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0CAN050503

May 31, 2005

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: Arkansas Nuclear One – Response to Request for Additional Information for Proposed Upgraded Emergency Action Levels (EALs) Using NEI 99-01, Revision 4 Methodology

Arkansas Nuclear One
Units 1 and 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6

REFERENCES:

1. February 27, 2004 letter to Document Control Desk, Arkansas Nuclear One – Proposed Upgraded Emergency Action Levels (letter number 0CAN020407)
2. December 16, 2004 letter to Document Control Desk, Arkansas Nuclear One – Response to Request for Additional Information for Proposed Upgraded Emergency Action Levels (EALs) Using NEI 99-01, Revision 4 Methodology (letter number 0CAN120405)
3. April 7, 2005 letter from Mr. Thomas Alexion, NRC, Request for Additional Information on Proposed Upgraded Emergency Action Levels (EALs) (letter number 0CNA040505)

Dear Sir or Madam:

Reference 1 provided Arkansas Nuclear One's (ANO) original submittal of proposed EALs using the methodology outlined in NEI 99-01, *Methodology for Development of Emergency Action Levels (*Revision 4, January 2003); while reference 2 provided ANO's response to an NRC Request for Additional Information (RAI) in the form of a complete revision of the proposed EALs. Reference 3 contains an additional RAI, and this letter provides ANO's response to reference 3.

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Plant specific information is attached as follows:

- Response to NRC RAI questions
- Proposed EAL pages – to be incorporated into procedure
- Proposed EAL bases pages – to be incorporated into procedure
- Proposed definitions – to be incorporated into procedure
- NEI 99-01, Revision 4 to Plant Specific Correlations, Differences, Deviations, and Justifications Pages

Differences and Deviations from NEI 99-01, Revision 4 are based on NRC guidance contained in Supplement 1 to RIS 2003-00018 dated July 13, 2004.

This correspondence contains no new regulatory commitments. If you have any questions regarding this submittal, please contact Mr. Robert Holeyfield, Manager, Emergency Planning at (479) 858-4995.

Sincerely,

Richard H Schaido for
Dale E. James
Manager, Licensing

DEJ/fpv
Attachments:

Attachment 1 ANO Responses to NRC Requests for Additional Information
Attachment 2 Proposed EAL Matrix Pages
Attachment 3 Proposed EAL Bases Pages
Attachment 4 Definitions
Attachment 5 Deviation Document Pages

cc: Dr. Bruce S. Mallett
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Attachment 1

0CAN050503

ANO RESPONSES TO NRC REQUESTS FOR ADDITIONAL INFORMATION REGARDING ADOPTION OF NEI 99-01, REVISION 4 FOR ARKANSAS NUCLEAR ONE, UNITS 1 AND 2

ABNORMAL RADIATION LEVELS / RADIOLOGICAL EFFLUENTS CATEGORY

1. [AU1 / AA1] The licensee included a NOTE stating "If monitor reading is sustained for the time period indicated in the EAL AND the required assessments using procedure calculations cannot be completed within this period, declaration must be made based on the valid radiation monitor reading." Addition of this note is inconsistent with the NEI 99-01 and licensee Bases, which indicate that the Emergency Director should not wait until the designated time has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed the designated duration time. Resolve inconsistency.

   ANO Response:

   The note was deleted from AU1 and AA1.

2. [AA2 / EAL 2] The licensee Basis states, "EAL #2 indicators may include instrumentation (such as water level and local area radiation monitors) ..." Deviation to EAL 2 in Attachment 5 states, "ANO does not have indication of water level for the spent fuel pool or refueling canal." Resolve inconsistency.

   ANO Response:

   The EAL basis was revised to more clearly describe the indicators available for the EAL.

   The Deviation document was revised to more clearly describe the deviation to this EAL.

3. [AA3 / EAL 1] Revise site-specific list to address continuous occupancy requirements for the central alarm station (CAS) and/or secondary alarm station (SAS) per the ANO Physical Security Plan, or identify that the CAS or SAS is contained within the main control room envelope.

   ANO Response:

   EAL 1 and the basis have been changed to reflect the addition of the Central Alarm Station and Secondary Alarm Station.

   The Deviation document has been modified to reflect this change.

4. [AA3 / EAL 2] The licensee Basis states, "...the single value of 10 R/hr was selected because it is a value that would result in exposure control measures intended to maintain doses within normal occupational guidelines and limits..." However, the licensee Basis also states that Entergy establishes an administrative limit of 2000 mrem/yr TEDE, which would limit stay time to 12 minutes (at 170 mR/minute), and thus likely require multiple entries with multiple personnel to accomplish a task. The

licensee's response to Specific Comment 7.b states that Entergy procedures do not require a specific action prior to an expected dose of 5 Rem and that, per RP-105 (Radiation Work Permits), stay times are required for activities that will result in an exposure of > 5000 mrem/entry. Provide a dose rate threshold within Entergy or station normal administrative guidelines that would reflect the need to obtain a dose extension, calculation of stay times, or additional radiation protection measures (e.g., calculation of stay times, etc.) prior to entry, thus impeding immediate access.

ANO Response:

EAL 2 has been modified to provide a dose rate threshold within Entergy administrative guidelines that would reflect the need for additional measures prior to entry, thus impeding access.

5. [AA3 / EAL 2] Clarify whether evaluation of site-specific areas included other areas containing safe shutdown equipment (e.g., ECCS pump rooms, remote shutdown area(s), electrical distribution panels, emergency diesel generators, etc.), which are not frequently accessed to maintain plant safety functions.

ANO Response:

The radiation monitors in EAL 2 are representative of the areas containing safe shutdown equipment as specified in NEI 99-01. The listed monitors are either in the specified areas or in the accesses to such areas. EAL 2 was modified to include the emergency diesel generators which had been omitted from the original listing.

6. [AS1 / EAL 1 and AG1 / EAL 1] The licensee Basis (5th paragraph) states, "The monitor readings in EAL #1 were determined by using the same meteorology and source term as those used for determining the monitor readings in AU1 and AA1." Per the licensee Basis for AU1 and AA1, these monitor readings were calculated based on the default source term as described in the Offsite Dose Calculation Manual (ODCM), which is consistent with NEI 99-01 guidance. However, the licensee Basis for AS1 and AG1 (6th paragraph) continues by stating, "Monitor indications in EAL #1 are calculated using SAR source terms applicable to each monitored pathway." Resolve this inconsistency.

ANO Response:

Paragraph 6 (referred to in the question above) has been removed from the bases for AS1 and AG1.

7. [AU1 / EAL 2, AA1 / EAL 2, AS1 / EAL 1 and AG1 / EAL 1] Provide references in licensee Basis to the site-specific calculations performed per NEI 99-01 guidance to determine radiation monitor thresholds.

ANO Response:

References have been added to the bases document for these EALs.

FISSION PRODUCT BARRIER DEGRADATION

8. The Licensee states in Attachment 5 that the NEI 99-01 guidance for the loss and/or potential loss of barriers based on Critical Safety Function Status (CSFS) is not applicable since neither unit at ANO uses CSFS trees. Clarify whether equivalent site-specific safety function status checks, developed based on owners group guidance for ANO units, is capable of providing equivalent indications to the following CSFS tree statuses per guidance in NEI 99-01, Section 3.9:
   - Core Cooling - Red
   - Core Cooling - Orange
   - Heat Sink - Red
   - RCS Integrity - Red
   - Containment - Red

ANO Response:

The Deviation document has been revised to more clearly explain the deviation for these EALs.

9. [FCB3: Potential Loss] The licensee Basis states, "RVLMS [Reactor Vessel Level Monitoring System] is used as an indication of potential core uncovery only if CET [Core Exit Thermocouple] indication is unavailable." This qualifier is not contained in the EAL threshold itself and is not identified as a deviation by licensee in Attachment 5. Per the NEI 99-01 guidance, criterion is only provided for a potential loss under Reactor Vessel Water Level, and not only if CET indication is unavailable. (The NEI 99-01 guidance already considers that a barrier loss is better covered by other fuel clad barrier Loss EALs, such as core exit thermocouples.) Identify change as a deviation and provide technical justification in Attachment 5, or revise basis to be consistent with NEI 99-01 guidance.

ANO Response:

The statement has been removed from the EAL basis.

10. [FCB4: Loss] The licensee value for the containment high range monitor reading is based on approximately 2-5% cladding failure, instead of a specific concentration of 300 uCi/gm dose equivalent iodine I-131 as identified in the NEI 99-01 guidance. Clarify why a specific concentration of 300 uCi/gm dose equivalent iodine I-131 was not utilized. In addition, identify any deviation or difference in Attachment 5 and provide technical justification, as applicable.

ANO Response:

The ANO EAL was, in fact, calculated based on 300 μCi/gm dose equivalent I-131. The ANO EAL basis has been changed to include the correct basis.

11. [FCB5: Loss] The licensee established a site-specific threshold of at least 5% fuel clad damage. Provide further technical justification for threshold, based on NEI 99-01 guidance which uses a specific concentration of 300 uCi/gm dose equivalent iodine I-131 as indication of a fuel clad barrier loss. In addition, the licensee's evaluation of NEI 99-01 Fuel Barrier Example EAL 6 (Other Site-Specific Indications) under Attachment 5 states, "A review was done which determined that other available EALs adequately address the fuel clad barrier. Therefore, this EAL was not used." Resolve inconsistency between statement in Attachment 5 and site-specific threshold established in Attachments 3 and 4.

ANO Response:

EAL FCB5 was included as an additional site-specific indication of loss of the fuel clad barrier (NEI 99-01 Fuel Clad Barrier Example EAL 6).

12. [RCB3: Loss] Clarify whether an RCS concentration of 60 uCi/gm dose equivalent I-131 is consistent with NEI 99-01 guidance, which identifies the use of reactor coolant and iodine inventory associated with normal operating concentrations (i.e., within technical specifications).

ANO Response:

The basis of the PWR Fission Product Barrier Degradation RCS Barrier EAL #4 from NEI 99-01 does not state whether iodine spiking is to be assumed; however, the basis for the PWR Fission Product Barrier Degradation Fuel Clad Barrier EAL #5 from NEI 99-01 states,

> "Reactor coolant concentrations of this magnitude are several times larger than the maximum concentrations (including iodine spiking) allowed within technical specifications and are therefore indicative of fuel damage. This value is higher than that specified for RCS barrier Loss EAL #4. Thus, this EAL indicates a loss of both the fuel clad barrier and a loss of RCS barrier."

ANO-2 Technical Specification LCO 3.4.8 refers to Figure 3.4.1, which limits DEQ I-131 to 60 μCi/gm at 100% power. This value represents 20% of the 300 μCi/gm DEQ I-131

setpoint recommended for the Fuel Clad Barrier EAL #5 from NEI 99-01, and would be consistent with the statement cited above, that the 300 µCi/gm setpoint would be several times larger than the maximum concentrations (including iodine spiking) allowed within technical specifications.

While ANO-1 Technical Specifications on RCS DEQ I-131 do not consider iodine spiking, a setpoint based on blowdown of the Reactor Coolant System (RCS) to the reactor building at 60 µCi/gm would serve the same function.

13. [CNB4] The licensee Basis includes the following statement, which is not contained in the NEI 99-01 guidance: "This EAL is not intended to prohibit overridding containment isolation valves when directed by plant procedures. A manually overridden containment isolation valve is considered isolable until proven otherwise." Clarify whether the Containment barrier would be considered lost per the NEI 99-01 EAL criterion if the isolation valves were manually overridden, with an isolation actuation signal present, creating a downstream pathway to the environment.

ANO Response:

The statement was removed from the EAL.

14. [CNB4: Loss] Clarify whether the site emergency operating procedures provide for the venting of the containment during an emergency as a means of preventing catastrophic failure per NEI 99-01 guidance. Provide a proposed site-specific change if intentional venting of containment is addressed in site emergency operating procedures.

ANO Response:

Neither unit's Emergency Operating Procedures (EOP) provide for venting the containment as a means of preventing catastrophic failure of the containment.

HAZARDS AND OTHER CONDITIONS AFFECTING PLANT SAFETY

15. [HU6 / EAL 6 and HA6 / EAL 5] The intent of this EAL is to address the effect of flooding caused by internal events. Clarify whether all the areas listed in Table H-1 are susceptible to flooding due to component failures, equipment misalignment, or outage activity mishaps, and the systems and equipment are not designed to be wetted or submerged per the NEI 99-01 guidance.

ANO Response:

The areas listed are susceptible to flooding from various sources and contain equipment that is not designed to be wetted or submerged.

16. [HA4 / EAL 1] The licensee's Table H1 lists areas such as the Unit 1 HP Office Area and Hot Tool Room/Decon Room and Unit 2 Hot Machine Shop. Clarify whether all the areas listed contain functions and systems required for the safe shutdown of the plant per NEI 99-01 guidance.

ANO Response:

The areas listed contain cable runs that provide electrical power to systems required for safe shutdown of the plant.

17. [HA6 / EAL 1] Clarify how the "0.1g acceleration alarm" provides indication of an earthquake exceeding operating basis earthquake (OBE) threshold. In addition, identify site-specific indication that could be used to quantify earthquake as exceeding OBE threshold.

ANO Response:

The Unit 1 and Unit 2 Safety Analysis Reports (SAR) describe the operating basis earthquake as 0.1g. Thus, the 0.1g annunciator in the Control Room is an indicator that the OBE threshold has been exceeded.

EVENTS RELATED TO INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI)

18. [E-HU1 / E-HU2] The mode applicability on the proposed EALs (Attachment 3) lists all operating modes (1 thru 6 & Defuel), which is consistent with the deviation described in Attachment 5. The mode applicability block in proposed EAL Basis (Attachment 4) lists "Not applicable," which is consistent with the NEI 99-01 guidance. Resolve inconsistency.

ANO Response:

The mode applicability in the EAL basis has been changed to "All".

