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**SALEM GENERATING STATION
EVENT CLASSIFICATION GUIDE TECHNICAL BASIS
January 31, 2003**

**CHANGE PAGES FOR
REVISION #15**

The Table of Contents forms a general guide to the current revision of each section and attachment of the Salem ECG Technical Basis. The changes that are made in this TOC Revision #15 are shown below.

1. Check that your revision packet is complete.
2. Add the revised documents.
3. Remove and recycle the outdated material listed below.

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REVISION SUMMARY

Biennial Review Performed: Yes No

Clarified basis to specifically identify that a MS-10 (steam generator power operated relief valve) stuck open at power should be evaluated under this EAL.

SIGNATURE PAGE


Prepared By: William Detwiler 01/17/2003
Date

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Effective Date of this Revision: 01/31/03
Date

3.0 Fission Product Barriers

3.3 Containment Barrier

3.3.1 CRITICAL SAFETY FUNCTION STATUS

3.3.1.a

IC Potential Loss of Containment Barrier = 1 POINT

EAL

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CNTMT ENVIRONMENT RED PATH

MODE - 1, 2, 3, 4

BASIS

Containment Environment RED Path, as verified by EOP-CFST-1, results from RCS barrier loss or a faulted S/G inside Containment and signifies that breach of the Primary Containment is imminent. For this condition, all Containment isolations, as well as automatic Containment Spray and CFCU "low speed" operation should be initiated before this threshold is reached.

Barrier Analysis

Containment Barrier has been potentially lost.

ESCALATION CRITERIA

This event will be classified and/or escalated based on the potential loss or loss of additional barriers per EAL Section 3.0.

DISCUSSION

Symptom based criteria from the Emergency Operating Procedures Critical Safety Function Tree (CFST) Monitoring are integrated into this EAL. The CFSTs are contained as a tab to the ECG. The intent of using confirmed CFST status in this EAL is to simplify the identification of the EAL threshold criteria monitored in the Control Room.

Although the yield strength of the Primary Containment may be much higher than 47 psig, for the purposes of event classification, the barrier is considered potentially lost at that value. Thus, this EAL is primarily a discriminator between a Site Area Emergency and a General Emergency,

EAL - 3.3.1.a

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representing a potential loss of the third barrier. CFST status will not be used for event classification until the Control Room Staff has implemented the CFSTs.

DEVIATION

None

REFERENCES

NUMARC NESP-007, PC1
EOP-CFST-1
EOP-TRIP-1
EOP-FRCE-1

3.0 Fission Product Barriers

3.3 Containment Barrier

3.3.1 CRITICAL SAFETY FUNCTION STATUS

3.3.1.b

IC Potential Loss of Containment Barrier =1 POINT

EAL

CORE COOLING RED PATH for > 15 minutes

MODE - 1, 2, 3, 4

BASIS

Core Cooling RED Path, as verified by EOP-CFST-1, represents an imminent melt sequence which if not corrected could lead to Reactor Vessel failure and potential for Containment failure. The 15 minutes is used as a threshold for indicating that operator actions have not been effective in restoring core cooling.

Barrier Analysis

Fuel Clad Barrier has been lost; RCS and the Containment Barriers have been potentially lost.

ESCALATION CRITERIA

This event will be classified and/or escalated based on the loss of an additional barrier per EAL Section 3.0.

DISCUSSION

Symptom based criteria from the Emergency Operating Procedures Critical Safety Function Tree (CFST) Monitoring are integrated into this EAL. The CFSTs are contained as a tab to the ECG. The intent of using confirmed CFST status in this EAL is to simplify the identification of the EAL threshold criteria monitored in the Control Room.

Severe accident analysis has concluded that functional restoration procedures can arrest core degradation within the Reactor Vessel in a significant fraction of the scenarios, and that the

EAL - 3.3.1.b

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likelihood of Containment failure in these scenarios is small. It is appropriate; therefore, to allow a reasonable period of time for the functional restoration procedures to arrest the core melt sequence. It should be apparent within 15 minutes if the procedures will be effective. The Emergency Coordinator should make the classification as soon as it is determined that the procedures have been, or will be, ineffective. CFST status will not be used for event classification until the Control Room Staff has implemented the CFSTs.

DEVIATION

None

REFERENCES

NUMARC NESP-007, PC6
EOP-CFST-1
EOP-TRIP-1

3.0 Fission Product Barriers

3.3 Containment Barrier

3.3.2 CONTAINMENT PRESSURE

3.3.2.a

IC Potential Loss of Containment Barrier = 1 POINT

EAL

| |
|----------------------------------|
| Containment H ₂ > 4 % |
|----------------------------------|

MODE - 1, 2, 3, 4

BASIS

Hydrogen gas can be present in the Containment at the threshold level only as a result of an inadequate core cooling accident, substantial zirc-water reaction, and a breach of the RCS. Containment H₂ level above 4% signifies that an explosive mixture may exist.

Barrier Analysis

Containment Barrier has been potentially lost.

ESCALATION CRITERIA

This event will be classified and/or escalated based on the potential loss or loss of additional barriers per EAL Section 3.0.

