Equipment Room	3, 4

Table 2H-2 Unit 2 Safe Operation & Shutdown Rooms/Areas	
Room/Area	**Mode**
Aux Building 317' Emergency Core Cooling Rooms	3, 4
Aux Building 317' Tendon Gallery Access	3, 4
Aux Building 335' Charging Pumps / MCC 2B-52	3, 4
Aux Building 354' MCC 2B-62 Area	3, 4
Emergency Diesel Generator Corridor	3, 4
Lower South Piping Penetration Room	3, 4
Aux Building 386' Containment Hatch	3, 4

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
HA6	Control Room evacuation resulting in transfer of plant control to alternate locations. MODE: All	HA6	Control Room evacuation resulting in transfer of plant control to alternate locations. MODE: All	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	An event has resulted in plant control being transferred from the Control Room to (site-specific remote shutdown panels and local control stations).	HA6.1	An event has resulted in plant control being transferred from the Control Room to alternate locations.	Shutdown activities at ANO are transferred from the Control Room to multiple locations within the plant.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
HA7	Other conditions exist which in the judgment of the Emergency Director warrant declaration of an Alert. MODE: All	HA7	Other conditions exist that in the judgment of the Emergency Director warrant declaration of an Alert. MODE: All	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. Any releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.	HA7.1	Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. **Any** releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.	None

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
HS1	HOSTILE ACTION within the PROTECTED AREA. MODE: All	HS1	HOSTILE ACTION within the PROTECTED AREA. MODE: All	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by the (site-specific security shift supervision).	HS1.1	A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by ANO Security Shift Supervision.	None

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
HS6	Inability to control a key safety function from outside the Control Room. MODE: All	HS6	Inability to control a key safety function from outside the Control Room. MODE: 1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown, 5 - Cold Shutdown, 6 - Refueling	Deleted defueled mode applicability. Control of the cited safety functions is not critical for a defueled reactor as there is no energy source in the reactor vessel or RCS. **This is an acceptable deviation from the generic NEI 99-01 Revision 6 guidance.**

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	a. An event has resulted in plant control being transferred from the Control Room to (site-specific remote shutdown panels and local control stations). **AND** b. Control of **ANY** of the following key safety functions is not reestablished within (site-specific number of minutes). • Reactivity control • Core cooling [PWR] / RPV water level [BWR] • RCS heat removal	HS6.1	An event has resulted in plant control being transferred from the Control Room to alternate locations **AND** Control of **any** of the following key safety functions is **not** re-established within 15 min. (Note 1): • Reactivity (Modes 1, 2 and 3 **only**) • Core cooling • RCS heat removal	Shutdown activities at ANO are transferred from the Control Room to multiple locations within the plant. The Mode applicability for the reactivity control safety function has been limited to Modes 1, 2, and 3 (hot operating conditions). In the cold operating modes adequate shutdown margin exists under all conditions. EP FAQ 2015-014. **This is an acceptable deviation from the generic NEI 99-01 Revision 6 guidance.**

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
HS7	Other conditions exist which in the judgment of the Emergency Director warrant declaration of a Site Area Emergency. MODE: All	HS7	Other conditions exist that in the judgment of the Emergency Director warrant declaration of a Site Area Emergency. MODE: All	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Other conditions exist which in the judgment of the Emergency Director indicate that events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or HOSTILE ACTION that results in intentional damage or malicious acts, (1) toward site personnel or equipment that could lead to the likely failure of or, (2) that prevent effective access to equipment needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels beyond the site boundary.	HS7.1	Other conditions exist which in the judgment of the Emergency Director indicate that events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or HOSTILE ACTION that results in intentional damage or malicious acts, (1) toward site personnel or equipment that could lead to the likely failure of or, (2) that prevent effective access to equipment needed for the protection of the public. **Any** releases are **not** expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels beyond the SITE BOUNDARY.	None

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
HG1	HOSTILE ACTION resulting in loss of physical control of the facility. MODE: All	N/A	N/A	IC HG1 and associated example EAL are not implemented in the ANO scheme. There are several other ICs that are redundant with this IC, and are better suited to ensure timely and effective emergency declarations. In addition, the development of new spent fuel pool level EALs, as a result of NRC Order EA-12-051, clarified the intended emergency classification level for spent fuel pool level events. **This is an acceptable deviation from the generic NEI 99-01 Revision 6 guidance.**

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	a. A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by the (site-specific security shift supervision). **AND** b. **EITHER** of the following has occurred: 1. **ANY** of the following safety functions cannot be controlled or maintained. • Reactivity control • Core cooling [PWR]/RPV water level [BWR] • RCS heat removal **OR** 2. Damage to spent fuel has occurred or is IMMINENT.	N/A	N/A	IC HG1 and associated example EAL are not implemented in the ANO scheme. There are several other ICs that are redundant with this IC, and are better suited to ensure timely and effective emergency declarations. In addition, the development of new spent fuel pool level EALs, as a result of NRC Order EA-12-051, clarified the intended emergency classification level for spent fuel pool level events. This deviation is justified because: 1. Hostile Action in the Protected Area is bounded by ICs HS1 and HS7. Hostile Action resulting in a loss of physical control is bound by EAL HG7, as well as any event that may lead to radiological releases to the public in excess of Environmental Protection Agency (EPA) Protective Action Guides (PAGs). a. If, for whatever reason, the Control Room must be evacuated, and control of safety functions (e.g., reactivity control, core cooling, and RCS heat removal) cannot be reestablished, then IC HS6 would apply, as well as IC HS7 if desired by the EAL decision-maker. b. Also, as stated above, any event (including Hostile Action) that could reasonably be expected to have a release exceeding EPA PAGs would be bound by IC HG7. c. From a Hostile Action perspective, ICs HS1, HS7 and HG7 are appropriate, and therefore, make this part of HG1 redundant and unnecessary. d. From a loss of physical control perspective, ICs HS6, HS7 and HG7 are appropriate, and therefore, make this part of HG1 redundant and unnecessary. 2. Any event which causes a loss of spent fuel pool level will be bounded by ICs AA2, AS2 and AG2, regardless of whether it was based upon a Hostile Action or not, thus making this part of HG1 redundant and unnecessary. a. An event that leads to a radiological release will be bounded by ICs AU1, AA1, AS1 and AG1. Events that lead to radiological releases in excess of EPA PAGs will be bounded by EALs AG1 and HG7, thus making this part of HG1 redundant and unnecessary. ICs AA2, AS2, AG2, AS1, AG1, HS1, HS6, HS7 and HG7 have been implemented consistent with NEI 99-01, Revision 6, and thus HG1 is adequately bounded as described above. EP FAQ 2015-013 **This is an acceptable deviation from the generic NEI 99-01 Revision 6 guidance.**

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
HG7	Other conditions exist which in the judgment of the Emergency Director warrant declaration of a General Emergency. MODE: All	HG7	Other conditions exist that in the judgment of the Emergency Director warrant declaration of a General Emergency. MODE: All	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Other conditions exist which in the judgment of the Emergency Director indicate that events are in progress or have occurred which involve actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.	HG7.1	Other conditions exist which in the judgment of the Emergency Director indicate that events are in progress or have occurred which involve actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.	None

Category S

System Malfunction

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
SU1	Loss of all offsite AC power capability to emergency buses for 15 minutes or longer. MODE: Power Operation, Startup, Hot Standby, Hot Shutdown	SU1	Loss of **all** offsite AC power capability to vital buses for 15 minutes or longer. MODE: 1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown	"vital buses" is the ANO-specific terminology for "emergency buses".

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Loss of **ALL** offsite AC power capability to (site-specific emergency buses) for 15 minutes or longer.	SU1.1	Loss of **all** offsite AC power capability, Table 1[2]S-1, to vital 4.16 KV buses A3[2A3] and A4[2A4] for ≥ 15 min. (Note 1)	4.16 KV buses A3[2A3] and A4[2A4] are the site-specific emergency buses. Site-specific AC power sources are tabularized in Table 1[2]S-1.
Note	The Emergency Director should declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added "The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded." To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

Table 1S-1 Unit 1 AC Power Sources
Offsite • Startup Transformer No. 1 • Startup Transformer No. 2 • Unit Auxiliary Transformer (from 22 KV switchyard) **Onsite** • Unit Auxiliary Transformer (main generator via main transformer) • DG1 • DG2 • AAC Gen

Table 2S-1 Unit 2 AC Power Sources
Offsite • Startup Transformer No. 3 • Startup Transformer No. 2 • Unit Auxiliary Transformer (backfed from main transformer) **Onsite** • Unit Auxiliary Transformer (main generator via main transformer) • 2DG1 • 2DG2 • AAC Gen

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
SU2	UNPLANNED loss of Control Room indications for 15 minutes or longer. MODE: Power Operation, Startup, Hot Standby, Hot Shutdown	SU3	UNPLANNED loss of Control Room indications for 15 minutes or longer. MODE: 1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	An UNPLANNED event results in the inability to monitor one or more of the following parameters from within the Control Room for 15 minutes or longer.	SU3.1	An UNPLANNED event results in the inability to monitor one or more Table 1[2]S-2 parameters from within the Control Room for ≥ 15 min. (Note 1)	The site-specific Safety System Parameter list is tabulated in Table 1[2]S-2. Added the words “to at least one S/G” to Auxiliary or emergency feedwater flow. This is consistent with Level in at least on S/G.
Note	The Emergency Director should declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added “The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.” To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

[*BWR parameter list*]	[*PWR parameter list*]
Reactor Power	Reactor Power
RPV Water Level	RCS Level
RPV Pressure	RCS Pressure
Primary Containment Pressure	In-Core/Core Exit Temperature
Suppression Pool Level	Levels in at least (site-specific number) steam generators
Suppression Pool Temperature	Steam Generator Auxiliary or Emergency Feed Water Flow

Table 1[2]S-2 Safety System Parameters
• Reactor power • RCS level • RCS pressure • CET temperature • Level in at least one S/G • EFW flow to at least one S/G

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
SU3	Reactor coolant activity greater than Technical Specification allowable limits MODE: Power Operation, Startup, Hot Standby, Hot Shutdown	SU4	RCS activity greater than Technical Specification allowable limits. MODE: 1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown	Changed "Reactor coolant" to read "RCS" for consistency with normally used terminology.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	(Site-specific radiation monitor) reading greater than (site-specific value).	SU4.1	Failed Fuel Iodine radiation monitor RI-1237S[2RITS-4806B] reading > 9.0 E5 cpm	Unit 1 RE-1237S, Failed Fuel Monitor, is in the letdown system to monitor the letdown line for evidence of fuel damage. Unit 2 specific activity monitor 2RITS-4806B monitors the letdown fluid for the presence of Iodine-131.
2	Sample analysis indicates that a reactor coolant activity value is greater than an allowable limit specified in Technical Specifications.	SU4.2	RCS sample activity > 1.0 µCi/gm dose equivalent I-131 for > 48 hours (Note 1) **OR** RCS sample activity > 60 µCi/gm dose equivalent I-131 **OR** RCS sample activity > 2200[3100] µCi/gm dose equivalent Xe-133 for > 48 hours (Note 1)	Changed "Reactor coolant" to read "RCS" for consistency with normally used terminology. ANO Unit 1 T.S. LCO 3.4.12 and Unit 2 T.S. LCO 3.4.8 provides the TS allowable coolant activity limits that are duplicated in the EAL.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
SU4	RCS leakage for 15 minutes or longer. MODE: Power Operation, Startup, Hot Standby, Hot Shutdown	SU5	RCS leakage for 15 minutes or longer. MODE: 1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	RCS unidentified or pressure boundary leakage greater than (site-specific value) for 15 minutes or longer.	SU5.1	RCS unidentified or pressure boundary leakage > 10 gpm for ≥ 15 min. (Note 1) **OR** RCS identified leakage > 25 gpm for ≥ 15 min. (Note 1) **OR** Reactor coolant leakage to a location outside containment > 25 gpm for ≥ 15 min. (Note 1)	Example EALs #1, 2 and 3 have been combined into a single EAL for usability. Changed the term 'RCS' to 'Reactor' coolant for the third threshold. For ANO, leakage outside containment is not termed RCS leakage. Added "Failure to isolate the leak (from the Control Room or locally), within 15 minutes or if known that the leak cannot be isolated within 15 minutes, from the start of the leak requires immediate classification" to the basis. This provides agreement with the definition of "Unisolable" and ensures isolation attempts, both locally and remotely, are achieved in a timely manner.
2	RCS identified leakage greater than (site-specific value) for 15 minutes or longer.			
3	Leakage from the RCS to a location outside containment greater than 25 gpm for 15 minutes or longer.			
Note	The Emergency Director should declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added "The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded." To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
SU5	Automatic or manual (trip [PWR] / scram [BWR]) fails to shutdown the reactor. MODE: Power Operation	SU6	Automatic or manual trip fails to shut down the reactor. MODE: 1 - Power Operation	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	a. An automatic (trip [PWR] / scram [BWR]) did not shutdown the reactor. **AND** b. A subsequent manual action taken at the reactor control consoles is successful in shutting down the reactor.	SU6.1	An automatic trip did **not** shut down the reactor as indicated by reactor power > 5% after **any** RPS setpoint is exceeded **AND** A subsequent automatic trip or manual trip action taken at the reactor control console (C03[2C03/2C14]) (manual reactor trip pushbuttons or DROPS[DSS]) is successful in shutting down the reactor as indicated by reactor power ≤ 5% (Note 8)	As specified in the generic developers guidance “Developers may include site-specific EOP criteria indicative of a successful reactor shutdown in an EAL statement, the Basis or both (e.g., a reactor power level).” Reactor power < 5% is the site-specific indication of a successful reactor trip. Added the words "... as indicated by reactor power > 5% after any RPS setpoint is exceeded" to clarify that it is a failure of the automatic trip when a valid trip signal has been exceeded. Panels C03[2C03/2C14] are the site-specific reactor control consoles with manual trip capability.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
2	a. A manual trip ([PWR] / scram [BWR]) did not shutdown the reactor. **AND** b. **EITHER** of the following: 1. A subsequent manual action taken at the reactor control consoles is successful in shutting down the reactor. **OR** 2 A subsequent automatic (trip [PWR] / scram [BWR]) is successful in shutting down the reactor.	SU6.2	A manual trip did **not** shut down the reactor as indicated by reactor power > 5% after **any** manual trip action was initiated **AND** A subsequent automatic trip or manual trip action taken at the reactor control console (C03[2C03/2C14]) (manual reactor trip pushbuttons or DROPS[DSS]) is successful in shutting down the reactor as indicated by reactor power ≤ 5% (Note 8)	As specified in the generic developers guidance “Developers may include site-specific EOP criteria indicative of a successful reactor shutdown in an EAL statement, the Basis or both (e.g., a reactor power level).” Reactor power < 5% is the site-specific indication of a successful reactor trip. Added the words "... as indicated by reactor power > 5% after any manual trip action was initiated" to clarify that it is a failure of any manual trip when an actual manual trip signal has been inserted. Combined conditions b.1 and b.2 into a single statement to simplify the presentation. Panels C03[2C03/2C14] are the site-specific reactor control consoles with manual trip capability.
Notes	**Note:** A manual action is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does not include manually driving in control rods or implementation of boron injection strategies.	N/A	Note 8: A manual action is **any** operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does **not** include manually driving in control rods or implementation of boron injection strategies.	None

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
SU6	Loss of all onsite or offsite communications capabilities. MODE: Power Operation, Startup, Hot Standby, Hot Shutdown	SU7	Loss of **all** onsite or offsite communications capabilities. MODE: 1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Loss of **ALL** of the following onsite communication methods: (site-specific list of communications methods)	SU7.1	Loss of **all** Table 1[2]S-4 onsite communication methods **OR** Loss of **all** Table 1[2]S-4 State and local agency communication methods **OR** Loss of **all** Table 1[2]S-4 NRC communication methods.	Example EALs #1, 2 and 3 have been combined into a single EAL for simplification of presentation. Replaced “ORO” with “State and local agency” for clarification. Table 1[2]S-4 provides a site-specific list of onsite, State and local agency (ORO) and NRC communications methods.
2	Loss of **ALL** of the following ORO communications methods: (site-specific list of communications methods)			
3	Loss of **ALL** of the following NRC communications methods: (site-specific list of communications methods)			

Table 1[2]S-4 Communication Methods			
System	**Onsite**	**State/Local**	**NRC**
Station radio system	X		
ANO plant phone system	X		
Gaitronics	X		
Telephone Systems: • Commercial • Microwave • Satellite • VOIP		X	X
Emergency Notification System (ENS)			X

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
SU7	Failure to isolate containment or loss of containment pressure control. [PWR] MODE: Power Operation, Startup, Hot Standby, Hot Shutdown	SU8	Failure to isolate containment or loss of containment pressure control. MODE: 1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	a. Failure of containment to isolate when required by an actuation signal. **AND** b. **ALL** required penetrations are not closed within 15 minutes of the actuation signal.	SU8.1	**Any** penetration is **not** closed within 15 min. of an ESAS[CIAS] actuation signal **OR** Containment pressure > 44.7 psia [23.3 psia] with < one full train of containment heat removal systems (Note 9) operating per design for ≥ 15 min. (Note 1)	Reworded EAL to better describe the intent. Penetrations cannot close, but they can be isolated by closure of one or more isolation valves associated with that penetration. The revised wording maintains the generic example EAL intent while more clearly describing failure to isolate threshold. ESAS[CIAS] is the site-specific system that initiates containment isolation signals. The Containment pressure setpoint is the pressure at which the Containment Spray System should actuate and begin performing its function. Added statement to the NEI basis that penetrations are considered closed when one of the two associated valves are closed or a check valve is intact. This change provides clarification and meets the intent of the EAL of ensuring that a functional boundary is maintained between the containment and the outside environment.
2	a. Containment pressure greater than (site-specific pressure). **AND** b. Less than one full train of (site-specific system or equipment) is operating per design for 15 minutes or longer.			

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
N/A	N/A	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added “The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.” To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.
N/A	N/A	N/A	Note 9: One full train of containment heat removal systems consists of one train of RB[Containment] Spray and one train of RB[Containment] Cooling System.	Added new Note 9 to clarify what constitutes one full train of containment heat removal systems.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
SA1	Loss of all but one AC power source to emergency buses for 15 minutes or longer. MODE: Power Operation, Startup	SA1	Loss of **all but one** AC power source to vital buses for 15 minutes or longer. MODE: 1 - Power Operation	“vital buses” is the ANO-specific terminology for “emergency buses”.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	a. AC power capability to (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 a loss of all AC power to SAFETY SYSTEMS.	SA1.1	AC power capability, Table 1[2]S-1, to vital 4.16 KV buses A3[2A3] and A4[2A4] reduced to a single power source for ≥ 15 min. (Note 1) **AND** **Any** additional single power source failure will result in loss of **all** AC power to SAFETY SYSTEMS.	4.16KV buses A3[2A3] and A4[2A4] are the site-specific emergency buses. Site-specific AC power sources are listed in Table 1[2]S-1.
Note	The Emergency Director should declare the Alert promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added “The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.” To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

Table 1S-1 Unit 1 AC Power Sources
Offsite
• Startup Transformer No. 1
• Startup Transformer No. 2
• Unit Auxiliary Transformer (from 22 KV switchyard)
Onsite
• Unit Auxiliary Transformer (main generator via main transformer)
• DG1
• DG2
• AAC Gen

Table 2S-1 Unit 2 AC Power Sources
Offsite
• Startup Transformer No. 3
• Startup Transformer No. 2
• Unit Auxiliary Transformer (backfed from main transformer)
Onsite
• Unit Auxiliary Transformer (main generator via main transformer)
• 2DG1
• 2DG2
• AAC Gen

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
SA2	UNPLANNED loss of Control Room indications for 15 minutes or longer with a significant transient in progress. MODE: Power Operation, Startup, Hot Standby, Hot Shutdown	SA3	UNPLANNED loss of Control Room indications for 15 minutes or longer with a significant transient in progress. MODE: 1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	An UNPLANNED event results in the inability to monitor one or more of the following parameters from within the Control Room for 15 minutes or longer. **AND** **ANY** of the following transient events in progress. • Automatic or manual runback greater than 25% thermal reactor power • Electrical load rejection greater than 25% full electrical load • Reactor scram [BWR] / trip [PWR] • ECCS (SI) actuation • Thermal power oscillations greater than 10% [BWR]	SA3.1	An UNPLANNED event results in the inability to monitor **one or more** Table 1[2]S-2 parameters from within the Control Room for ≥ 15 min. (Note 1) **AND** **Any** significant transient is in progress, Table 1[2]S-3	The site-specific Safety System Parameter list to listed in Table 1[2]S-2. The site-specific significant transients list to listed in Table 1[2]S-3. ANO is a PWR and thus does not include thermal power oscillations > 10%.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
Note	The Emergency Director should declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added "The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded." To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

[*BWR parameter list*]	[*PWR parameter list*]
Reactor Power	Reactor Power
RPV Water Level	RCS Level
RPV Pressure	RCS Pressure
Primary Containment Pressure	In-Core/Core Exit Temperature
Suppression Pool Level	Levels in at least (site-specific number) steam generators
Suppression Pool Temperature	Steam Generator Auxiliary or Emergency Feed Water Flow

Table 1[2]S-2 Safety System Parameters
• Reactor power • RCS level • RCS pressure • CET temperature • Level in at least one S/G • EFW flow to at least one S/G

Table 1[2]S-3 Significant Transients
• Reactor trip • Runback > 25% thermal power • Electrical load rejection > 25% electrical load • Safety injection actuation

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
SA5	Automatic or manual (trip [PWR] / scram [BWR]) fails to shutdown the reactor, and subsequent manual actions taken at the reactor control consoles are not successful in shutting down the reactor. MODE: Power Operation	SA6	Automatic or manual trip fails to shut down the reactor and subsequent manual actions taken at the reactor control consoles are not successful in shutting down the reactor. MODE: 1 - Power Operation	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	a. An automatic or manual (trip [PWR] / scram [BWR]) did not shutdown the reactor. **AND** b. Manual actions taken at the reactor control consoles are not successful in shutting down the reactor.	SA6.1	An automatic or manual trip fails to shut down the reactor as indicated by reactor power > 5% **AND** Manual trip actions taken at the reactor control console (C03[2C03/2C14]) (manual reactor trip pushbuttons or DROPS[DSS]) are **not** successful in shutting down the reactor as indicated by reactor power > 5%. (Note 8)	As specified in the generic developers guidance "Developers may include site-specific EOP criteria indicative of a successful reactor shutdown in an EAL statement, the Basis or both (e.g., a reactor power level)." Reactor power < 5% is the site-specific indication of a successful reactor trip. Panels C03[2C03/2C14] are the site-specific reactor control consoles with manual trip capability.
Notes	**Note:** A manual action is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does not include manually driving in control rods or implementation of boron injection strategies.	N/A	Note 8: A manual action is **any** operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does **not** include manually driving in control rods or implementation of boron injection strategies.	None

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
SA9	Hazardous event affecting a SAFETY SYSTEM needed for the current operating mode. MODE: Power Operation, Startup, Hot Standby, Hot Shutdown	SA9	Hazardous event affecting SAFETY SYSTEMS needed for the current operating mode. MODE: 1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown	Pluralized safety systems to be consistent with NRC EP FAQ 2016-002 that specifies degraded performance or visible damage in more than one safety system train.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
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: 1. Event damage has caused indications of degraded performance in at least one train of a SAFETY SYSTEM needed for the current operating mode. **OR** 2. The event has caused VISIBLE DAMAGE to a SAFETY SYSTEM component or structure needed for the current operating mode.	SA9.1	The occurrence of **any** Table 1[2]S-5 hazardous event **AND** Event damage has caused indications of degraded performance on one train of a SAFETY SYSTEM needed for the current operating mode **AND EITHER:** • Event damage has caused indications of degraded performance to the second train of the SAFETY SYSTEM needed for the current operating mode • Event damage has resulted in VISIBLE DAMAGE to the second train of the SAFETY SYSTEM needed for the current operating mode. (Notes 10, 11)	The hazardous events have been tabularized in Table 1[2]S-5. SA9.1 reflects NRC FAQ 2016-002 requiring degraded performance or visible damage to more than one train of a safety system caused by the specified events. **This wording is a deviation from NEI 99-01 Revision 6 SA9 generic wording and bases but is deemed acceptable in order to ensure that an Alert is declared only when a hazardous event causes actual or potential performance issues with safety systems. This is consistent with NRC-approved EP FAQ 2016-002.** The word “a” is replaced with “the” in the FAQ wording to provide agreement with the FAQ basis information indicating that the criteria is applicable to another train of the same safety system.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
N/A	N/A	N/A	Note 10: If the affected SAFETY SYSTEM train was already inoperable or out of service before the hazardous event occurred, then emergency classification is not warranted	Added Note 10 consistent with the recommendation of NRC EP FAQ 2016-002.
N/A	N/A	N/A	Note 11: If the hazardous event only resulted in VISIBLE DAMAGE, with no indications of degraded performance to at least one train of a SAFETY SYSTEM, then this emergency classification is not warranted.	Added Note 11 consistent with the recommendation of NRC EP FAQ 2016-002.

Table 1[2]S-5 Hazardous Events
• Seismic event (earthquake) • Internal or external FLOODING event • High winds or tornado strike • FIRE • EXPLOSION • Other events with similar hazard characteristics as determined by the Shift Manager

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
SS1	Loss of all offsite and all onsite AC power to emergency buses for 15 minutes or longer. MODE: Power Operation, Startup, Hot Standby, Hot Shutdown	SS1	Loss of **all** offsite and **all** onsite AC power to vital buses for 15 minutes or longer. MODE: 1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown	"vital buses" is the ANO-specific terminology for "emergency buses".