SYSTEM MALFUNCTIONS (including Cold Shutdown/Refueling Modes)

19. [SU1 / SA1 / SS1 / SG1 / CU5 / CA5] The licensee's criteria indicates a loss of offsite power as a loss of all unit auxiliary and start-up transformers. In its response to Specific Comment 4 (Attachment 1), the licensee indicates that the auxiliary transformer is available to supply power to Unit 1 only. The licensee's response further states that the Unit 2 Auxiliary Transformer is not connected to the electrical distribution system, except during some outage evolutions. As written, the licensee EAL criterion infers that both the start-up and auxiliary transformers are available for Units 1 and 2, and will auto-transfer upon loss. Provide further technical justification for including the auxiliary transformer for a loss of offsite power to Unit 2, or change consistent with licensee response to Specific Comment 4.

ANO Response:

Contrary to the originally submitted EALs, the unit auxiliary transformers on each unit are not available as a power source after the main turbines trip. The main turbines will trip on a loss of offsite power.

Thus, the references to the unit auxiliary transformers have been removed from the EALs listed above.

20. [SU1 / EAL 1 and CU5 / EAL 1.b] Per NEI 99-01 guidance, this EAL is intended to reflect a loss of offsite power for greater than 15 minutes with emergency generators supplying power to the essential busses, and not just one essential bus. The licensee EAL states, "At least one vital 4.16 KV bus powered from an independent diesel generator." The intent of the ALERT classification under NEI 99-01 guidance for Modes 1 thru 4, is that an additional single failure (e.g., loss of power from diesel generator to single 4.16 KV bus) would result in a station blackout. Provide a change to EALs that meet the NEI 99-01 guidance for an NOUE based on a loss of offsite power, or provide further technical justification for existing EAL criterion.

ANO Response:

The EAL for SU1 was revised to meet NEI guidance.

Under SU1, both vital busses must be powered or escalation to an Alert would be warranted for reduction to a single AC power source (if not restored in 15 minutes), whereas, no such Alert exists for upgrade from CU5. The NEI basis for CA3 states, "Loss of all AC power compromises all plant safety systems requiring electric power including RHR, ECCS, Containment Heat Removal, Spent Fuel Heat Removal and the Ultimate Heat Sink. When in cold shutdown, refueling, or defueled mode the event can be classified as an Alert, because of the significantly reduced decay heat, lower temperature and pressure, increasing the time to restore one of the emergency busses." NEI, therefore, treats the availability of diesel generators differently for shutdown and non-shutdown modes. At ANO, one train of safety related equipment is sufficient for RHR, ECCS, Containment Heat Removal, Spent Fuel Heat Removal and the Ultimate

Heat Sink, but in accordance with NEI guidance, the availability of emergency diesel generators is treated differently for shutdown and non-shutdown conditions. The EAL for CU5, therefore, has not been revised.

21. [SU6 / EAL 1] In response to Specific Comments 50.a and b, the licensee states that the unit specific differences and the reference to a specific number of annunciator panels for Unit 2 were removed . However, licensee Basis defines a loss of annunciators as 75% for Unit 1 and greater than 9 panels for Unit 2. This difference is not identified by the licensee in Attachment 5, nor reflected in Basis for SA6 or SS6. Clarify inconsistency.

ANO Response:

The statement related to Unit 2 annunciators was removed.

22. [SU8 / EAL 2 and CU8 / EAL 2] The licensee takes credit for the station radio system as a means of offsite communications under Tables M2/C2. The NEI 99-01 guidance identifies the relaying of information from radio transmissions as an extraordinary means of communication. Identify whether the use of the station radio system is identified in the station emergency plan and implementing procedures as an alternate means of notifying offsite agencies.

ANO Response:

The station radio system is listed in emergency plan implementing procedures as one backup method for notifying offsite agencies of an emergency at ANO.

23. [SU9 / EAL 1 and CU4 / EAL 1] The licensee states that no site-specific monitor reading was provided for Unit 2, since there is no alarm setpoint that correlates with the technical specification limit. However, the NEI 99-01 guidance does not require a specific alarm, but rather a monitor reading. Provide a monitor reading equivalent to the technical specification limit for the Unit 2 Letdown Radiation Monitor, or provide further technical justification for deviation.

ANO Response:

A monitor reading has been included in the EALs.

24. [SA6] The initiating condition (IC) statement in the NEI 99-01 guidance states, "Compensatory Non-Alarming Indicators are Unavailable." The licensee revised the IC statement to state, "SPDS and PMS dynamic alarming functions are unavailable." [underlining added] Also, the licensee's IC is inconsistent with EAL 1.b criterion, which identifies compensatory non-alarming indications, rather than dynamic alarming functions. Resolve inconsistency and provide technical justification for any deviation.

ANO Response:

The IC statement has been changed to be consistent with NEI 99-01 guidance.

25. [CA1 / EAL 1] The licensee provides the following indication for RPV water level less than the bottom ID of the RCS loop:

EAL Threshold	Basis Discussion
Unit 1: RVLMS Levels 1 through **8** DRY	Unit 1: ~RVMLS Level **9**
Unit 2: RVLMS Levels 1 through 5 DRY	Unit 2: RVMLS Level 5

Resolve inconsistency between EAL threshold and Basis for Unit 1 and between units.

ANO Response:

The basis discussion was changed to correspond to the EAL threshold.

26. [CS1 / EALs 1 and 2] The licensee states that (Unit 1) RVLMS Levels 1 through 9 DRY indicates both RPV water level at top of active fuel and 6" below the bottom ID of the RCS loop. Clarify rational for this perceived inconsistency.

ANO Response:

The NEI 99-01 basis discussion for this EAL states, "If a PWRs RVLIS is unable to distinguish 6" below the bottom ID of the RCS loop penetration, then the first observable point below the bottom ID of the loop should be chosen as the setpoint."

On Unit 1, RVLMS Level 8 is considered the bottom of the hot leg penetration. Level 9 is the next observable point and also corresponds to approximately the top of the active fuel (TOAF).

27. [CS2 / EAL 1 and CG1 / EAL 2.b] The NEI 99-01 Bases for CS2 and CG1 state that calculations for Containment High Range Monitor reading should be performed to conservatively estimate a site-specific dose rate setpoint indicative of core uncovery (i.e., level at TOAF). The licensee proposes a threshold of 10 R/hr, because it is sufficiently above the normal shutdown reading to avoid an unnecessary entry into the EAL and is indicative of potential fuel uncovery. In its response to Specific Comment 19, the licensee further states that the containment radiation monitor alarm setpoint of 500 R/hr would be indicative of fuel uncovery. Resolve inconsistency, and provide a technical evaluation that would more accurately reflect expected the Containment High Range Monitor reading with RPV level at the TOAF.

ANO Response:

The bases for CS2, EAL 1 and CG1, EAL 2.b have been changed to provide a more accurate justification for the expected reading.

28. [CG1 / EAL 2.b] Provide the technical basis for inclusion of site-specific criterion, "Core exit thermocouples indicate superheat."

ANO Response:

In accordance with reference documents 1 and 2 for this EAL (which have been added to the basis), core exit thermocouples (CET) are the primary indication of core uncovery in conditions of inadequate core cooling.

ADMINISTRATIVE ITEMS

29. Identify where the various NEI 99-01 terms used in licensee EALs are defined by the licensee, and provide justification for any differences from the definitions in Section 5.4 to NEI 99-01 (i.e., NORMAL OPERATIONS, SIGNIFICANT TRANSIENT, RUPTURED vs. FAULTED S/G, VISIBLE DAMAGE, etc.).

ANO Response:

The NEI 99-01 definitions will be incorporated into the "front matter" of the EAL classification procedure. They are included for review.

Attachment 2

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Proposed EAL Matrix Pages

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT

ABNORMAL RADIATION LEVELS/EFFLUENT RELEASES

Radiological Effluents

AG1 Offsite dose resulting from an actual or imminent release of gaseous radioactivity exceeds 1000 mR TEDE or 5000 mR child thyroid CDE for the actual or projected duration of the release using actual meteorology

1 2 3 4 5 6 D

Emergency Action Level(s):

Note: If dose assessment results are available at the time of declaration, the classification should be based on EAL #2 instead of EAL #1. While necessary declarations should not be delayed awaiting results, the dose assessment should be initiated/completed in order to more accurately characterize the nature of the release.

1. VALID reading on Channel 9 of one or more of the following radiation monitors that exceeds or is expected to exceed the reading shown for 15 minutes or longer:

MONITORS – UNIT 1		LIMIT
RX-9820	Containment Purge	5.90E+2 µCi/cc
RX-9825	Radwaste Area	5.36E+2 µCi/cc
RX-9830	Fuel Handling Area	4.54E+2 µCi/cc
RX-9835	Emergency Penetration Room	9.56E+3 µCi/cc
MONITORS – UNIT 2		**LIMIT**
2RX-9820	Containment Purge	4.46E+2 µCi/cc
2RX-9825	Radwaste Area	3.32E+2 µCi/cc
2RX-9830	Fuel Handling Area	4.46E+2 µCi/cc
2RX-9835	Emergency Penetration Room	8.84E+3 µCi/cc
2RX-9840	Post Accident Sampling Building	4.42E+3 µCi/cc
2RX-9845	Aux. Building Extension	1.26E+3 µCi/cc
2RX-9850	Low Level Radwaste Storage Bldg.	1.77E+3 µCi/cc

OR

2. Dose assessment using actual meteorology indicates doses > 1000 mR TEDE or 5000 mR child thyroid CDE at or beyond the site boundary.

OR

3. Field survey results indicate closed-window dose rates > 1000 mR/hr expected to continue for more than one hour; or analyses of field survey samples indicate child thyroid CDE of 5000 mR for one hour of inhalation, at or beyond site boundary.

AS1 Offsite dose resulting from an actual or imminent release of gaseous radioactivity exceeds 100 mR TEDE or 500 mR child thyroid CDE for the actual or projected duration of the release

1 2 3 4 5 6 D

Emergency Action Level(s):

Note: If dose assessment results are available at the time of declaration, the classification should be based on EAL #2 instead of EAL #1. While necessary declarations should not be delayed awaiting results, the dose assessment should be initiated/completed in order to determine if the classification should be subsequently escalated.

1. VALID reading on Channel 9 of one or more of the following radiation monitors that exceeds or is expected to exceed the reading shown for ≥ 15 minutes:

MONITORS – UNIT 1		LIMIT
RX-9820	Containment Purge	5.90E+1 µCi/cc
RX-9825	Radwaste Area	5.36E+1 µCi/cc
RX-9830	Fuel Handling Area	4.54E+1 µCi/cc
RX-9835	Emergency Penetration Room	9.56E+2 µCi/cc
MONITORS – UNIT 2		**LIMIT**
2RX-9820	Containment Purge	4.46E+1 µCi/cc
2RX-9825	Radwaste Area	3.32E+1 µCi/cc
2RX-9830	Fuel Handling Area	4.46E+1 µCi/cc
2RX-9835	Emergency Penetration Room	8.84E+2 µCi/cc
2RX-9840	Post Accident Sampling Building	4.42E+2 µCi/cc
2RX-9845	Aux. Building Extension	1.26E+2 µCi/cc
2RX-9850	Low Level Radwaste Storage Bldg.	1.77E+2 µCi/cc

OR

2. Dose assessment using actual meteorology indicates doses > 100 mR TEDE or 500 mR child thyroid CDE at or beyond the site boundary.

OR

3. Field survey results indicate closed-window dose rates exceeding 100 mR/hr expected to continue for more than one hour; or analyses of field survey samples indicate child thyroid CDE ≥ 500 mR for one hour of inhalation, at or beyond the site boundary.

AA1 Any UNPLANNED release of gaseous or liquid radioactivity to the environment exceeds 200 times the ODCM limits for ≥ 15 minutes

1 2 3 4 5 6 D

Emergency Action Level(s):

1. VALID reading on any effluent monitor that exceeds 200 times the alarm setpoint established by a current release permit for ≥ 15 minutes:

EFFLUENT MONITORS – UNIT 1	
RX-9820	Containment Purge (Channel 7 or 9)
RE-4830	Waste Gas Radiation Monitor
RE-4642	Liquid Radwaste Monitor
EFFLUENT MONITORS – UNIT 2	
2RX-9820	Containment Purge (Channel 7 or 9)
2RE-2429	Waste Gas Monitoring System
2RE-2330	BMS Liquid Discharge Monitor
2RE-4423	Radwaste Liquid Discharge Monitor

OR

2. VALID reading on Channel 7 of one or more of the following radiation monitors that exceeds the reading shown for ≥ 15 minutes:

MONITORS – UNIT 1		LIMIT
RX-9820	Containment Purge	5.90E0 µCi/cc
RX-9825	Radwaste Area	5.36E0 µCi/cc
RX-9830	Fuel Handling Area	4.54E0 µCi/cc
RX-9835	Emergency Penetration Room	9.56E+1 µCi/cc
MONITORS – UNIT 2		**LIMIT**
2RX-9820	Containment Purge	4.46E0 µCi/cc
2RX-9825	Radwaste Area	3.32E0 µCi/cc
2RX-9830	Fuel Handling Area	4.46E0 µCi/cc
2RX-9835	Emergency Penetration Room	8.84E+1 µCi/cc
2RX-9840	Post Accident Sampling Building	4.42E+1 µCi/cc
2RX-9845	Aux. Building Extension	1.26E+1 µCi/cc
2RX-9850	Low Level Radwaste Storage Bldg.	1.77E+1 µCi/cc

OR

3. Confirmed grab sample analyses for gaseous or liquid releases indicates concentrations or release rates, with a release duration of ≥ 15 minutes, in excess of 200 times the applicable values of the ODCM.

OR

4. RDACS data indicating ALERT.

AU1 Any UNPLANNED release of gaseous or liquid radioactivity to the environment that exceeds two times the ODCM limits for ≥ 60 minutes

1 2 3 4 5 6 D

Emergency Action Level(s):

1. VALID reading on any effluent monitor that exceeds two times the alarm setpoint established by a current release permit for ≥ 60 minutes:

EFFLUENT MONITORS – UNIT 1	
RX-9820	Containment Purge (Channel 7 or 9)
RE-4830	Waste Gas Radiation Monitor
RE-4642	Liquid Radwaste Monitor
EFFLUENT MONITORS – UNIT 2	
2RX-9820	Containment Purge (Channel 7 or 9)
2RE-2429	Waste Gas Monitoring System
2RE-2330	BMS Liquid Discharge Monitor
2RE-4423	Radwaste Liquid Discharge Monitor

OR

2. VALID reading on Channel 7 of one or more of the following radiation monitors that exceeds the reading shown for ≥ 60 minutes:

MONITORS – UNIT 1		LIMIT
RX-9820	Containment Purge	5.90E-2 µCi/cc
RX-9825	Radwaste Area	5.36E-2 µCi/cc
RX-9830	Fuel Handling Area	4.54E-2 µCi/cc
RX-9835	Emergency Penetration Room	9.56E-1 µCi/cc
MONITORS – UNIT 2		**LIMIT**
2RX-9820	Containment Purge	4.46E-2 µCi/cc
2RX-9825	Radwaste Area	3.32E-2 µCi/cc
2RX-9830	Fuel Handling Area	4.46E-2 µCi/cc
2RX-9835	Emergency Penetration Room	8.84E-1 µCi/cc
2RX-9840	Post Accident Sampling Building	4.42E-1 µCi/cc
2RX-9845	Aux. Building Extension.	1.26E-1 µCi/cc
2RX-9850	Low Level Radwaste Storage Bldg.	1.77E-1 µCi/cc

OR

3. Confirmed grab sample analyses for gaseous or liquid releases indicates concentrations or release rates, with a release duration of ≥ 60 minutes, in excess of two times the applicable values of the ODCM.

OR

4. RDACS data indicating NUE.

Plant Modes (white boxes indicate applicable modes) 1 Power Operation 2 Startup 3 Hot Standby 4 Hot Shutdown 5 Cold Shutdown 6 Refueling D Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
ABNORMAL RADIATION LEVELS/EFFLUENT RELEASES			

Abnormal Radiation Levels

AA3 Release of radioactive material or elevated radiation levels within the facility that impede operation of systems required to maintain safe operations or to establish or maintain cold shutdown

1 2 3 4 5 6 D

Emergency Action Level(s):

1. VALID radiation readings > 15 mR/hr in any of the following areas:
   - Unit 1 Control Room
   - Unit 2 Control Room
   - Central Alarm Station
   - Secondary Alarm Station

   OR

2. VALID radiation readings > 2.5 R/hr on any of the following monitors:

Unit 1	
RI-8002	404' Computer Room
RI-8004	317' Outside Stairway
RI-8005	354' Sample Room Vestibule
RI-8006	354' Radiochemistry Lab
RI-8007	369' EDG Hallway
RI-8010	386' CA Area
RI-8011	335' Outside Stairway
RI-8013	335' EFW Pump Area
Unit 2	
2RITS-8900	317' General Area
2RITS-8901	335' Coolant Charging Pumps Area
2RITS-8902	335' 2F-3 Hallway
2RITS-8903	354' Volume Control Tank Access Area
2RITS-8907	372' EDG Hallway
2RITS-8910	386' Emergency Chiller Hallway
2RITS-8914	404' Spent Fuel Pool Cask Washdown Area
2RITS-8917	354' Hot Lab Sample Room

Plant Modes (white boxes indicate applicable modes) 1 Power Operation 2 Startup 3 Hot Standby 4 Hot Shutdown 5 Cold Shutdown 6 Refueling D Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION			
Fuel Clad Degradation			**CU4** Fuel clad degradation [ ][ ][5][6][ ] **Emergency Action Level(s):** 1. Failed Fuel Iodine radiation monitor reading indicates fuel clad degradation > Technical Specification allowable limits. **Unit 1:** RI-1237S reads > 1.3×10^5 counts per minute. **Unit 2:** 2RITS-4806B reads > 6.5×10^4 counts per minute. **OR** 2. RCS sample activity indicates fuel clad degradation > Technical Specification allowable limits. **Unit 1:** > 3.50 µCi/gm IDE > 72/Ē µCi/gm Gross Activity **Unit 2:** > 1.0 µCi/gm IDE > 100/Ē µCi/gm Gross Activity
Loss of AC Power		**CA5** Loss of all offsite power and loss of all onsite AC power to Vital 4.16KV busses [ ][ ][ ][5][6][D] **Emergency Action Level(s):** 1. a. Loss of power to all Startup Transformers. **AND** b. Failure of all Diesel Generators to supply power to Vital 4.16 KV busses. **AND** c. Failure to restore power to at least one Vital 4.16 KV bus within 15 minutes from the time of loss of both offsite and onsite AC power.	**CU5** Loss of all offsite power to vital 4.16 KV busses for > 15 minutes [ ][ ][ ][5][6][ ] **Emergency Action Level(s):** 1. a. Loss of power to all Startup Transformers for > 15 minutes. **AND** b. Each Vital 4.16 KV bus is powered from an independent diesel generator.

Plant Modes (white boxes indicate applicable modes) [1] Power Operation [2] Startup [3] Hot Standby [4] Hot Shutdown [5] Cold Shutdown [6] Refueling [D] Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION			
Loss of Communications			**CU8** UNPLANNED loss of all onsite or offsite communications capabilities [: : : 5 6 :] **Emergency Action Level(s):** 1. Loss of all onsite communications capability (Table C1) affecting the ability to perform routine operations. **Table C1** **Onsite Communications Equipment** Station radio system Plant paging system In-plant telephones Gaitronics **OR** 2. Loss of all offsite communications capability (Table C2). **Table C2** **Offsite Communications Equipment** All telephone lines (commercial and microwave) Station radio system ENS

Plant Modes (white boxes indicate applicable modes) [1] Power Operation [2] Startup [3] Hot Standby [4] Hot Shutdown [5] Cold Shutdown [6] Refueling [D] Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
ISFSI MALFUNCTION			
Cask Damage			**E-HU1** Damage to a loaded cask CONFINEMENT BOUNDARY [1][2][3][4][5][6][D] **Emergency Action Level(s):** 1. Natural phenomena events affecting a loaded cask CONFINEMENT BOUNDARY: a. Tornado/High winds resulting in: • Missile impact causing a loss of shielding • Blockage of air inlets for > 24 hours **OR** b. Flooding resulting in blockage of air inlets for > 24 hours. **OR** c. Seismic event resulting in cask tip-over causing a loss of shielding. **OR** 2. Accident conditions affecting a loaded cask CONFINEMENT BOUNDARY: a. Cask drop of > 11 inches **OR** b. Blockage of air inlets for > 24 hours **OR** c. Fire or explosion resulting in a loss of shielding **OR** d. Cask tip-over causing a loss of shielding 3. Any condition in the opinion of the SM/TSC Director/EOF Director that indicates loss of loaded fuel storage cask CONFINEMENT BOUNDARY.
Security Event			**E-HU2** Confirmed security event with potential loss of level of safety of the ISFSI [1][2][3][4][5][6][D] **Emergency Action Level(s):** 1. Security event as determined from the ANO Safeguards Contingency Plan and reported by ANO Security shift supervision.

Plant Modes (white boxes indicate applicable modes) [1] Power Operation [2] Startup [3] Hot Standby [4] Hot Shutdown [5] Cold Shutdown [6] Refueling [D] Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
SYSTEM MALFUNCTION			
Loss of AC Power	**SG1** Prolonged loss of all offsite power and prolonged loss of all onsite AC power to Vital 4.16 KV busses [1][2][3][4] **Emergency Action Level(s):** 1. Loss of power to all Startup transformers. **AND** Failure of all Diesel Generators to supply power to Vital 4.16 KV busses. **AND** Either of the following: (a **OR** b) a. Restoration of at least one Vital 4.16 KV bus within four (4) hours is not likely **OR** b. **FA1** entry conditions met	**SS1** Loss of all offsite power and loss of all onsite AC power to Vital 4.16 KV busses [1][2][3][4] **Emergency Action Level(s):** 1. Loss of power to all Startup transformers. **AND** Failure of all diesel generators to supply power to Vital 4.16 KV busses. **AND** Failure to restore power to at least one Vital 4.16 KV bus within 15 minutes from the loss of both offsite and onsite AC power	**SA1** AC power capability to Vital 4.16 KV busses reduced to a single power source for > 15 minutes such that any additional single failure would result in station blackout [1][2][3][4] **Emergency Action Level(s):** 1. AC power capability to Vital 4.16 KV busses reduced to a single power source for > 15 minutes. **AND** Any additional single failure will result in station blackout.	**SU1** Loss of all offsite power to Vital 4.16 KV busses for > 15 minutes [1][2][3][4] **Emergency Action Level(s):** 1. Loss of power to all Startup Transformers for > 15 minutes. **AND** Each Vital 4.16 KV bus is powered from an independent diesel generator.

Plant Modes (white boxes indicate applicable modes) [1] Power Operation [2] Startup [3] Hot Standby [4] Hot Shutdown [5] Cold Shutdown [6] Refueling [D] Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
SYSTEM MALFUNCTION			
Loss of Heat Removal	**SS5** Complete loss of heat removal capability [1][2][3][4][ ][ ] **Emergency Action Level(s):** 1. Loss of core cooling and heat sink.		
Loss of Annunciators	**SS6** Inability to monitor a SIGNIFICANT TRANSIENT in progress [1][2][3][4][ ][ ] **Emergency Action Level(s):** 1. a. Loss of ≥ 75% of annunciators associated with safety systems. **AND** b. Compensatory non-alarming indications are unavailable. **AND** c. Indications needed to monitor safety functions (reactivity control, core cooling, RCS integrity, or containment integrity) are unavailable. **AND** d. A SIGNIFICANT TRANSIENT in progress.	**SA6** UNPLANNED loss of most or all safety system annunciation or indication in Control Room with either (1) a SIGNIFICANT TRANSIENT in progress, or (2) compensatory non-alarming indicators are unavailable [1][2][3][4][ ][ ] **Emergency Action Level(s):** 1. UNPLANNED loss of most or all annunciators or indicators associated with safety systems for > 15 minutes. **AND** Either of the following: a. A SIGNIFICANT TRANSIENT is in progress. **OR** b. Compensatory non-alarming indications are unavailable.	**SU6** UNPLANNED loss of most or all safety system annunciation or indication in the Control Room for > 15 minutes [1][2][3][4][ ][ ] **Emergency Action Level(s):** 1. UNPLANNED loss of most or all annunciators or indicators associated with safety systems for > 15 minutes.
RCS Leakage			**SU7** RCS leakage [1][2][3][4][ ][ ] **Emergency Action Level(s):** 1. Unidentified or pressure boundary leakage > 10 gpm. **OR** 2. Identified leakage > 25 gpm.

Plant Modes (white boxes indicate applicable modes) [1] Power Operation [2] Startup [3] Hot Standby [4] Hot Shutdown [5] Cold Shutdown [6] Refueling [D] Defueled

GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT
SYSTEM MALFUNCTION			
Fuel Clad Degradation			[1][2][3][4][ ][ ][ ] **SU9** Fuel clad degradation **Emergency Action Level(s):** 1. Failed Fuel Iodine radiation monitor reading indicates fuel clad degradation > Technical Specification allowable limits. **Unit 1:** RI-1237S reads > 1.3×10^5 counts per minute. **Unit 2:** 2RITS-4806B reads > 6.5×10^4 counts per minute 2. RCS sample activity value indicating fuel clad degradation > Technical Specification allowable limits. **Unit 1:** RCS Sample Analysis: > 3.50 µCi/gm IDE RCS Sample Analysis: > 72/Ē µCi/gm Gross Activity **Unit 2:** RCS Sample Analysis: > 1.0 µCi/gm IDE RCS Sample Analysis: > 100/Ē µCi/gm Gross Activity
Inadvertent Criticality			[ ][ ][3][4][ ][ ][ ] **SU10** Inadvertent criticality **Emergency Action Level(s):** 1. An UNPLANNED sustained positive startup rate observed on nuclear instrumentation
Failure to Shut Down			[1][2][3][4][ ][ ][ ] **SU11** *Inability to reach required* shutdown within Technical Specification limits **Emergency Action Level(s):** 1. Plant is not brought to required operating mode within Technical Specifications LCO action statement time.

Plant Modes (white boxes indicate applicable modes) [1] Power Operation [2] Startup [3] Hot Standby [4] Hot Shutdown [5] Cold Shutdown [6] Refueling [D] Defueled

Attachment 3

0CAN050503

Proposed EAL Bases Pages

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

AU1

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Any UNPLANNED release of gaseous or liquid radioactivity to the environment that exceeds two times the ODCM limits for ≥ 60 minutes

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2 OR 3 OR 4)

1. VALID reading on any effluent monitor that exceeds two times the alarm setpoint established by a current release permit for ≥ 60 minutes.

EFFLUENT MONITORS – UNIT 1	
RX-9820	Containment Purge (Channel 7 or 9)
RE-4830	Waste Gas Radiation Monitor
RE-4642	Liquid Radwaste Monitor
EFFLUENT MONITORS – UNIT 2	
2RX-9820	Containment Purge (Channel 7 or 9)
2RE-2429	Waste Gas Monitoring System
2RE-2330	BMS Liquid Discharge Monitor
2RE-4423	Radwaste Liquid Discharge Monitor

OR

2. VALID reading on Channel 7 of one or more of the following radiation monitors that exceeds the reading shown for ≥ 60 minutes:

MONITORS – Unit 1		LIMIT
RX-9820	Containment Purge	5.90E-2 (µCi/cc)
RX-9825	Radwaste Area	5.36E-2 (µCi/cc)
RX-9830	Fuel Handling Area	4.54E-2 (µCi/cc)
RX-9835	Emergency Penetration Room	9.56E-1 (µCi/cc)
MONITORS – Unit 2		**LIMIT**
2RX-9820	Containment Purge	4.46E-2 (µCi/cc)
2RX-9825	Radwaste Area	3.32E-2 (µCi/cc)
2RX-9830	Fuel Handling Area	4.46E-2 (µCi/cc)
2RX-9835	Emergency Penetration Room	8.84E-1 (µCi/cc)
2RX-9840	Post Accident Sampling Building	4.42E-1 (µCi/cc)
2RX-9845	Aux. Building Extension	1.26E-1 (µCi/cc)
2RX-9850	Low Level Radwaste Storage Building	1.77E-1 (µCi/cc)

OR

(Continued on next page)

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT (AU1)

3. Confirmed grab sample analyses for gaseous or liquid releases indicates concentrations or release rates, with a release duration of ≥ 60 minutes, in excess of two times the applicable values of the ODCM.