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Loss of **ALL** offsite and **ALL** onsite AC power to (site-specific emergency buses) for 15 minutes or longer.	SS1.1	Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3[2A3] and A4[2A4] for ≥ 15 min. (Note 1)	4.16KV buses A3[2A3] and A4[2A4] are the site-specific emergency buses.
Note	The Emergency Director should declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added "The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded." To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
SS5	Inability to shutdown the reactor causing a challenge to (core cooling [PWR] / RPV water level [BWR]) or RCS heat removal. MODE: Power Operation	SS6	Inability to shut down the reactor causing a challenge to core cooling or RCS heat removal. MODE: 1 - Power Operation	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	a. An automatic or manual (trip [PWR] / scram [BWR]) did not shutdown the reactor. **AND** b. All manual actions to shutdown the reactor have been unsuccessful. **AND** c. **EITHER** of the following conditions exist: • (Site-specific indication of an inability to adequately remove heat from the core) • (Site-specific indication of an inability to adequately remove heat from the RCS)	SS6.1	An automatic or manual trip fails to shut down the reactor as indicated by reactor power > 5% **AND** **All** actions to shut down the reactor are **not** successful as indicated by reactor power > 5% **AND EITHER:** • CETs > 1200°F • RCS heat removal **cannot** be established using steam generators and an on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI[Once Through] cooling	As specified in the generic developers guidance "Developers may include site-specific EOP criteria indicative of a successful reactor shutdown in an EAL statement, the Basis or both (e.g., a reactor power level)." Reactor power < 5% is the site-specific indication of a successful reactor trip. Deleted the term "manual actions" from the second condition. For generic IC SS5, all actions to shut down the reactor can be credited, not just those actions from the reactor control panel that may be identified as "manual actions." Indication that heat removal is extremely challenged is manifested by the loss of both steam generators as a heat sink, requiring the initiation of HPI[Once Through] cooling.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
SS8	Loss of all Vital DC power for 15 minutes or longer. MODE: Power Operation, Startup, Hot Standby, Hot Shutdown	SS2	Loss of **all** vital DC power for 15 minutes or longer. MODE: 1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown	None

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	Indicated voltage is less than (site-specific bus voltage value) on **ALL** (site-specific Vital DC busses) for 15 minutes or longer.	SS2.1	Indicated voltage is < 105 VDC on D01 [2D01] and D02[2D02] vital 125 VDC buses for ≥ 15 min. (Note 1)	105 VDC is the site-specific minimum vital DC bus voltage. DC buses on D01[2D01] and D02[2D02] are the site-specific credited vital DC buses.
Note	The Emergency Director should declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added “The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.” To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
SG1	Prolonged loss of all offsite and all onsite AC power to emergency buses. MODE: Power Operation, Startup, Hot Standby, Hot Shutdown	SG1a	Prolonged loss of **all** offsite and **all** onsite AC power to vital buses. MODE: 1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown	“vital buses” is the ANO-specific terminology for “emergency buses”.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	a. Loss of **ALL** offsite and **ALL** onsite AC power to (site-specific emergency buses). **AND** b. **EITHER** of the following: • Restoration of at least one AC emergency bus in less than (site-specific hours) is not likely. • (Site-specific indication of an inability to adequately remove heat from the core)	SG1.1	Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3[2A3] and A4[2A4] **AND EITHER:** • Restoration of at least one vital 4.16 KV bus in < 4 hrs is **not** likely (Note 1) • CETs > 1200°F	4.16KV buses A3[2A3] and A4[2A4] are the site-specific emergency buses. 4 hours is the site-specific SBO coping analysis time. CETs reading > 1200°F indicates significant core exit superheating and core uncovery.
Note	The Emergency Director should declare the General Emergency promptly upon determining that (site-specific hours) has been exceeded, or will likely be exceeded.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added “The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.” To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

NEI IC#	NEI IC Wording	ANO IC#(s)	ANO IC Wording	Difference/Deviation Justification
SG8	Loss of all AC and Vital DC power sources for 15 minutes or longer. MODE: Power Operation, Startup, Hot Standby, Hot Shutdown	SG1b	Loss of **all** vital AC and vital DC power sources for 15 minutes or longer. MODE: 1 - Power Operation, 2 - Startup, 3 - Hot Standby, 4 - Hot Shutdown	“Vital buses” is the ANO-specific terminology for “emergency buses”.

NEI Ex. EAL #	NEI Example EAL Wording	ANO EAL #	ANO EAL Wording	Difference/Deviation Justification
1	a. Loss of **ALL** offsite and **ALL** onsite AC power to (site-specific emergency buses) for 15 minutes or longer. **AND** b. Indicated voltage is less than (site-specific bus voltage value) on ALL (site-specific Vital DC busses) for 15 minutes or longer.	SG1.2	Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3[2A3] and A4[2A4] for ≥ 15 min. **AND** Indicated voltage is < 105 VDC on D01 [2D01] and D02[2D02] vital 125 VDC buses for ≥ 15 min. (Note 1)	4.16KV buses A3[2A3] and A4[2A4] are the site-specific emergency buses. 105 VDC is the site-specific minimum vital DC bus voltage. D01[2D01] and D02[2D02] are the credited site-specific vital DC buses.
Note	The Emergency Director should declare the Unusual Event promptly upon determining that 15 minutes has been exceeded, or will likely be exceeded.	N/A	Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.	The classification timeliness note has been standardized across the ANO EAL scheme by referencing the "time limit" specified within the EAL wording. Added “The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.” To reinforce the concept that the EAL timing component runs concurrent with the classification timeliness clock.

Enclosure 5 to

0CAN091801

Proposed EAL Matrix Chart and Review Table (for information only)

UNIT 1

A — Abnorm. Rad Levels / Rad Effluent

1 — Rad Effluent

GENERAL EMERGENCY

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

1	2	3	4	5	6	DEF

AG1.1

Reading on **any** Table 1A-1 effluent radiation monitor > column "GE" for ≥ 15 min. (Notes 1, 2, 3, 4)

AG1.2

Dose assessment using actual meteorology indicates doses > 1000 mrem TEDE or 5000 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

AG1.3

Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:

- Closed window dose rates > 1000 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 5000 mrem for 60 min. of inhalation

(Notes 1, 2)

SITE AREA EMERGENCY

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

1	2	3	4	5	6	DEF

AS1.1

Reading on **any** Table 1A-1 effluent radiation monitor > column "SAE" for ≥ 15 min. (Notes 1, 2, 3, 4)

AS1.2

Dose assessment using actual meteorology indicates doses > 100 mrem TEDE or 500 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

AS1.3

Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:

- Closed window dose rates > 100 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 500 mrem for 60 min. of inhalation

(Notes 1, 2)

ALERT

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

1	2	3	4	5	6	DEF

AA1.1

Reading on **any** Table 1A-1 effluent radiation monitor > column "ALERT" for ≥ 15 min. (Notes 1, 2, 3, 4)

AA1.2

Dose assessment using actual meteorology indicates doses > 10 mrem TEDE or 50 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

AA1.3

Analysis of a liquid effluent sample indicates a concentration or release rate that would result in doses > 10 mrem TEDE or 50 mrem thyroid CDE at or beyond the SITE BOUNDARY for 60 min. of exposure (Notes 1, 2)

AA1.4

Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:

- Closed window dose rates > 10 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 50 mrem for 60 min. of inhalation

(Notes 1, 2)

UNUSUAL EVENT

Release of gaseous or liquid radioactivity greater than 2 times the ODCM limits for 60 minutes or longer

1	2	3	4	5	6	DEF

AU1.1

Reading on **any** Table 1A-1 effluent radiation monitor > column "UE" for ≥ 60 min. (Notes 1, 2, 3)

AU1.2

Sample analysis for a gaseous or liquid release indicates a concentration or release rate > 2 x ODCM limits for ≥ 60 min. (Notes 1, 2)

2 — Irradiated Fuel Event

GENERAL EMERGENCY

Spent fuel pool level **cannot** be restored to at least the top of the fuel racks for 60 minutes or longer

1	2	3	4	5	6	DEF

AG2.1

Spent fuel pool level **cannot** be restored to at least 377.0 ft. (Alarm 3) on LIT-2020-3(4) for ≥ 60 min. (Note 1)

SITE AREA EMERGENCY

Spent fuel pool level at the top of the fuel racks

1	2	3	4	5	6	DEF

AS2.1

Lowering of spent fuel pool level to 377.0 ft. (Alarm 3) on LIT-2020-3(4)

ALERT

Significant lowering of water level above, or damage to, irradiated fuel

1	2	3	4	5	6	DEF

AA2.1

IMMINENT uncovery of irradiated fuel in the REFUELING PATHWAY

AA2.2

Damage to irradiated fuel resulting in a release of radioactivity

AND

High alarm on **any** Table 1A-2 radiation monitor

AA2.3

Lowering of spent fuel pool level to 387.0 ft. (Alarm 2) on LIT-2020-3(4)

UNUSUAL EVENT

UNPLANNED loss of water level above irradiated fuel

1	2	3	4	5	6	DEF

AU2.1

UNPLANNED water level drop in the REFUELING PATHWAY as indicated by low water level alarm, visual observation, or BWST level drop due to makeup demands

AND

UNPLANNED rise in corresponding area radiation levels as indicated by **any** of the following radiation monitors:

- RE-8009 Spent Fuel Area
- RE-8017 Fuel Handling

Table 1A-1 Unit 1 Effluent Monitor Classification Thresholds (2 min. avg reading)

		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	RX-9820 (SPING 1)	4.15E+01 µCi/cc	4.15E+00 µCi/cc	4.15E-01 µCi/cc	1.21E-03 µCi/cc
Gaseous	Radwaste Area	RX-9825 (SPING 2)	2.67E+01 µCi/cc	2.67E+00 µCi/cc	2.67E-01 µCi/cc	4.94E-04 µCi/cc
Gaseous	Fuel Handling Area	RX-9830 (SPING 3)	6.20E+02 µCi/cc	6.20E+01 µCi/cc	6.20E+00 µCi/cc	5.44E-04 µCi/cc
Gaseous	Emergency Penetration Room	RX-9835 (SPING 4)	6.55E+02 µCi/cc	6.55E+01 µCi/cc	6.55E+00 µCi/cc	1.21E-02 µCi/cc
Liquid	Liquid Radwaste	RE-4642	----	----	----	2.46E+05 cpm

3 — Area Rad Levels

GENERAL EMERGENCY / SITE AREA EMERGENCY

None

Table 1A-3 Unit 1 Safe Operation & Shutdown Rooms/Areas

Room / Area	Mode
A-4 Switchgear Room	3, 4
Upper North Electrical Penetration Room	3, 4
Lower South Electrical Equipment Room	3, 4

ALERT

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

AA3.1

1	2	3	4	5	6	DEF

Dose rate > 15 mR/hr in **EITHER** of the following areas:

- Control Room
- Central Alarm Station (by survey)

AA3.2

		3	4			

An UNPLANNED event results in radiation levels that prohibit or IMPEDE access to **any** Table 1A-3 room or area (Note 5)

Table 1A-2 Unit 1 Fuel Damage Radiation Monitors

- RE-8009 Spent Fuel Area
- RE-8017 Fuel Handling
- RE-8060 Containment High Range Radiation Monitor
- RE-8061 Containment High Range Radiation Monitor
- RE-9820 (SPING 1) Containment Purge
- RE-9825 (SPING 2) Radwaste Area
- RE-9830 (SPING 3) Fuel Handling Area

		GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
C **Cold SD/Refuel System Malfunct.**	**1** **RCS Level**	Loss of RCS inventory affecting fuel clad integrity with containment challenged 5 6 **CG1.1 [Unit 2 ONLY]** **CG1.2** RCS level **cannot** be monitored for ≥ 30 min. (Note 1) **AND** Core uncovery is indicated by **any** of the following: - UNPLANNED rise in **any** Table 1C-1 sump/tank level of sufficient magnitude to indicate core uncovery - Containment High Range Radiation Monitor RE-8060/8061 reading > 10 R/hr - Erratic Source Range Monitor indication **AND** **Any** Containment Challenge indication, Table 1C-2	Loss of RCS inventory affecting core decay heat removal capability 5 6 **CS1.1** CONTAINMENT CLOSURE **not** established **AND** RVLMS Levels 1 through 9 indicate DRY **CS1.2** RCS level **cannot** be monitored for ≥ 30 min. (Note 1) **AND** Core uncovery is indicated by **any** of the following: - UNPLANNED rise in **any** Table 1C-1 sump/tank level of sufficient magnitude to indicate core uncovery - Containment high range radiation monitor RE-8060/8061 reading > 10 R/hr - Erratic Source Range Monitor indication	Significant loss of RCS inventory 5 6 **CA1.1** Loss of RCS inventory as indicated by **EITHER**: - RVLMS Levels 1 through 8 indicate DRY - Reactor vessel level < 370.2 ft. (LT-1195/LT-1196) (minimum level for DHR operation @ 1000 gpm) **CA1.2** RCS level **cannot** be monitored for ≥ 15 min. (Note 1) **AND EITHER:** - UNPLANNED rise in **any** Table 1C-1 Sump/Tank level due to a loss of RCS inventory - Visual observation of UNISOLABLE RCS leakage	UNPLANNED loss of RCS inventory 5 6 **CU1.1** UNPLANNED loss of reactor coolant results in RCS water level less than a required lower limit for ≥ 15 min. (Note 1) **CU1.2** RCS level **cannot** be monitored **AND EITHER:** - UNPLANNED rise in **any** Table 1C-1 sump/tank level due to loss of RCS inventory - Visual observation of UNISOLABLE RCS leakage
	2 **Loss of Vital AC Power**	None	None	Loss of **all** offsite and **all** onsite AC power to vital buses for 15 minutes or longer 5 6 DEF **CA2.1** Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3 and A4 for ≥ 15 min. (Note 1)	Loss of **all but one** AC power source to vital buses for 15 minutes or longer 5 6 DEF **CU2.1** AC power capability, Table 1C-3, to vital 4.16 KV buses A3 and A4 reduced to a single power source for ≥ 15 min. (Note 1) **AND** **Any** additional single power source failure will result in loss of **all** AC power to SAFETY SYSTEMS
	3 **RCS Temp.**	None	None	Inability to maintain plant in cold shutdown 5 6 **CA3.1** UNPLANNED rise in RCS temperature to > 200°F for > Table 1C-4 duration (Note 1) **OR** UNPLANNED RCS pressure rise > 10 psig (this EAL does not apply during water-solid plant conditions)	UNPLANNED rise in RCS temperature 5 6 **CU3.1** UNPLANNED rise in RCS temperature to > 200°F **CU3.2** Loss of **all** RCS temperature and RCS level indication for ≥ 15 min. (Note 1)
	4 **Loss of Vital DC Power**	None	None	None	Loss of Vital DC power for 15 minutes or longer 5 6 **CU4.1** Indicated voltage is < 105 VDC on vital 125 VDC buses for ≥ 15 min. (Note 1)
	5 **Loss of Comm.**	None	None	None	Loss of **all** onsite or offsite communications capabilities 5 6 DEF **CU5.1** Loss of **all** Table 1C-5 onsite communication methods **OR** Loss of **all** Table 1C-5 State and local agency communication methods **OR** Loss of **all** Table 1C-5 NRC communication methods

		GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
C **Cold SD/Refuel System Malfunct.**	**6** **Hazardous Event Affecting Safety Systems**	None	None	Hazardous event affecting SAFETY SYSTEMS needed for the current operating mode Modes: 5, 6 **CA6.1** The occurrence of **any** Table 1C-6 hazardous event **AND** Event damage has caused indications of degraded performance on one train of a SAFETY SYSTEM needed for the current operating mode **AND EITHER:** - Event damage has caused indications of degraded performance to the second train of the SAFETY SYSTEM needed for the current operating mode - Event damage has resulted in VISIBLE DAMAGE to the second train of the SAFETY SYSTEM needed for the current operating mode (Notes 10, 11)	None

Table 1C-1 Unit 1 Sumps / Tanks

- Reactor Building Sump
- Reactor Drain Tank
- Aux. Building Equipment Drain Tank
- Aux. Building Sump
- Quench Tank

Table 1C-2 Containment Challenge Indications

- CONTAINMENT CLOSURE **not** established (Note 6)
- Containment hydrogen concentration > 4%
- UNPLANNED rise in containment pressure

Table 1C-3 Unit 1 AC Power Sources

Offsite

- Startup Transformer No. 1
- Startup Transformer No. 2
- Unit Auxiliary Transformer (from 22 KV switchyard)

Onsite

- DG1
- DG2
- AAC Gen

Table 1C-4 RCS Heat-up Duration Thresholds

RCS Status	CONTAINMENT CLOSURE Status	Heat-up Duration
Intact (but **not** lowered inventory)	N/A	60 min.*
Not intact **OR** lowered inventory	established	20 min.*
	not established	0 min.

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

Table 1C-5 Communication Methods

System	Onsite	State / Local	NRC
Station radio system	X		
ANO plant phone system	X		
Gaitronics	X		
Telephone Systems: • Commercial • Microwave • Satellite • VOIP		X	X
Emergency Notification System (ENS)			X

Table 1C-6 Hazardous Events

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

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
E **ISFSI**	None	None		Damage to a loaded cask CONFINEMENT BOUNDARY 1 | 2 | 3 | 4 | 5 | 6 | DEF **EU1.1** Damage to a loaded cask CONFINEMENT BOUNDARY as indicated by an on-contact radiation reading on the surface of a loaded spent fuel cask (VSC-24 VCC or HI-STORM overpack) > **any** Table 1E-1 value

Table 1E-1 ISFSI Dose Rates	
VSC-24 VCC	**HI-STORM**
- 200 mrem/hr on the sides - 400 mrem/hr on the top - 700 mrem/hr at the air inlet - 200 mrem/hr at the air outlet	- 60 mrem/hr (gamma + neutron) on the top or outlet vent - 600 mrem/hr (gamma + neutron) on the side of the overpack (excluding inlet and outlet ducts)

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
F **Fission Product Barriers**	1 | 2 | 3 | 4 **FG1.1** Loss of **any** two barriers **AND** Loss or potential loss of the third barrier (Table 1F-1)	1 | 2 | 3 | 4 **FS1.1** Loss or potential loss of **any** two barriers (Table 1F-1)	1 | 2 | 3 | 4 **FA1.1** **Any** loss or **any** potential loss of either Fuel Clad or RCS barrier (Table 1F-1)	None

Table 1F-1 Fission Product Barrier Threshold Matrix

Category	Fuel Clad Barrier (FCB)		Reactor Coolant System Barrier (RCB)		Containment Barrier (CNB)	
	Loss	**Potential Loss**	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**
A. RCS or S/G Tube Leakage	None	FCB1 RVLMS Levels 1 through 9 indicate DRY	RCB1 An automatic or manual ESAS actuation required by **EITHER**: - UNISOLABLE RCS leakage - S/G tube RUPTURE	RCB2 UNISOLABLE RCS leakage or S/G tube leakage > 50 gpm excluding normal reductions in RCS inventory (e.g., letdown, RCP seal leakoff) RCB3 PTS limits apply (RT14) **AND** RCS pressure and temperature are left of the NDTT/LTOP limit lines on EOP Figure 3 (Note 12)	CNB1 A S/G that is leaking > 50 gpm (excluding normal reductions in RCS inventory) or that is RUPTURED is also FAULTED outside of containment	None
B Inadequate Heat Removal	FCB2 CETs > 1200°F	FCB3 CETs > 700°F FCB4 RCS heat removal **cannot** be established using steam generators **AND** An on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI cooling	None	RCB4 RCS heat removal **cannot** be established using steam generators **AND** An on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI cooling	None	CNB2 CETs > 1200°F **AND** Restoration procedures **not** effective within 15 min. (Note 1)
C CTMT Radiation / RCS Activity	FCB5 Containment High Range Radiation Monitor RE-8060/8061 > 750 R/hr FCB6 Coolant activity > 300 µCi/gm dose equivalent I-131	None	RCB5 Containment High Range Radiation Monitor RE-8060/8061 > 40 R/hr	None	None	CNB3 Containment High Range Radiation Monitor RE-8060/8061 > 10,000 R/hr
D CTMT Integrity or Bypass	None	None	None	None	CNB4 Containment isolation is required **AND EITHER:** - Containment integrity has been lost based on Emergency Director judgment - UNISOLABLE pathway from Containment to the environment exists CNB5 Indications of RCS leakage outside of Containment	CNB6 Containment pressure > 73.7 psia CNB7 Containment hydrogen concentration > 4% CNB8 Containment pressure > 44.7 psia with < one full train of containment heat removal systems (Note 9) operating per design for ≥ 15 min. (Note 1)
E Emergency Director Judgment	FCB7 **Any** condition in the opinion of the Emergency Director that indicates loss of the Fuel Clad barrier	FCB8 **Any** condition in the opinion of the Emergency Director that indicates potential loss of the Fuel Clad barrier	RCB6 **Any** condition in the opinion of the Emergency Director that indicates loss of the RCS barrier	RCB7 **Any** condition in the opinion of the Emergency Director that indicates potential loss of the RCS barrier	CNB9 **Any** condition in the opinion of the Emergency Director that indicates loss of the Containment barrier	CNB10 **Any** condition in the opinion of the Emergency Director that indicates potential loss of the Containment barrier

		GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
H **Hazards**	**1** **Security**	None	HOSTILE ACTION within the PROTECTED AREA 1 | 2 | 3 | 4 | 5 | 6 | DEF **HS1.1** A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by ANO Security Shift Supervision	HOSTILE ACTION within the SECURITY OWNER CONTROLLED AREA or airborne attack threat within 30 minutes 1 | 2 | 3 | 4 | 5 | 6 | DEF **HA1.1** A HOSTILE ACTION is occurring or has occurred within the SECURITY OWNER CONTROLLED AREA as reported by ANO Security Shift Supervision **OR** A validated notification from NRC of an aircraft attack threat within 30 min. of the site	Confirmed SECURITY CONDITION or threat 1 | 2 | 3 | 4 | 5 | 6 | DEF **HU1.1** A SECURITY CONDITION that does **not** involve a HOSTILE ACTION as reported by ANO Security Shift Supervision **OR** Notification of a credible security threat directed at the site **OR** A validated notification from the NRC providing information of an aircraft threat
	2 **Seismic Event**			**[Refer to CA6.1 or SA9.1 for potential escalation due to a seismic event]** None	Seismic event greater than OBE levels 1 | 2 | 3 | 4 | 5 | 6 | DEF **HU2.1** Seismic event > OBE as indicated by annunciation of the 0.10 g acceleration alarm
	3 **Natural or Technical Hazard**			**[Refer to CA6.1 or SA9.1 for potential escalation due to a hazardous event]** None	Natural or Technological Hazard 1 | 2 | 3 | 4 | 5 | 6 | DEF **HU3.1** A tornado strike within the PROTECTED AREA **HU3.2** Internal room or area FLOODING of a magnitude sufficient to require manual or automatic electrical isolation of a SAFETY SYSTEM component required by Technical Specifications for the current operating mode **HU3.3** Movement of personnel within the PROTECTED AREA is IMPEDED due to an event external to the PROTECTED AREA involving hazardous materials (e.g., an offsite chemical spill or toxic gas release) **HU3.4** A hazardous event that results in on-site conditions sufficient to prohibit the plant staff from accessing the site via personal vehicles (Note 7)

NOTES

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Note 3: 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.

Note 4: The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Note 5: 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.

Note 6: If CONTAINMENT CLOSURE is re-established prior to exceeding the 30-minute time limit, declaration of a General Emergency is **not** required.

Note 7: This EAL does **not** apply to routine traffic impediments such as fog, snow, ice, or vehicle breakdowns or accidents.

Note 8: A manual action is **any** operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does **not** include manually driving in control rods or implementation of boron injection strategies.

Note 9: One full train of containment heat removal systems consists of one train of RB Spray and one train of RB Cooling System.

Note 10: If the affected SAFETY SYSTEM train was already inoperable or out of service before the hazardous event occurred, then emergency classification is **not** warranted.

Note 11: If the hazardous event **only** resulted in VISIBLE DAMAGE, with **no** indications of degraded performance to at least one train of a SAFETY SYSTEM, then this emergency classification is **not** warranted.

Note 12: Once PTS limits are first invoked, if RCS temperature and pressure are not brought within the limits within 15 minutes, this threshold is met and an immediate declaration is warranted. This threshold is met immediately upon exceeding the limits after this initial 15 minute period until PTS limits no longer apply.

Note 13: Bullet 2 of this EAL (multiple fire alarm indications) is not applicable for LOCAs or MSL breaks in containment.

Note 14: During Modes 1 and 2, HU4.2 is not applicable to a single fire alarm in the Reactor Building.

		GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT

H Hazards

4 Fire

General Emergency: None

Site Area Emergency: None

Alert: **[Refer to CA6.1 or SA9.1 for potential escalation due to a fire]**

None

Unusual Event: Fire potentially degrading the level of safety of the plant

1	2	3	4	5	6	DEF

HU4.1

A FIRE is **not** extinguished within 15 min. of **any** of the following FIRE detection indications (Note 1):

- Report from the field (i.e., visual observation)
- Receipt of multiple (more than 1) fire alarms or indications (Note 13)
- Field verification of a single fire alarm

AND

The FIRE is located within **any** Table 1H-1 area

HU4.2

Receipt of a single fire alarm (i.e., **no** other indications of a FIRE) (Note 14)

AND

The fire alarm is indicating a FIRE within **any** Table 1H-1 area

AND

The existence of a FIRE is **not** verified (i.e., proved or disproved) within 30 min. of alarm receipt (Note 1)

HU4.3

A FIRE within the PROTECTED AREA **not** extinguished within 60 min. of the initial report, alarm or indication (Note 1)

HU4.4

A FIRE within the PROTECTED AREA that requires firefighting support by an offsite fire response agency to extinguish

Table 1H-1 Unit 1 Fire Areas

Reactor Building

All elevations

Auxiliary Building

All elevations including: Penthouse/MSIV Room

Exceptions:

Boric Acid Mix Tank Room (Chem Add Area), 404' (157-B), EDG Exhaust Fan area on 386' (1-E and 2-E)

Turbine Building

All elevations on the west side of Turbine Building and including: Pipechase under ICW Coolers, CRD Pump Pit/T-28 Room/Area under ICW Pumps

372' Elevation from non-vital switchgear area to Auxiliary Building wall at DR 56

Outside Areas

Manholes adjacent to Startup #2 XFMR (MH-03/MH-04)

Manholes adjacent to Intake Structure (MH-05/MH-06)

Intake Structure (354' and 366')

Diesel Fuel Vault

Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

5 Hazardous Gases

General Emergency: None

Site Area Emergency: None

Alert: Gaseous release IMPEDING access to equipment necessary for normal plant operations, cooldown or shutdown

		3	4			

HA5.1

Release of a toxic, corrosive, asphyxiant or flammable gas into **any** Table 1H-2 room or area

AND

Entry into the room or area is prohibited or IMPEDED (Note 5)

Unusual Event: None

Table 1H-2 Unit 1 Safe Operation & Shutdown Rooms/Areas

Room/Area	Mode
A-4 Switchgear Room	3, 4
Upper North Electrical Penetration Room	3, 4
Lower South Electrical Equipment Room	3, 4

6 Control Room Evacuation

General Emergency: None

Site Area Emergency: Inability to control a key safety function from outside the Control Room

1	2	3	4	5	6	

HS6.1

An event has resulted in plant control being transferred from the Control Room to alternate locations

AND

Control of **any** of the following key safety functions is **not** re-established within 15 min. (Note 1):

- Reactivity (Modes 1, 2 and 3 **only**)
- Core cooling
- RCS heat removal

Alert: Control Room evacuation resulting in transfer of plant control to alternate locations

1	2	3	4	5	6	DEF

HA6.1

An event has resulted in plant control being transferred from the Control Room to alternate locations

Unusual Event: None

		GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
H Hazards	**7** ED Judgment	Other conditions exist that in the judgment of the Emergency Director warrant declaration of a GENERAL EMERGENCY 1 | 2 | 3 | 4 | 5 | 6 | DEF	Other conditions exist that in the judgment of the Emergency Director warrant declaration of a SITE AREA EMERGENCY 1 | 2 | 3 | 4 | 5 | 6 | DEF	Other conditions exist that in the judgment of the Emergency Director warrant declaration of an ALERT 1 | 2 | 3 | 4 | 5 | 6 | DEF	Other conditions exist that in the judgment of the Emergency Director warrant declaration of a UE 1 | 2 | 3 | 4 | 5 | 6 | DEF
		HG7.1 Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.	**HS7.1** Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or HOSTILE ACTION that results in intentional damage or malicious acts, (1) toward site personnel or equipment that could lead to the likely failure of or, (2) that prevent effective access to equipment needed for the protection of the public. **Any** releases are **not** expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels beyond the SITE BOUNDARY.	**HA7.1** Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. **Any** releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.	**HU7.1** Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. **No** releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of SAFETY SYSTEMS occurs.

		GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
S **System Malfunct.**	**1** **Loss of Vital AC Power**	Prolonged loss of **all** offsite and **all** onsite AC power to vital buses 1 2 3 4 **SG1.1** Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3 and A4 **AND EITHER:** - Restoration of at least one vital 4.16 KV bus in < 4 hours is **not** likely (Note 1) - CETs > 1200°F Loss of **all** vital AC and vital DC power sources for 15 minutes or longer **SG1.2** Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3 and A4 for ≥ 15 min. (Note 1) **AND** Indicated voltage is < 105 VDC on D01 and D02 vital 125 VDC buses for ≥ 15 min. (Note 1)	Loss of **all** offsite and **all** onsite AC power to vital buses for 15 minutes or longer 1 2 3 4 **SS1.1** Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses A3 and A4 for ≥ 15 min. (Note 1)	Loss of **all but one** AC power source to vital buses for 15 minutes or longer 1 2 3 4 **SA1.1** AC power capability, Table 1S-1, to vital 4.16 KV buses A3 and A4 reduced to a single power source for ≥ 15 min. (Note 1) **AND** **Any** additional single power source failure will result in loss of **all** AC power to SAFETY SYSTEMS	Loss of **all** offsite AC power capability to vital buses for 15 minutes or longer 1 2 3 4 **SU1.1** Loss of **all** offsite AC power capability, Table 1S-1, to vital 4.16 KV buses A3 and A4 for ≥ 15 min. (Note 1)
	2 **Loss of Vital DC Power**	None	Loss of **all** vital DC power for 15 minutes or longer 1 2 3 4 **SS2.1** Indicated voltage is < 105 VDC on D01 and D02 vital 125 VDC buses for ≥ 15 min. (Note 1)	Non	
	3 **Loss of Control Room Indications**	None		UNPLANNED loss of Control Room indications for 15 minutes or longer with a significant transient in progress 1 2 3 4 **SA3.1** An UNPLANNED event results in the inability to monitor **one or more** Table 1S-2 parameters from within the Control Room for ≥ 15 min. (Note 1) **AND** **Any** significant transient is in progress, Table 1S-3	UNPLANNED loss of Control Room indications for 15 minutes or longer 1 2 3 4 **SU3.1** An UNPLANNED event results in the inability to monitor one or more Table 1S-2 parameters from within the Control Room for ≥ 15 min. (Note 1)
	4 **RCS Activity**	None	None		RCS activity greater than Technical Specification allowable limits 1 2 3 4 **SU4.1** Failed Fuel Iodine radiation monitor RI-1237S > 9.0 E5 cpm **SU4.2** RCS sample activity > 1.0 μCi/gm dose equivalent I-131 for > 48 hours (Note 1) **OR** RCS sample activity > 60 μCi/gm dose equivalent I-131 **OR** RCS sample activity > 2200 μCi/gm dose equivalent Xe-133 for > 48 hours (Note 1)

Table 1S-1 Unit 1 AC Power Sources

Offsite
- Startup Transformer No. 1
- Startup Transformer No. 2
- Unit Auxiliary Transformer (from 22 KV switchyard)

Onsite
- Unit Auxiliary Transformer (main generator via main transformer)
- DG1
- DG2
- AAC Gen

Table 1S-3 Significant Transients
- Reactor trip
- Runback > 25% thermal power
- Electrical load rejection > 25% electrical load
- Safety injection actuation

Table 1S-2 Unit 2 Safety System Parameters
- Reactor power
- RCS level
- RCS pressure
- CET temperature
- Level in at least one S/G
- EFW flow to at least one S/G

		GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
S **System Malfunct.**	**5** **RCS Leakage**	None	None	None	RCS leakage for 15 minutes or longer 1 2 3 4 **SU5.1** RCS unidentified or pressure boundary leakage > 10 gpm for ≥ 15 min. (Note 1) **OR** RCS identified leakage > 25 gpm for ≥ 15 min. (Note 1) **OR** Reactor coolant leakage to a location outside containment > 25 gpm for ≥ 15 min. (Note 1)
	6 **RPS Failure**	None	Inability to shut down the reactor causing a challenge to core cooling or RCS heat removal 1 **SS6.1** An automatic or manual trip fails to shut down the reactor as indicated by reactor power > 5% **AND** **All** actions to shut down the reactor are **not** successful as indicated by reactor power > 5% **AND EITHER:** - CETs >1200°F - RCS heat removal **cannot** be established using steam generators and an on-shift SRO has determined that the procedure conditions are met to commence initiation of HPI cooling	Automatic or manual trip fails to shut down the reactor and subsequent manual actions taken at the reactor control consolers are **not** successful in shutting down the reactor 1 **SA6.1** An automatic or manual trip fails to shut down the reactor as indicated by reactor power > 5% **AND** Manual trip actions taken at the reactor control console (C03) (manual reactor trip pushbuttons or DROPS) are **not** successful in shutting down the reactor as indicated by reactor power > 5% (Note 8)	Automatic or manual trip fails to shut down the reactor 1 **SU6.1** An automatic trip did **not** shut down the reactor as indicated by reactor power > 5% after **any** RPS setpoint is exceeded **AND** A subsequent automatic trip or manual trip action taken at the reactor control console (C03) (manual reactor trip pushbuttons or DROPS) is successful in shutting down the reactor as indicated by reactor power ≤ 5% (Note 8) **SU6.2** A manual trip did **not** shut down the reactor as indicated by reactor power > 5% after **any** manual trip action was initiated **AND** A subsequent automatic trip or manual trip action taken at the reactor control console (C03) (manual reactor trip pushbuttons or DROPS) is successful in shutting down the reactor as indicated by reactor power ≤ 5% (Note 8)
	7 **Loss of Comm.**	None	None		Loss of **all** onsite or offsite communications capabilities 1 2 3 4 **SU7.1** Loss of **all** Table 1S-4 onsite communication methods **OR** Loss of **all** Table 1S-4 State and local agency communication methods **OR** Loss of **all** Table 1S-4 NRC communication methods
	8 **CTMT Failure**	None	None	None	Failure to isolate containment or loss of containment pressure control 1 2 3 4 **SU8.1** **Any** penetration is **not** closed within 15 min. of an ESAS actuation signal **OR** Containment pressure > 44.7 psia with < one full train of containment heat removal systems (Note 9) operating per design for ≥ 15 min. (Note 1)

Table 1S-4 Communication Methods

System	Onsite	State / Local	NRC
Station radio system	X		
ANO plant phone system	X		
Gaitronics	X		
Telephone Systems: • Commercial • Microwave • Satellite • VOIP		X	X
Emergency Notification System (ENS)			X

		GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
S **System Malfunct.**	**9** **Hazardous Event Affecting Safety Systems**	None	**Table 1S-5 Hazardous Events** • Seismic event (earthquake) • Internal or external FLOODING event • High winds or tornado strike • FIRE • EXPLOSION • Other events with similar hazard characteristics as determined by the Shift Manager	Hazardous event affecting SAFETY SYSTEMS needed for the current operating mode 1 2 3 4 **SA9.1** The occurrence of **any** Table 1S-5 hazardous event **AND** Event damage has caused indications of degraded performance on one train of a SAFETY SYSTEM needed for the current operating mode **AND EITHER:** - Event damage has caused indications of degraded performance to the second train of the SAFETY SYSTEM needed for the current operating mode - Event damage has resulted in VISIBLE DAMAGE to the second train of the SAFETY SYSTEM needed for the current operating mode (Notes 10, 11)	None

UNIT 2

A – Abnorm. Rad Levels / Rad Effluent

1 – Rad Effluent

GENERAL EMERGENCY

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

1	2	3	4	5	6	DEF

AG1.1

Reading on **any** Table 2A-1 effluent radiation monitor > column "GE" for ≥ 15 min. (Notes 1, 2, 3, 4)

AG1.2

Dose assessment using actual meteorology indicates doses > 1000 mrem TEDE or 5000 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

AG1.3

Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:

- Closed window dose rates > 1000 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 5000 mrem for 60 min. of inhalation

(Notes 1, 2)

SITE AREA EMERGENCY

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

1	2	3	4	5	6	DEF

AS1.1

Reading on **any** Table 2A-1 effluent radiation monitor > column "SAE" for ≥ 15 min. (Notes 1, 2, 3, 4)

AS1.2

Dose assessment using actual meteorology indicates doses > 100 mrem TEDE or 500 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

AS1.3

Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:

- Closed window dose rates > 100 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 500 mrem for 60 min. of inhalation

(Notes 1, 2)

ALERT

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

1	2	3	4	5	6	DEF

AA1.1

Reading on **any** Table 2A-1 effluent radiation monitor > column "ALERT" for ≥ 15 min. (Notes 1, 2, 3, 4)

AA1.2

Dose assessment using actual meteorology indicates doses > 10 mrem TEDE or 50 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

AA1.3

Analysis of a liquid effluent sample indicates a concentration or release rate that would result in doses > 10 mrem TEDE or 50 mrem thyroid CDE at or beyond the SITE BOUNDARY for 60 min. of exposure (Notes 1, 2)

AA1.4

Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:

- Closed window dose rates > 10 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 50 mrem for 60 min. of inhalation

(Notes 1, 2)

UNUSUAL EVENT

Release of gaseous or liquid radioactivity greater than 2 times the ODCM limits for 60 minutes or longer

1	2	3	4	5	6	DEF

AU1.1

Reading on **any** Table 2A-1 effluent radiation monitor > column "UE" for ≥ 60 min. (Notes 1, 2, 3)

AU1.2

Sample analysis for a gaseous or liquid release indicates a concentration or release rate > 2 x ODCM limits for ≥ 60 min. (Notes 1, 2)

2 – Irradiated Fuel Event

GENERAL EMERGENCY

Spent fuel pool level **cannot** be restored to at least the top of the fuel racks for 60 minutes or longer

1	2	3	4	5	6	DEF

AG2.1

Spent fuel pool level **cannot** be restored to at least 379.5 ft. (Alarm 3) on 2LIT-2020-1(2) for ≥ 60 min. (Note 1)

SITE AREA EMERGENCY

Spent fuel pool level at the top of the fuel racks

1	2	3	4	5	6	DEF

AS2.1

Lowering of spent fuel pool level to 379.5 ft. (Alarm 3) on 2LIT-2020-1(2)

ALERT

Significant lowering of water level above, or damage to, irradiated fuel

1	2	3	4	5	6	DEF

AA2.1

IMMINENT uncovery of irradiated fuel in the REFUELING PATHWAY

AA2.2

Damage to irradiated fuel resulting in a release of radioactivity

AND

High alarm on **any** Table 2A-2 radiation monitor

AA2.3

Lowering of spent fuel pool level to 389.5 ft. (Alarm 2) on 2LIT-2020-1(2)

UNUSUAL EVENT

UNPLANNED loss of water level above irradiated fuel

1	2	3	4	5	6	DEF

AU2.1

UNPLANNED water level drop in the REFUELING PATHWAY as indicated by low water level alarm, visual observation, or RWT level drop due to makeup demands

AND

UNPLANNED rise in corresponding area radiation levels as indicated by **any** of the following radiation monitors:

- 2RE-8914 Spent Fuel Area
- 2RE-8915 Spent Fuel Area
- 2RE-8916 Spent Fuel Area
- 2RE-8912 Containment Incore Instrumentation

Table 2A-1 Unit 1 Effluent Monitor Classification Thresholds (2 min. avg reading)

		Monitor	GE	SAE	Alert	UE
Gaseous	Containment Purge	2RX-9820 (SPING 5)	1.88E+01 µCi/cc	1.88E+00 µCi/cc	1.88E-01 µCi/cc	5.48E-04 µCi/cc
Gaseous	Radwaste Area	2RX-9825 (SPING 6)	2.35E+01 µCi/cc	2.35E+00 µCi/cc	2.35E-01 µCi/cc	4.35E-04 µCi/cc
Gaseous	Fuel Handling Area	2RX-9830 (SPING 7)	6.86E+02 µCi/cc	6.86E+01 µCi/cc	6.86E+00 µCi/cc	6.04E-04 µCi/cc
Gaseous	Emergency Penetration Room	2RX-9835 (SPING 8)	5.88E+02 µCi/cc	5.88E+01 µCi/cc	5.88E+00 µCi/cc	1.09E-02 µCi/cc
Liquid	BMS Liquid Discharge	2RE-2330	----	----	----	2.45E+04 cpm
Liquid	Regenerative Waste Discharge	2RE-4423	----	----	----	2.45E+05 cpm

3 – Area Rad Levels

GENERAL EMERGENCY / SITE AREA EMERGENCY

None

Table 2A-3 Unit 2 Safe Operation & Shutdown Rooms/Areas

Room / Area	Mode
Aux Building 317' Emergency Core Cooling Rooms	3, 4
Aux Building 317' Tendon Gallery Access	3, 4
Aux Building 335' Charging Pumps / MCC 2B-52	3, 4
Aux Building 354' MCC 2B-62 Area	3, 4
Emergency Diesel Generator Corridor	3, 4
Lower South Piping Penetration Room	3, 4
Aux Building 386' Containment Hatch	3, 4

ALERT

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

AA3.1

1	2	3	4	5	6	DEF

Dose rate > 15 mR/hr in **EITHER** of the following areas:

- Control Room
- Central Alarm Station (by survey)

AA3.2

		3	4			

An UNPLANNED event results in radiation levels that prohibit or IMPEDE access to **any** Table 2A-3 room or area (Note 5)

UNUSUAL EVENT

Table 2A-2 Unit 2 Fuel Damage Radiation Monitors

2RE-8905 Containment Equipment Hatch Area
2RE-8909 Containment Personnel Access Area
2RE-8912 Containment Incore Instrumentation
2RE-8914 Spent Fuel Area
2RE-8915 Spent Fuel Area
2RE-8916 Spent Fuel Area
2RE-8925-1 Containment High Range Radiation Monitor
2RE-8925-2 Containment High Range Radiation Monitor
2RX-9820 (SPING 5) Containment Purge
2RX-9825 (SPING 6) Radwaste Area
2RX-9830 (SPING 7) Fuel Handling Area

		GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
C **Cold SD/Refuel System Malfunct.**	**1** **RCS Level**	Loss of RCS inventory affecting fuel clad integrity with containment challenged 5 6 **CG1.1** RVLMS Levels 1 through 7 indicate DRY **AND** **Any** Containment Challenge indication, Table 2C-2 **CG1.2** RCS level **cannot** be monitored for ≥ 30 min. (Note 1) **AND** Core uncovery is indicated by **any** of the following: - UNPLANNED rise in **any** Table 2C-1 sump/tank level of sufficient magnitude to indicate core uncovery - Containment High Range Radiation Monitor 2RE-8925-1/8925-2 reading > 10 R/hr - Erratic Source Range Monitor indication **AND** **Any** Containment Challenge indication, Table 2C-2	Loss of RCS inventory affecting core decay heat removal capability 5 6 **CS1.1** CONTAINMENT CLOSURE **not** established **AND** RVLMS Levels 1 through 6 indicate DRY **CS1.2** RVLMS Levels 1 through 7 indicate DRY **OR** RCS level **cannot** be monitored for ≥ 30 min. (Note 1) **AND** Core uncovery is **indicated** by **any** of the following: - UNPLANNED rise in **any** Table 2C-1 sump/tank level of sufficient magnitude to indicate core uncovery - Containment high range radiation monitor 2RE-8925-1/8925-2 reading > 10 R/hr - Erratic Source Range Monitor indication	Significant loss of RCS inventory 5 6 **CA1.1** Loss of RCS inventory as indicated by **EITHER**: - RVLMS Levels 1 through 5 indicate DRY - Reactor vessel level < 24 in. (L4791/L4792) (minimum level for SDC operation) **CA1.2** RCS level **cannot** be monitored for ≥ 15 min. (Note 1) **AND EITHER:** - UNPLANNED rise in **any** Table 2C-1 Sump/Tank level due to a loss of RCS inventory - Visual observation of UNISOLABLE RCS leakage	UNPLANNED loss of RCS inventory 5 6 **CU1.1** UNPLANNED loss of reactor coolant results in RCS water level less than a required lower limit for ≥ 15 min. (Note 1) **CU1.2** RCS level **cannot** be monitored **AND EITHER:** - UNPLANNED rise in **any** Table 2C-1 sump/tank level due to loss of RCS inventory - Visual observation of UNISOLABLE RCS leakage
	2 **Loss of Vital AC Power**	None	None	Loss of **all** offsite and **all** onsite AC power to vital buses for 15 minutes or longer 5 6 DEF **CA2.1** Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses 2A3 and 2A4 for ≥ 15 min. (Note 1)	Loss of **all but one** AC power source to vital buses for 15 minutes or longer 5 6 DEF **CU2.1** AC power capability, Table 2C-3, to vital 4.16 KV buses 2A3 and 2A4 reduced to a single power source for ≥ 15 min. (Note 1) **AND** **Any** additional single power source failure will result in loss of **all** AC power to SAFETY SYSTEMS
	3 **RCS Temp.**	None	None	Inability to maintain plant in cold shutdown 5 6 **CA3.1** UNPLANNED rise in RCS temperature to > 200°F for > Table 2C-4 duration (Note 1) **OR** UNPLANNED RCS pressure rise > 10 psig (this EAL does not apply during water-solid plant conditions)	UNPLANNED rise in RCS temperature 5 6 **CU3.1** UNPLANNED rise in RCS temperature to > 200°F **CU3.2** Loss of **all** RCS temperature and RCS level indication for ≥ 15 min. (Note 1)
	4 **Loss of Vital DC Power**	None	None	None	Loss of Vital DC power for 15 minutes or longer 5 6 **CU4.1** Indicated voltage is < 105 VDC on vital 125 VDC buses for ≥ 15 min. (Note 1)
	5 **Loss of Comm.**	None	None	None	Loss of **all** onsite or offsite communications capabilities 5 6 DEF **CU5.1** Loss of **all** Table 2C-5 onsite communication methods **OR** Loss of **all** Table 2C-5 State and local agency communication methods **OR** Loss of **all** Table 2C-5 NRC communication methods

		GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
C **Cold SD/Refuel System Malfunct.**	**6** **Hazardous Event Affecting Safety Systems**	None	None	Hazardous event affecting SAFETY SYSTEMS needed for the current operating mode Modes: 5, 6 **CA6.1** The occurrence of **any** Table 2C-6 hazardous event **AND** Event damage has caused indications of degraded performance on one train of a SAFETY SYSTEM needed for the current operating mode **AND EITHER:** - Event damage has caused indications of degraded performance to the second train of the SAFETY SYSTEM needed for the current operating mode - Event damage has resulted in VISIBLE DAMAGE to the second train of the SAFETY SYSTEM needed for the current operating mode (Notes 10, 11)	None

Table 2C-1 Unit 2 Sumps / Tanks

- CNTMT Sump
- Reactor Drain Tank
- LRW Waste Tank (2T-20)
- Holdup Tank
- Aux. Building Sump
- Quench Tank

Table 2C-2 Containment Challenge Indications

- CONTAINMENT CLOSURE **not** established (Note 6)
- Containment hydrogen concentration > 4%
- UNPLANNED rise in containment pressure

Table 2C-3 Unit 2 AC Power Sources

Offsite

- Startup Transformer No. 3
- Startup Transformer No. 2
- Unit Auxiliary Transformer (backfed from main transformer)

Onsite

- 2DG1
- 2DG2
- AAC Gen

Table 2C-4 RCS Heat-up Duration Thresholds

RCS Status	CONTAINMENT CLOSURE Status	Heat-up Duration
Intact (but **not** lowered inventory)	N/A	60 min.*
Not intact **OR** lowered inventory	established	20 min.*
	not established	0 min.

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

Table 2C-5 Communication Methods

System	Onsite	State / Local	NRC
Station radio system	X		
ANO plant phone system	X		
Gaitronics	X		
Telephone Systems: • Commercial • Microwave • Satellite • VOIP		X	X
Emergency Notification System (ENS)			X

Table 2C-6 Hazardous Events

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

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
E **ISFSI**	None	None	**Table 2E-1 ISFSI Dose Rates** **VSC-24 VCC:** - 200 mrem/hr on the sides - 400 mrem/hr on the top - 700 mrem/hr at the air inlet - 200 mrem/hr at the air outlet **HI-STORM:** - 60 mrem/hr (gamma + neutron) on the top or outlet vent - 600 mrem/hr (gamma + neutron) on the side of the side of the overpack (excluding inlet and outlet ducts)	Damage to a loaded cask CONFINEMENT BOUNDARY 1 | 2 | 3 | 4 | 5 | 6 | DEF **EU1.1** Damage to a loaded cask CONFINEMENT BOUNDARY as indicated by an on-contact radiation reading on the surface of a loaded spent fuel cask (VSC-24 VCC or HI-STORM overpack) > **any** Table 2E-1 value

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
F **Fission Product Barriers**	1 | 2 | 3 | 4 **FG1.1** Loss of **any** two barriers **AND** Loss or potential loss of the third barrier (Table 2F-1)	1 | 2 | 3 | 4 **FS1.1** Loss or potential loss of **any** two barriers (Table 2F-1)	1 | 2 | 3 | 4 **FA1.1** **Any** loss or **any** potential loss of either Fuel Clad or RCS barrier (Table 2F-1)	None

Table 2F-1 Fission Product Barrier Threshold Matrix						
Category	**Fuel Clad Barrier (FCB)**		**Reactor Coolant System Barrier (RCB)**		**Containment Barrier (CNB)**	
	Loss	**Potential Loss**	**Loss**	**Potential Loss**	**Loss**	**Potential Loss**
A. RCS or S/G Tube Leakage	None	FCB1 RVLMS Levels 1 through 7 indicate DRY	RCB1 An automatic or manual ESFAS actuation required by **EITHER**: - UNISOLABLE RCS leakage - S/G tube RUPTURE	RCB2 UNISOLABLE RCS leakage or S/G tube leakage > 44 gpm excluding normal reductions in RCS inventory (e.g., letdown, RCP seal leakoff) RCB3 Uncontrolled RCS cooldown (> 50 °F step change or > 100 °F change in less than a one-hour period) **AND** RCS pressure and temperature are left of line B (200 degrees MTS) Standard Attachment 1, P-T Limits (Note 12)	CNB1 A S/G that is leaking > 44 gpm (excluding normal reductions in RCS inventory) or that is RUPTURED is also FAULTED outside of containment	None
B Inadequate Heat Removal	FCB2 CETs > 1200°F	FCB3 CETs > 700°F FCB4 RCS heat removal **cannot** be established using steam generators **AND** An on-shift SRO has determined that the procedure conditions are met to commence initiation of Once Through cooling	None	RCB4 RCS heat removal **cannot** be established using steam generators **AND** An on-shift SRO has determined that the procedure conditions are met to commence initiation of Once Through cooling	None	CNB2 CETs > 1200°F **AND** Restoration procedures **not** effective within 15 min. (Note 1)
C CTMT Radiation / RCS Activity	FCB5 Containment High Range Radiation Monitor 2RE-8925-1/ 8925-2 > 700 R/hr FCB6 Coolant activity > 300 μCi/gm dose equivalent I-131	None	RCB5 Containment High Range Radiation Monitor 2RE-8925-1/8925-2 > 50 R/hr	None	None	CNB3 Containment High Range Radiation Monitor 2RE-8925-1/8925-2 > 12,000 R/hr
D CTMT Integrity or Bypass	None	None	None	None	CNB4 Containment isolation is required **AND EITHER:** - Containment integrity has been lost based on Emergency Director judgment - UNISOLABLE pathway from Containment to the environment exists CNB5 Indications of RCS leakage outside of Containment	CNB6 Containment pressure > 73.7 psia CNB7 Containment hydrogen concentration > 4% CNB8 Containment pressure > 23.3 psia with < one full train of containment heat removal systems (Note 9) operating per design for ≥ 15 min. (Note 1)
E Emergency Director Judgment	FCB7 **Any** condition in the opinion of the Emergency Director that indicates loss of the Fuel Clad barrier	FCB8 **Any** condition in the opinion of the Emergency Director that indicates potential loss of the Fuel Clad barrier	RCB6 **Any** condition in the opinion of the Emergency Director that indicates loss of the RCS barrier	RCB7 **Any** condition in the opinion of the Emergency Director that indicates potential loss of the RCS barrier	CNB9 **Any** condition in the opinion of the Emergency Director that indicates loss of the Containment barrier	CNB10 **Any** condition in the opinion of the Emergency Director that indicates potential loss of the Containment barrier

		GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
H **Hazards**	**1** **Security**	None	HOSTILE ACTION within the PROTECTED AREA 1 | 2 | 3 | 4 | 5 | 6 | DEF **HS1.1** A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by ANO Security Shift Supervision	HOSTILE ACTION within the SECURITY OWNER CONTROLLED AREA or airborne attack threat within 30 minutes 1 | 2 | 3 | 4 | 5 | 6 | DEF **HA1.1** A HOSTILE ACTION is occurring or has occurred within the SECURITY OWNER CONTROLLED AREA as reported by ANO Security Shift Supervision **OR** A validated notification from NRC of an aircraft attack threat within 30 min. of the site	Confirmed SECURITY CONDITION or threat 1 | 2 | 3 | 4 | 5 | 6 | DEF **HU1.1** A SECURITY CONDITION that does **not** involve a HOSTILE ACTION as reported by ANO Security Shift Supervision **OR** Notification of a credible security threat directed at the site **OR** A validated notification from the NRC providing information of an aircraft threat
	2 **Seismic Event**			**[Refer to CA6.1 or SA9.1 for potential escalation due to a seismic event]** None	Seismic event greater than OBE levels 1 | 2 | 3 | 4 | 5 | 6 | DEF **HU2.1** Seismic event > OBE as indicated by annunciation of the 0.10 g acceleration alarm
	3 **Natural or Technical Hazard**			**[Refer to CA6.1 or SA9.1 for potential escalation due to a hazardous event]** None	Natural or Technological Hazard 1 | 2 | 3 | 4 | 5 | 6 | DEF **HU3.1** A tornado strike within the PROTECTED AREA **HU3.2** Internal room or area FLOODING of a magnitude sufficient to require manual or automatic electrical isolation of a SAFETY SYSTEM component required by Technical Specifications for the current operating mode **HU3.3** Movement of personnel within the PROTECTED AREA is IMPEDED due to an event external to the PROTECTED AREA involving hazardous materials (e.g., an offsite chemical spill or toxic gas release) **HU3.4** A hazardous event that results in on-site conditions sufficient to prohibit the plant staff from accessing the site via personal vehicles (Note 7)

NOTES

Note 1: The Emergency Director should declare the event promptly upon determining that the time limit has been exceeded, or will likely be exceeded. The Emergency Director is not allowed an additional 15 minutes to declare after the time limit is exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Note 3: 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.

Note 4: The pre-calculated effluent monitor values presented in EALs AA1.1, AS1.1 and AG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Note 5: 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.

Note 6: If CONTAINMENT CLOSURE is re-established prior to exceeding the 30-minute time limit, declaration of a General Emergency is **not** required.

Note 7: This EAL does **not** apply to routine traffic impediments such as fog, snow, ice, or vehicle breakdowns or accidents.

Note 8: A manual action is **any** operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and does **not** include manually driving in control rods or implementation of boron injection strategies.

Note 9: One full train of containment heat removal systems consists of one train of Containment Spray and one train of Containment Cooling System.

Note 10: If the affected SAFETY SYSTEM train was already inoperable or out of service before the hazardous event occurred, then emergency classification is **not** warranted.

Note 11: If the hazardous event **only** resulted in VISIBLE DAMAGE, with **no** indications of degraded performance to at least one train of a SAFETY SYSTEM, then this emergency classification is **not** warranted.

Note 12: Once PTS limits are first invoked, if RCS temperature and pressure are not brought within the limits within 15 minutes, this threshold is met and an immediate declaration is warranted. This threshold is met immediately upon exceeding the limits after this initial 15 minute period until PTS limits no longer apply.

Note 13: Bullet 2 of this EAL (multiple fire alarm indications) is not applicable for LOCAs or MSL breaks in containment.

Note 14: During Modes 1 and 2, HU4.2 is not applicable to a single fire alarm in the Reactor Building.

		GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
H **Hazards**	**4** **Fire**	None	See Table 2H-1 below	**[Refer to CA6.1 or SA9.1 for potential escalation due to a fire]** None	See HU4 below
	5 **Hazardous Gases**	None	See Table 2H-2 below	See HA5 below	None
	6 **Control Room Evacuation**	None	See HS6 below	See HA6 below	None

Table 2H-1 Unit 2 Fire Areas

Reactor Building

All elevations

Auxiliary Building

All elevations including: MG Set Room, UNEPR, LNEPR, 2B-53 Room

Auxiliary Building Extension

MSIV Room

Turbine Building

All elevations on the west side of Turbine Building and 372' Elevation from non-vital switchgear area to Auxiliary Building wall at DR 340

Outside Areas

Intake Structure (354' and 366')

Concrete Manhole East, NE of intake (2MH-01)

Concrete Manhole East of Turbine Building next to train bay (2MH-03)

Diesel Fuel Vault

Diesel Fuel Vault Pump Manholes (MH-09 and MH-10)

Table 2H-2 Unit 2 Safe Operation & Shutdown Rooms/Areas

Room/Area	Mode
Aux Building 317' Emergency Core Cooling Rooms	3, 4
Aux Building 317' Tendon Gallery Access	3, 4
Aux Building 335' Charging Pumps / MCC 2B-52	3, 4
Aux Building 354' MCC 2B-62 Area	3, 4
Emergency Diesel Generator Corridor	3, 4
Lower South Piping Penetration Room	3, 4
Aux Building 386' Containment Hatch	3, 4

Unusual Event – Fire potentially degrading the level of safety of the plant

Modes: 1 | 2 | 3 | 4 | 5 | 6 | DEF

HU4.1

A FIRE is **not** extinguished within 15 min. of **any** of the following FIRE detection indications (Note 1):

- Report from the field (i.e., visual observation)
- Receipt of multiple (more than 1) fire alarms or indications (Note 13)
- Field verification of a single fire alarm

AND

The FIRE is located within **any** Table 2H-1 area

HU4.2

Receipt of a single fire alarm (i.e., **no** other indications of a FIRE) (Note 14)

AND

The fire alarm is indicating a FIRE within **any** Table 2H-1 area

AND

The existence of a FIRE is **not** verified (i.e., proved or disproved) within 30 min. of alarm receipt (Note 1)

HU4.3

A FIRE within the PROTECTED AREA **not** extinguished within 60 min. of the initial report, alarm or indication (Note 1)

HU4.4

A FIRE within the PROTECTED AREA that requires firefighting support by an offsite fire response agency to extinguish

Alert – Gaseous release IMPEDING access to equipment necessary for normal plant operations, cooldown or shutdown

Modes: 3 | 4

HA5.1

Release of a toxic, corrosive, asphyxiant or flammable gas into **any** Table 2H-2 room or area

AND

Entry into the room or area is prohibited or IMPEDED (Note 5)

Site Area Emergency – Inability to control a key safety function from outside the Control Room

Modes: 1 | 2 | 3 | 4 | 5 | 6

HS6.1

An event has resulted in plant control being transferred from the Control Room to alternate locations

AND

Control of **any** of the following key safety functions is **not** re-established within 15 min. (Note 1):

- Reactivity (Modes 1, 2 and 3 **only**)
- Core cooling
- RCS heat removal

Alert – Control Room evacuation resulting in transfer of plant control to alternate locations

Modes: 1 | 2 | 3 | 4 | 5 | 6 | DEF

HA6.1

An event has resulted in plant control being transferred from the Control Room to alternate locations

		GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
H **Hazards**	**7** **ED Judgment**	Other conditions exist that in the judgment of the Emergency Director warrant declaration of a GENERAL EMERGENCY 1 | 2 | 3 | 4 | 5 | 6 | DEF	Other conditions exist that in the judgment of the Emergency Director warrant declaration of a SITE AREA EMERGENCY 1 | 2 | 3 | 4 | 5 | 6 | DEF	Other conditions exist that in the judgment of the Emergency Director warrant declaration of an ALERT 1 | 2 | 3 | 4 | 5 | 6 | DEF	Other conditions exist that in the judgment of the Emergency Director warrant declaration of a UE 1 | 2 | 3 | 4 | 5 | 6 | DEF
		HG7.1 Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.	**HS7.1** Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or HOSTILE ACTION that results in intentional damage or malicious acts, (1) toward site personnel or equipment that could lead to the likely failure of or, (2) that prevent effective access to equipment needed for the protection of the public. **Any** releases are **not** expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels beyond the SITE BOUNDARY.	**HA7.1** Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. **Any** releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.	**HU7.1** Other conditions exist which, in the judgment of the Emergency Director, indicate that events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. **No** releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of SAFETY SYSTEMS occurs.

		GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
S **System Malfunct.**	**1** **Loss of Vital AC Power**	Prolonged loss of **all** offsite and **all** onsite AC power to vital buses 1 2 3 4 **SG1.1** Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses 2A3 and 2A4 **AND EITHER:** - Restoration of at least one vital 4.16 KV bus in < 4 hours is **not** likely (Note 1) - CETs > 1200°F Loss of **all** vital AC and vital DC power sources for 15 minutes or longer **SG1.2** Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses 2A3 and 2A4 for ≥ 15 min. (Note 1) **AND** Indicated voltage is < 105 VDC on 2D01 and 2D02 vital 125 VDC buses for ≥ 15 min. (Note 1)	Loss of **all** offsite and **all** onsite AC power to vital buses for 15 minutes or longer 1 2 3 4 **SS1.1** Loss of **all** offsite and **all** onsite AC power to vital 4.16 KV buses 2A3 and 2A4 for ≥ 15 min. (Note 1)	Loss of **all but one** AC power source to vital buses for 15 minutes or longer 1 2 3 4 **SA1.1** AC power capability, Table 2S-1, to vital 4.16 KV buses 2A3 and 2A4 reduced to a single power source for ≥ 15 min. (Note 1) **AND** **Any** additional single power source failure will result in loss of **all** AC power to SAFETY SYSTEMS	Loss of **all** offsite AC power capability to vital buses for 15 minutes or longer 1 2 3 4 **SU1.1** Loss of **all** offsite AC power capability, Table 2S-1, to vital 4.16 KV buses 2A3 and 2A4 for ≥ 15 min. (Note 1)
	2 **Loss of Vital DC Power**	None	Loss of **all** vital DC power for 15 minutes or longer 1 2 3 4 **SS2.1** Indicated voltage is < 105 VDC on 2D01 and 2D02 vital 125 VDC buses for ≥ 15 min. (Note 1)	None	
	3 **Loss of Control Room Indications**	None		UNPLANNED loss of Control Room indications for 15 minutes or longer with a significant transient in progress 1 2 3 4 **SA3.1** An UNPLANNED event results in the inability to monitor **one or more** Table 2S-2 parameters from within the Control Room for ≥ 15 min. (Note 1) **AND** **Any** significant transient is in progress, Table 2S-3	UNPLANNED loss of Control Room indications for 15 minutes or longer 1 2 3 4 **SU3.1** An UNPLANNED event results in the inability to monitor one or more Table 2S-2 parameters from within the Control Room for ≥ 15 min. (Note 1)
	4 **RCS Activity**	None	None		RCS activity greater than Technical Specification allowable limits 1 2 3 4 **SU4.1** Failed Fuel Iodine radiation monitor 2RITS-4806B > 9.0 E5 cpm **SU4.2** RCS sample activity > 1.0 µCi/gm dose equivalent I-131 for > 48 hours (Note 1) **OR** RCS sample activity > 60 µCi/gm dose equivalent I-131 **OR** RCS sample activity > 3100 µCi/gm dose equivalent Xe-133 for > 48 hours (Note 1)

Table 2S-1 Unit 2 AC Power Sources

Offsite
- Startup Transformer No. 3
- Startup Transformer No. 2
- Unit Auxiliary Transformer (backfed from main transformer)

Onsite
- Unit Auxiliary Transformer (main generator via main transformer)
- 2DG1
- 2DG2
- AAC Gen

Table 2S-3 Significant Transients

- Reactor trip
- Runback > 25% thermal power
- Electrical load rejection > 25% electrical load
- Safety injection actuation

Table 2S-2 Unit 2 Safety System Parameters

- Reactor power
- RCS level
- RCS pressure
- CET temperature
- Level in at least one S/G
- EFW flow to at least one S/G

		GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
S **System Malfunct.**	**5** **RCS Leakage**	None	None	None	RCS leakage for 15 minutes or longer 1 2 3 4 **SU5.1** RCS unidentified or pressure boundary leakage > 10 gpm for ≥ 15 min. (Note 1) **OR** RCS identified leakage > 25 gpm for ≥ 15 min. (Note 1) **OR** Reactor coolant leakage to a location outside containment > 25 gpm for ≥ 15 min. (Note 1)
	6 **RPS Failure**	None	Inability to shut down the reactor causing a challenge to core cooling or RCS heat removal 1 **SS6.1** An automatic or manual trip fails to shut down the reactor as indicated by reactor power > 5% **AND** **All** actions to shut down the reactor are **not** successful as indicated by reactor power > 5% **AND EITHER:** - CETs >1200°F - RCS heat removal **cannot** be established using steam generators and an on-shift SRO has determined that the procedure conditions are met to commence initiation of Once Through cooling	Automatic or manual trip fails to shut down the reactor and subsequent manual actions taken at the reactor control consoles are **not** successful in shutting down the reactor 1 **SA6.1** An automatic or manual trip fails to shut down the reactor as indicated by reactor power > 5% **AND** Manual trip actions taken at the reactor control console (2C03/2C14) (manual reactor trip pushbuttons or DSS) are **not** successful in shutting down the reactor as indicated by reactor power > 5% (Note 8)	Automatic or manual trip fails to shut down the reactor 1 **SU6.1** An automatic trip did **not** shut down the reactor as indicated by reactor power > 5% after **any** RPS setpoint is exceeded **AND** A subsequent automatic trip or manual trip action taken at the reactor control console (2C03/2C14) (manual reactor trip pushbuttons or DSS) is successful in shutting down the reactor as indicated by reactor power ≤ 5% (Note 8) **SU6.2** A manual trip did **not** shut down the reactor as indicated by reactor power > 5% after **any** manual trip action was initiated **AND** A subsequent automatic trip or manual trip action taken at the reactor control console (2C03/2C14) (manual reactor trip pushbuttons or DSS) is successful in shutting down the reactor as indicated by reactor power ≤ 5% (Note 8)
	7 **Loss of Comm.**	None	None		Loss of **all** onsite or offsite communications capabilities 1 2 3 4 **SU7.1** Loss of **all** Table 2S-4 onsite communication methods **OR** Loss of **all** Table 2S-4 State and local agency communication methods **OR** Loss of **all** Table 2S-4 NRC communication methods
	8 **CTMT Failure**	None	None	None	Failure to isolate containment or loss of containment pressure control 1 2 3 4 **SU8.1** **Any** penetration is **not** closed within 15 min. of a CIAS actuation signal **OR** Containment pressure > 23.3 psia with < one full train of containment heat removal systems (Note 9) operating per design for ≥ 15 min. (Note 1)

Table 2S-4 Communication Methods

System	Onsite	State / Local	NRC
Station radio system	X		
ANO plant phone system	X		
Gaitronics	X		
Telephone Systems: • Commercial • Microwave • Satellite • VOIP		X	X
Emergency Notification System (ENS)			X

		GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
S **System Malfunct.**	**9** **Hazardous Event Affecting Safety Systems**	None	**Table 2S-5 Hazardous Events** • Seismic event (earthquake) • Internal or external FLOODING event • High winds or tornado strike • FIRE • EXPLOSION • Other events with similar hazard characteristics as determined by the Shift Manager	Hazardous event affecting SAFETY SYSTEMS needed for the current operating mode 1 2 3 4 **SA9.1** The occurrence of **any** Table 2S-5 hazardous event **AND** Event damage has caused indications of degraded performance on one train of a SAFETY SYSTEM needed for the current operating mode **AND EITHER:** - Event damage has caused indications of degraded performance to the second train of the SAFETY SYSTEM needed for the current operating mode - Event damage has resulted in VISIBLE DAMAGE to the second train of the SAFETY SYSTEM needed for the current operating mode (Notes 10, 11)	None

Enclosure 6 to

0CAN091801

Supporting Referenced Document Pages

Table of Contents

1. PURPOSE

The Arkansas Nuclear One (ANO) Emergency Action Level (EAL) Technical Bases Manual contains background information, event declaration thresholds, bases and references for the EAL and Fission Product Barrier (FPB) values used to implement the Nuclear Energy Institute (NEI) 99-01 Revision 6 EAL guidance. This calculation document provides additional technical detail specific to the derivation of the gaseous and liquid radiological effluent EAL values developed in accordance with the guidance in NEI 99-01 Revision 6.

Documentation of the assumptions, calculations and results are provided for the Ax1 series EAL effluent monitor values associated with the following NEI 99-01 Revision 6 EALs:

- NEI EAL AU1.1 (gaseous and liquid)
- NEI EAL AA1.1 (gaseous and liquid)
- NEI EAL AS1.1 (gaseous)
- NEI EAL AG1.1 (gaseous)

2. DEVELOPMENT METHODOLOGY AND BASES

2.1 Threshold Limits

2.1.1 AU1.1 Liquid Threshold Limits

Guidance Criteria

AU1 addresses a release of gaseous or liquid radioactivity greater than 2 times the Offsite Dose Calculation Manual (ODCM) limits for 60 minutes or longer.

ANO Bases

ODCM Section L 2.3.1 states that the concentration limits for the radioactive liquid effluents released to the discharge canal are as follows:

- Less than or equal to the concentrations specified in 10 CFR Part 20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases
- Less than or equal to 2.0E-04 µCi/ml total activity for dissolved and entrained noble gases

The site specific AU1.1 liquid effluent EAL threshold values will equate to 2 times the ODCM limit.

2.1.2 AU1.1 Gaseous Threshold Limits

Guidance Criteria

AU1 addresses a release of gaseous or liquid radioactivity greater than 2 times the Offsite Dose Calculation Manual (ODCM) limits for 60 minutes or longer.

ANO Bases

ODCM Section L 2.4.1 states that the dose rate limits for the radioactive gaseous effluents released from the site to unrestricted areas are as follows:

- Less than or equal to 500 mrem/yr to the total body (Noble Gasses)
- Less than or equal to 3000 mrem/yr to the skin (Noble Gasses)
- Less than or equal to 1500 mrem/yr to any organ (I-131, H-3, and for all radionuclides in particulate form with half-lives greater than 8 days)

  ODCM gaseous setpoint calculations are based on the noble gas limits. Organ dose includes inhalation, ingestion and deposition pathways and are applied in unrestricted area site boundary gaseous effluent dose calculations used in the Annual Radioactive Effluent Release Report. Ingestion pathway bases are not compatible or directly comparable with short term event considerations, and are not a significant contribution to the total dose (total body or skin dose limits from noble gas are the major exposure pathway). Thus, the organ dose limit is not applicable for EAL threshold determination.

The site specific AU1.1 gaseous effluent EAL threshold values will equate to 2 times the ODCM limit for the lesser of the total body or skin exposure pathways.

2.1.3 AA1.1 Liquid Threshold Limits

Guidance Criteria

AA1 addresses a release of radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE.

This is based on values at 1% of the EPA Protective Action Guides (PAGs).

Per NEI 99-01, the effluent monitor readings should correspond to the above dose limits at the “site-specific dose receptor point” (consistent with the calculation methodology employed) for one hour of exposure.

ANO Bases

The liquid effluent limits are based on the water concentration values given in 10 CFR 20 Appendix B Table 2 Column 2 (see Section 2.1.1 above). The 10 CFR 20 values are equivalent to the radionuclide concentrations which, if ingested continuously over the course of a year, would produce a total effective dose equivalent of 0.05 rem (50 mrem). The EPA PAGs are based on a TEDE dose from immersion, inhalation and deposition. The 10 CFR 20 limits and the EPA limits do not represent the same type of exposure and thus cannot be compared on a one to one basis.

Thus, the site specific EALs will not contain an AA1.1 liquid effluent monitor threshold value that equates to 1% of the EPA PAG. However, EALs AA1.3 (liquid effluent sample analysis) and AA1.4 (field survey results) will remain applicable for liquid effluent releases that exceed their respective thresholds.

2.1.4 AA1.1 Gaseous Threshold Limits

Guidance Criteria

AA1 addresses a release of radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE.

Per NEI 99-01, the effluent monitor readings are based on values at 1% of the EPA Protective Action Guides (PAGs) at the “site-specific dose receptor point” (consistent with the calculation methodology employed) for one hour of exposure.

ANO Bases

The gaseous effluent limits for AA1.1 are based on values that equate to an offsite dose greater than 10 mrem TEDE or 50 mrem CDE thyroid, which are 1% of the EPA PAGs.

2.1.5 AS1.1 Gaseous Threshold Limits

Guidance Criteria

AS1 addresses a release of radioactivity resulting in offsite dose greater than 100 mrem TEDE or 500 mrem thyroid CDE.

This is based on values at 10% of the EPA Protective Action Guides (PAGs) at the “site-specific dose receptor point” (consistent with the calculation methodology employed) for one hour of exposure.

ANO Bases

The gaseous effluent limits for AS1.1 are based on values that equate to an offsite dose greater than 100 mrem TEDE or 500 mrem CDE thyroid, which are 10% of the EPA PAGs.

2.1.6 AG1.1 Gaseous Threshold Limits

Guidance Criteria

AG1 addresses a release of radioactivity resulting in offsite dose greater than 1,000 mrem TEDE or 5,000 mrem thyroid CDE.

This is based on values at 100% of the EPA Protective Action Guides (PAGs) at the "site-specific dose receptor point" (consistent with the calculation methodology employed) for one hour of exposure.

ANO Bases

The gaseous effluent limits for AG1.1 are based on values that equate to an offsite dose greater than 1,000 mrem TEDE or 5,000 mrem CDE thyroid, which are 100% of the EPA PAGs.

2.2 Effluent Release Points

Note – All effluent release points assume a background reading of zero to conservatively account for all modes of operation applicable to the EALs.

2.2.1 Liquid Release Points

Guidance Criteria

Per NEI 99-01, the AU1 IC addresses normally occurring continuous radioactivity releases from monitored gaseous or liquid effluent pathways (EAL AU1.1) and planned batch releases from non-continuous release pathways (EAL AU1.2).

Per NEI 99-01, the AA1 IC includes events or conditions involving a radiological release, whether gaseous or liquid, monitored or un-monitored. 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.

The "site-specific monitor list and threshold values" should be determined with consideration of the selection of the appropriate installed gaseous and liquid effluent monitors.

ANO Bases

There are three monitored liquid effluent lines that discharge to the environment at ANO (ODCM Section 2.1):

ANO-1: RE-4642 – Liquid Radwaste Monitor

ANO-2: 2RE-2330 – Liquid Radwaste Monitor

2RE-4423 – Liquid Radwaste Monitor

2.2.2 Gaseous Release Points

Guidance Criteria

Per NEI 99-01, the AU1 IC addresses normally occurring continuous radioactivity releases from monitored gaseous or liquid effluent pathways (EAL #1) and planned batch releases from non-continuous release pathways (EAL #2).

Per NEI 99-01, the AA1 IC includes events or conditions involving a radiological release, whether gaseous or liquid, monitored or un-monitored. 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.

Per NEI 99-01, the AS1 and AG1 ICs address monitored and un-monitored releases of gaseous radioactivity. 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.

The “site-specific monitor list and threshold values” should include the effluent monitors described in emergency plan and emergency dose assessment procedures.

ANO Bases

There are ten monitored gaseous effluent lines that discharge to the environment at ANO (ODCM Section 3.1.2.a):

ANO-1: RX-9820 (SPING 1) – Unit 1 Containment Purge Exhaust

RX-9825 (SPING 2) – Unit 1 Radwaste Area Exhaust (RE-4830 – Waste Gas Holdup System Monitor is upstream to RX-9825)

RX-9830 (SPING 3) – Unit 1 Fuel Handling Area Exhaust

RX-9835 (SPING 4) – Unit 1 Penetration Room Exhaust

ANO-2: 2RX-9820 (SPING 5) – Unit 2 Containment Purge Exhaust (2RE-8233 – Containment Building Purge Monitor is upstream to 2RX-9820)

2RX-9825 (SPING 6) – Unit 2 Radwaste Area Exhaust (2RE-2429 – Waste Gas Holdup System Monitor is upstream to 2RX-9825)

2RX-9830 (SPING 7) – Unit 2 Fuel Handling Area Exhaust

2RX-9835 (SPING 8) – Unit 2 Penetration Room Exhaust

2RX-9845 (SPING 10) – Auxiliary Building Extension Exhaust (ABE)

The Auxiliary Building Extension (ABE) is a clean area that was originally designed to process radioactive waste following a major Steam Generator tube rupture event assumed to grossly contaminate

the secondary system. The lower level of the building is an open area with large compartments where low level radioactive equipment with fixed contamination is sometimes stored.

Other than a fire event, there is no potential for an airborne radioactive release from the ABE. Should a fire occur, it is unlikely that release of the fixed contamination would pass by the SPING monitor.

The NEI 99-01 basis for gaseous effluent thresholds specifies the release point be a normally occurring continuous radioactivity release or a planned batch release from non-continuous release pathways, neither of which applies to 2RX-9845 (SPING 10) for the ABE.

2RX-9850 (SPING 11) – Low Level Radwaste Building Exhaust

Per the ANO-2 Safety Analysis Report (SAR), Section 11.5.6.1, the LLRWSB is designed to provide a controlled environment for receiving and shipping, inspection, equipment sorting, compaction, and decontamination activities associated with on-site storage and off-site shipment of LLRW. Compacting operations are the only activity that could result in a potential release of radioactivity; however, the compaction process is not used at ANO.

The LLRWSB is separate from the Reactor and Auxiliary Buildings, therefore activity cannot pass through those buildings into the LLRWSB to the environment. The activity contained in the LLRWSB, primarily particulate isotopes, is not sufficient to exceed the UE threshold of 2x ODCM limit for 60 minutes for any credible event.

The most probable event for the LLRWSB is a release due to a fire in the building. Should a fire occur, it is unlikely that the activity in the LLRWSB would pass by the SPING monitor. Even if the activity in the LLRWSB were to become airborne and pass the SPING monitor, there is not sufficient activity to exceed the UE threshold of 2x ODCM limit for 60 minutes.

The NEI 99-01 basis for gaseous effluent thresholds specifies the release point be a normally occurring continuous radioactivity release or a planned batch release from non-continuous release pathways, neither of which applies to 2RX-9850 (SPING 11) for the LLRWSB.

2.3 Source Term

2.3.1 AU1.1 Liquid Source Term

Guidance Criteria

NEI 99-01 does not provide specific guidance for AU1 liquid source term assumptions.

ANO Bases

The ODCM setpoint method calls for a sample to be obtained and a gross gamma (Cs-137 equivalent) count and a gamma isotopic analysis performed.

Since liquid releases vary in isotopic composition, Cs-137 is considered a reasonable representative isotope and is used as the assumed source term for the liquid effluent EAL calculations.

2.3.2 AU1.1 Gaseous Source Term

Guidance Criteria

NEI 99-01 does not provide specific guidance for AU1 gaseous source term assumptions.

ANO Bases

The gaseous source term is based upon the NUREG-1940 Table 1-6 noble gas fraction of activity available at shutdown.

2.3.3 AA1.1, AS1.1 and AG1.1 Gaseous Source Terms

Guidance Criteria

NEI 99-01 specifies that the calculation of monitor readings will require use of an assumed release isotopic mix; the selected mix should be the same for ICs AA1, AS1 and AG1.

ANO Bases

The AA1.1, AS1.1 and AG1.1 gaseous EAL thresholds are based upon the ANO URI dose model results using input assumptions applicable to the event, pathway and particular monitor.

The source term used in the URI dose model is taken from NUREG-1940 Table 1.1 (URI Requirements Specification Appendix A Section A.2).

The process reductions used in the URI dose model are taken from NUREG-1228 and NUREG-1465 (URI Requirements Specification Appendix A Sections A.4 and A.5).

Note – HUT is hold-up time.

URI input assumptions for the gaseous release points are as follows:

Unit 1

RCS	**Containment** HUT < 2 hrs Sprays On	**CP Filter** Working	**CP Exhaust**	**Env**

RX-9820 (SPING 1) is modeled to release path ‘A’ utilizing an event with fuel clad damage.

RCS	**Containment** HUT < 2 hrs Sprays On	**Aux Building** HUT < 2 hrs	**RWA Filter** Working	**RWA Exhaust**	**Env**

RX-9825 (SPING 2) is modeled to release path ‘D’ utilizing an event with fuel clad damage.

SFP	**Fuel Building** HUT < 2 hrs	**FHA Filter** Working	**SFA Exhaust**	**Env**

RX-9830 (SPING 3) is modeled to release path ‘M’ utilizing an event with underwater fuel clad damage.

RCS	**Containment** HUT < 2 hrs Sprays On	**Aux Building** HUT < 2 hrs	**EPPR Filter** Working	**PPR Exhaust**	**Env**

RX-9835 (SPING 4) is modeled to release path ‘C’ utilizing an event with fuel clad damage.

Unit 2

RCS	**Containment** HUT < 2 hrs Sprays On	**CP Filter** Working	**CP Exhaust**	**Env**

2RX-9820 (SPING 5) is modeled to release path ‘A’ utilizing an event with fuel clad damage.

RCS	**Containment** HUT < 2 hrs Sprays On	**Aux Building** HUT < 2 hrs	**RWA Filter** Working	**RWA Exhaust**	**Env**

2RX-9825 (SPING 6) is modeled to release path ‘D’ utilizing an event with fuel clad damage.

SFP	**Fuel Building** HUT < 2 hrs	**FHA Filter** Working	**SFA Exhaust**	**Env**

2RX-9830 (SPING 7) is modeled to release path ‘M’ utilizing an event with underwater fuel clad damage.

RCS	**Containment** HUT < 2 hrs Sprays On	**Aux Building** HUT < 2 hrs	**EPPR Filter** Working	**PPR Exhaust**	**Env**

2RX-9835 (SPING 8) is modeled to release path ‘C’ utilizing an event with fuel clad damage.

For RCS initiated accidents, 0 time after shutdown (TAS) is used as no credit is taken for source term decay.

For the spent fuel accident, the new fuel age option is used with 80 hours for time after shutdown (TAS).

2.4 Effluent Flow

2.4.1 Effluent Liquid Discharge Flow

Guidance Criteria

NEI 99-01 does not provide specific guidance for effluent liquid flow assumptions.

ANO Bases

Discharge Flow

Unit 1 SAR Section 11.1.1 describes the liquid waste processing system for Unit 1. The radioactive waste disposal systems are designed to collect, store, process, monitor, and safely dispose all liquids, gases and solids which are potentially radioactive. U1 SAR Table 11-6 discharge flows are as follows:

- Treated Waste Pumps, P-47A/B – 85 gpm Max Flow Rate to Discharge Flume
- Filtered Waste Pumps P-53A/B – 38 gpm Max Flow Rate to Discharge Flume
- Laundry Drain Pump, P-45 – 50 gpm Max Flow Rate to Discharge Flume

A representative discharge flow rate of 85 gpm is used as the input for purposes of the U1 liquid effluent EAL calculations.

Unit 2 SAR Section 11.2.1 describes the liquid waste processing system for Unit 2. Radioactive liquid wastes which are discharged from the plant are first processed by the Waste Management System (WMS) or the Boron Management System (BMS). The

contents of turbine building sumps and detergent wastes are routinely discharged unprocessed due to their very small potential for radioactive contamination. Discharge flows per U2 SAR are as follows:

- Treated Waste Pumps, 2P-47A/B – 50 gpm Max Flow Rate to Discharge Flume (Table 11.2-2)
- Treated Waste Pumps, 2P-53A/B – 50 gpm Max Flow Rate to Discharge Flume (Table 11.2-8)
- Regenerative Waste Tank Pumps, 2P-135A/B – 100 gpm Max Flow Rate to Discharge Flume (Table 11.2-23)

A representative discharge flow rate of 100 gpm is used as the input for purposes of the U2 liquid effluent EAL calculations.