   OR

4. RDACS data indicating NUE.

Basis:

This IC addresses a potential or actual reduction in the level of safety of the plant as indicated by a radiological release that exceeds regulatory commitments for an extended period of time. ANO incorporates features intended to control the release of radioactive effluents to the environment. Further, there are administrative controls established to prevent unintentional releases, or control and monitor intentional releases. These controls are located in the Offsite Dose Calculation Manual (ODCM). The occurrence of extended, uncontrolled radioactive releases to the environment is indicative of degradation in these features and/or controls.

The ODCM multiples are specified in **AU1** and **AA1** only to distinguish between non-emergency conditions, and from each other. While these multiples obviously correspond to an offsite dose or dose rate, the emphasis in classifying these events is the degradation in the level of safety of the plant, NOT the magnitude of the associated dose or dose rate. Releases should not be prorated or averaged over 60 minutes. For example, a release exceeding 4 times ODCM limits for 30 minutes does not meet the threshold for this IC.

The ODCM contains the site specific release limits and appropriate surveillance requirements which normally monitor these limits. The 60 minute time period allows sufficient time to isolate any release after exceeding ODCM limits. Releases continuing for more than 60 minutes represent inability to isolate or control the release.

"UNPLANNED", as used in this context, includes any release for which a liquid waste release or a gaseous waste release discharge permit was not prepared, or a release that exceeds the conditions (e.g., minimum dilution flow, maximum discharge flow, alarm set points, etc.) on the applicable release permit. Unplanned releases in excess of two times of the ODCM limit that continue for 60 minutes or longer represent an uncontrolled situation and a potential degradation in the level of safety of the plant. The SM/TSC Director/EOF Director should not wait until 60 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 60 minutes. Also, if an ongoing release is detected and the starting time for that release is unknown, the SM/TSC Director/EOF Director should, in the absence of data to the contrary, assume that the release has exceeded 60 minutes.

EAL #1 addresses radioactivity releases, that for whatever reason, cause effluent radiation monitor readings to exceed two times the alarm setpoint and such releases are not terminated within 60 minutes. This alarm setpoint may be associated with a planned batch release, or a continuous release path. In either case, the setpoint is established by the discharge permit to warn of a release that is not in compliance.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT (AU1)

EAL #2 is similar to EAL #1, but is intended to address effluent or accident radiation monitors on release pathways for which a discharge permit would not be prepared for a non-routine release. The ODCM establishes a methodology for determining effluent radiation monitor setpoints. The monitor readings in EAL #2 were calculated based on the default source term as described in the ODCM and annual average meteorological conditions for the most limiting downwind sector. The monitor readings in EAL #2 are set to indicate two times the ODCM limit.

EAL #3 addresses uncontrolled releases that are detected by sample analyses, particularly on unmonitored pathways, (e.g., spills of radioactive liquids into storm drains, leakage into river water systems or lake, etc.).

EAL #4 addresses RDACS calculations for NUE. RDACS is a 60 minute rolling calculation and once alarmed no additional 60 minutes are required.

Escalation is via **AA1, AS1,** or **AG1.**

Reference Documents:

1. Calculation CL-1863, GERMS SPING-4 Setpoints
2. Offsite Dose Calculation Manual

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

AA1

ALERT

Initiating Condition:

Any UNPLANNED release of gaseous or liquid radioactivity to the environment that exceeds 200 times the ODCM limits for ≥ 15 minutes

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2 OR 3 OR 4)

1. VALID reading on any effluent monitor that exceeds 200 times the alarm setpoint established by a current release permit for ≥ 15 minutes.

EFFLUENT MONITORS – UNIT 1	
RX-9820	Containment Purge (Channel 7 or 9)
RE-4830	Waste Gas Radiation Monitor
RE-4642	Liquid Radwaste Monitor
EFFLUENT MONITORS – UNIT 2	
2RX-9820	Containment Purge (Channel 7 or 9)
2RE-2429	Waste Gas Monitoring System
2RE-2330	BMS Liquid Discharge Monitor
2RE-4423	Radwaste Liquid Discharge Monitor

OR

2. VALID reading on Channel 7 of one or more of the following radiation monitors that exceeds the reading shown for ≥ 15 minutes:

MONITORS – Unit 1		LIMIT
RX-9820	Containment Purge	5.90E0 (µCi/cc)
RX-9830	Fuel Handling Area	4.54E0 (µCi/cc)
RX-9825	Radwaste Area	5.36E0 (µCi/cc)
RX-9835	Emergency Penetration Room	9.56E+1 (µCi/cc)
MONITORS – Unit 2		**LIMIT**
2RX-9820	Containment Purge	4.46E0 (µCi/cc)
2RX-9825	Radwaste Area	3.32E0 (µCi/cc)
2RX-9830	Fuel Handling Area	4.46E0 (µCi/cc)
2RX-9835	Emergency Penetration Room	8.84E+1 (µCi/cc)
2RX-9840	Post Accident Sampling Building	4.42E+1 (µCi/cc)
2RX-9845	Aux. Building Extension	1.26E+1 (µCi/cc)
2RX-9850	Low Level Radwaste Storage Building	1.77E+1 (µCi/cc)

OR

(Continued on next page)

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT (AA1)

3. Confirmed grab sample analyses for gaseous or liquid releases indicates concentrations or release rates, with a release duration of ≥ 15 minutes, in excess of 200 times the applicable values of the ODCM.

   OR

4. RDACS data indicating ALERT.

Basis:

This event escalates from the Notification of Unusual Event by escalating the magnitude of the release.

These EALs address a potential or actual drop in the level of safety of the plant as indicated by a radiological release that exceeds regulatory commitments for an extended period of time. ANO incorporates features intended to control the release of radioactive effluents to the environment. Further, there are administrative controls established to prevent unintentional releases, or control and monitor intentional releases. These controls are located in the ODCM. The occurrence of extended, uncontrolled radioactive releases to the environment is indicative of degradation in these features and/or controls.

The ODCM multiples are specified in **AA1** and **AU1** only to distinguish between non-emergency conditions, and from each other. While these multiples obviously correspond to an offsite dose or dose rate, the emphasis in classifying these events is the degradation in the level of safety of the plant, NOT the magnitude of the associated dose or dose rate.

Releases should not be prorated or averaged. For example, a release exceeding 400 times ODCM limits for 7.5 minutes does not meet the threshold for this event classification.

"UNPLANNED", as used in this context, includes any release for which a liquid waste release or a gaseous waste release discharge permit was not prepared, or a release that exceeds the conditions (e.g., minimum dilution flow, maximum discharge flow, alarm set points, etc.) on the applicable package permit. The SM/TSC Director/EOF Director should not wait until 15 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 15 minutes. Also, if an ongoing release is detected and the starting time for that release is unknown, the SM/TSC Director/EOF Director should, in the absence of data to the contrary, assume that the release has exceeded 15 minutes.

EAL #1 addresses radioactivity releases that, for whatever reason, cause effluent radiation monitor readings to exceed 200 times the alarm setpoint and are not terminated within 15 minutes. This alarm setpoint may be associated with a planned batch release, or a continuous release path. In either case, the setpoint is established by the discharge permit to warn of a release that is not in compliance.

EAL #2 is similar to EAL #1, but is intended to address effluent or accident radiation monitors on release pathways for which a discharge permit would not be prepared for a non-routine release. The ODCM establishes a methodology for determining effluent radiation monitor setpoints. The monitor readings in EAL #2 were calculated based on the default source term as described in the ODCM and annual average meteorological conditions for the most limiting downwind sector. The monitor readings in EAL #2 are set to indicate 200 times the ODCM limit.

EAL #3 addresses uncontrolled releases that are detected by sample analyses, particularly on unmonitored pathways, e.g., spills of radioactive liquids into storm drains, leakage into Lake Dardanelle, etc.

EALs #1 and #2 directly correlate with the ODCM since annual average meteorology is required to be used in showing compliance with the ODCM and is used in calculating the alarm setpoints. The fundamental basis of these ICs is not a dose or dose rate, but rather the degradation in the level of safety of the plant implied by the uncontrolled release that was not isolated within 15 minutes.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT (AA1)

Due to the uncertainty associated with meteorology, emergency implementing procedures should call for the timely performance of dose assessments using actual (real-time and sector) meteorology in the event of a gaseous radioactivity release of this magnitude. The results of these assessments should be compared to **AS1** and **AG1** to determine if the event classification should be escalated. Classification should not be delayed pending the results of these dose assessments.

EAL #4 addresses RDACS calculations for ALERT. Once RDACS data indicates ALERT, no additional time is required.

Reference Documents:

1. Calculation CL-1863, GERMS SPING-4 Setpoints
2. Offsite Dose Calculation Manual

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

AA2

ALERT

Initiating Condition:

Damage to irradiated fuel or loss of water level that has or will result in the uncovering of irradiated fuel outside the reactor vessel

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2)

1. A VALID alarm on one or more of the following radiation monitors:

Unit 1	
RX-9820	Containment Purge (Channel 7 or 9)
RX-9825	Radwaste Area (Channel 7 or 9)
RX-9830	Fuel Handling Area (Channel 7 or 9)
RE-8060	Containment High Range Radiation Monitors
RE-8061	Containment High Range Radiation Monitors
RE-8009	Spent Fuel Area
RE-8017	Fuel Handling
Unit 2	
2RX-9820	Containment Purge (Channel 7 or 9)
2RX-9825	Radwaste Area (Channel 7 or 9)
2RX-9830	Fuel Handling Area (Channel 7 or 9)
2RE-8925-1	Containment High Range Radiation Monitors
2RE-8925-2	Containment High Range Radiation Monitors
2RE-8914	Spent Fuel Area
2RE-8915	Spent Fuel Area
2RE-8916	Spent Fuel Area
2RE-8912	Containment Incore Inst.

OR

2. VALID indication of uncontrolled water level drop in the refueling canal or spent fuel pool such that irradiated fuel will become uncovered.

Basis:

This IC and associated EALs address specific events that have resulted, or may result in unexpected rises in radiation dose rates within plant buildings, and may be a precursor to a radioactivity release to the environment. These events represent a loss of control over radioactive material and represent a degradation in the level of safety of the plant. These events escalate from **AU2** in that fuel activity has been released, or is anticipated due to fuel heatup.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT (AA2)

These EALs apply to spent fuel requiring water coverage. There is time available to take corrective actions, and there is little potential for substantial fuel damage. Uncontrolled lowering of water level may be detected by visual observation, elevated radiation levels, or various other symptoms that consider valid indicators of the event. Fuel uncovery may be expected based on abnormal radiation level, visual observation, or best judgment of the SM/TSC Director/EOF Director based on present and past trends.

EAL #1 addresses radiation monitor indications of fuel uncovery and/or fuel damage. Elevated readings on ventilation monitors may be indicative of a radioactivity release from the fuel, confirming that damage has occurred. Elevated background at the monitor due to water level drop may mask elevated ventilation exhaust airborne activity and should be considered. While a radiation monitor could detect a rise in dose rate due to a drop in the water level, it might not be a reliable indication of whether or not the fuel is covered. For example, the monitor could in fact be properly responding to a known event involving transfer or relocation of a source stored in or near the fuel pool or responding to a planned evolution such as removal of the reactor head. Application of these ICs requires understanding of the actual radiological conditions present in the vicinity of the monitor.

EAL #2 indicators may include instrumentation (such as local area radiation monitors) and personnel (e.g., refueling crew) reports.

Escalation, if appropriate, would occur via **AS1** or **AG1** or SM/TSC Director/EOF Director judgment.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

AA3

ALERT

Initiating Condition:

Release of radioactive material or elevated radiation levels within the facility that impede operation of systems required to maintain safe operations or to establish or maintain cold shutdown

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2)

1. VALID radiation readings > 15 mR/hr in any of the following areas:

   - Unit 1 Control Room
   - Unit 2 Control Room
   - Central Alarm Station
   - Secondary Alarm Station

   OR

2. VALID radiation readings > 2.5 R/hr on any of the following monitors:

Unit 1	
RI-8002	404' Computer Room
RI-8004	317' Outside Stairway
RI-8005	354' Sample Room Vestibule
RI-8006	354' Radiochemistry Lab
RI-8007	369' EDG Hallway
RI-8010	386' CA Area
RI-8011	335' Outside Stairway
RI-8013	335' EFW Pump Area
Unit 2	
2RITS-8900	317' General Area
2RITS-8901	335' Coolant Charging Pumps Area
2RITS-8902	335' 2F-3 Hallway
2RITS-8903	354' Volume Control Tank Access Area
2RITS-8907	372' EDG Hallway
2RITS-8910	386' Emergency Chiller Hallway
2RITS-8914	404' Spent Fuel Pool Cask Washdown Area
2RITS-8917	354' Hot Lab Sample Room

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT (AA3)

Basis:

This IC addresses elevated radiation levels that impede necessary access to operating stations, or other areas containing equipment that must be operated manually or that requires local monitoring, in order to maintain safe operation or perform a safe shutdown. It is this impaired ability to operate the plant that results in the actual or potential substantial degradation of the level of safety of the plant. The cause and/or magnitude of the rise in radiation levels is not a concern of these EALs. The SM/TSC Director/EOF Director must consider the source or cause of the elevated radiation levels and determine if any other EAL may be involved. For example, a 15 mR/hr dose rate in the control room or a high radiation monitor reading may be a problem in itself. However, the elevated radiation readings levels may also be indicative of high dose rates in the containment due to a LOCA. In this latter case, an SAE or GE may be indicated by the fission product barrier matrix EALs.