Dilution Flow

Per ODCM Section 2.1.4, dilution volume is the number of circulating water pumps in operation multiplied by the approximate flowrate of a circulating water pump (normally 191,500 gpm) or an indicated flow rate.

A normal dilution flow rate of one circulating water pump (191,500 gpm) is selected for EAL calculations.

2.4.2 Effluent Gaseous Vent Flow

Guidance Criteria

NEI 99-01 does not provide specific guidance for effluent gaseous vent flow assumptions.

ANO Bases

Vent flow values for AU1.1, AA1.1, AS1.1 and AG1.1 use the URI default flow values.

2.5 Release Duration

Guidance Criteria

Per NEI 99-01, the effluent monitor readings for AA1.1, AS1.1 and AG1.1 gaseous EAL threshold values should correspond to a dose at the “site-specific dose receptor point” (consistent with the calculation methodology employed) for one hour of exposure.

ANO Bases

The effluent monitor readings for AA1.1, AS1.1 and AG1.1 gaseous EAL threshold values are calculated for a release duration of one hour.

2.6 Meteorology

Guidance Criteria

The effluent monitor readings should correspond to the applicable dose limit at the "site-specific dose receptor point." 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. This is typically the boundary of the Security Owner Controlled Area.

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 for ICs AA1, AS1 and AG1.

ANO Bases

The site specific meteorology used for the EAL calculation inputs are based upon the FSAR and ODCM as documented below.

2.6.1 ODCM Gaseous Dispersion Factor (U1 SAR 2.3.6.2.5)

The highest annual average X/Q value for a ground level release, derived using the methodology of Regulatory Guide 1.111, is 2.0E-5 sec/m^3 in the west-southwest sector at a distance of 0.65 miles.

For purposes of EALs thresholds the SAR historical stability class is used as a basis and any changes in SAR stability results need not require a recalculation of this input.

2.6.2 ODCM Gaseous Dispersion Factor (U1 SAR 2.3.6.2.5)

The predominant stability class of 'E' is determined from the seasonal and annual percent frequency tables.

For purposes of EAL thresholds a long term historical meteorological stability of class E is used as a basis and any changes in seasonal or annual stability results need not require a redetermination of this input.

2.6.3 Wind Speed

190' (elevated) wind speed having the greatest number of intervals for all stability classes is 5 kts or 5.75 mph (U1 SAR Table 2-40).

40' (ground level) wind speed having the greatest number of intervals for all stability classes is 4 mph (U1 SAR Table 2-41).

For purposes of EALs thresholds the SAR historical meteorological wind speeds are used as a basis and any changes in annual predominant wind speed results need not require a recalculation of this input.

2.6.4 Wind Direction

190' (elevated) wind direction having the greatest number of intervals for all stability classes is sector E (U1 SAR Table 2-40).

40' (elevated) wind direction having the greatest number of intervals for all stability classes is sector E (U1 SAR Table 2-41).

For purposes of EALs thresholds the SAR historical meteorological wind directions are used as a basis and any changes in annual predominant wind direction results need not require a recalculation of this input.

2.6.5 Other Parameters

No precipitation is assumed to occur for the duration of the release and plume transport across the EPZ.

3. DESIGN INPUTS

3.1 General Constants and Conversion Factors

3.1.1 472 cc/sec per cfm

3.1.2 10^6 μCi per Ci

3.2 Liquid Effluent

3.2.1 Liquid Effluent Monitor Ranges

1) RE-4642 (STM 1-62 Table 62.2, TDL185 0080/0090) .... 1E+0 to 1E+8 cpm
2) 2RE-2330 (TDW120 2020 Section 1.1.2.1) .... 1E+0 to 1E+6 cpm
3) 2RE-4423 (TDW120 2020 Section 1.1.2.1) .... 1E+0 to 1E+6 cpm

3.2.2 Offset Factor (EMS Report)

1) RE-4642 .... 3.027E+07 cpm
2) 2RE-2330 .... 2.054E+06 cpm
3) 2RE-4423 .... 2.054E+06 cpm

3.2.3 Slope Factor (EMS Report)

1) RE-4642 .... 9.572E-01 cpm per μCi/ml
2) 2RE-2330 .... 9.178E-01 cpm per μCi/ml
3) 2RE-4423 .... 9.178E-01 cpm per μCi/ml

3.2.4 Liquid Effluent Dilution Flowrate – DV (ODCM 2.1.4)

1) Minimum Flow .... 191,500 gpm

3.2.5 Liquid Effluent Actual Flowrate – F_A

1) RE-4642 Liquid Radwaste Discharge (see section 2.4.1) .... 85 gpm
2) 2RE-2330 Liquid Radwaste Discharge (see section 2.4.1) .... 100 gpm
3) 2RE-4423 Liquid Radwaste Discharge (see section 2.4.1) .... 100 gpm

3.2.6 10 CFR 20 Appendix B, Table 2, Column 2 Source Term Limit (MPC_i)

Cs-137... 1E-6 μCi/ml

3.3 <u>Gaseous Effluent</u>

3.3.1 Gaseous Effluent Monitor Ranges (TDE070 0290)

Note – Containment Purge, Radwaste Area, Fuel Handling Area and Penetration Room SPING monitors have identical ranges.

1) Low Range .... 1.12E-7 to 3.63E-2 μCi/cc Xe-133
2) Medium Range... 4.16E-5 to 6.76E+1 μCi/cc Xe-133
3) High Range .... 4.57E-3 to 5.51E+3 μCi/cc Xe-133

3.3.2 Gaseous Effluent Source Flow (URI default values)

1) <u>Unit 1</u>
   - RX-9820 (Containment Purge) ....1.8E+04 cfm
   - RX-9825 (Radwaste Area) ....4.4E+04 cfm
   - RX-9830 (Fuel Handling Area) ....4.0E+04 cfm
   - RX-9835 (Penetration Room)...1.8E+03 cfm

2) <u>Unit 2</u>
   - 2RX-9820 (Containment Purge) ....3.97E+04 cfm
   - 2RX-9825 (Radwaste Area) ....5.0E+04 cfm
   - 2RX-9830 (Fuel Handling Area) ....3.6E+04 cfm
   - 2RX-9835 (Penetration Room)..2.0E+03 cfm

3.3.3 AU1.1 Dispersion Factor (X/Q)

Dispersion Factor (SAR 2.3.6.2.5) ....2.0E-05 sec/m^3

3.3.4 AU1.1 Gaseous Source Term Fraction (A_i)

NUREG-1940 Table 1-6 noble gas fraction of activity available at shutdown.

	Isotopic Fraction A_i (unitless)
Kr-83m	1.83E-02
Kr-85	1.70E-03
Kr-85m	3.71E-02
Kr-87	7.40E-02
Kr-88	1.02E-01
Xe-131m	2.20E-03
Xe-133	3.26E-01
Xe-133m	1.03E-02
Xe-135	8.54E-02
Xe-135m	6.90E-02
Xe-138	2.74E-01
	1.00E+00

3.3.5 ODCM Dose Factors (Regulatory Guide 1.109 Table B-1)

Note – RG 1.109 values converted from mRem/yr per ρCi/m^3 to mRem/yr per μCi/m^3.

	Total Body Dose Factor - Ki (mRem/yr / μCi/m^3)	Skin Beta Dose Factor - Li (mRem/yr / μCi/m^3)	Gamma Air Dose Factor - Mi (mRad/yr / μCi/m^3)
Kr-83m	7.56E-02	0.00E+00	1.93E+01
Kr-85	1.61E+01	1.34E+03	1.72E+01
Kr-85m	1.17E+03	1.46E+03	1.23E+03
Kr-87	5.92E+03	9.73E+03	6.17E+03
Kr-88	1.47E+04	2.37E+03	1.52E+04
Xe-131m	9.15E+01	4.76E+02	1.56E+02
Xe-133	2.94E+02	3.06E+02	3.53E+02
Xe-133m	2.51E+02	9.94E+02	3.27E+02
Xe-135	1.81E+03	1.86E+03	1.92E+03
Xe-135m	3.12E+03	7.11E+02	3.36E+03
Xe-138	8.83E+03	4.13E+03	9.21E+03

4. CALCULATIONS

4.1 AU1.1 Liquid Release

4.1.1 ODCM Liquid Release Limit (ODCM Section 2.1)

$$M_L = A \times \left(Offset \times S_A^{Slope}\right) \times \frac{\frac{DV}{\left(\sum_i {C_i}/{MPC_i} + {C_{TNG}}/{MPC_{TNG}}\right)}}{FA} + B$$

Where:

M_L	Radiation monitor setpoint equivalent to the ODCM limit (cpm)
A	Allocation fraction for the specific unit (1 selected for EAL calculations)
Offset	Detector response for the minimum detectable sample activity calculated from the calibration data (cpm)
S_A	Gross gamma (Cs-137 equivalent) activity for the tank (µCi/ml) (Cs-137 10 CFR 20 limit of 1E-6 µCi/ml selected for EAL calculations)
Slope	Log of the detector response (cpm) / Log of activity concentration (µCi/ml)
DV	Dilution volume flowrate (gpm)
C_i	Concentration of isotope “i” (µCi/ml) (Cs-137 10 CFR 20 limit of 1E-6 µCi/ml selected for EAL calculations)
MPC_i	10 CFR 20 isotope “i” concentration limit (µCi/ml) (Cs-137 10 CFR 20 limit of 1E-6 µCi/ml selected for EAL calculations)
C_{TNG}	Total concentration of noble gases (µCi/ml) (No noble gas assumed in the liquid discharge for EAL calculations)
MPC_{TNG}	10 CFR 20 Total Noble Gas limit of 2E-4 (µCi/ml)
F_A	Actual flowrate (gpm) - maximum flowrate of the discharge pump
B	background countrate prior to the release (cpm) (0 cpm selected for EAL calculations)

4.1.2 AU1.1 Liquid Release EAL Threshold

AU1.1 liquid is two times (2x) the calculated ODCM limit setpoint.

See Attachment 1 for the spreadsheet calculations that develop the AU1.1 liquid effluent EAL threshold values for each applicable monitor.

4.2 AU1.1 Gaseous Release

4.2.1 ODCM Gaseous Release Limit

$$\text{Limit}_{\text{total body}} = \left(\frac{500}{472 \times f \times \frac{\chi}{Q} \times \sum_i \left(A_i \times K_i \right)} \right)$$

$$\text{Limit}_{\text{Skin}} = \left(\frac{3000}{472 \times f \times \frac{\chi}{Q} \times \sum_i \left(A_i \times \left(L_i + 1.1\text{M}_\text{i} \right) \right)} \right)$$

Where:

Limit	radiation monitor reading equivalent to the ODCM limit (μCi/cc)
500/3000	ODCM Limit – 500 total body or 3000 skin (mrem/yr)
472	conversion factor (cc/ft^3 per sec/min)
f	vent flow (cfm)
X/Q	highest annual average gaseous site boundary dispersion factor (sec/m^3)
A_i	isotopic fraction of the mix activity released (unitless)
K_i	total body dose factor (mrem/yr per μCi/m^3)
L_i + 1.1M_i	skin dose factor (mrem/yr per μCi/m^3)

4.2.2 AU1.1 Gaseous Release EAL Threshold

AU1.1 is two times (2x) the lesser of the calculated total body or skin value ODCM limit setpoint.

See Attachment 2 for the spreadsheet calculations that develop the AU1.1 gaseous effluent EAL threshold values for each applicable monitor.

4.3 AA1.1, AS1.1 and AG1.1 Gaseous Release

The AA1.1, AS1.1 and AG1.1 gaseous release EAL threshold are developed using the site specific URI dose assessment models with the inputs described in Section 2 above.

Note – URI calculations were performed for each unit. There was no difference in results between units.

Refer to Attachment 3 for the results of the URI gaseous effluent EAL threshold calculations.

5. CONCLUSIONS

5.1 Unit 1

	Monitor #	Monitor Name	GE	SAE	Alert	UE
Gaseous	RX-9820	Containment Purge	4.15E+1 (μCi/cc)	4.15E+0 (μCi/cc)	4.15E-1 (μCi/cc)	1.21E-3 (μCi/cc)
	RX-9825	Radwaste Area	2.67E+1 (μCi/cc)	2.67E+0 (μCi/cc)	2.67E-1 (μCi/cc)	4.94E-4 (μCi/cc)
	RX-9830	Fuel Handling Area	6.20E+2 (μCi/cc)	6.20E+1 (μCi/cc)	6.20E+0 (μCi/cc)	5.44E-4 (μCi/cc)
	RX-9835	Penetration Room	6.55E+2 (μCi/cc)	6.55E+1 (μCi/cc)	6.55E+0 (μCi/cc)	1.21E-2 (μCi/cc)
Liquid	RE-4642	Liquid Radwaste	N/A	N/A	N/A	2.46E+05 (cpm)

5.2 Unit 2

	Monitor #	Monitor Name	GE	SAE	Alert	UE
Gaseous	2RX-9820	Containment Purge	1.88+01 (μCi/cc)	1.88E+00 (μCi/cc)	1.88E-01 (μCi/cc)	5.48E-4 (μCi/cc)
	2RX-9825	Radwaste Area	2.35+01 (μCi/cc)	2.35E+00 (μCi/cc)	2.35E-01 (μCi/cc)	4.35E-4 (μCi/cc)
	2RX-9830	Fuel Handling Area	6.86E+02 (μCi/cc)	6.86E+01 (μCi/cc)	6.86E+00 (μCi/cc)	6.04E-4 (μCi/cc)
	2RX-9835	Penetration Room	5.88E+02 (μCi/cc)	5.88E+01 (μCi/cc)	5.88E+00 (μCi/cc)	1.09E-2 (μCi/cc)
Liquid	2RE-2330	Liquid Radwaste	N/A	N/A	N/A	2.45E+04 (cpm)
	2RE-4423	Liquid Radwaste	N/A	N/A	N/A	2.45E+05 (cpm)

6. REFERENCES

6.1 10 CFR Part 20, Appendix B, Table 2, Column 2

6.2 Regulatory Guide 1.109 Table B-1

6.3 NEI 99-01 Revision 6, Methodology for Development of Emergency Action Levels, November 2012

6.4 NUREG-1940, RASCAL 4, Description of Models and Methods, December 2012

6.5 NUREG-1228, Source Term Estimation During Incident Response to Severe Nuclear Power Plant Accidents, October 1988

6.6 ANO Offsite Dose Calculation Manual (ODCM), Revision 25

6.7 Unified RASCAL Interface Requirement Specification, Draft 051611

6.8 Unified RASCAL Interface Requirement Specification ANO Unit 1 Site Annex, Version 1.1

6.9 Unified RASCAL Interface Requirement Specification ANO Unit 2 Site Annex, Version 1.1

6.10 ANO1 Safety Analysis Report (SAR), Amendment 26

6.11 ANO2 Safety Analysis Report (SAR), Amendment 27

6.12 STM 1-62, Radiation Monitoring, Revision 13

6.13 STM 2-47-2, Turbine Building and Auxiliary Building Extension Ventilation, Revision 15

6.14 TD L185.0080, Operation and Maintenance Samplers, Revision 0

6.15 TD L185 0080.0090, Operation and Maintenance Digital Ratemeter Model DRM-100 and DRM-100S, Revision 4

6.16 TDW120 2020, Installation, Operation, and Maintenance Instructions Switchboard Edgewise Instruments Five Inch Classification 252 Line, Revision 0

6.17 TDE070 0290, Instruction Manual Particulate, Iodine and Noble Gas Air Monitor Model SPING-3A/SPING-4A, Revision 15

6.18 EMS Activity Monitors Report dated 10/07/15

ATTACHMENT 1

AU1.1 Liquid Effluent EAL Calculations

Monitor	Offset	Slope	Expected Countrate (cpm) K=Offset * S^Slope	Actual Flowrate (Fa)	Monitor Setpoint - M=A*(K*Fm/Fa)+B	RU1.1 EAL Threshold Value (cpm)
RE-4642	3.03E+07	9.57E-01	5.47E+01	85	1.23E+05	2.46E+05
2RE-2330	2.05E+06	9.18E-01	6.39E+00	100	1.22E+04	2.45E+04
2RE-4423	2.05E+06	9.18E-01	6.39E+00	100	1.22E+04	2.45E+04

Gross gamma Cs-137 Equivalent Activity - S (µCi/ml):	1.00E-06
Dilution Volume Flowrate - DV (gpm):	1.92E+05
Cs-137 Activity - C (µCi/ml):	1.00E-06
Cs-137 10 CFR 20 Limit - MPC (µCi/ml):	1.00E-06
Dilution Factor - DF=Σi(Ci/MPCi) + CTNG/MPCTNG:	1.00E+00
Theoretical Release Rate - Fm=DV/DF (gpm):	1.92E+05
Allocation Fraction - A:	100%
Background (cpm):	0

ATTACHMENT 2

AU1.1 Gaseous Effluent EAL Calculations

	Total Body Dose Factor - Ki (mRem/yr per µCi/m3)	Skin Beta Dose Factor - Li (mRem/yr per µCi/m3)	Gamma Air Dose Factor - Mi (mRad/yr per µCi/m3)	Source Term Fraction - Ai	Ai x Ki (mRem/yr per µCi/m3)	Ai x (Li + 1.1Mi) (mRem/yr per µCi/m3)
Kr-83m	7.56E-02	0.00E+00	1.93E+01	1.83E-02	1.38E-03	3.89E-01
Kr-85	1.61E+01	1.34E+03	1.72E+01	1.70E-03	2.74E-02	2.31E+00
Kr-85m	1.17E+03	1.46E+03	1.23E+03	3.71E-02	4.34E+01	1.04E+02
Kr-87	5.92E+03	9.73E+03	6.17E+03	7.40E-02	4.38E+02	1.22E+03
Kr-88	1.47E+04	2.37E+03	1.52E+04	1.02E-01	1.50E+03	1.95E+03
Xe-131m	9.15E+01	4.76E+02	1.56E+02	2.20E-03	2.01E-01	1.42E+00
Xe-133	2.94E+02	3.06E+02	3.53E+02	3.26E-01	9.59E+01	2.26E+02
Xe-133m	2.51E+02	9.94E+02	3.27E+02	1.03E-02	2.59E+00	1.39E+01
Xe-135	1.81E+03	1.86E+03	1.92E+03	8.54E-02	1.55E+02	3.39E+02
Xe-135m	3.12E+03	7.11E+02	3.36E+03	6.90E-02	2.15E+02	3.04E+02
Xe-138	8.83E+03	4.13E+03	9.21E+03	2.74E-01	2.42E+03	3.90E+03
				1.00E+00	4.87E+03	8.07E+03

Calculation Constants

Total Body-DDE (mRem/yr):	500
Skin Dose-SDE (mRem/yr):	3000
UCF (CFM to cc/sec):	472
X/Q (sec/m3):	2.00E-05
DCF (mRad to mRem):	1.1

Calculation Results

Unit 1:	**RX-9820**	**RX-9825**	**RX-9830**	**RX-9835**
Flow (cfm):	1.80E+04	4.40E+04	4.00E+04	1.80E+03
Limit-TB (µCi/cc):	6.04E-04	2.47E-04	2.72E-04	6.04E-03
Limit-Skin (µCi/cc):	2.19E-03	8.95E-04	9.85E-04	2.19E-02
2x ODCM (µCi/cc):	**1.21E-03**	**4.94E-04**	**5.44E-04**	**1.21E-02**

Unit 2:	**2RX-9820**	**2RX-9825**	**2RX-9830**	**2RX-9835**
Flow (cfm):	3.97E+04	5.00E+04	3.60E+04	2.00E+03
Limit-TB (µCi/cc):	2.74E-04	2.18E-04	3.02E-04	5.44E-03
Limit-Skin (µCi/cc):	9.92E-04	7.88E-04	1.09E-03	1.97E-02
2x ODCM (µCi/cc):	**5.48E-04**	**4.35E-04**	**6.04E-04**	**1.09E-02**

ATTACHMENT 3

AA1.1, AS1.1 and AG1.1 Gaseous Effluent EAL Calculations

Radiological Effluent EAL Values
EP-CALC-ANO-1701, Rev. 1

U1 RX-9820 (SPING 1) Containment Purge Exhaust – Alert

Dose Assessment

ANO Unit 1 **Wednesday, October 07, 2015 15:52**

Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <CP Filters> < Env> PRF: 3.00E-03

Containment HUT: = < 2 Hours Containment Sprays: = ON Purge Filters: = Working Steam Gen: = N/A

Aux / FHB HUT: = N/A Filters: = N/A Turb Bldg HUT: = N/A

Source Term: Reactor Core Accident – Clad On Site 57 m

Time After S/D (hh:mm): 0:00 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

Monitor: CP Gas Conc Readings: 4.15E-01 µCI/cc Flowrate: 18000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	8.00E+00	5.32E+00	1.19E+00	6.77E-01	7.19E+00	5.01E+01
0.7	7.44E+00	4.92E+00	1.11E+00	6.66E-01	6.70E+00	4.56E+01
1.0	5.36E+00	3.47E+00	8.68E-01	5.91E-01	4.93E+00	3.26E+01
1.5	3.55E+00	2.26E+00	6.52E-01	4.47E-01	3.36E+00	2.35E+01
2.0	2.40E+00	1.52E+00	5.12E-01	3.15E-01	2.35E+00	1.86E+01
3.0	2.14E+00	1.41E+00	3.61E-01	2.20E-01	1.99E+00	1.32E+01
4.0	1.63E+00	1.05E+00	2.89E-01	1.67E-01	1.50E+00	1.05E+01
5.0	1.36E+00	8.64E-01	2.53E-01	1.35E-01	1.25E+00	9.29E+00
7.0	9.84E-01	6.27E-01	2.01E-01	0.00E+00	8.29E-01	7.67E+00
10.0	5.72E-01	3.56E-01	1.24E-01	0.00E+00	4.80E-01	5.00E+00

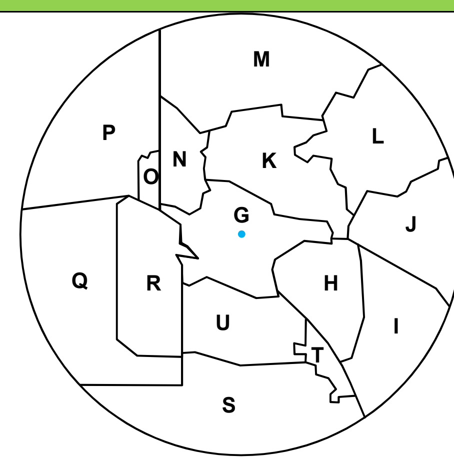
Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 155234.UR17

*** * * Classification: Validate against Emergency Action Levels * * ***

Reviewed By: ______________________________

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)

Particulate	6.56E-04 (0.0%)
Iodine	1.61E-02 (0.5%)
Noble Gas	3.53E+00 (99.5%)

U1 RX-9820 (SPING 1) Containment Purge Exhaust – Site Area Emergency

Dose Assessment

ANO Unit 1 **Wednesday, October 07, 2015 15:52**

Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <CP Filters> < Env> PRF: 3.00E-03

Containment HUT: = < 2 Hours Containment Sprays: = ON Purge Filters: = Working Steam Gen: = N/A

Aux / FHB HUT: = N/A Filters: = N/A Turb Bldg HUT: = N/A

Source Term: Reactor Core Accident – Clad On Site 57 m

Time After S/D (hh:mm): 0:00 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

Monitor: CP Gas Conc Readings: 4.15E+00 µCI/cc Flowrate: 18000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	8.00E+01	5.32E+01	1.19E+01	6.77E+00	7.19E+01	5.01E+02
0.7	7.44E+01	4.92E+01	1.11E+01	6.66E+00	6.70E+01	4.56E+02
1.0	5.36E+01	3.47E+01	8.68E+00	5.91E+00	4.93E+01	3.26E+02
1.5	3.55E+01	2.26E+01	6.52E+00	4.47E+00	3.36E+01	2.35E+02
2.0	2.40E+01	1.52E+01	5.12E+00	3.15E+00	2.35E+01	1.86E+02
3.0	2.14E+01	1.41E+01	3.61E+00	2.20E+00	1.99E+01	1.32E+02
4.0	1.63E+01	1.05E+01	2.89E+00	1.67E+00	1.50E+01	1.05E+02
5.0	1.36E+01	8.64E+00	2.53E+00	1.35E+00	1.25E+01	9.29E+01
7.0	9.84E+00	6.27E+00	2.01E+00	9.23E-01	9.21E+00	7.67E+01
10.0	5.72E+00	3.56E+00	1.24E+00	4.53E-01	5.25E+00	5.00E+00

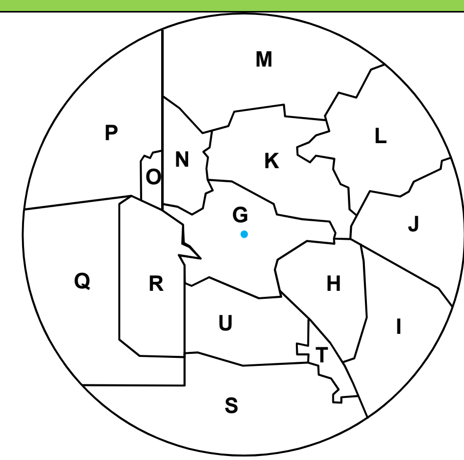
Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 155209.UR17

*** * * Classification: Site Area Emergency * * ***

Reviewed By: ______________________________

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	6.56E-03 (0.0%)
Iodine	1.61E-01 (0.5%)
Noble Gas	3.53E+01 (99.5%)

Radiological Effluent EAL Values

EP-CALC-ANO-1701, Rev. 1

U1 RX-9820 (SPING 1) Containment Purge Exhaust – General Emergency

Dose Assessment

ANO Unit 1 **Wednesday, October 07, 2015 15:52**

Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <CP Filters> < Env> PRF: 3.00E-03

Containment HUT: = < 2 Hours Containment Sprays: = ON Purge Filters: = Working Steam Gen: = N/A

Aux / FHB HUT: = N/A Filters: = N/A Turb Bldg HUT: = N/A

Source Term: Reactor Core Accident – Clad On Site 57 m

Time After S/D (hh:mm): 0:00 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

Monitor: CP Gas Conc Readings: 4.15E+01 µCI/cc Flowrate: 18000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	8.00E+01	5.32E+01	1.19E+01	6.77E+00	7.19E+01	5.01E+02
0.7	7.44E+01	4.92E+01	1.11E+01	6.66E+00	6.70E+01	4.56E+02
1.0	5.36E+01	3.47E+01	8.68E+00	5.91E+00	4.93E+01	3.26E+02
1.5	3.55E+01	2.26E+01	6.52E+00	4.47E+00	3.36E+01	2.35E+02
2.0	2.40E+01	1.52E+01	5.12E+00	3.15E+00	2.35E+01	1.86E+02
3.0	2.14E+01	1.41E+01	3.61E+00	2.20E+00	1.99E+01	1.32E+02
4.0	1.63E+01	1.05E+01	2.89E+00	1.67E+00	1.50E+01	1.05E+02
5.0	1.36E+01	8.64E+00	2.53E+00	1.35E+00	1.25E+01	9.29E+01
7.0	9.84E+00	6.27E+00	2.01E+00	9.23E-01	9.21E+00	7.67E+01
10.0	5.72E+00	3.56E+00	1.24E+00	4.53E-01	5.25E+00	5.00E+01