This IC is not meant to apply to elevated radiation levels in the containment as these are events which are addressed in the fission product barrier matrix EALs. This IC is not intended to apply to anticipated temporary rises due to planned events (e.g., incore detector movement, radwaste container movement, depleted resin transfers, etc.).

At ANO, the only areas that are required to be manned continuously in order to maintain safe operation or establish or maintain cold shutdown are the Control Rooms, Central Alarm Station, and Secondary Alarm Station. The reading on the Unit 1 Control Room Area Radiation Monitor (RE-8001) may be used as the indicator for both Control Rooms. The value of 15 mR/hr is derived from the GDC 19 value of 5 Rem in 30 days with adjustment for expected occupancy times. Although Section III.D.3 of NUREG-0737, *"Clarification of TMI Action Plan Requirements"*, provides that the 15 mR/hr value can be averaged over the 30 days, the value is used here without averaging, as a 30 day duration implies an event potentially more significant than an Alert.

For areas requiring infrequent access, the value of 2.5 R/hr was selected because it is a value with a specific action for Radiation Protection Manager approval addressed in RP-105, *Radiation Work Permits*, that would result in exposure control measures intended to maintain doses within normal occupational guidelines and limits (i.e., 10CFR20), and in doing so, will impede necessary access. As used here, *impede*, includes hindering or interfering provided that the interference or delay is sufficient to significantly threaten the safe operation of the plant.

Applicable areas requiring infrequent access were developed from the site's Abnormal Operating Procedures and Emergency Operating Procedures.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

AS1

SITE AREA EMERGENCY

Initiating Condition:

Offsite dose resulting from an actual or imminent release of gaseous radioactivity exceeds 100 mR TEDE or 500 mR child thyroid CDE for the actual or projected duration of the release

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2 OR 3)

Note: *If dose assessment results are available at the time of declaration, the classification should be based on EAL #2 instead of EAL #1. While necessary declarations should not be delayed awaiting results, the dose assessment should be initiated/completed in order to determine if the classification should be subsequently escalated.*

1. VALID reading on Channel 9 of one or more of the following radiation monitors that exceeds or is expected to exceed the reading shown for ≥ 15 minutes:

MONITORS – UNIT 1		LIMIT
RX-9820	Containment Purge	5.90E+1 (µCi/cc)
RX-9825	Radwaste Area	5.36E+1 (µCi/cc)
RX-9830	Fuel Handling Area	4.54E+1 (µCi/cc)
RX-9835	Emergency Penetration Room	9.56E+2 (µCi/cc)
MONITORS – UNIT 2		**LIMIT**
2RX-9820	Containment Purge	4.46E+1 (µCi/cc)
2RX-9825	Radwaste Area	3.32E+1 (µCi/cc)
2RX-9830	Fuel Handling Area	4.46E+1 (µCi/cc)
2RX-9835	Emergency Penetration Room	8.84E+2 (µCi/cc)
2RX-9840	Post Accident Sampling Building	4.42E+2 (µCi/cc)
2RX-9845	Aux. Building Extension	1.26E+2 (µCi/cc)
2RX-9850	Low Level Radwaste Storage Building	1.77E+2 (µCi/cc)

OR

2. Dose assessment using actual meteorology indicates doses > 100 mR TEDE or 500 mR child thyroid CDE at or beyond the site boundary.

OR

3. Field survey results indicate closed-window dose rates exceeding 100 mR/hr expected to continue for more than one hour; or analyses of field survey samples indicate child thyroid CDE ≥ 500 mR for one hour of inhalation, at or beyond the site boundary.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT (AS1)

Basis:

This IC addresses radioactivity releases that result in doses at or beyond the site boundary that exceed a small fraction of the EPA Protective Action Guides (PAGs). Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public. While these failures may be addressed by other ICs, this IC provides appropriate diversity and addresses events which may not be able to be classified on the basis of plant status alone (e.g., fuel handling accident in spent fuel building).

The actual or projected dose of 100 mR TEDE is set at 10% of the EPA Protective Action Guide (PAG) values given in EPA-400-R-92-001, while the 500 mR child thyroid CDE was established in consideration of the 1:5 ratio of the EPA PAG for TEDE and thyroid CDE. The TEDE integrated dose value also provides a desirable gradient (one order of magnitude) between the Alert, Site Area Emergency and General Emergency Classes.

The SM/TSC Director/EOF Director should not wait until 15 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 15 minutes.

The monitor list in EAL #1 includes monitors on all potential release pathways (plant stack, primary-secondary leak, fuel handling accident). The EPA PAGs are expressed in terms of the sum of the "effective dose equivalent (EDE)" and the "committed effective dose equivalent (CEDE)", or as the child thyroid "committed dose equivalent (CDE)". For the purpose of these ICs, the dose quantity "total effective dose equivalent (TEDE)", as defined in 10 CFR 20, is used in lieu of "...sum of EDE and CEDE...." The EPA PAG guidance in EPA-400R-92-001 provides for the use adult thyroid dose conversion factors.

The monitor readings in EAL #1 were determined by using the same meteorology and source term as those used for determining the monitor reading EALs in **AU1** and **AA1**. This protocol maintains intervals between the ICs for the four classifications. Since doses are not monitored in real-time, a release duration of one hour was assumed and the monitor readings are based on a site boundary (or beyond) dose of 100 mR/hour TEDE.

Since dose assessment in EAL #2 is based on actual meteorology, whereas the monitor readings in EAL #1 are not, the results from these assessments may indicate that the classification is not warranted, or may indicate that a higher classification is warranted. For this reason, emergency implementing procedures should call for performance of dose assessments within 15 minutes using actual meteorology and release information. If the results of these dose assessments are available when the classification is made (e.g., initiated at a lower classification level), the dose assessment results override the monitor reading EALs. However, classification should not be delayed pending the results of these dose assessments. If dose assessment team calculations cannot be completed in 15 minutes, then valid monitor readings should be used for emergency classification.

Field team surveys in EAL #3 should be performed at or beyond the SITE BOUNDARY and at the most accurate indicator of the condition. Field data are independent of release elevation and meteorology. The assumed release duration is one hour. Expected post accident source terms would be dominated by noble gases providing the dose rate value. Sampling of radioiodine by adsorption on a charcoal cartridge should determine the iodine value.

Escalation is via **AG1**.

Reference Documents:

1. Calculation CL-1863, Calculation CL-1863, GERMS SPING-4 Setpoints
2. Offsite Dose Calculation Manual

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

AG1

GENERAL EMERGENCY

Initiating Condition:

Offsite dose resulting from an actual or imminent release of gaseous radioactivity exceeds 1000 mR TEDE or 5000 mR child thyroid CDE for the actual or projected duration of the release using actual meteorology

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2 OR 3)

Note: *If dose assessment results are available at the time of declaration, the classification should be based on EAL #2 instead of EAL #1. While necessary declarations should not be delayed awaiting results, the dose assessment should be initiated/completed in order to more accurately characterize the nature of the release.*

1. VALID reading on Channel 9 of one or more of the following radiation monitors that exceeds or is expected to exceed the reading shown for 15 minutes or longer:

MONITORS – UNIT 1		LIMIT
RX-9820	Containment Purge	5.90E+2 (µCi/cc)
RX-9825	Radwaste Area	5.36E+2 (µCi/cc)
RX-9830	Fuel Handling Area	4.54E+2 (µCi/cc)
RX-9835	Emergency Penetration Room	9.56E+3 (µCi/cc)
MONITORS – UNIT 2		**LIMIT**
2RX-9820	Containment Purge	4.46E+2 (µCi/cc)
2RX-9825	Radwaste Area	3.32E+2 (µCi/cc)
2RX-9830	Fuel Handling Area	4.46E+2 (µCi/cc)
2RX-9835	Emergency Penetration Room	8.84E+3 (µCi/cc)
2RX-9840	Post Accident Sampling Building	4.42E+3 (µCi/cc)
2RX-9845	Aux. Building Extension	1.26E+3 (µCi/cc)
2RX-9850	Low Level Radwaste Storage Building	1.77E+3 (µCi/cc)

OR

2. Dose assessment using actual meteorology indicates doses > 1000 mR TEDE or 5000 mR child thyroid CDE at or beyond the site boundary.

OR

3. Field survey results indicate closed window dose rates > 1000 mR/hr expected to continue for more than one hour; or analyses of field survey samples indicate child thyroid CDE of 5000 mR for one hour of inhalation, at or beyond site boundary.

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT (AG1)

Basis:

This IC and associated EALs address radioactivity releases that result in doses at or beyond the site boundary that exceed the EPA Protective Action Guides (PAGs). Public protective actions will be necessary. Releases of this magnitude are associated with the failure of plant systems needed for the protection of the public and likely involve fuel damage. While these failures are addressed by other EALs, this EAL provides appropriate diversity and addresses events which may not be able to be classified on the basis of plant status alone. It is important to note that, for the more severe accidents, the release may be unmonitored or there may be large uncertainties associated with the source term and/or meteorology.

The actual or projected dose of 1000 mR TEDE and 5000 mR child thyroid CDE integrated doses are based on the EPA Protective Action Guide (PAG) values given in EPA-400-R-92-001, which indicates that public protective actions are indicated if doses exceed these values. This is consistent with the emergency class description of a General Emergency.

The SM/TSC Director/EOF Director should not wait until 15 minutes has elapsed, but should declare the event as soon as it is determined that the release duration has or will likely exceed 15 minutes.

The monitor list in EAL #1 includes monitors on all potential release pathways (Plant stack, Primary/Secondary Leak, Fuel Handling Accident). The EPA PAGs are expressed in terms of the sum of the "effective dose equivalent (EDE)" and the "committed effective dose equivalent (CEDE)", or as the child thyroid "committed dose equivalent (CDE)". For the purpose of these ICs, the dose quantity "total effective dose equivalent (TEDE)", as defined in 10 CFR 20, is used in lieu of "...sum of EDE and CEDE...." The EPA PAG guidance EPA-400R-92-001 provides for the use of adult thyroid dose conversion factors.

The monitor readings in EAL #1 were determined by using the same meteorology and source term as those used for determining the monitor reading EALs in **AU1** and **AA1**. This protocol maintains intervals between the ICs for the four classifications. Since doses are not monitored in real-time, a release duration of one hour was assumed and the monitor readings are based on a site boundary (or beyond) dose of 1000 mR/hour TEDE.

Since dose assessment in EAL #2 is based on actual meteorology, whereas the monitor reading in EAL #1 are not, the results from these assessments may indicate that the classification is not warranted. For this reason, emergency implementing procedures should call for performance of dose assessments within 15 minutes using actual meteorology and release information. If the results of these dose assessments are available when the classification is made (e.g., initiated at a lower classification level), the dose assessment results override the monitor reading EALs. However, classification should not be delayed pending the results of these dose assessments. If dose assessment team calculations cannot be completed in 15 minutes, then valid monitor readings should be used for emergency classification.

Field team surveys in EAL #3 should be performed at or beyond the SITE BOUNDARY and at the most accurate indicator of the condition. Field data are independent of release elevation and meteorology. The assumed release duration is one hour. Expected post accident source terms would be dominated by noble gases providing the dose rate value. Sampling of radioiodine by adsorption on charcoal cartridge should determine the iodine value.

Reference Documents:

1. Calculation CL-1863, Calculation CL-1863, GERMS SPING-4 Setpoints
2. Offsite Dose Calculation Manual

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CU4

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Fuel clad degradation

Operating Mode Applicability:

Cold Shutdown (Mode 5)
Refueling (Mode 6)

Emergency Action Level(s): (1 OR 2)

1. Failed Fuel Iodine radiation monitor reading indicates fuel clad degradation > Technical Specification allowable limits.

   Unit 1:
   RI-1237S reads > 1.3×10^5 counts per minute.

   Unit 2:
   2RITS-4806B reads > 6.5×10^4 counts per minute.

   OR

2. RCS sample activity indicates fuel clad degradation > Technical Specification allowable limits.

   Unit 1:
   > 3.50 µCi/gm IDE
   > 72/$\bar{E}$ µCi/gm Gross Activity

   Unit 2:
   > 1.0 µCi/gm IDE
   > 100/$\bar{E}$ µCi/gm Gross Activity

Basis:

The condition noted in this EAL is considered to be a potential degradation in the level of safety of the plant and a potential precursor of more serious problems. EAL #1 addresses the Letdown Radiation Monitor reading that is indicative of RCS Iodine levels that may exceed the Technical Specification limit. EAL #2 addresses reactor coolant samples exceeding Technical Specification limits for iodine spikes that are indicative of a loss of fuel clad integrity.

Reference Documents:

1. ANO-2005-2-0029, *Expected Response of 2RITS-4806B to TS Iodine Activity*

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CU5

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Loss of all offsite power to vital 4.16 KV busses for > 15 minutes

Operating Mode Applicability:

Cold Shutdown (Mode 5)
Refueling (Mode 6)

Emergency Action Level(s):

1. a. Loss of power to all Startup Transformers for > 15 minutes.

   AND

   b. Each vital 4.16 KV bus is powered from an independent diesel generator.

Basis:

Prolonged loss of AC power reduces required redundancy and potentially degrades the level of safety of the plant by rendering the plant more vulnerable to a complete loss of AC Power (e.g., station blackout). Fifteen minutes was selected as a threshold to exclude transient or momentary power losses.

Escalation is via **CA5**.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CA1

ALERT

Initiating Condition:

Loss of RCS Inventory

Operating Mode Applicability:

Cold Shutdown (Mode 5)

Emergency Action Level(s): (1 OR 2)

1. Loss of RCS inventory as indicated by:

   Unit 1: RVLMS Levels 1 through 8 indicate DRY
   Unit 2: RVLMS Levels 1 through 5 indicate DRY

   OR

2. a. Loss of RCS inventory as indicated by unexplained Reactor Building Sump, Reactor Drain Tank, Aux. Building Equipment Drain Tank, Aux. Building Sump, or Quench Tank level rise.

      AND

   b. Reactor vessel level cannot be monitored for > 15 minutes.

Basis:

These EALs serve as precursors to a loss of the ability to adequately cool the core. The magnitude of this loss of water indicates that makeup systems have not been effective and may not be capable of preventing further reactor vessel level drop and potential core uncovery. This condition will result in a minimum classification of ALERT. The bottom of the RCS hot leg penetration into the reactor vessel is approximately RLVMS Level 8 (Unit 1) or RVLMS Level 5 (Unit 2). Below this level, remote Reactor vessel level indication may be lost and loss of suction to decay heat removal systems will occur. The inability to restore and maintain level after reaching this setpoint would, therefore, be indicative of a failure of the RCS barrier.

In cold shutdown the decay heat available to raise RCS temperature during a loss of inventory or heat removal event may be significantly greater than in the refueling mode. Entry into cold shutdown conditions may be attained within hours of operating at power or hours after refueling is completed. Entry into the refueling mode procedurally may not occur for several hours after the reactor has been shutdown. Thus the heatup threat and therefore the threat to damaging the fuel clad may be lower for events that occur in the refueling mode with irradiated fuel in the reactor vessel. The above forms the basis for needing both a cold shutdown specific IC (**CA1**) and a refueling specific IC (**CA2**).

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION (CA1)

In cold shutdown, normal RCS level and RPV level instrumentation systems will normally be available. However, if all level indication were to be lost during a loss of RCS inventory event, the operators would need to determine that RPV inventory loss was occurring by observing sump and tank level changes. Sump and tank level rises must be evaluated against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of RCS leakage. The 15-minute duration for the loss of level indication was chosen because it is half of the CS1 Site Area Emergency EAL duration. The 15-minute duration allows CA1 to be an effective precursor to CS1. Significant fuel damage is not expected to occur until the core has been uncovered for greater than 1 hour per the analysis referenced in the CS1 basis. Therefore, this EAL meets the definition for an Alert emergency class.

The difference between **CA1** and **CA2** deals with the reactor conditions that exist between cold shutdown and refueling mode applicability. In cold shutdown the reactor vessel will normally be intact and standard reactor vessel level monitoring means are available.

If reactor vessel level continues to drop, then escalation to Site Area Emergency will be via **CS1**.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CA5

ALERT

Initiating Condition:

Loss of all offsite power and loss of all onsite AC power to Vital 4.16 KV busses

Operating Mode Applicability:

Cold Shutdown (Mode 5)
Refueling (Mode 6)
Defueled

Emergency Action Level(s):

1. a. Loss of power to all Startup transformers.

   AND

   b. Failure of all Diesel Generators to supply power to Vital 4.16 KV busses.

   AND

   c. Failure to restore power to at least one Vital 4.16 KV bus within 15 minutes from the time of loss of both offsite and onsite AC power.

Basis:

Loss of all AC power compromises all plant safety systems requiring electric power including DHR/shutdown cooling, emergency core cooling, containment cooling, spent fuel pool cooling, and the ultimate heat sink. When in the cold shutdown, refueling, or defueled mode the event can be classified as an Alert because of the significantly reduced decay heat and lower temperature and pressure which allow raising the time to restore one of the emergency busses, relative to that specified for the Site Area Emergency EAL. Fifteen minutes was selected as a threshold to exclude transient or momentary power losses. Escalating to Site Area Emergency, if appropriate, is by Abnormal Rad Levels/Radiological Effluent, or SM/TSC Director/EOF Director judgment ICs.

Consideration should be given to available loads necessary to remove decay heat or provide reactor vessel makeup capability when evaluating loss of AC power to vital busses. Even though a vital bus may be energized, if necessary loads (i.e., loads that, if lost, would inhibit decay heat removal capability or reactor vessel makeup capability) are not available on the energized bus, then the bus should not be considered available.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CS2

SITE AREA EMERGENCY

Initiating Condition:

Loss of RCS inventory affecting core decay heat removal capability with irradiated fuel in the reactor vessel

Operating Mode Applicability:

Refueling (Mode 6)

Emergency Action Level(s):

1. Reactor vessel level cannot be monitored with core uncovery indicated by one or more of the following:
   - Containment High Range Radiation Monitor reading > 10 R/hr
   - Erratic source range monitor indication
   - Core Exit Thermocouples indicate superheat

Basis:

Under the conditions specified by these EALs, continued drop in reactor vessel level is indicative of a loss of inventory control. Inventory loss may be due to a reactor vessel breach, pressure boundary leakage, or continued boiling in the reactor vessel.

In cold shutdown the decay heat available to raise RCS temperature during a loss of inventory or heat removal event may be significantly greater than in the refueling mode. Entry into cold shutdown conditions may be attained within hours of operating at power or hours after refueling is completed. Entry into the refueling mode procedurally may not occur for several hours after the reactor has been shutdown. Thus the heatup threat and, therefore, the threat to damaging the fuel clad may be lower for events that occur in the refueling mode with irradiated fuel in the reactor vessel (note that the heatup threat could be lower for cold shutdown conditions if the entry into cold shutdown was following a refueling). The above forms the basis for needing both a cold shutdown specific IC (**CS1**) and a refueling specific IC (**CS2**).

If all reactor vessel level indication were to be lost during a loss of RCS inventory event, the operators would need to determine that RCS inventory loss was occurring by observing containment sump level, reactor drain tank level, or quench tank level change. Containment sump level, reactor drain tank level, or quench tank level rises must be evaluated against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of RCS leakage. This EAL is based on 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.* A number of variables, (mid-loop, reduced level/flange level, head in place, cavity flooded, RCS venting strategy, decay heat removal system design, vortexing pre-disposition, or steam generator U-tube draining) can have a significant impact on heat removal capability challenging the fuel clad barrier. Analysis in the above references indicates that core damage may occur within an hour following continued core uncovery; therefore, 30 minutes was chosen to be conservative.

As water level in the reactor vessel lowers, the dose rate above the core will rise. The dose rate due to core shine should result in up-scaled Containment High Range Monitor indication. A reading of greater than or equal to 10 R/hr may be indicative of fuel damage. The basis for 10 R/hr is that it is sufficiently above the normal indication of 0.74 R/hr (nominal shutdown) to avoid an unnecessary entry into the EAL but substantially lower than the calculated values for RCS barrier failure (100 R/hr) and fuel clad barrier failure (1000 R/hr) for barrier losses in Section F(Fission Product Barrier) to give an early indication of vessel level lowering to the point of potential fuel damage. The 10 R/hr is also high enough to be indicative of potential fuel uncovery.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION (CS2)

The 30-minute duration allowed when CONTAINMENT CLOSURE is established allows sufficient time for actions to be performed to recover needed cooling equipment and is considered to be conservative. As water level in the reactor vessel lowers, the dose rate above the core will rise. Additionally, studies indicate that the installed nuclear instrumentation will operate erratically when the core is uncovered and can be used as a tool for making such determinations. In the refueling mode, normal means of reactor vessel level indication is not available; however, a temporary means of reactor vessel level indication is normally installed to assure that the ability to monitor level will not be interrupted. This temporary means of level indication will only indicate to the bottom of the hot leg. Since effluent release is not expected with closure established, declaration of a Site Area Emergency is warranted under the conditions specified.

Declaration of an Site Area Emergency is warranted under the conditions specified by the IC. Escalation to a General Emergency is via **CG1** or **AG1**.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CG1

GENERAL EMERGENCY

Initiating Condition:

Loss of RCS inventory affecting fuel clad integrity with containment challenged with irradiated fuel in the reactor vessel

Operating Mode Applicability:

Cold Shutdown (Mode 5)
Refueling (Mode 6)

Emergency Action Level(s): (1 AND 2 AND 3)

1. Loss of RCS inventory as indicated by unexplained Reactor Building Sump, Reactor Drain Tank, Quench Tank, Aux. Building Equipment Drain Tank, or Aux. Building Sump level rise.

   AND

2. Reactor vessel level:

   a. (MODE 5 ONLY) Less than the top of active fuel for > 30 minutes:
   Unit 1: RVLMS Levels 1 through 9 indicate DRY
   Unit 2: RVLMS Levels 1 through 7 indicate DRY

   OR

   b. Cannot be monitored with indication of core uncovery for > 30 minutes as evidenced by one or more of the following:

   - Containment High Range Radiation Monitor reading > 10 R/hr
   - Erratic source range monitor indication
   - Core exit thermocouples indicate superheat

   AND

3. CONTAINMENT is challenged as indicated by one or more of the following:

   - An explosive mixture exists in containment.
   - Containment pressure with CONTAINMENT INTEGRITY established is:
   Unit 1: > 59 psig
   Unit 2: > 73.7 psia
   - CONTAINMENT CLOSURE not established.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION (CG1)

Basis:

For EAL #1 the operators would need to determine that RCS inventory loss was occurring by observing sump and tank level changes. Sump and tank level rises must be evaluated against other potential sources of leakage such as cooling water sources inside the containment to ensure they are indicative of RCS leakage.

EAL #2 represents the inability to restore and maintain reactor vessel level above the top of active fuel. Fuel damage is probable if reactor vessel level cannot be restored, as available decay heat will cause boiling further reducing the reactor vessel level. These EALs are based on 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.* A number of variables (e.g., mid-loop, reduced level/flange level, head in place, cavity flooded, RCS venting strategy, decay heat removal system design, vortexing pre-disposition, or steam generator U-tube draining) can have a significant impact on heat removal capability challenging the fuel clad barrier. Analysis in the above references indicates that core damage may occur within an hour following continued core uncovery; therefore, 30 minutes was chosen to be conservative. As water level in the reactor vessel lowers, the dose rate above the core will rise. Additionally, post-TMI studies indicated that the installed nuclear instrumentation will operate erratically when the core is uncovered and that this should be used as a tool for making such determinations. The GE is declared on the occurrence of the loss or imminent loss of function of all three barriers. Based on the above discussion, RCS barrier failure resulting in core uncovery for 30 minutes or more may cause fuel clad failure. With the CONTAINMENT breached or challenged, the potential for unmonitored fission product release to the environment is high. This represents a direct path for radioactive inventory to be released to the environment. This is consistent with the definition of a GE.

As water level in the reactor vessel lowers, the dose rate above the core will rise. The dose rate due to core shine should result in up-scaled Containment High Range Monitor indication. 10 R/hr was selected as the setpoint for this EAL because it is sufficiently above the expected normal shutdown reading to preclude unnecessary entry into the EAL. 10 R/hr is also high enough to be indicative of potential fuel uncovery.

In the context of EAL #3, containment closure is the action taken to secure containment and its associated structures, systems, and components as a functional barrier to fission product release under existing plant conditions. Containment closure should not be confused with refueling containment integrity as defined in technical specifications. Site shutdown contingency plans provide for re-establishing containment closure following a loss of heat removal or RCS inventory functions. If the closure is re-established prior to exceeding the temperature or level thresholds of the RCS barrier and fuel clad barrier EALs, escalation to GE would not occur.

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION (CG1)

The pressure at which containment is considered challenged is based on the condition of the containment. If containment integrity is established, then the containment will be challenged at the design pressure. This is consistent with the owners groups' Emergency Response Procedures. Since no significant pressurization is expected during cold shutdown/refueling operations, there is no specific pressure setpoint at which the containment is considered to be challenged. Plant procedures provide for the establishment of containment closure when required and for the monitoring of the status of containment closure.

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 mixture of dissolved gasses in containment. However, containment monitoring and/or sampling should be performed to verify this assumption and a General Emergency declared if it is determined that an explosive mixture exists.

Reference Documents

1. ULD-1-SYS-24, Unit 1 Inadequate Core Cooling System
2. ULD-2-SYS-24, Unit 2 Inadequate Core Cooling Monitoring System

FISSION PRODUCT BARRIER DEGRADATION

FUEL CLAD BARRIER EALs: FCB1 **OR** FCB2 **OR** FCB3 **OR** FCB4 **OR** FCB5 **OR** FCB6

The fuel clad barrier is the zircalloy tubes that contain the fuel pellets.

3. Reactor Vessel Water Level (FCB3)

Loss:

None

Potential Loss:

Unit 1: RVLMS levels 1 through 9 indicate DRY

Unit 2: RVLMS levels 1 through 7 indicate DRY

Basis:

The Reactor Vessel Level Monitoring Systems at ANO do not provide positive indication of core uncovery. The above core level indication provided 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.

Per reference document #1, the reactor vessel level indicators installed in Unit 1 extend from the top of the reactor vessel to the fuel alignment plate, and information in reference document #2 indicates that the lowest sensor is greater than 2 feet above the top of active fuel. If any of the 4 RCPs are running, flow induced turbulence produced by the pumps renders the reactor vessel level indicator readings invalid.

Per reference document #3, only the reactor vessel level indicators above the core are considered part of the ICC monitoring system. Per reference document #4, the lowest sensor above the core, RVLMS LVL 6 on the ICC monitoring panel 2C388, is 47 inches above the top of the core. If any of the 4 RCPs are running, flow induced turbulence produced by the pumps renders the reactor vessel level indicator readings invalid.

For either unit then, should CET indication be unavailable and reactor vessel level indication be unavailable due to RCP operation or any other cause, a degraded ability to monitor the barrier would exist.

Reference Documents

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

FISSION PRODUCT BARRIER DEGRADATION

FUEL CLAD BARRIER EALs: FCB1 **OR** FCB2 **OR** FCB3 **OR** FCB4 **OR** FCB5 **OR** FCB6

The fuel clad barrier is the zircalloy tubes that contain the fuel pellets.

4. Containment Radiation Monitoring (FCB4)

Loss:

Containment high range rad monitor reading > 1000 R/hr

Potential Loss:

None

Basis:

The 1000 R/hr reading on the containment high range radiation monitors (RE-8060 or RE-8061 for Unit 1, 2RE-8925-1 or 2RE-8925-2 for Unit 2) is a value that indicates the release of reactor coolant, with elevated activity indicative of fuel damage, into the containment. The reading was calculated assuming the instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory associated with an RCS concentration of 300 μCi/gm dose equivalent I-131 into the containment atmosphere. Reactor coolant concentrations of this magnitude are several times larger than that expected for iodine spikes and are therefore indicative of fuel damage. This value is higher than that specified for RCS barrier loss EAL **RCB3.** Therefore, this EAL condition represents a potential loss of both the fuel clad and the RCS barriers, and represents a Site Area Emergency per **FS1.**

There is no potential loss EAL associated with this item.