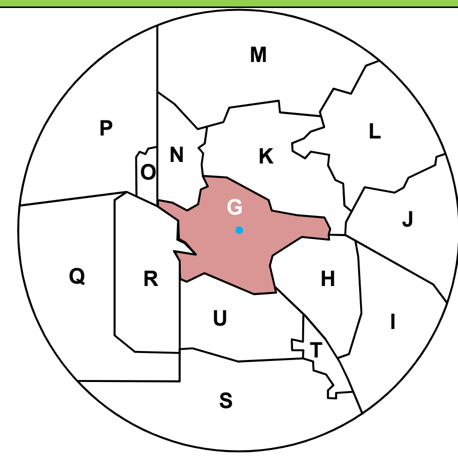
Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 155647.UR17

*** * * Classification: General Emergency * * ***

Reviewed By: ______________________________

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	6.56E-02 (0.0%)
Iodine	1.61E+00 (0.5%)
Noble Gas	3.53E+02 (99.5%)

U1 RX-9825 (SPING 2) Radwaste Area Exhaust – Alert

Dose Assessment

ANO Unit 1 **Wednesday, October 07, 2015 15:59**

Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <Aux Bldg> <RWA Filters> < Env> PRF: 1.20E-03

Containment HUT: = < 2 Hours Containment Sprays: = ON Purge Filters: = N/A Steam Gen: = N/A

Aux / FHB HUT: = < 2 Hours Filters: = Working Turb Bldg HUT: = N/A

Source Term: Reactor Core Accident – Clad On Site 57 m

Time After S/D (hh:mm): 0:00 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

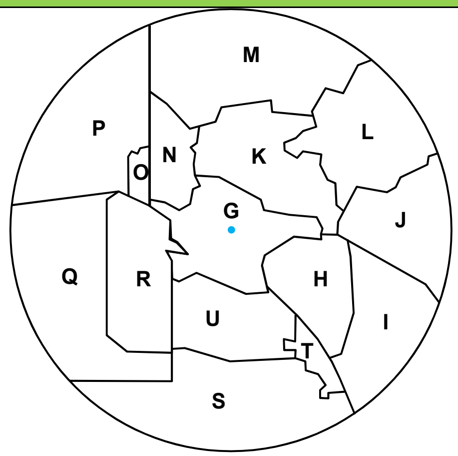
Monitor: RWA Gas Conc Readings: 2.67E-01 µCI/cc Flowrate: 44000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.24E+01	8.31E+00	9.39E-01	7.70E-01	1.00E+01	3.15E+01
0.7	1.16E+01	7.68E+00	9.00E-01	7.78E-01	9.36E+00	2.87E+01
1.0	8.36E+00	5.40E+00	7.60E-01	7.38E-01	6.90E+00	2.06E+01
1.5	5.52E+00	3.52E+00	5.92E-01	5.66E-01	4.67E+00	1.49E+01
2.0	3.74E+00	2.38E+00	4.56E-01	3.91E-01	3.22E+00	1.18E+01
3.0	3.33E+00	2.20E+00	3.23E-01	2.78E-01	2.80E+00	8.30E+00
4.0	2.54E+00	1.64E+00	2.60E-01	2.10E-01	2.11E+00	6.61E+00
5.0	2.12E+00	1.35E+00	2.26E-01	1.68E-01	1.74E+00	5.85E+00
7.0	1.54E+00	9.82E-01	1.75E-01	1.09E-01	1.27E+00	4.83E+00
10.0	8.92E-01	5.56E-01	1.03E-01	0.00E+00	6.59E-01	3.15E+00

Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 155932.UR17

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	4.13E-04 (0.0%)
Iodine	1.01E-02 (0.2%)
Noble Gas	5.54E+00 (99.8%)

*** * * Classification: Validate against Emergency Action Levels * * ***

Reviewed By: ______________________________

U1 RX-9825 (SPING 2) Radwaste Area Exhaust – Site Area Emergency

Dose Assessment

ANO Unit 1 **Wednesday, October 07, 2015 15:59**
Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <Aux Bldg> <RWA Filters> < Env> PRF: 1.20E-03
Containment HUT: = < 2 Hours Containment Sprays: = ON Purge Filters: = N/A Steam Gen: = N/A
Aux / FHB HUT: = < 2 Hours Filters: = Working Turb Bldg HUT: = N/A

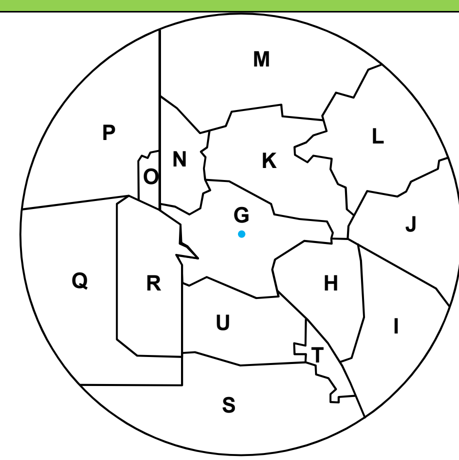
Source Term: Reactor Core Accident – Clad On Site 57 m
Time After S/D (hh:mm): 0:00 Wind: From 270° @ 5.8 mph
Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E
Precipitation: None

Monitor: RWA Gas Conc Readings: 2.67E+00 µCI/cc Flowrate: 44000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.24E+02	8.31E+01	9.39E+00	7.70E+00	1.00E+02	3.15E+02
0.7	1.16E+02	7.68E+01	9.00E+00	7.78E+00	9.36E+01	2.87E+02
1.0	8.36E+01	5.40E+01	7.60E+00	7.38E+00	6.90E+01	2.06E+02
1.5	5.52E+01	3.52E+01	5.92E+00	5.66E+00	4.67E+01	1.49E+02
2.0	3.74E+01	2.38E+01	4.56E+00	3.91E+00	3.22E+01	1.18E+02
3.0	3.33E+01	2.20E+01	3.23E+00	2.78E+00	2.80E+01	8.30E+01
4.0	2.54E+01	1.64E+01	2.60E+00	2.10E+00	2.11E+01	6.61E+01
5.0	2.12E+01	1.35E+01	2.26E+00	1.68E+00	1.74E+01	5.85E+01
7.0	1.54E+01	9.82E+00	1.75E+00	1.09E+00	1.27E+01	4.83E+01
10.0	8.92E+00	5.56E+00	1.03E+00	4.90E+01	7.08E+00	3.15E+01

Assessment Data Results Save to File:
ANO Unit 1 10Miles Monitored Release 10072015 155911.UR17

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	4.13E-03 (0.0%)
Iodine	1.01E-01 (0.2%)
Noble Gas	5.54E+01 (99.8%)

*** * * Classification: Site Area Emergency * * ***

Reviewed By: ______________________

U1 RX-9825 (SPING 2) Radwaste Area Exhaust – General Emergency

Dose Assessment

ANO Unit 1 | **Wednesday, October 07, 2015 15:58**

Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <Aux Bldg> <RWA Filters> < Env> | PRF: 1.20E-03

Containment HUT: = < 2 Hours | Containment Sprays: = ON | Purge Filters: = N/A | Steam Gen: = N/A

Aux / FHB HUT: = < 2 Hours | Filters: = Working | Turb Bldg HUT: = N/A

Source Term: Reactor Core Accident – Clad | On Site 57 m

Time After S/D (hh:mm): 0:00 | Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 | ETE (hh:mm): [N/A] | Stability Class: E

Precipitation: None

Monitor: RWA Gas Conc | Readings: 2.67E+01 µCi/cc | Flowrate: 44000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.24E+03	8.31E+02	9.39E+01	7.70E+01	1.00E+03	3.15E+03
0.7	1.16E+03	7.68E+02	9.00E+01	7.78E+01	9.36E+02	2.87E+03
1.0	8.36E+02	5.40E+02	7.60E+01	7.38E+01	6.90E+02	2.06E+03
1.5	5.52E+02	3.52E+02	5.92E+01	5.66E+01	4.67E+02	1.49E+03
2.0	3.74E+02	2.38E+02	4.56E+01	3.91E+01	3.22E+02	1.18E+03
3.0	3.33E+02	2.20E+02	3.23E+01	2.78E+01	2.80E+02	8.30E+02
4.0	2.54E+02	1.64E+02	2.60E+01	2.10E+01	2.11E+02	6.61E+02
5.0	2.12E+02	1.35E+02	2.26E+01	1.68E+01	1.74E+02	5.85E+02
7.0	1.54E+02	9.82E+01	1.75E+01	1.09E+01	1.27E+02	4.83E+02
10.0	8.92E+01	5.56E+01	1.03E+01	4.90E+00	7.08E+01	3.15E+02

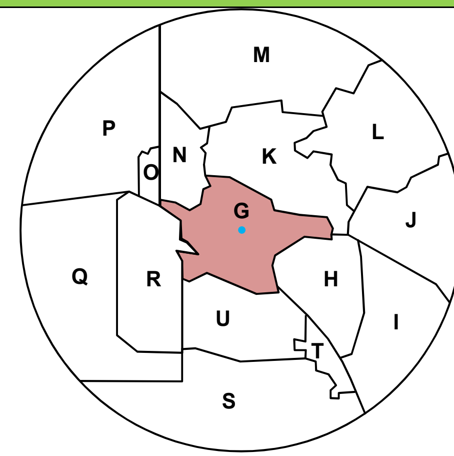
Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 155849.UR17

*** * * Classification: General Emergency * * ***

Reviewed By: ______________________________

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)

Particulate	4.13E-02 (0.0%)
Iodine	1.01E+00 (0.2%)
Noble Gas	5.54E+02 (99.8%)

U1 RX-9830 (SPING 3) Spent Fuel Area Exhaust – Alert

Dose Assessment

ANO Unit 1 **Wednesday, October 07, 2015 16:05**

Method: Detailed Assessment – Monitored Release

Release Pathway: <SF> <Under Water> <Fuel Bldg> <FHA Filters> < Env> PRF: 4.00E-04

Containment HUT: = N/A Containment Sprays: = N/A Purge Filters: = N/A Steam Gen: = N/A

Aux / FHB HUT: = < 2 Hours Filters: = Working Turb Bldg HUT: = N/A

Source Term: Spent Fuel Accident – Under Water Damage: 0.560% On Site 57 m

Time After S/D (hh:mm): 80:01 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

Monitor: FH Gas Conc Readings: 6.20E+00 µCI/cc Flowrate: 40000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.42E+01	9.98E+00	0.00E+00	0.00E+00	9.98E+00	3.89E+00
0.7	1.31E+01	9.20E+00	0.00E+00	0.00E+00	9.20E+00	3.54E+00
1.0	9.60E+00	6.72E+00	0.00E+00	0.00E+00	6.72E+00	2.54E+00
1.5	6.80E+00	4.76E+00	0.00E+00	0.00E+00	4.76E+00	1.84E+00
2.0	5.36E+00	3.75E+00	0.00E+00	0.00E+00	3.75E+00	1.46E+00
3.0	3.69E+00	2.56E+00	0.00E+00	0.00E+00	2.56E+00	1.03E+00
4.0	3.11E+00	2.10E+00	0.00E+00	0.00E+00	2.10E+00	8.19E-01
5.0	2.87E+00	1.92E+00	0.00E+00	0.00E+00	1.92E+00	7.27E-01
7.0	2.54E+00	1.69E+00	0.00E+00	0.00E+00	1.69E+00	6.03E-01
10.0	1.88E+00	1.20E+00	0.00E+00	0.00E+00	1.20E+00	3.95E-01

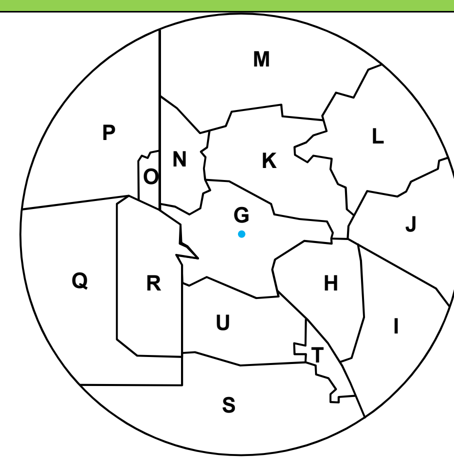
Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 160534.UR17

*** * * Classification: Validate against Emergency Action Levels * * ***

Reviewed By: ______________________________

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	9.72E-05 (0.0%)
Iodine	2.31E-04 (0.0%)
Noble Gas	1.17E+02 (100.0%)

U1 RX-9830 (SPING 3) Spent Fuel Area Exhaust – Site Area Emergency
Dose Assessment

ANO Unit 1 **Wednesday, October 07, 2015 16:04**

Method: Detailed Assessment – Monitored Release

Release Pathway: <SF> <Under Water> <Fuel Bldg> <FHA Filters> < Env> PRF: 4.00E-04

Containment HUT: = N/A Containment Sprays: = N/A Purge Filters: = N/A Steam Gen: = N/A

Aux / FHB HUT: = < 2 Hours Filters: = Working Turb Bldg HUT: = N/A

Source Term: Spent Fuel Accident – Under Water Damage: 0.560% On Site 57 m

Time After S/D (hh:mm): 80:00 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

Monitor: FH Gas Conc Readings: 6.20E+01 µCi/cc Flowrate: 40000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.42E+02	9.98E+01	8.74E-01	2.18E-01	1.01E+02	3.89E+01
0.7	1.31E+02	9.20E+01	7.96E-01	1.98E-01	9.30E+01	3.54E+01
1.0	9.60E+01	6.72E+01	5.72E-01	1.42E-01	6.79E+01	2.54E+01
1.5	6.80E+01	4.76E+01	4.12E-01	1.03E-01	4.81E+01	1.84E+01
2.0	5.36E+01	3.75E+01	3.28E-01	0.00E+00	3.78E+01	1.46E+01
3.0	3.69E+01	2.56E+01	2.30E-01	0.00E+00	2.58E+01	1.03E+01
4.0	3.11E+01	2.10E+01	1.83E-01	0.00E+00	2.12E+01	8.19E+00
5.0	2.87E+01	1.92E+01	1.62E-01	0.00E+00	1.94E+01	7.27E+00
7.0	2.54E+01	1.69E+01	1.34E-01	0.00E+00	1.70E+01	6.03E+00
10.0	1.88E+01	1.20E+01	0.00E+00	0.00E+00	1.20E+01	3.95E+00

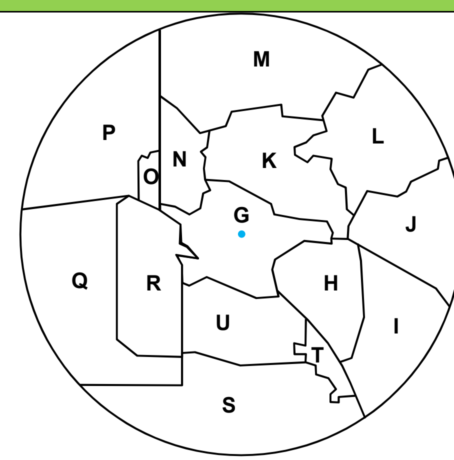
Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 160416.UR17

*** Classification: Site Area Emergency *****

Reviewed By: ______________________________

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	9.72E-04 (0.0%)
Iodine	2.31E-03 (0.0%)
Noble Gas	1.17E+03 (100.0%)

U1 RX-9830 (SPING 3) Spent Fuel Area Exhaust – General Emergency

Dose Assessment

ANO Unit 1 **Wednesday, October 07, 2015 16:03**

Method: Detailed Assessment – Monitored Release

Release Pathway: <SF> <Under Water> <Fuel Bldg> <FHA Filters> < Env> PRF: 4.00E-04

Containment HUT: = N/A Containment Sprays: = N/A Purge Filters: = N/A Steam Gen: = N/A

Aux / FHB HUT: = < 2 Hours Filters: = Working Turb Bldg HUT: = N/A

Source Term: Spent Fuel Accident – Under Water Damage: 0.560% On Site 57 m

Time After S/D (hh:mm): 80:00 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

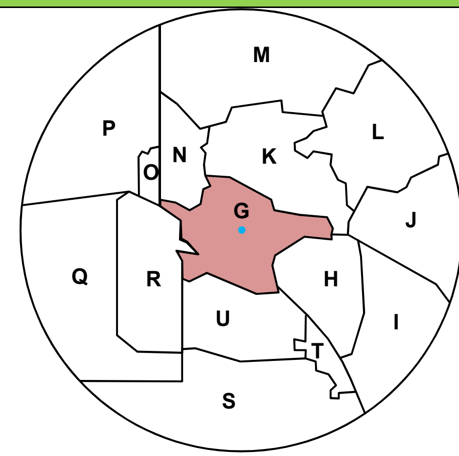
Monitor: FH Gas Conc Readings: 6.20E+02 µCi/cc Flowrate: 40000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.42E+03	9.98E+02	8.74E+00	2.18E+00	1.01E+03	3.89E+02
0.7	1.31E+03	9.20E+02	7.96E+00	1.98E+00	9.30E+02	3.54E+02
1.0	9.60E+02	6.72E+02	5.72E+00	1.42E+00	6.79E+02	2.54E+02
1.5	6.80E+02	4.76E+02	4.12E+00	1.03E+00	4.81E+02	1.84E+02
2.0	5.36E+02	3.75E+02	3.28E+00	8.16E-01	3.79E+02	1.46E+02
3.0	3.69E+02	2.56E+02	2.30E+00	5.06E-01	2.58E+02	1.03E+02
4.0	3.11E+02	2.10E+02	1.83E+00	3.93E-01	2.13E+02	8.19E+01
5.0	2.87E+02	1.92E+02	1.62E+00	3.44E-01	1.94E+02	7.27E+01
7.0	2.54E+02	1.69E+02	1.34E+00	2.79E-01	1.70E+02	6.03E+01
10.0	1.88E+02	1.20E+02	8.79E-01	1.75E-01	1.21E+02	3.95E+01

Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 160358.UR17

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	9.72E-03 (0.0%)
Iodine	2.31E-02 (0.0%)
Noble Gas	1.17E+04 (100.0%)

*** * * Classification: General Emergency * * ***

Reviewed By: ______________________________

U1 RX-9835 (SPING 4) Penetration Room Exhaust – Alert

Dose Assessment

ANO Unit 1 **Wednesday, October 07, 2015 16:10**

Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <Aux Bldg> <EPPR Filters> < Env> PRF: 1.20E-03

Containment HUT: = < 2 Hours Containment Sprays: = ON Purge Filters: = N/A Steam Gen: = N/A

Aux / FHB HUT: = < 2 Hours Filters: = Working Turb Bldg HUT: = N/A

Source Term: Reactor Core Accident – Clad On Site 57 m

Time After S/D (hh:mm): 0:00 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

Monitor: EPPR Gas Conc Readings: 6.55E+00 µCI/cc Flowrate: 1800 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.25E+01	8.35E+00	9.40E-01	7.74E-01	1.01E+01	3.16E+01
0.7	1.16E+01	7.72E+00	9.00E-01	7.83E-01	9.40E+00	2.88E+01
1.0	8.40E+00	5.44E+00	7.64E-01	7.41E-01	6.95E+00	2.06E+01
1.5	5.56E+00	3.54E+00	5.92E-01	5.69E-01	4.70E+00	1.49E+01
2.0	3.75E+00	2.39E+00	4.60E-01	3.93E-01	3.24E+00	1.18E+01
3.0	3.34E+00	2.21E+00	3.24E-01	2.80E-01	2.82E+00	8.31E+00
4.0	2.55E+00	1.64E+00	2.61E-01	2.11E-01	2.12E+00	6.62E+00
5.0	2.13E+00	1.36E+00	2.27E-01	1.69E-01	1.75E+00	5.86E+00
7.0	1.54E+00	9.87E-01	1.76E-01	1.10E-01	1.27E+00	4.84E+00
10.0	8.96E-01	5.59E-01	1.04E-01	0.00E+00	6.62E-01	3.15E+00

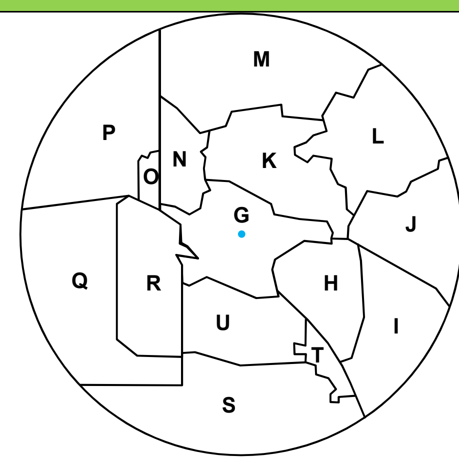
Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 161015.UR17

*** * * Classification: Validate against Emergency Action Levels * * ***

Reviewed By: ______________________________

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	4.14E-04 (0.0%)
Iodine	1.02E-02 (0.2%)
Noble Gas	5.56E+00 (99.8%)

U1 RX-9835 (SPING 4) Penetration Room Exhaust – Site Area Emergency

Dose Assessment

ANO Unit 1 **Wednesday, October 07, 2015 16:09**

Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <Aux Bldg> <EPPR Filters> < Env> PRF: 1.20E-03

Containment HUT: = < 2 Hours Containment Sprays: = ON Purge Filters: = N/A Steam Gen: = N/A

Aux / FHB HUT: = < 2 Hours Filters: = Working Turb Bldg HUT: = N/A

Source Term: Reactor Core Accident – Clad On Site 57 m

Time After S/D (hh:mm): 0:00 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

Monitor: EPPR Gas Conc Readings: 6.55E+01 µCi/cc Flowrate: 1800 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.25E+02	8.35E+01	9.40E+00	7.74E+00	1.01E+02	3.16E+02
0.7	1.16E+02	7.72E+01	9.00E+00	7.83E+00	9.40E+01	2.88E+02
1.0	8.40E+01	5.44E+01	7.64E+00	7.41E+00	6.95E+01	2.06E+02
1.5	5.56E+01	3.54E+01	5.92E+00	5.69E+00	4.70E+01	1.49E+02
2.0	3.75E+01	2.39E+01	4.60E+00	3.93E+00	3.24E+01	1.18E+02
3.0	3.34E+01	2.21E+01	3.24E+00	2.80E+00	2.82E+01	8.31E+01
4.0	2.55E+01	1.64E+01	2.61E+00	2.11E+00	2.12E+01	6.62E+01
5.0	2.13E+01	1.36E+01	2.27E+00	1.69E+00	1.75E+01	5.86E+01
7.0	1.54E+01	9.87E+00	1.76E+00	1.10E+00	1.27E+01	4.84E+01
10.0	8.96E+00	5.59E+00	1.04E+00	4.92E-01	6.62E+00	3.15E+01

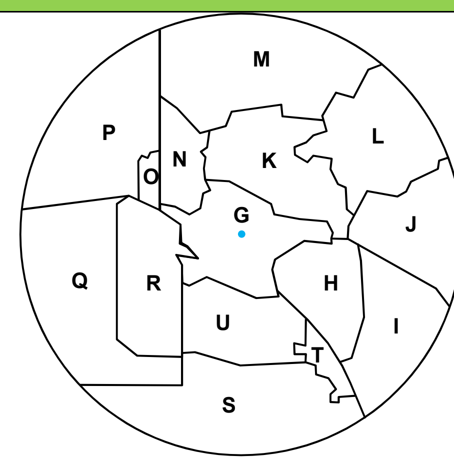
Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 160956.UR17

*** * * Classification: Site Area Emergency * * ***

Reviewed By: ______________________________

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	4.14E-03 (0.0%)
Iodine	1.02E-01 (0.2%)
Noble Gas	5.56E+01 (99.8%)

U1 RX-9835 (SPING 4) Penetration Room Exhaust – General Emergency

Dose Assessment

ANO Unit 1 — **Wednesday, October 07, 2015 16:09**

Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <Aux Bldg> <EPPR Filters> < Env> — PRF: 1.20E-03

Containment HUT: = < 2 Hours — Containment Sprays: = ON — Purge Filters: = N/A — Steam Gen: = N/A

Aux / FHB HUT: = < 2 Hours — Filters: = Working — Turb Bldg HUT: = N/A

Source Term: Reactor Core Accident – Clad — On Site 57 m

Time After S/D (hh:mm): 0:00 — Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 — ETE (hh:mm): [N/A] — Stability Class: E

Precipitation: None

Monitor: EPPR Gas Conc — Readings: 6.55E+02 µCI/cc — Flowrate: 1800 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.25E+03	8.35E+02	9.40E+01	7.74E+01	1.01E+03	3.16E+03
0.7	1.16E+02	7.72E+02	9.00E+01	7.83E+01	9.40E+02	2.88E+03
1.0	8.40E+02	5.44E+02	7.64E+01	7.41E+01	6.95E+02	2.06E+03
1.5	5.56E+02	3.54E+02	5.92E+01	5.69E+01	4.70E+02	1.49E+03
2.0	3.75E+02	2.39E+02	4.60E+01	3.93E+01	3.24E+02	1.18E+03
3.0	3.34E+02	2.21E+02	3.24E+01	2.80E+01	2.82E+02	8.31E+02
4.0	2.55E+02	1.64E+02	2.61E+01	2.11E+01	2.12E+02	6.62E+02
5.0	2.13E+02	1.36E+02	2.27E+01	1.69E+01	1.75E+02	5.86E+02
7.0	1.54E+02	9.87E+01	1.76E+01	1.10E+01	1.27E+02	4.84E+02
10.0	8.96E+01	5.59E+01	1.04E+01	4.92E+00	7.11E+01	3.15E+02

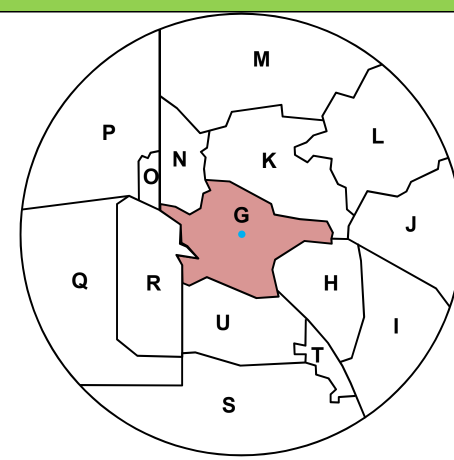
Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 160932.UR17

*** * * Classification: General Emergency * * ***

Reviewed By: ______________________________

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	4.14E-02 (0.0%)
Iodine	1.02E+00 (0.2%)
Noble Gas	5.56E+02 (99.8%)

U2 2RX-9820 (SPING 5) Containment Purge Exhaust – Alert

Dose Assessment

ANO Unit 2 **Wednesday, October 07, 2015 16:15**

Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <CP Filters> < Env> PRF: 3.00E-03

Containment HUT: = < 2 Hours Containment Sprays: = ON Purge Filters: = Working Steam Gen: = N/A

Aux / FHB HUT: = N/A Filters: = N/A Turb Bldg HUT: = N/A

Source Term: Reactor Core Accident – Clad On Site 57 m

Time After S/D (hh:mm): 0:00 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

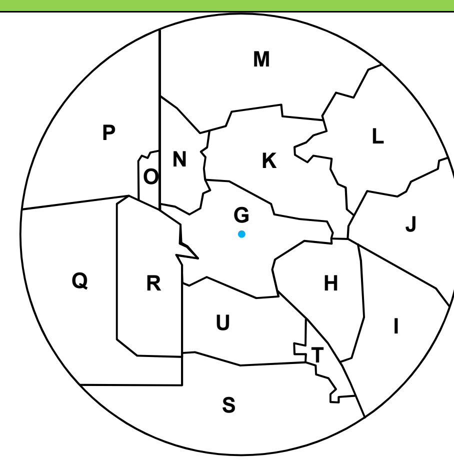
Monitor: CP Gas Conc Readings: 1.88E-01 µCI/cc Flowrate: 39700 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	8.00E+00	5.32E+00	1.19E+00	6.77E-01	7.19E+00	5.01E+01
0.7	7.44E+00	4.92E+00	1.11E+00	6.66E-01	6.70E+00	4.56E+01
1.0	5.36E+00	3.47E+00	8.68E-01	5.90E-01	4.93E+00	3.26E+01
1.5	3.55E+00	2.26E+00	6.52E-01	4.46E-01	3.35E+00	2.35E+01
2.0	2.40E+00	1.52E+00	5.12E-01	3.15E-01	2.35E+00	1.86E+01
3.0	2.14E+00	1.41E+00	3.61E-01	2.20E-01	1.99E+00	1.32E+01
4.0	1.63E+00	1.05E+00	2.89E-01	1.67E-01	1.50E+00	1.05E+01
5.0	1.36E+00	8.64E-01	2.53E-01	1.35E-01	1.25E+00	9.29E+00
7.0	9.84E-01	6.27E-01	2.01E-01	0.00E+00	8.29E-01	7.67E+00
10.0	5.72E-01	3.56E-01	1.24E-01	0.00E+00	4.80E-01	5.00E+00

Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 161518.UR17

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	6.56E-04 (0.0%)
Iodine	1.61E-02 (0.5%)
Noble Gas	3.52E+00 (99.5%)

*** * * Classification: Validate against Emergency Action Levels * * ***

Reviewed By: ______________________

Radiological Effluent EAL Values

EP-CALC-ANO-1701, Rev. 1

U2 2RX-9820 (SPING 5) Containment Purge Exhaust – Site Area Emergency

Dose Assessment

ANO Unit 2 **Wednesday, October 07, 2015 16:15**

Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <CP Filters> < Env> PRF: 3.00E-03

Containment HUT: = < 2 Hours Containment Sprays: = ON Purge Filters: = Working Steam Gen: = N/A

Aux / FHB HUT: = N/A Filters: = N/A Turb Bldg HUT: = N/A

Source Term: Reactor Core Accident – Clad On Site 57 m

Time After S/D (hh:mm): 0:00 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

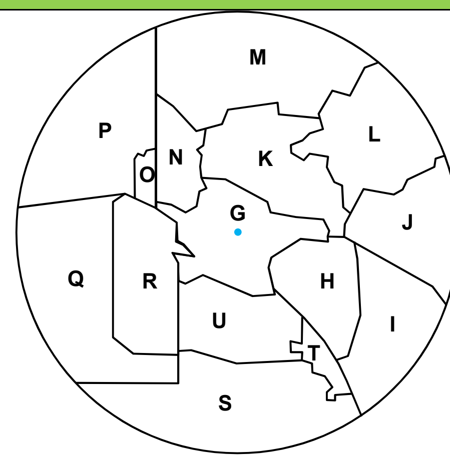
Monitor: CP Gas Conc Readings: 1.88E+00 µCi/cc Flowrate: 39700 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	8.00E+01	5.32E+01	1.19E+01	6.77E+00	7.19E+01	5.01E+02
0.7	7.44E+01	4.92E+01	1.11E+01	6.66E+00	6.70E+01	4.56E+02
1.0	5.36E+01	3.47E+01	8.68E+00	5.90E+00	4.93E+01	3.26E+02
1.5	3.55E+01	2.26E+01	6.52E+00	4.46E+00	3.35E+01	2.35E+02
2.0	2.40E+01	1.52E+01	5.12E+00	3.15E+00	2.35E+01	1.86E+02
3.0	2.14E+01	1.41E+01	3.61E+00	2.20E+00	1.99E+01	1.32E+02
4.0	1.63E+01	1.05E+01	2.89E+00	1.67E+00	1.50E+01	1.05E+02
5.0	1.36E+01	8.64E+00	2.53E+00	1.35E+00	1.25E+01	9.29E+01
7.0	9.84E+00	6.27E+00	2.01E+00	9.22E-01	9.21E+00	7.67E+01
10.0	5.72E+00	3.56E+00	1.24E+00	4.52E-01	5.25E+00	5.00E+01

Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 161502.UR17

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)

Particulate	6.56E-03 (0.0%)
Iodine	1.61E-01 (0.5%)
Noble Gas	3.52E+01 (99.5%)

*** * * Classification: Site Area Emergency * * ***

Reviewed By: ______________________

Radiological Effluent EAL Values

EP-CALC-ANO-1701, Rev. 1

U2 2RX-9820 (SPING 5) Containment Purge Exhaust – General Emergency

Dose Assessment

ANO Unit 2 — **Wednesday, October 07, 2015 16:14**

Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <CP Filters> < Env> — PRF: 3.00E-03

Containment HUT: = < 2 Hours — Containment Sprays: = ON — Purge Filters: = Working — Steam Gen: = N/A

Aux / FHB HUT: = N/A — Filters: = N/A — Turb Bldg HUT: = N/A

Source Term: Reactor Core Accident – Clad — On Site 57 m

Time After S/D (hh:mm): 0:00 — Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 — ETE (hh:mm): [N/A] — Stability Class: E

Precipitation: None

Monitor: CP Gas Conc — Readings: 1.88E+01 µCi/cc — Flowrate: 39700 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	8.00E+02	5.32E+02	1.19E+02	6.77E+01	7.19E+02	5.01E+03
0.7	7.44E+02	4.92E+02	1.11E+02	6.66E+01	6.70E+02	4.56E+03
1.0	5.36E+02	3.47E+02	8.68E+01	5.90E+01	4.93E+02	3.26E+03
1.5	3.55E+02	2.26E+02	6.52E+01	4.46E+01	3.35E+02	2.35E+03
2.0	2.40E+02	1.52E+02	5.12E+01	3.15E+01	2.35E+02	1.86E+03
3.0	2.14E+02	1.41E+02	3.61E+01	2.20E+01	1.99E+02	1.32E+03
4.0	1.63E+02	1.05E+02	2.89E+01	1.67E+01	1.50E+02	1.05E+03
5.0	1.36E+02	8.64E+01	2.53E+01	1.35E+01	1.25E+02	9.29E+02
7.0	9.84E+01	6.27E+01	2.01E+01	9.22E+00	9.21E+01	7.67E+02
10.0	5.72E+01	3.56E+01	1.24E+01	4.52E+00	5.25E+01	5.00E+02

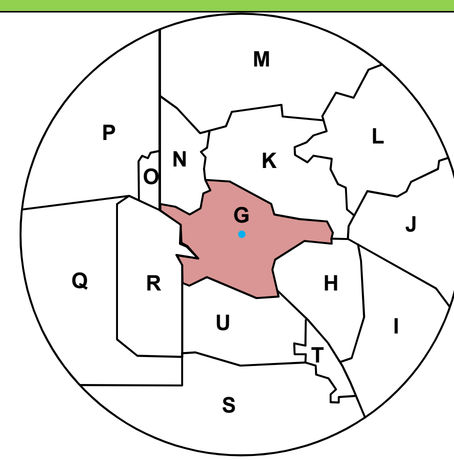
Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 161434.UR17

*** Classification: General Emergency ***

Reviewed By: ______________________________

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	6.56E-02 (0.0%)
Iodine	1.61E+00 (0.5%)
Noble Gas	3.52E+02 (99.5%)

U2 2RX-9825 (SPING 6) Radwaste Area Exhaust – Alert

Dose Assessment

ANO Unit 2 **Wednesday, October 07, 2015 16:18**

Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <Aux Bldg> <RWA Filters> < Env> PRF: 1.20E-03

Containment HUT: = < 2 Hours Containment Sprays: = ON Purge Filters: = N/A Steam Gen: = N/A

Aux / FHB HUT: = < 2 Hours Filters: = Working Turb Bldg HUT: = N/A

Source Term: Reactor Core Accident – Clad On Site 57 m

Time After S/D (hh:mm): 0:00 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

Monitor: RWA Gas Conc Readings: 2.35E-01 µCI/cc Flowrate: 50000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.24E+01	8.31E+00	9.39E-01	7.70E-01	1.00E+01	3.15E+01
0.7	1.16E+01	7.68E+00	9.00E-01	7.78E-01	9.36E+00	2.87E+01
1.0	8.36E+00	5.40E+00	7.60E-01	7.38E-01	6.90E+00	2.06E+01
1.5	5.52E+00	3.52E+00	5.92E-01	5.66E-01	4.67E+00	1.49E+01
2.0	3.74E+00	2.38E+00	4.56E-01	3.91E-01	3.22E+00	1.18E+01
3.0	3.33E+00	2.20E+00	3.23E-01	2.78E-01	2.80E+00	8.30E+00
4.0	2.54E+00	1.64E+00	2.60E-01	2.10E-01	2.11E+00	6.61E+00
5.0	2.12E+00	1.35E+00	2.26E-01	1.68E-01	1.74E+00	5.85E+00
7.0	1.54E+00	9.82E-01	1.75E-01	1.09E-01	1.27E+00	4.83E+00
10.0	8.92E-01	5.56E-01	1.03E-01	0.00E+00	6.59E-01	3.15E+00

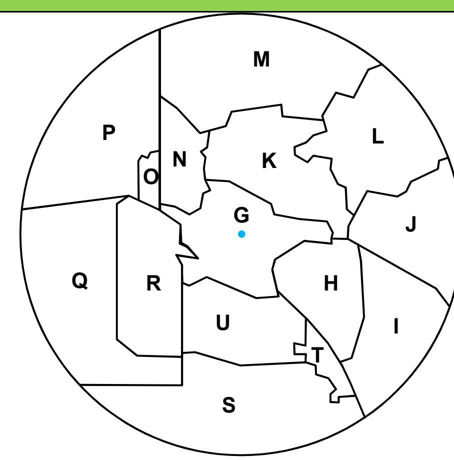
Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 161818.UR17

*** * * Classification: Validate against Emergency Action Levels * * ***

Reviewed By: ______________________________

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	4.13E-04 (0.0%)
Iodine	1.01E-02 (0.2%)
Noble Gas	5.55E+00 (99.8%)

U2 2RX-9825 (SPING 6) Radwaste Area Exhaust – Site Area Emergency

Dose Assessment

ANO Unit 2 **Wednesday, October 07, 2015 16:17**

Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <Aux Bldg> <RWA Filters> < Env> PRF: 1.20E-03

Containment HUT: = < 2 Hours Containment Sprays: = ON Purge Filters: = N/A Steam Gen: = N/A

Aux / FHB HUT: = < 2 Hours Filters: = Working Turb Bldg HUT: = N/A

Source Term: Reactor Core Accident – Clad On Site 57 m

Time After S/D (hh:mm): 0:00 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

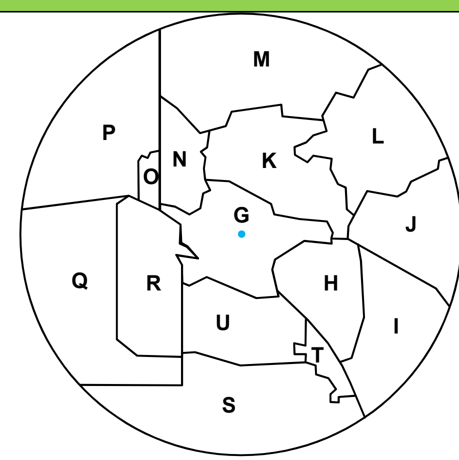
Monitor: RWA Gas Conc Readings: 2.35E+00 µCi/cc Flowrate: 50000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.24E+02	8.31E+01	9.39E+00	7.70E+00	1.00E+02	3.15E+02
0.7	1.16E+02	7.68E+01	9.00E+00	7.78E+00	9.36E+01	2.87E+02
1.0	8.36E+01	5.40E+01	7.60E+00	7.38E+00	6.90E+01	2.06E+02
1.5	5.52E+01	3.52E+01	5.92E+00	5.66E+00	4.67E+01	1.49E+02
2.0	3.74E+01	2.38E+01	4.56E+00	3.91E+00	3.22E+01	1.18E+02
3.0	3.33E+01	2.20E+01	3.23E+00	2.78E+00	2.80E+01	8.30E+01
4.0	2.54E+01	1.64E+01	2.60E+00	2.10E+00	2.11E+01	6.61E+01
5.0	2.12E+01	1.35E+01	2.26E+00	1.68E+00	1.74E+01	5.85E+01
7.0	1.54E+01	9.82E+00	1.75E+00	1.09E+00	1.27E+01	4.83E+01
10.0	8.92E+00	5.56E+00	1.03E+00	4.90E-01	7.08E+00	3.15E+01

Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 161756.UR17

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	4.13E-03 (0.0%)
Iodine	1.01E-01 (0.2%)
Noble Gas	5.55E+01 (99.8%)

*** * * Classification: Site Area Emergency * * ***

Reviewed By: ______________________________

U2 2RX-9825 (SPING 6) Radwaste Area Exhaust – General Emergency

Dose Assessment

ANO Unit 2 **Wednesday, October 07, 2015 16:17**

Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <Aux Bldg> <RWA Filters> < Env> PRF: 1.20E-03

Containment HUT: = < 2 Hours Containment Sprays: = ON Purge Filters: = N/A Steam Gen: = N/A

Aux / FHB HUT: = < 2 Hours Filters: = Working Turb Bldg HUT: = N/A

Source Term: Reactor Core Accident – Clad On Site 57 m

Time After S/D (hh:mm): 0:00 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

Monitor: RWA Gas Conc Readings: 2.35E+01 µCI/cc Flowrate: 50000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.24E+03	8.31E+02	9.39E+01	7.70E+01	1.00E+03	3.15E+03
0.7	1.16E+03	7.68E+02	9.00E+01	7.78E+01	9.36E+02	2.87E+03
1.0	8.36E+02	5.40E+02	7.60E+01	7.38E+01	6.90E+02	2.06E+03
1.5	5.52E+02	3.52E+02	5.92E+01	5.66E+01	4.67E+02	1.49E+03
2.0	3.74E+02	2.38E+02	4.56E+01	3.91E+01	3.22E+02	1.18E+03
3.0	3.33E+02	2.20E+02	3.23E+01	2.78E+01	2.80E+02	8.30E+02
4.0	2.54E+02	1.64E+02	2.60E+01	2.10E+01	2.11E+02	6.61E+02
5.0	2.12E+02	1.35E+02	2.26E+01	1.68E+01	1.74E+02	5.85E+02
7.0	1.54E+02	9.82E+01	1.75E+01	1.09E+01	1.27E+02	4.83E+02
10.0	8.92E+01	5.56E+01	1.03E+01	4.90E+00	7.08E+01	3.15E+02

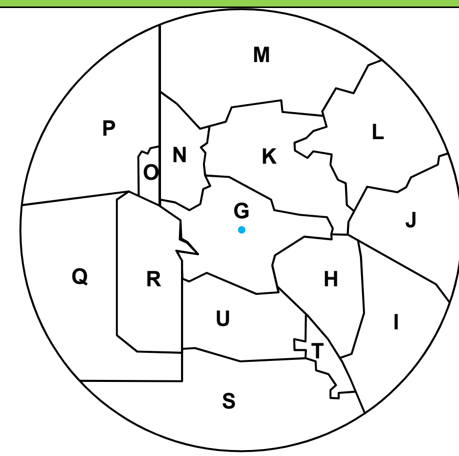
Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 161733.UR17

*** * * Classification: General Emergency * * ***

Reviewed By: ______________________________

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	4.13E-02 (0.0%)
Iodine	1.01E+00 (0.2%)
Noble Gas	5.55E+02 (99.8%)

U2 2RX-9830 (SPING 7) Spent Fuel Area Exhaust – Alert

Dose Assessment

ANO Unit 2 **Wednesday, October 07, 2015 16:28**

Method: Detailed Assessment – Monitored Release

Release Pathway: <SF> <Under Water> <Fuel Bldg> <FHA Filters> < Env> PRF: 4.00E-04

Containment HUT: = N/A Containment Sprays: = N/A Purge Filters: = N/A Steam Gen: = N/A

Aux / FHB HUT: = < 2 Hours Filters: = Working Turb Bldg HUT: = N/A

Source Term: Spent Fuel Accident – Under Water Damage: 0.560% On Site 57 m

Time After S/D (hh:mm): 80:02 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

Monitor: FH Gas Conc Readings: 6.86E+00 µCi/cc Flowrate: 36000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.42E+01	9.98E+00	0.00E+00	0.00E+00	9.98E+00	3.89E+00
0.7	1.31E+01	9.20E+00	0.00E+00	0.00E+00	9.20E+00	3.54E+00
1.0	9.60E+00	6.72E+00	0.00E+00	0.00E+00	6.72E+00	2.54E+00
1.5	6.80E+00	4.76E+00	0.00E+00	0.00E+00	4.76E+00	1.84E+00
2.0	5.36E+00	3.75E+00	0.00E+00	0.00E+00	3.75E+00	1.46E+00
3.0	3.69E+00	2.56E+00	0.00E+00	0.00E+00	2.56E+00	1.03E+00
4.0	3.11E+00	2.10E+00	0.00E+00	0.00E+00	2.10E+00	8.19E-01
5.0	2.87E+00	1.92E+00	0.00E+00	0.00E+00	1.92E+00	7.27E-01
7.0	2.54E+00	1.69E+00	0.00E+00	0.00E+00	1.69E+00	6.03E-01
10.0	1.88E+00	1.20E+00	0.00E+00	0.00E+00	1.20E+00	3.95E-01

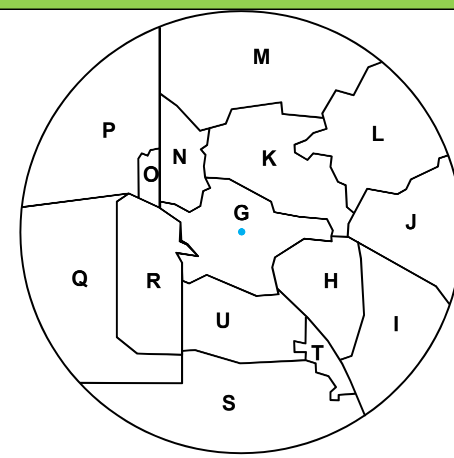
Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 162831.UR17

*** * * Classification: Validate against Emergency Action Levels * * ***

Reviewed By: ______________________________

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	9.68E-05 (0.0%)
Iodine	2.30E-04 (0.0%)
Noble Gas	1.17E+02 (100.0%)

U2 2RX-9830 (SPING 7) Spent Fuel Area Exhaust – Site Area Emergency

Dose Assessment

ANO Unit 2 — **Wednesday, October 07, 2015 16:28**

Method: Detailed Assessment – Monitored Release

Release Pathway: <SF> <Under Water> <Fuel Bldg> <FHA Filters> < Env> PRF: 4.00E-04

Containment HUT: = N/A Containment Sprays: = N/A Purge Filters: = N/A Steam Gen: = N/A

Aux / FHB HUT: = < 2 Hours Filters: = Working Turb Bldg HUT: = N/A

Source Term: Spent Fuel Accident – Under Water Damage: 0.560% On Site 57 m

Time After S/D (hh:mm): 80:02 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

Monitor: FH Gas Conc Readings: 6.86E+01 µCi/cc Flowrate: 36000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.42E+02	9.98E+01	8.73E-01	2.18E-01	1.01E+02	3.89E+01
0.7	1.31E+02	9.20E+01	7.96E-01	1.98E-01	9.30E+01	3.54E+01
1.0	9.60E+01	6.72E+01	5.68E-01	1.42E-01	6.79E+01	2.54E+01
1.5	6.80E+01	4.76E+01	4.12E-01	1.03E-01	4.81E+01	1.84E+01
2.0	5.36E+01	3.75E+01	3.27E-01	0.00E+00	3.78E+01	1.46E+01
3.0	3.69E+01	2.56E+01	2.29E-01	0.00E+00	2.58E+01	1.03E+01
4.0	3.11E+01	2.10E+01	1.83E-01	0.00E+00	2.12E+01	8.19E+00
5.0	2.87E+01	1.92E+01	1.62E-01	0.00E+00	1.94E+01	7.26E+00
7.0	2.54E+01	1.69E+01	1.34E-01	0.00E+00	1.70E+01	6.03E+00
10.0	1.88E+01	1.20E+01	0.00E+00	0.00E+00	1.20E+01	3.95E+00

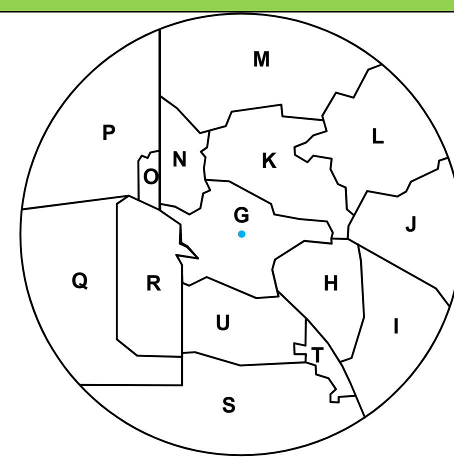
Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 162808.UR17

*** * * Classification: Site Area Emergency * * ***

Reviewed By: ______________________________

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)

Particulate	9.68E-04 (0.0%)
Iodine	2.30E-03 (0.0%)
Noble Gas	1.17E+03 (100.0%)

U2 2RX-9830 (SPING 7) Spent Fuel Area Exhaust – General Emergency

Dose Assessment

ANO Unit 2 **Wednesday, October 07, 2015 16:27**

Method: Detailed Assessment – Monitored Release

Release Pathway: <SF> <Under Water> <Fuel Bldg> <FHA Filters> < Env> PRF: 4.00E-04

Containment HUT: = N/A Containment Sprays: = N/A Purge Filters: = N/A Steam Gen: = N/A

Aux / FHB HUT: = < 2 Hours Filters: = Working Turb Bldg HUT: = N/A

Source Term: Spent Fuel Accident – Under Water Damage: 0.560% On Site 57 m

Time After S/D (hh:mm): 80:02 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

Monitor: FH Gas Conc Readings: 6.86E+02 µCI/cc Flowrate: 36000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.42E+03	9.98E+02	8.73E+00	2.18E+00	1.01E+03	3.89E+02
0.7	1.31E+03	9.20E+02	7.96E+00	1.98E+00	9.30E+02	3.54E+02
1.0	9.60E+02	6.72E+02	5.68E+00	1.42E+00	6.79E+02	2.54E+02
1.5	6.80E+02	4.76E+02	4.12E+00	1.03E+00	4.81E+02	1.84E+02
2.0	5.36E+02	3.75E+02	3.27E+00	8.14E-01	3.79E+02	1.46E+02
3.0	3.69E+02	2.56E+02	2.29E+00	5.05E-01	2.58E+02	1.03E+02
4.0	3.11E+02	2.10E+02	1.83E+00	3.93E-01	2.13E+02	8.19E+01
5.0	2.87E+02	1.92E+02	1.62E+00	3.43E-01	1.94E+02	7.26E+01
7.0	2.54E+02	1.69E+02	1.34E+00	2.78E-01	1.70E+02	6.03E+01
10.0	1.88E+02	1.20E+02	8.76E-01	1.75E-01	1.21E+02	3.95E+01

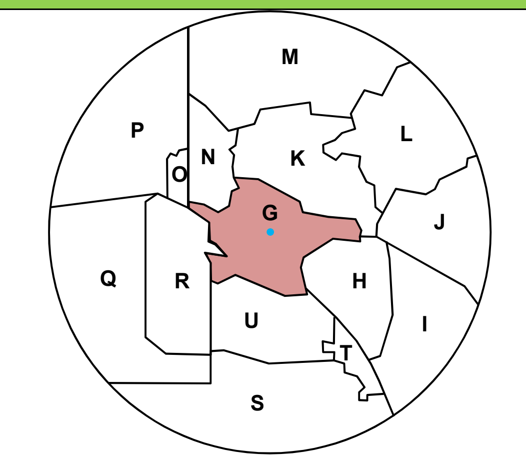
Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 162750.UR17

*** * * Classification: General Emergency * * ***

Reviewed By: ______________________________

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	9.68E-03 (0.0%)
Iodine	2.30E-02 (0.0%)
Noble Gas	1.17E+04 (100.0%)

U2 2RX-9835 (SPING 8) Penetration Room Exhaust – Alert

Dose Assessment

ANO Unit 2 — **Wednesday, October 07, 2015 16:31**

Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <Aux Bldg> <EPPR Filters> < Env> — PRF: 1.20E-03

Containment HUT: = < 2 Hours — Containment Sprays: = ON — Purge Filters: = N/A — Steam Gen: = N/A

Aux / FHB HUT: = < 2 Hours — Filters: = Working — Turb Bldg HUT: = N/A

Source Term: Reactor Core Accident – Clad — On Site 57 m

Time After S/D (hh:mm): 0:00 — Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 — ETE (hh:mm): [N/A] — Stability Class: E

Precipitation: None

Monitor: EPPR Gas Conc — Readings: 5.88E+00 µCi/cc — Flowrate: 2000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.25E+01	8.32E+00	9.40E-01	7.74E-01	1.01E+01	3.16E+01
0.7	1.16E+01	7.68E+00	9.00E-01	7.83E-01	9.36E+00	2.88E+01
1.0	8.40E+00	5.44E+00	7.60E-01	7.41E-01	6.94E+00	2.06E+01
1.5	5.56E+00	3.53E+00	5.92E-01	5.69E-01	4.69E+00	1.49E+01
2.0	3.74E+00	2.38E+00	4.56E-01	3.93E-01	3.23E+00	1.18E+01
3.0	3.34E+00	2.21E+00	3.24E-01	2.80E-01	2.81E+00	8.31E+00
4.0	2.55E+00	1.64E+00	2.61E-01	2.11E-01	2.11E+00	6.62E+00
5.0	2.12E+00	1.35E+00	2.27E-01	1.69E-01	1.75E+00	5.86E+00
7.0	1.54E+00	9.84E-01	1.75E-01	1.09E-01	1.27E+00	4.84E+00
10.0	8.92E-01	5.57E-01	1.03E-01	0.00E+00	6.60E-01	3.15E+00

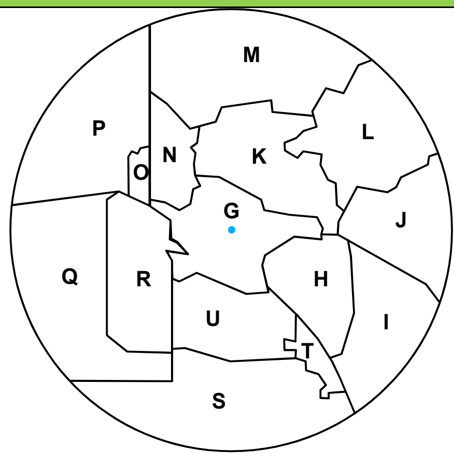
Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 163140.UR17

*** * * Classification: Validate against Emergency Action Levels * * ***

Reviewed By: ______________________

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)	
Particulate	4.13E-04 (0.0%)
Iodine	1.01E-02 (0.2%)
Noble Gas	5.55E+00 (99.8%)

U2 2RX-9835 (SPING 8) Penetration Room Exhaust – Site Area Emergency

Dose Assessment

ANO Unit 2 — **Wednesday, October 07, 2015 16:31**

Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <Aux Bldg> <EPPR Filters> < Env> — PRF: 1.20E-03

Containment HUT: = < 2 Hours — Containment Sprays: = ON — Purge Filters: = N/A — Steam Gen: = N/A

Aux / FHB HUT: = < 2 Hours — Filters: = Working — Turb Bldg HUT: = N/A

Source Term: Reactor Core Accident – Clad — On Site 57 m

Time After S/D (hh:mm): 0:00 — Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 — ETE (hh:mm): [N/A] — Stability Class: E