Reference Documents

1. NUREG 1228, Source Term Estimation During Incident Response to Severe Nuclear Power Plant Accidents
2. ANO Calculation 03-E-0002-01, Radiation Monitor EAL Setpoints for Fission Product Barrier Degradation

FISSION PRODUCT BARRIER DEGRADATION

CONTAINMENT BARRIER EALs: CNB1 **OR** CNB2 **OR** CNB3 **OR** CNB4 **OR** CNB5 **OR** CNB6 **OR** CNB7

The containment barrier includes the containment building, its connections up to and including the outermost containment isolation valves. This barrier also includes the main steam, feedwater, and blowdown line extensions outside the containment building up to and including the outermost secondary side isolation valve.

4. Containment Isolation Valve Status after Containment Isolation (CNB4)

Loss:

Unisolable breach of containment with a direct release path to the environment following containment isolation actuation

Potential Loss:

None

Basis:

This EAL is intended to address incomplete containment isolation that allows direct release to the environment. It represents a loss of the containment barrier. A breach of containment has also occurred if an inboard and outboard pair of isolation valves fails to close on an automatic actuation signal or from a manual action in the control room and opens a release path to the environment.

The breach is not isolable from the Control Room if an attempt for isolation from the Control Room has been made and was unsuccessful. An attempt for isolation should be made prior to the accident classification. If isolable upon identification then this Initiating Condition is not applicable.

The use of the modifier "direct" in defining the release path discriminates against release paths through interfacing liquid systems. The existence of an in-line charcoal filter does not make a release path indirect since the filter is not effective at removing fission noble gases. Typical filters have an efficiency of 95-99% removal of iodine. Given the magnitude of the core inventory of iodine, significant releases could still occur. In addition, since the fission product release would be driven by boiling in the reactor vessel, the high humidity in the release stream can be expected to render the filters ineffective in a short period.

There is no potential loss EAL associated with this item.

EVENTS RELATED TO ISFSI

E-HU1

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Damage to a loaded cask CONFINEMENT BOUNDARY

Operating Mode Applicability:

All

Emergency Action Level(s): (1 OR 2 OR 3)

1. Natural phenomena events affecting a loaded cask CONFINEMENT BOUNDARY:

   a. Tornado/High winds resulting in:
      - Missile impact causing a loss of shielding
      - Blockage of air inlets for > 24 hours

      OR

   b. Flooding resulting in blockage of air inlets for > 24 hours.

      OR

   c. Seismic event resulting in cask tip-over causing a loss of shielding.

      OR

2. Accident conditions affecting a loaded cask CONFINEMENT BOUNDARY:

   a. Cask drop of > 11 inches.

      OR

   b. Blockage of air inlets for > 24 hours

      OR

   c. Fire or explosion resulting in a loss of shielding

      OR

   d. Cask tip-over causing a loss of shielding.

      OR

3. Any condition in the opinion of the SM/TSC Director/EOF Director that indicates loss of loaded fuel storage cask CONFINEMENT BOUNDARY.

EVENTS RELATED TO ISFSI (E-HU1)

Basis:

An NUE would be declared on the basis of the occurrence of an event of sufficient magnitude that a loaded cask CONFINEMENT BOUNDARY is damaged or violated. This includes classification based on a loaded fuel storage cask CONFINEMENT BOUNDARY loss leading to the degradation of the fuel during storage or posing an operational safety problem with respect to its removal from storage.

For EAL #1 and EAL #2, the results of the ISFSI Safety Analysis Report (SAR) referenced in the cask('s) Certificate of Compliance and the related NRC Safety Evaluation Report are used to develop a list of natural phenomena events and accident conditions. These EALs address responses to a dropped cask, a tipped-over cask, explosion, missile damage, fire damage or natural phenomena affecting a cask (e.g., seismic event, tornado, etc.).

For EAL #3, any condition not explicitly detailed as an EAL threshold value, which, in the judgment of the SM/TSC Director/EOF Director, is a potential degradation in the level of safety of the ISFSI. .SM/TSC Director/EOF Director judgment is to be based on known conditions and the expected response to mitigating activities within a short time period.

Possible damage modes to the storage cask involve loss of shielding from impact damage due to tornado- or wind-generated missiles. Cask containment loss due to a tornado is not postulated except long-term loss of heat transfer due to blockage of air inlets as discussed in following paragraphs.

There is no fully immersing flood that might move or tip-over the cask postulated for the ANO site. The Maximum Probable Flood blocks the air inlets of the Holtec casks above site Elevation 354 feet.

The VSC-24 storage cask drop accident is a cask drop of 5 feet onto an essentially unyielding surface. The Holtec storage cask drop accident is a cask drop of 11 inches onto an essentially unyielding surface. 11 inches was selected in the interest of conservatism. Any similar drop or tip-over of a loaded canister while being transported in a site transfer cask can also potentially affect a confinement boundary.

The full blockage of air inlets event is a postulated blockage of the airflow inlets for greater than 24 hours for the VSC-24 casks and 72 hours (or 24 hours with the difference between the average air outlet temperature and the ISFSI ambient temperature equal to or greater than 126°F) for the Holtec casks. In the interest of conservatism, 24 hours was selected as the EAL threshold value. The cask has four air inlets and the classification is not based on a loss of confinement boundary, but the condition could lead to the degradation of the fuel during storage or posing an operational safety problem with respect to its removal from storage.

A fire inside the ISFSI fence or explosion that generates missiles that enter the ISFSI area could lead to the degradation of the fuel during storage or pose an operational safety problem with respect to its removal from storage.

EVENTS RELATED TO ISFSI

E-HU2

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Confirmed security event with potential loss of level of safety of the ISFSI

Operating Mode Applicability:

All

Emergency Action Level(s):

1. Security event as determined from the ANO Safeguards Contingency Plan and reported by ANO Security shift supervision.

Basis:

This EAL is based on ANO Security Plans. Security events which do not represent a potential degradation in the level of safety of the ISFSI are reported under 10 CFR 73.71 or in some cases under 10 CFR 50.72.

Security shift supervision are the designated personnel qualified and trained to confirm that a security event is occurring or has occurred. Training on security event classification confirmation is closely controlled due to the strict secrecy controls placed on the Security Plan.

SYSTEM MALFUNCTION

SU1

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Loss of all offsite power to Vital 4.16 KV busses for > 15 minutes

Operating Mode Applicability:

Power Operation (Mode 1)
Startup (Mode 2)
Hot Standby (Mode 3)
Hot Shutdown (Mode 4)

Emergency Action Level(s):

1. Loss of power to all Startup Transformers for > 15 minutes.

   AND

   Each vital 4.16 KV bus is powered from an independent diesel generator.

Basis:

Prolonged loss of AC power reduces required redundancy and potentially degrades the level of safety of the plant by rendering the plant more vulnerable to a complete loss of AC power (e.g., Station Blackout). Fifteen minutes was selected as a threshold to exclude transient or momentary power losses.

The EAL allows credit for operation of installed design feature (Alternate AC Diesel Generator).

Reference Documents:

1. 1202.007, *Degraded Power*
2. 1202.008, *Blackout*
3. 2202.007, *Loss of Off-Site Power*
4. 2202.008, *Station Blackout*
5. 2104.037, *Alternate AC Diesel Generator Operations*

SYSTEM MALFUNCTION

SU6

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

UNPLANNED loss of most or all safety system annunciation or indication in the Control Room for > 15 minutes

Operating Mode Applicability:

Power Operation (Mode 1)
Startup (Mode 2)
Hot Standby (Mode 3)
Hot Shutdown (Mode 4)

Emergency Action Level(s):

1. UNPLANNED loss of most or all annunciators or indicators associated with safety systems for > 15 minutes.

Basis:

This IC and its associated EALs are intended to recognize the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment.

Recognition of the availability of computer based indication equipment is considered (e.g., SPDS, plant computer, etc.).

Quantification of "Most" is arbitrary, however, it is estimated that if approximately 75% of the safety system annunciators or indicators are lost, there is a higher risk that a degraded plant condition could go undetected. It is not intended that plant personnel perform a detailed count of the instrumentation lost but use the value as a judgment threshold for determining the severity of the plant conditions.

It is further recognized that each plant design provides redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This will be addressed by the specific Technical Specification. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification action, the NUE is based on **SU11**.

Annunciators or indicators for this EAL must include those identified in the Abnormal Operating Procedures, in the Emergency Operating Procedures, and in other EALs (e.g., area, process, and/or effluent rad monitors, etc.). The loss of control room annunciators increases the difficulty to recognize changing plant conditions. It is estimated that if approximately 75% of the safety system annunciators or indications are lost, there is an increased risk that a degraded plant condition could go undetected.

SYSTEM MALFUNCTION (SU6)

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

Due to the limited number of safety systems in operation during cold shutdown, refueling, and defueled modes, no EAL is indicated during these modes of operation.

This NUE will be escalated to an Alert if a transient is in progress during the loss of annunciation or indication (**SA6**).

Reference Documents:

1. 1203.043, *Loss Control Room Annunciator*
2. 2203.042, *Loss of Annunciators*

SYSTEM MALFUNCTION

SU9

NOTIFICATION OF UNUSUAL EVENT

Initiating Condition:

Fuel clad degradation

Operating Mode Applicability:

Power Operation (Mode 1)
Startup (Mode 2)
Hot Standby (Mode 3)
Hot Shutdown (Mode 4)

Emergency Action Level(s):

1. Failed Fuel Iodine radiation monitor reading indicates fuel clad degradation > Technical Specification allowable limits.

   Unit 1:
   RI-1237S reads > 1.3×10^5 counts per minute.

   Unit 2:
   2RITS-4806B reads > 6.5×10^4 counts per minute.

2. RCS sample activity value indicating fuel clad degradation > Technical Specification allowable limits.

   Unit 1:
   RCS Sample Analysis: > 3.50 µCi/gm IDE
   RCS Sample Analysis: > 72/$\bar{E}$ µCi/gm Gross Activity

   Unit 2:
   RCS Sample Analysis: > 1.0 µCi/gm IDE
   RCS Sample Analysis: > 100/$\bar{E}$ µCi/gm Gross Activity

Basis:

This IC and its associated EALs are included as an NUE because it is considered to be a potential degradation in the level of safety of the plant and a potential precursor of more serious problems. EAL #1 addresses the Letdown Radiation Monitor reading that is indicative of RCS Iodine levels that may exceed the Technical Specification limit. EAL #2 addresses reactor coolant samples exceeding Technical Specification limits for iodine spikes that are indicative of a loss of fuel clad integrity. Escalation of this EAL to the Alert level is via the Fission Product Barrier Degradation Monitoring EALs. The companion EAL to **SU4** for the Cold Shutdown/Refueling modes is **CU4.**

SYSTEM MALFUNCTION

SA1

ALERT

Initiating Condition:

AC power capability to Vital 4.16 KV busses reduced to a single power source for > 15 minutes such that any additional single failure would result in station blackout

Operating Mode Applicability:

Power Operation (Mode 1)
Startup (Mode 2)
Hot Standby (Mode 3)
Hot Shutdown (Mode 4)

Emergency Action Level(s):

1. AC power capability to Vital 4.16 KV busses reduced to a single power source for > 15 minutes.

   AND

   Any additional single failure will result in station blackout.

Basis:

This IC and its associated EAL is intended to provide an escalation from SU1. The condition indicated is the degradation of the offsite and onsite power systems such that any additional single failure would result in a station blackout. This condition could occur due to a loss of offsite power with a concurrent failure of one emergency generator to supply power to its emergency busses. Another related condition could be the loss of all offsite power and loss of onsite emergency diesels with only one train of emergency busses being backfed from the unit main generator, or the loss of onsite emergency diesels with only one train of emergency busses being backfed from offsite power. The subsequent loss of this single power source would escalate the event to a Site Area Emergency in accordance with **SS1.**

The EAL allows credit for operation of the Alternate AC Diesel Generator.

Even though a vital 4.16 KV bus may be energized, if necessary loads (i.e., loads that if lost would inhibit decay heat removal capability or reactor vessel makeup capability) are not operable on the energized bus then the bus should not be considered operable. If this bus was the only energized bus then a Site Area Emergency per **SS1** should be declared.

Reference Documents:
1. 1202.007, *Degraded Power*
2. 1202.008, *Blackout*
3. 2202.007, *Loss of Off-Site Power*
4. 2202.008, *Station Blackout*
5. 2104.037, *Alternate AC Diesel Generator Operations*

SYSTEM MALFUNCTION

SA6

ALERT

Initiating Condition:

UNPLANNED loss of most or all safety system annunciation or indication in Control Room with either (1) a SIGNIFICANT TRANSIENT in progress, or (2) compensatory non-alarming indicators are unavailable

Operating Mode Applicability:

Power Operation (Mode 1)
Startup (Mode 2)
Hot Standby (Mode 3)
Hot Shutdown (Mode 4)

Emergency Action Level(s):

1. UNPLANNED loss of most or all annunciators or indicators associated with safety systems for > 15 minutes.

   AND

   Either of the following:

   a. A SIGNIFICANT TRANSIENT is in progress.

      OR

   b. Compensatory non-alarming indications are unavailable.

Basis:

This EAL is intended to recognize the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment during a transient. Recognition of the availability of computer based indication equipment is considered (e.g., SPDS, plant computer, etc.).

"Planned" loss of annunciators or indicators includes scheduled maintenance and testing activities.

Quantification of "Most" is arbitrary, however, it is estimated that if approximately 75% of the safety system annunciators or indicators are lost, there is higher risk that a degraded plant condition could go undetected. It is not intended that plant personnel perform a detailed count of the instrumentation lost but use the value as a judgment threshold for determining the severity of the plant conditions. It is also not intended that the Shift Manager be tasked with making a judgment decision as to whether additional personnel are required to provide more monitoring of system operation.