Precipitation: None

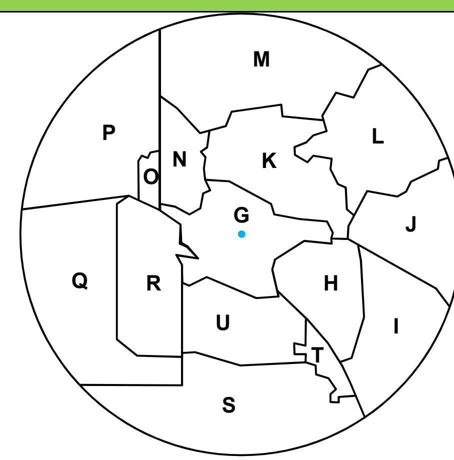
Monitor: EPPR Gas Conc — Readings: 5.88E+01 µCi/cc — Flowrate: 2000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.25E+02	8.32E+01	9.40E+00	7.74E+00	1.01E+02	3.16E+02
0.7	1.16E+02	7.68E+01	9.00E+00	7.83E+00	9.36E+01	2.88E+02
1.0	8.40E+01	5.44E+01	7.60E+00	7.41E+00	6.94E+01	2.06E+02
1.5	5.56E+01	3.53E+01	5.92E+00	5.69E+00	4.69E+01	1.49E+02
2.0	3.74E+01	2.38E+01	4.56E+00	3.93E+00	3.23E+01	1.18E+02
3.0	3.34E+01	2.21E+01	3.24E+00	2.80E+00	2.81E+01	8.31E+01
4.0	2.55E+01	1.64E+01	2.61E+00	2.11E+00	2.11E+01	6.62E+01
5.0	2.12E+01	1.35E+01	2.27E+00	1.69E+00	1.75E+01	5.86E+01
7.0	1.54E+01	9.84E+00	1.75E+00	1.09E+00	1.27E+01	4.84E+01
10.0	8.92E+00	5.57E+00	1.03E+00	4.92E-01	7.09E+00	3.15E+01

Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 163125.UR17

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)

Particulate	4.13E-03 (0.0%)
Iodine	1.01E-01 (0.2%)
Noble Gas	5.55E+01 (99.8%)

*** * * Classification: Site Area Emergency * * ***

Reviewed By: ______________________________

Radiological Effluent EAL Values

EP-CALC-ANO-1701, Rev. 1

U2 2RX-9835 (SPING 8) Penetration Room Exhaust – General Emergency

Dose Assessment

ANO Unit 2 **Wednesday, October 07, 2015 16:31**

Method: Detailed Assessment – Monitored Release

Release Pathway: <RCS> <Containment> <Aux Bldg> <EPPR Filters> < Env> PRF: 1.20E-03

Containment HUT: = < 2 Hours Containment Sprays: = ON Purge Filters: = N/A Steam Gen: = N/A

Aux / FHB HUT: = < 2 Hours Filters: = Working Turb Bldg HUT: = N/A

Source Term: Reactor Core Accident – Clad On Site 57 m

Time After S/D (hh:mm): 0:00 Wind: From 270° @ 5.8 mph

Release Duration (hh:mm): 1.:00 ETE (hh:mm): [N/A] Stability Class: E

Precipitation: None

Monitor: EPPR Gas Conc Readings: 5.88E+02 µCI/cc Flowrate: 2000 CFM

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem
S.B.	1.25E+03	8.32E+02	9.40E+01	7.74E+01	1.00E+03	3.16E+03
0.7	1.16E+02	7.68E+02	9.00E+01	7.83E+01	9.36E+02	2.88E+03
1.0	8.40E+02	5.44E+02	7.60E+01	7.41E+01	6.94E+02	2.06E+03
1.5	5.56E+02	3.53E+02	5.92E+01	5.69E+01	4.69E+02	1.49E+03
2.0	3.74E+02	2.38E+02	4.56E+01	3.93E+01	3.23E+02	1.18E+03
3.0	3.34E+02	2.21E+02	3.24E+01	2.80E+01	2.81E+02	8.31E+02
4.0	2.55E+02	1.64E+02	2.61E+01	2.11E+01	2.11E+02	6.62E+02
5.0	2.12E+02	1.35E+02	2.27E+01	1.69E+01	1.75E+02	5.86E+02
7.0	1.54E+02	9.84E+01	1.75E+01	1.09E+01	1.27E+02	4.84E+02
10.0	8.92E+01	5.57E+01	1.03E+01	4.92E+00	7.09E+01	3.15E+02

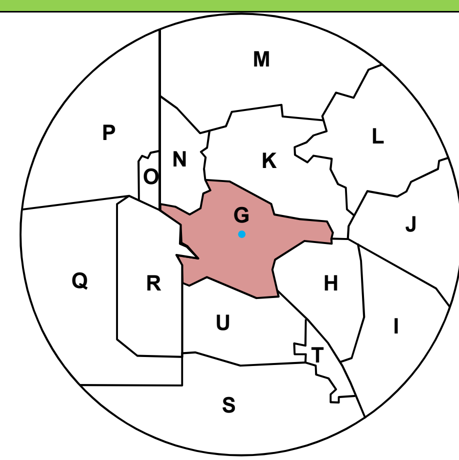
Assessment Data Results Save to File:

ANO Unit 1 10Miles Monitored Release 10072015 163106.UR17

*** * * Classification: General Emergency * * ***

Reviewed By: ______________________________

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

Release Rates (Ci/sec)

Particulate	4.13E-02 (0.0%)
Iodine	1.01E+00 (0.2%)
Noble Gas	5.55E+02 (99.8%)

Containment High Range Radiation Monitor EAL Values

EP-CALC-ANO-1702, Rev. 0

Table of Contents

1. PURPOSE

The Arkansas Nuclear One (ANO) Emergency Action Level (EAL) Technical Bases Manual contains background information, event declaration thresholds, bases and references for the EAL and Fission Product Barrier (FPB) values used to implement the Nuclear Energy Institute (NEI) 99-01 Revision 6 EAL guidance. This calculation document provides additional technical detail specific to the derivation of the FPB containment high range radiation monitor (CHRRM) readings developed in accordance with the guidance in NEI 99-01 Revision 6.

Documentation of the assumptions, calculations and results are provided for the values associated the NEI 99-01 Revision 6 Table 9-F-3, PWR EAL Fission Product Barrier Table, thresholds listed below.

- NEI Fuel Clad Loss 3.A
- NEI Reactor Coolant Loss 3.A
- NEI Containment Potential Loss 3.A

2. DEVELOPMENT METHODOLOGY AND BASES

2.1 Fuel Clad Loss

Guidance Criteria

Per NEI 99-01 Revision 6, this radiation monitor reading corresponds to an instantaneous release of all reactor coolant mass into the primary containment, assuming that reactor coolant activity equals 300 μCi/gm dose equivalent I-131 (DEI-131). Reactor coolant activity above this level is greater than that expected for iodine spikes and corresponds to an approximate range of 2% to 5% fuel clad damage. Since this condition indicates that a significant amount of fuel clad damage has occurred, it represents a loss of the fuel clad barrier.

The radiation monitor reading in this threshold is higher than that specified for RCS barrier loss threshold since it indicates a loss of both the fuel clad barrier and the RCS barrier.

The reading should be determined assuming the instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory, with RCS radioactivity concentration equal to 300 μCi/gm dose equivalent I-131, into the primary containment atmosphere.

ANO Bases

The fuel clad FPB threshold value is based on an instantaneous release of reactor coolant into the containment at a percent fuel clad damage equivalent to 300 μCi/gm DEI-131 RCS activity. That percent fuel clad damage value is ratioed to a containment radiation reading for 100% fuel clad damage to determine the fuel clad FPB threshold value in R/hr.

2.2 Reactor Coolant System Loss

Guidance Criteria

Per NEI 99-01 Revision 6, this radiation monitor reading corresponds to an instantaneous release of all reactor coolant mass into the primary containment, assuming that reactor coolant activity equals Technical Specification allowable limits. This value is lower than that specified for fuel clad barrier loss threshold since it indicates a loss of the RCS barrier only.

The reading should be determined assuming the instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory, with RCS activity at Technical Specification allowable limits, into the primary containment atmosphere. RCS activity at this level will typically result in primary containment radiation levels that can be more readily detected by primary containment radiation monitors, and more readily differentiated from those caused by piping or component “shine” sources. If desired, a plant may use a lesser value of RCS activity for determining this value.

In some cases, the site-specific physical location and sensitivity of the containment radiation monitor(s) may be such that radiation from a cloud of released RCS gases cannot be distinguished from radiation emanating from piping and components containing elevated reactor coolant activity. If so, determine if an alternate indication is available.

ANO Bases

The ANO technical specification high value for DEI-131 is 60 µCi/gm. This activity would yield a containment radiation monitor reading approximately 5x lower than the fuel clad loss fission product barrier containment radiation reading equivalent to 300 µCi/gm. NUREG-1940 Figure 1-1 provides estimates for standard plant containment radiation based on spiked RCS activity, which is slightly less than half the value obtained by the 300 µCi/gm to 60 µCi/gm DEI-131 ratio.

NUREG-1940 Figure 1-1 models a spiked RCS activity that is lower than the RCS activity equivalent to 60 µCi/gm DEI-131 described above (the NUREG-1940 graph is based on a release into containment of 100 times the non-noble gas fission products normally found in the coolant). This is the preferred value for the RCS loss threshold as it provides for a containment monitor escalation of approximately one decade between fission product barrier thresholds at the 1 hour point. NEI 99-01 guidance criteria allows the use of a lesser value for RCS activity (see guidance criteria section above).

The ANO RCS FPB threshold value is based on NUREG-1940 standard plant containment radiation readings for an instantaneous release of spiked reactor coolant, which is lower than 60 µCi/gm DEI-131 Technical Specification allowable limits, and is adjusted for the site specific power rating.

2.3 Containment Potential Loss

Guidance Criteria

Per NEI 99-01 Revision 6, this radiation monitor reading corresponds to an instantaneous release of all reactor coolant mass into the primary containment, assuming that 20% of the fuel cladding has failed. This level of fuel clad failure is well above that used to determine the analogous fuel clad and RCS barrier loss thresholds.

NUREG-1228 indicates the fuel clad failure must be greater than approximately 20% in order for there to be a major release of radioactivity requiring offsite protective actions. For this condition to exist, there must already have been a loss of the RCS and the fuel clad barriers. It is therefore prudent to treat this condition as a potential loss of containment which would then escalate the classification level to a General Emergency.

NUREG-1228 provides the basis for using the 20% fuel cladding failure value. Unless there is a site-specific analysis justifying a different value, the reading should be determined assuming the instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory associated with 20% fuel clad failure into the primary containment atmosphere.

ANO Bases

The Containment FPB threshold value is based on an instantaneous release of all reactor coolant into the containment at an equivalent of 20% clad damage.

The ANO FPB containment radiation reading value equivalent to 20% fuel clad damage is obtained by ratio of the 100% fuel clad damage containment radiation reading value to 20% fuel clad damage.

2.4 Source Term

Guidance Criteria

NEI 99-01 does not specify a basis for the source term activity or the reduction factors.

RG 1.183 provides assumptions for a LOCA used as a reference for FSAR design basis event analysis. Per RG 1.183 Section 1.1.4, Emergency Preparedness Applications:

> *Requirements for emergency preparedness at nuclear power plants are set forth in 10 CFR 50.47, "Emergency Plans." Additional requirements are set forth in Appendix E, "Emergency Planning and Preparedness for Production and Utilization Facilities," to 10 CFR Part 50. The planning basis for many of these requirements was published in NUREG-0396, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants". This joint effort by the Environmental Protection Agency (EPA) and the NRC considered the principal characteristics (such as nuclides released and distances) likely to be involved for a spectrum of design basis and severe (core melt) accidents. No single accident scenario is the basis of the required preparedness. The*

objective of the planning is to provide public protection that would encompass a wide spectrum of possible events with a sufficient basis for extension of response efforts for unanticipated events. These requirements were issued after a long period of involvement by numerous stakeholders, including the Federal Emergency Management Agency, other Federal agencies, local and State governments (and in some cases, foreign governments), private citizens, utilities, and industry groups.

Although the AST provided in this guide was based on a limited spectrum of severe accidents, the particular characteristics have been tailored specifically for DBA analysis use. The AST is not representative of the wide spectrum of possible events that make up the planning basis of emergency preparedness. Therefore, the AST is insufficient by itself as a basis for requesting relief from the emergency preparedness requirements of 10 CFR 50.47 and Appendix E to 10 CFR Part 50.

Thus, RG 1.183 is not used as a basis for the containment radiation monitor thresholds.

Guidance contained in NUREG-1940 is considered representative of the wide spectrum of possible events that make up the emergency preparedness planning basis and provides radiological consequence assessment methods which are acceptable to the NRC. Additionally, the source term used to develop the effluent EAL thresholds and in the Unified RASCAL Interface/Radiological Assessment System for Consequence Analysis (URI/RASCAL) dose assessment model is from NUREG-1940. Thus, NUREG-1940 has been selected as a source term basis for the fission product barrier containment radiation thresholds for conformance to NRC guidance and consistency with other source term bases used within the Entergy emergency preparedness program.

ANO Bases

2.4.1 The NUREG-1940 source term inputs used for the fission product barrier containment radiation thresholds are as follows:

Fuel Clad Damage Equivalent to 300 µCi/g DEI-131 – NUREG-1940 Table 1-1 equilibrium core activity, in conjunction with the NUREG-1940 Table 1-5 non-noble gas release fraction, is used to develop the site specific iodine source term.

Fuel Clad and Containment Barrier Thresholds – NUREG-1940 Figure 1-1 for cladding failure is used as a basis to establish these thresholds.

RCS Barrier Threshold – NUREG-1940 Figure 1-1 for spiked coolant is used as a basis to establish this threshold.

Note – Source term reduction from containment spray is not included as an assumption for these thresholds.

2.4.2 NUREG-1940 source term is based on a generic plant with a power rating of 3000 MWt. The ANO site specific source term is derived from the licensed core thermal power output of 2,568 megawatts for Unit 1 and 3,026 megawatts for Unit 2 (SAR Section 1.1).

2.4.3 Dose equivalent iodine 131 (DEI-131) dose conversion factors (DCFs) are developed from EPA-400-R-92-001 isotopic DCFs. EPA-400 is the basis for the protective action guidelines and is the appropriate source for DCFs used in emergency preparedness.

The DEI-131 dose conversion factors are not based on the FSAR Chapter 15 or other 10 CFR 20 reference sources as those are not reflective of the exposure assumptions used within the EPA guidance for emergency preparedness use.

2.5 Decay Considerations

Guidance Criteria

Fission product barrier thresholds and their associated EALs are applicable only when the plant is in Hot Shutdown, Startup, or Power Operation modes (known as the hot operating modes).

The events for these thresholds correspond to an instantaneous release of all reactor coolant mass into the primary containment.

ANO Bases

Consistent with the NUREG-1940 graphs, the instantaneous release of the RCS to the containment is assumed to occur one hour after the damage event / reactor scram to account for damage progression, dispersion of activity and decay of the very short half-life isotopes.

3. DESIGN INPUTS

3.1 Constants and Conversion Factors

None

3.2 Plant Inputs

3.2.1 Rated Power

1) Standard Plant (NUREG-1940 Section 1.2.4) ....3,000 MWt
2) Unit 1 (SAR Section 1.1) ....2,568 MWt
3) Unit 2 (SAR Section 1.1) ....3,026 MWt

3.2.2 RCS Water Mass at STP (1302.022 Attachment 3 Section 2.3)

1) Unit 1 .... 2.41E+8 gm
2) Unit 2 .... 2.14E+8 gm

3.2.3 Standard Plant Containment Radiation Reading (NUREG-1940 Figure 1-1)

1) 100% fuel clad damage (spray off).................. 60,000 R/hr (@ 1 hr after shutdown)
2) 100% spiked coolant (spray off) .... 50 R/hr (@ 1 hr after shutdown)

3.2.4 Monitor Range

1) RE-8060/8061 (TM GO63.0010/TD G063 0020) .... 1.00E+0 to 1.00E+8 R/hr
2) 2RE-8925-1/2RE-8925-2 (TM GO63.0010/TD G063 0020)1.00E+0 to 1.00E+8 R/hr

3.3 <u>Source Term</u>

3.3.1 Source Term Activity (NUREG-1940 Table 1-1)

	Core Activity (Ci/MWt)
1-131	2.67E+04
1-132	3.88E+04
1-133	5.42E+04
1-134	5.98E+04
1-135	5.18E+04

3.3.2 Monitor Range

1) Non-Noble Gasses (I, Cs, Rb) – Fuel Clad Damage................................. 0.05 (5%)

3.3.3 Release Fractions – RF_{Core} (NUREG-1940 Table 1-5)

	Rem/hr per µCi/cc
1-131	1.3E+06
1-132	7.7E+03
1-133	2.2E+05
1-134	1.3E+03
1-135	3.8E+04

4. CALCULATIONS

4.1 Fuel Clad Damage Estimate Based on 300 µCi/gm DEI-131

4.1.1 Equivalent Iodine Core Activity

$$100\%\ Core\ Activity_i(Ci) = Core\ Activity_i(Ci/MWt) \times Unit\ MWt$$

	Core Activity (Ci)	
	Unit 1	**Unit 2**
1-131	6.86E+07	8.08E+07
1-132	9.96E+07	1.17E+08
1-133	1.39E+08	1.64E+08
1-134	1.54E+08	1.81E+08
1-135	1.33E+08	1.57E+08
Total	5.94E+08	7.00E+08

4.1.2 100% Core Activity Equivalent Reactor Coolant Iodine Concentrations

$$100\%\ Core\ RCS\ Activity_i(\mu Ci/gm) = \frac{100\%\ Core\ RCS\ Activity_i(Ci) \times 10^6}{RCS\ Mass\ (gm)}$$

	RCS Activity (µCi/gm)	
	Unit 1	**Unit 2**
1-131	2.85E+05	3.78E+05
1-132	4.13E+05	5.49E+05
1-133	5.78E+05	7.66E+05
1-134	6.37E+05	8.46E+05
1-135	5.52E+05	7.32E+05
Total	2.46E+06	3.27E+06

4.1.3 100% Core Activity Equivalent Reactor Coolant Iodine Concentrations

$$100\%\ Clad\ Damage\ RCS\ Activity_i(\mu Ci/gm) = 100\%\ Core\ RCS\ Activity_i(\mu Ci/gm) \times RF_{Core}$$

	RCS Activity (µCi/gm)	
	Unit 1	**Unit 2**
1-131	1.42E+04	1.89E+04
1-132	2.07E+04	2.74E+04
1-133	2.89E+04	3.83E+04
1-134	3.19E+04	4.23E+04
1-135	2.76E+04	3.66E+04
Total	1.23E+05	1.64E+05

4.1.4 100% Fuel Clad Damage Activity Equivalent Reactor Coolant DEI-131 Concentrations

$$100\%\ \textit{DEI RCS Activity}_i(\mu Ci/gm) =$$
$$= \sum 100\%\ \textit{Clad Damage RCS Activity}_i(\mu Ci/gm) \times \textit{DEI DCF}_i$$

Note – The DEI DCF value for each iodine isotope is determined as follows:

$$\textit{DEI DCF}_i = \frac{\textit{EPA} - 400\ \textit{Table}\ 5 - 2\ \textit{Iodine DCF}_i(\textit{Rem/hr per}\ \mu Ci/cc)}{\textit{EPA} - 400\ \textit{Table}\ 5 - 2\ \textit{Iodine DCF}_{I\text{-}131}(\textit{Rem/hr per}\ \mu Ci/cc)}$$

	DEI DCF (unit less)	RCS Activity (µCi/gm)	
		Unit 1	Unit 2
1-131	1.00E+00	1.42E+04	1.89E+04
1-132	5.92E-03	1.22E+02	1.62E+02
1-133	1.69E-01	4.89E+03	6.48E+03
1-134	1.00E-03	3.19E+01	4.23E+01
1-135	2.92E-02	8.07E+02	1.07E+03
Total		2.01E+04	2.66E+04

4.1.5 % Fuel Clad Damage Activity Equivalent Reactor Coolant at 300 µCi/gm DEI-131

$$\%\ \textit{Clad Damage} = \frac{300\ \mu Ci/gm}{100\%\ \textit{DEI RCS Activity}(\mu Ci/gm)}$$

U1 300 µCi/gm DEI-131..1.49% Fuel Clad Damage

U2 300 µCi/gm DEI-131..1.13% Fuel Clad Damage

See Attachment 1 for the spreadsheet calculations that develop the fuel clad source term activity and the % clad damage.

4.2 Fission Product Barrier Thresholds

See Attachment 2 for the spreadsheet calculations that develop the FPB threshold monitor readings.

4.2.1 Containment Potential Loss (20% Fuel Clad Damage Monitor Reading)

$$\text{Unit}_{20\%\ clad}(R/hr) = \textit{Std Plant}_{100\%\ clad}(R/hr) \times 20\% \times \frac{MWt_{Unit}}{MWt_{Std\ Plant}}$$

U1 Containment Potential Loss Threshold Monitor Reading........... 1.03E+4 R/hr

U2 Containment Potential Loss Threshold Monitor Reading........... 1.21E+4 R/hr

4.2.2 Fuel Clad Loss (300 µCi/gm DEI-131 Equivalent Clad Damage Monitor Reading)

$$\text{Unit}_{1.49\%\ clad}(R/hr) = Std\ Plant_{100\%\ clad}(R/hr) \times 1.49\% \times \frac{MWt_{U1}}{MWt_{Std\ Plant}}$$

$$\text{Unit}_{1.13\%\ clad}(R/hr) = Std\ Plant_{100\%\ clad}(R/hr) \times 1.13\% \times \frac{MWt_{U2}}{MWt_{Std\ Plant}}$$

U1 Fuel Clad Loss Threshold Monitor Reading................................	**7.68E+2 R/hr**
U2 Fuel Clad Loss Threshold Monitor Reading................................	**6.82E+2 R/hr**

4.2.3 RCS Loss (Spiked Coolant Monitor Reading)

$$\text{Unit}_{Spiked}(R/hr) = Std\ Plant_{100\%\ Spiked}(R/hr) \times \frac{MWt_{Unit}}{MWt_{Std\ Plant}}$$

U1 RCS Loss Threshold Monitor Reading	**4.28E+1 R/hr**
U2 RCS Loss Threshold Monitor Reading	**5.04E+1 R/hr**

5. CONCLUSIONS

5.1 300 µCi/gm DEI-131 is equivalent to:

1) Unit 1 .... 1.49% fuel clad (gap) damage
2) Unit 2 .... 1.13% fuel clad (gap) damage

5.2 Calculated containment high range radiation monitor values are as follows:

	Fuel Clad Loss	RCS Loss	Containment Potential Loss
Unit 1	7.68E+2 R/hr	4.28E+1 R/hr	1.03E+4 R/hr
Unit 2	6.82E+2 R/hr	5.04E+1 R/hr	1.21E+4 R/hr

Based on monitor accuracy/readability and human factors, the EAL Fission Product Barrier thresholds are established as follows:

	Fuel Clad Loss	RCS Loss	Containment Potential Loss
Unit 1	750 R/hr	40 R/hr	10,000 R/hr
Unit 2	700 R/hr	50 R/hr	12,000 R/hr

6. REFERENCES

6.1 NEI 99-01 R6, Development of Emergency Action Levels for Non-Passive Reactors, September 2012

6.2 EPA-400-R-92-001, Manual of Protective action Guides and Protective Actions for Nuclear Incidents, May 1992

6.3 NUREG-1940, RASCAL 4: Description of Models and Methods, December 2012

6.4 NUREG-1228, Source Term Estimation During Incident Response to Severe Nuclear Power Plant Accidents, October 1988

6.5 Regulatory Guide 1.183, Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors, July 2000

6.6 ANO1 Safety Analysis Report (SAR)

1) Section 1.1, Introduction, Amendment 20

6.7 ANO2 Safety Analysis Report (SAR)

1) Section 1.1, Introduction, Amendment 17

6.8 ANO1 Technical Specifications

1) Section 3.4.12, RCS Specific Activity, Amendment 243

6.9 ANO2 Technical Specifications

1) Section 3.4.8, RCS Specific Activity, Amendment 293

6.10 1302.022, Core Damage Assessment, Change 5

6.11 TM GO63.00, General Atomic Tech Manual, Revision 2

6.12 TD G063 0020, General Atomic Tech Manual, Revision 2

ATTACHMENT 1

300 µCi/gm DEI-131 Equivalent Clad Damage

Unit 1

	NUREG-1940 Table 1-1 Core Activity (Ci/MWt)	U1 Core Activity (Ci)	U1 RCS Activity (µCi/gm 100% Core)	U1 RCS Activity (µCi/gm 100% Clad)	EPA-400 Table 5-2 Dose Conversion Factors (Rem/hr per µCi/cc)	DEI DCF	U1 RCS Activity (µCi/gm 100% Gap DEI)
I-131	2.67E+04	6.86E+07	2.85E+05	1.42E+04	1.30E+06	1.00E+00	1.42E+04
I-132	3.88E+04	9.96E+07	4.13E+05	2.07E+04	7.70E+03	5.92E-03	1.22E+02
I-133	5.42E+04	1.39E+08	5.78E+05	2.89E+04	2.20E+05	1.69E-01	4.89E+03
I-134	5.98E+04	1.54E+08	6.37E+05	3.19E+04	1.30E+03	1.00E-03	3.19E+01
I-135	5.18E+04	1.33E+08	5.52E+05	2.76E+04	3.80E+04	2.92E-02	8.07E+02
Total	2.31E+04	5.94E+08	2.46E+06	1.23E+05			2.01E+04

U1 Rate Power (MWt):	2568
RCS Liquid Volume (gm):	2.41E+08
Halogen Release Fraction:	5.0%
Target DEI:	3.00E+02
%Clad Damage:	1.49%

Unit 2

	NUREG-1940 Table 1-1 Core Activity (Ci/MWt)	U2 Core Activity (Ci)	U2 RCS Activity (µCi/gm 100% Core)	U2 RCS Activity (µCi/gm 100% Clad)	EPA-400 Table 5-2 Dose Conversion Factors (Rem/hr per µCi/cc)	DEI DCF	U2 RCS Activity (µCi/gm 100% Gap DEI)
I-131	2.67E+04	8.08E+07	3.78E+05	1.89E+04	1.30E+06	1.00E+00	1.89E+04
I-132	3.88E+04	1.17E+08	5.49E+05	2.74E+04	7.70E+03	5.92E-03	1.62E+02
I-133	5.42E+04	1.64E+08	7.66E+05	3.83E+04	2.20E+05	1.69E-01	6.48E+03
I-134	5.98E+04	1.81E+08	8.46E+05	4.23E+04	1.30E+03	1.00E-03	4.23E+01
I-135	5.18E+04	1.57E+08	7.32E+05	3.66E+04	3.80E+04	2.92E-02	1.07E+03
Total	2.31E+05	7.00E+08	3.27E+06	1.64E+05			2.66E+04

U2 Rate Power (MWt):	3026
RCS Liquid Volume (gm):	2.14E+08
Halogen Release Fraction:	5.0%
Target DEI:	3.00E+02
%Clad Damage:	1.13%

ATTACHMENT 2
Fission Product Barrier Threshold Values

	Rated Power (MWt)	Reading for 100% Clad Failure (R/hr)	Reading for 20% Clad Failure (R/hr)	% Damage for 300 µCi/gm RCS Activity	Reading for 300 µCi/gm RCS Activity (R/hr)	Reading for Spiked RCS Activity (R/hr)
Unit 1	2568	5.14E+04	1.03E+04	1.49%	7.68E+02	4.28E+01
Unit 2	3026	6.05E+04	1.21E+04	1.13%	6.82E+02	5.04E+01

NUREG-1940 100% Clad Failure (R/hr):	6.00E+04
NUREG-1940 100% Spiked Coolant (R/hr):	5.00E+01
Standard Plant (MWt):	3000

ATTACHMENT 3

NUREG-1940 Figure 1-1 PWR Containment Monitor Response