SYSTEM MALFUNCTION (SA6)

It is further recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This will be addressed by the specific Technical Specification. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification action, the NUE is based on **SU11.**

Due to the limited number of safety systems in operation during cold shutdown, refueling and defueled modes, no EAL is indicated during these modes of operation.

This Alert will be escalated to a Site Area Emergency (**SS6**) if the operating crew cannot monitor the transient in progress.

Reference Documents:

1. 1015.037, *Post Transient Review*
2. 1203.043, *Loss Control Room Annunciator*
3. 2203.042, *Loss of Control Room Annunciators*

SYSTEM MALFUNCTION

SS1

SITE AREA EMERGENCY

Initiating Condition:

Loss of all offsite power and loss of all onsite AC power to Vital 4.16 KV busses

Operating Mode Applicability:

Power Operation (Mode 1)
Startup (Mode 2)
Hot Standby (Mode 3)
Hot Shutdown (Mode 4)

Emergency Action Level(s):

1. Loss of power to all Startup transformers.

   AND

   Failure of all diesel generators to supply power to Vital 4.16 KV busses.

   AND

   Failure to restore power to at least one Vital 4.16 KV bus within 15 minutes from the loss of both offsite and onsite AC power.

Basis:

Loss of all AC power compromises all plant safety systems requiring electric power including DHR or SDC, ECCS, containment heat removal and the ultimate heat sink. Prolonged loss of all AC power will cause core uncovering and loss of containment integrity, thus this event can escalate to a General Emergency. The 15 minute duration is selected to exclude transient or momentary power losses.

Escalation to General Emergency is via fission product barrier degradation **FG1** or **SG1**.

Loss of the 6.9 KV busses and non-vital 4.16 KV busses puts the plant in a natural circulation mode with Decay Heat being removed by the EFW System. Maintaining the required components for Natural Circulation Cooling is of vital importance. Consideration should be given to operable loads necessary to remove decay heat or provide Reactor Vessel makeup capability when evaluating loss of AC power to vital 4.16 KV busses. Even though a vital bus may be energized, if necessary loads (i.e., loads that, if lost, would inhibit decay heat removal capability or Reactor Vessel makeup capability) are not operable on the energized bus, then the bus should not be considered operable for this IC. If this bus was the only energized bus, than a Site Area Emergency per **SS1** should be declared.

Reference Documents:

1. 1202.007, *Degraded Power*
2. 1202.008, *Blackout*
3. 2202.007, *Loss of Off-Site Power*
4. 2202.008, *Station Blackout*
5. 2104.037, *Alternate AC Diesel Generator Operations*

SYSTEM MALFUNCTION

SG1

GENERAL EMERGENCY

Initiating Condition:

Prolonged loss of all offsite power and prolonged loss of all onsite AC power to Vital 4.16 KV busses

Operating Mode Applicability:

Power Operation (Mode 1)
Startup (Mode 2)
Hot Standby (Mode 3)
Hot Shutdown (Mode 4)

Emergency Action Level(s):

1. Loss of power to all Startup transformers.

   AND

   Failure of all Diesel Generators to supply power to Vital 4.16 KV busses.

   AND

   Either of the following: (a **OR** b)

   a. Restoration of at least one Vital 4.16 KV bus within four (4) hours is not likely

      OR

   b. **FA1** entry conditions met.

SYSTEM MALFUNCTION (SG1)

Basis:

Loss of all AC power compromises all plant safety systems requiring electric power including DHR, SDC, ECCS, containment heat removal and the ultimate heat sink. Prolonged loss of all AC power will lead to loss of fuel clad, RCS, and containment barriers. The 4 hours to restore AC power is based on the results of the calculations referenced below. Appropriate allowance for offsite emergency response including evacuation of surrounding areas should be considered. Although this IC may be viewed as redundant to the Fission Product Barrier Degradation ICs, its inclusion is necessary to better assure timely recognition and emergency response.

This IC is specified to assure that in the unlikely event of a prolonged station blackout, timely recognition of the seriousness of the event occurs and that declaration of a General Emergency occurs as early as is appropriate, based on a reasonable assessment of the event trajectory.

The likelihood of restoring at least one emergency bus should be based on a realistic appraisal of the situation since a delay in an upgrade decision based on only a chance of mitigating the event could result in a loss of valuable time in preparing and implementing public protective actions.

In addition, under these conditions, fission product barrier monitoring capability may be degraded. Although it may be difficult to predict when power can be restored, it is necessary to give the SM/TSC Director/EOF Director a reasonable idea of how quickly the need to declare a General Emergency may be based on two major considerations:

1. Are there any present indications that core cooling is already degraded to the point that Loss or Potential Loss of fission product barriers is imminent.

2. If there are no present indications of such core cooling degradation, how likely is it that power can be restored in time to assure that a loss of two barriers with a potential loss of the third barrier can be prevented.

Thus, indication of continuing core cooling degradation must be based on fission product barrier monitoring with particular emphasis on SM/TSC Director/EOF Director judgment as it relates to imminent Loss or Potential Loss of fission product barriers and degraded ability to monitor fission product barriers.

Reference Documents:

1. Unit 1 Calculation 85-E-0072-02, *Time from Loss of All AC Power to Loss of Subcooling*
2. Unit 2 Calculation 85-E-0072-01, *Time from Loss of All AC Power to Loss of Subcooling*

Attachment 4

0CAN050503

Definitions

4.0 DEFINITIONS

4.1 AFFECTING SAFE SHUTDOWN: Event in progress has adversely affected functions that are necessary to bring the plant to and maintain it in the applicable HOT or COLD SHUTDOWN condition. Plant condition applicability is determined by Technical Specification LCOs in effect.

Example 1: An event causes damage that results in entry into an LCO that requires the plant to be placed in HOT SHUTDOWN. HOT SHUTDOWN is achievable, but COLD SHUTDOWN is not. This event is not "AFFECTING SAFE SHUTDOWN."

Example 2: An event causes damage that results in entry into an LCO that requires the plant to be placed in COLD SHUTDOWN. HOT SHUTDOWN is achievable, but COLD SHUTDOWN is not. This event is "AFFECTING SAFE SHUTDOWN."

4.2 BOMB: Refers to an explosive device suspected of having sufficient force to damage plant systems or structures.

4.3 CIVIL DISTURBANCE: A group of persons violently protesting station operations or activities at the site.

4.4 CONFINEMENT BOUNDARY: The barrier(s) between areas containing radioactive substances and the environment.

4.5 CONTAINMENT CLOSURE (UNIT 1): A condition where at least one integral barrier to the release of radioactive material is provided.

4.6 CONTAINMENT CLOSURE (UNIT 2): CONTAINMENT CLOSURE is a preliminary action that immediately and effectively reduces the likelihood of a release while providing flexibility to have the Containment Building open under appropriate conditions. The Containment Building provides the last integral barrier to the release of radioactive material to the general public. During core alterations with less than 23 feet of coolant above the fuel, Containment Closure must be set; with greater than 23 feet of coolant above the fuel, Containment Closure must be capable of being set. Containment Closure is set when the following conditions have been met:

- The equipment hatch door is closed and held in place by a minimum of four bolts such that no gaps exist in the sealing surface or the Temporary Equipment Hatch Cover (TEHC) is installed per Temporary Equipment Hatch Cover Installation/Removal (2504.036).
- A minimum of one barrier in each airlock is closed.
- Each penetration providing access from Containment to the outside atmosphere, is closed by a valve, blank flange, or other approved closure mechanism. Opening of systems inside Containment may create a Containment breach potential that is NOT readily apparent. An example would be an opening of the S/G secondary side manways thus expanding closure concerns to piping and valves up to the MSIVs.

4.17 EXPLOSION: A rapid, violent, unconfined combustion, or catastrophic failure of pressurized equipment that imparts energy of sufficient force to potentially damage permanent structures, systems, or components.

4.18 EXTORTION: An attempt to cause an action at the station by threat of force.

4.19 FAULTED: In a steam generator, the existence of secondary side leakage that results in an uncontrolled drop in steam generator pressure or the steam generator being completely depressurized.

4.20 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.

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

4.22 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.

4.23 IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH): A condition that either poses an immediate threat to life and health or an immediate threat of severe exposure to contaminants which are likely to have adverse delayed effects on health.

4.27 INTRUSION/INTRUDER: A person(s) present in a specified area without authorization. Discovery of a BOMB in a specified area is indication of INTRUSION into that area by a HOSTILE FORCE.

4.28 LOWER FLAMMABILITY LIMIT (LFL): The minimum concentration of combustible substance that is capable of propagating a flame through a homogenous mixture of the combustible and a gaseous oxidizer.

4.29 NORMAL PLANT OPERATIONS: Activities at the plant site associated with routine testing, maintenance, or equipment operations, in accordance with normal operating or administrative procedures. Entry into abnormal or emergency operating procedures, or deviation from normal security or radiological controls posture, is a departure from NORMAL PLANT OPERATIONS.

4.35 PROTECTED AREA: The area encompassed by physical barriers (i.e., the security fence) and to which access is controlled.

4.37 RUPTURED: In a steam generator, existence of primary-to-secondary leakage of a magnitude sufficient to require or cause a reactor trip and safety injection.

4.38 SABOTAGE: Deliberate damage, mis-alignment, or mis-operation of plant equipment with the intent to render the equipment inoperable. Equipment found tampered with or damaged due to malicious mischief may NOT meet the definition of SABOTAGE until this determination is made by security supervision.

4.39 SIGNIFICANT TRANSIENT: An UNPLANNED event involving one or more of the following: (1) automatic turbine runback greater than 25% thermal reactor power, (2) electrical load rejection greater than 25% full electrical load, (3) Reactor Trip, (4) Safety Injection Activation, or (5) thermal power oscillations greater than 10%

4.40 STRIKE ACTION: A work stoppage within the PROTECTED AREA by a body of workers to enforce compliance with demands made on the company. The STRIKE ACTION must threaten to interrupt NORMAL PLANT OPERATIONs.

4.42 UNPLANNED: A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions.

4.43 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.

4.44 VISIBLE DAMAGE: Damage to equipment or structure that is readily observable without measurements, testing, or analysis. Damage is sufficient to cause concern regarding the continued operability or reliability of affected safety structure, system, or component. Example damage includes: deformation due to heat or impact, denting, penetration, rupture, cracking, paint blistering. Surface blemishes (e.g., paint chipping, scratches) should not be included.

4.45 VITAL AREA: Any area, normally within the PROTECTED AREA, which contains equipment, systems, components, or material, the failure, destruction, or release of which could directly or indirectly endanger the public health and safety by exposure to radiation.

Attachment 5

0CAN050503

Deviation Document Pages

ABNORMAL RAD LEVELS/RADIOLOGICAL EFFLUENT

AA3

Initiating Condition -- ALERT

Release of Radioactive Material or Increases in Radiation Levels Within the Facility That Impedes Operation of Systems Required to Maintain Safe Operations or to Establish or Maintain Cold Shutdown

Operating Mode Applicability: **All**

Example Emergency Action Levels: (1 or 2)

1. VALID (site-specific) radiation monitor readings GREATER THAN 15 mR/hr in areas requiring continuous occupancy to maintain plant safety functions:

   (Site-specific) list

2. VALID (site-specific) radiation monitor readings GREATER THAN <site specific> values in areas requiring infrequent access to maintain plant safety functions.

   (Site-specific) list

Differences:

EAL 1: At ANO, the site-specific list of areas called for in the NEI example EAL does not include the "Radwaste Control Room" since ANO does not have one.

The EAL was re-worded to remove "radiation monitor" which will allow for the use of radiation monitors or portable RP instrumentation for determining the entry into the EAL.

Deviations:

None

COLD SHUTDOWN/REFUELING SYSTEM MALFUNCTION

CU5

Initiating Condition -- NOTIFICATION OF UNUSUAL EVENT

Fuel clad degradation

Operating Mode Applicability: Cold Shutdown
Refueling

Example Emergency Action Levels: (1 or 2)

1. (Site-specific) radiation monitor readings indicating fuel clad degradation greater than Technical Specification allowable limits.

2. (Site-specific) coolant sample activity value indicating fuel clad degradation greater than Technical Specification allowable limits.

Differences:

The IC was re-numbered CU4.

Deviations:

None

FUEL CLAD BARRIER EXAMPLE EALS (1 or 2 or 3 or 4 or 5 or 6)

1. Critical Safety Function Status
LOSS Core Cooling - Red
POTENTIAL LOSS: Core Cooling Orange OR Heat Sink – Red

Differences:

None

Deviations:

This EAL was not used since neither unit at ANO uses Critical Safety Function Status Trees. There is no equivalent core cooling color-designated pathway. The loss of core cooling fuel clad barrier thresholds are addressed under primary coolant activity level, CET readings, reactor vessel water level, and containment radiation monitoring for the loss and potential loss indicators.

RCS BARRIER EXAMPLE EALs: (1 or 2 or 3 or 4 or 5 or 6)

1. Critical Safety Function Status

LOSS Not Applicable
POTENTIAL LOSS: RCS Integrity – Red or Heat Sink- Red

Differences:

None

Deviations:

This EAL was not used since neither unit at ANO uses Critical Safety Function Status Trees. There are no equivalent color-designated path conditions. The loss of RCS barrier thresholds are addressed under RCS leak rate, steam generator tube rupture and containment radiation monitoring for the loss and potential loss indicators.

CONTAINMENT BARRIER EXAMPLE EALs: (1 or 2 or 3 or 4 or 5 or 6 or 7 or 8)

1. Critical Safety Function Status

LOSS Not Applicable
POTENTIAL LOSS: Containment - Red

Differences:

None

Deviations:

Neither unit at ANO uses CSFSTs. Therefore, this EAL was not used. There is no equivalent color-designated path. The loss of containment barrier thresholds are addressed under containment pressure, CET readings, steam generator secondary side release, containment isolation valve and containment radiation monitoring for the loss and potential loss indicators.