DISCUSSION

A 4% mixture of H₂ with normal Containment atmosphere represents the deflagration lower limit. Any subsequent ignition and burn of this level mixture releases a substantial amount of energy that must be absorbed by the Containment structure, which is already under stress due to the Loss of the RCS Barrier.

DEVIATION

None

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REFERENCES

NUMARC, NESP-007, PC2
EOP-TRIP-1
EOP-FRCE-1
EOP-Setpoint Doc (T.18)

3.0 Fission Product Barriers

3.3 Containment Barrier

3.3.2 CONTAINMENT PRESSURE

3.3.2.b

IC Potential Loss of Containment Barrier =1 POINT

EAL

CNTMT Press. > 15 psig with EITHER one of the following:

- No CNTMT Spray AND < 5 CFCUs Running in "Low Speed"
- One CNTMT Spray Train I/S AND <3 CFCUs Running in "Low Speed"

MODE - 1, 2, 3, 4

BASIS

Containment (CNTMT) pressure increase to >15 psig (the CNTMT Spray initiation setpoint) indicates a major release of energy to the Containment. Failure of ALL Containment Spray with <5 Containment Fan Coil Units (CFCUs) running in "low speed", or only one train of Containment Spray in service with <3 CFCUs running in "low speed", indicates a condition where systems designed for containment heat removal and depressurization do not have the capacity to maintain Containment pressure below the structural design limit. The threshold value for available Containment Depressurization and Cooling Systems is based upon system design basis for maintaining Containment integrity.

Barrier Analysis

Containment Barrier has been potentially lost.

ESCALATION CRITERIA

This event will be classified and/or escalated based on the potential loss or loss of additional barriers per EAL Section 3.0.

EAL - 3.3.2.b
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DISCUSSION

The CFCUs and the Containment Spray system are redundant to each other in providing post accident cooling of the Containment atmosphere. With less than the minimum combination of sub-systems stated in the EAL threshold value, the ability to remove energy from the Containment atmosphere is severely impaired. Containment pressure >15 psig with a loss of Containment Cooling and Depressurization systems represents a potential loss of the Containment barrier.

DEVIATION

None

REFERENCES

NUMARC, NESP-007, PC2
EOP-TRIP-1
EOP-FRCE-1
EOP-Setpoint Doc (T.02)
Technical Specification Section 3.6.2

3.0 Fission Product Barriers

3.3 Containment Barrier

3.3.2 CONTAINMENT PRESSURE

3.3.2.c

IC Loss of Containment Barrier =2 POINTS

EAL

A Rapid Unexplained Containment Pressure Drop following an initial Rise to > 4 psig

MODE - 1, 2, 3, 4

BASIS

Containment pressure increase to >4 psig (the containment pressure Safety Injection initiation setpoint) indicates a major release of energy to the Containment. These releases can only be provided by a large release of either primary or secondary coolant into the Containment. For the cases that primary coolant provides the source of energy, a loss of the RCS barrier has also occurred. A rapid unexplained loss of Containment pressure following an initial pressure rise indicates a loss of Containment integrity.

Unexplained means that the pressure drop is not as a result of operator actions taken to reduce Containment pressure. The term rapid was added as an attempt to quantify the size of the Containment breach.

Emergency Coordinator judgment should be used to determine if this EAL applies for rapid, unexplained Containment pressure drops following an initial rise to less than the 4-psig threshold.

Barrier Analysis

Containment Barrier has been lost.

ESCALATION CRITERIA

This event will be classified and/or escalated based on the potential loss or loss of additional barriers per EAL Section 3.0.

EAL - 3.3.2.c

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DISCUSSION

The threshold value of 4 psig was selected to be consistent with the Safety Injection and Adverse Containment criteria. For those cases where secondary coolant provides the source of energy, a faulted Steam Generator is possible. This requires actions in EOP-LOSC-1 to isolate the Main Steam lines to maintain intact Steam Generators for an RCS Heat Sink, minimize Containment Pressure, and to minimize RCS cooldown.

DEVIATION

None

REFERENCES

NUMARC NESP-007, PC2
EOP-TRIP-1
EOP-LOSC-1
Technical Specification Table 3.3-4

3.0 Fission Product Barriers

3.3 Containment Barrier

3.3.3 CONTAINMENT ISOLATION

3.3.3.a

IC Potential Loss of Containment Barrier = 1 POINT

EAL

CNTMT Sump Level > 78% (75% adverse)

MODE - 1, 2, 3, 4

BASIS

The Containment (CNTMT) Sump threshold of 78% (75% adverse) is based upon containment flooding concerns, and is consistent with the CFST level requiring implementation of EOP-FRCE-2. An indicated level greater than this value indicates that water has been introduced into the Containment from other sources. Potential flooding of critical system components and instrumentation required for responding to an accident or performing an orderly shutdown may be affected. Thus the Containment and associated systems may not be capable of performing their function as a fission product barrier.

Barrier Analysis

Containment Barrier has been potentially lost.

ESCALATION CRITERIA

This event will be classified and/or escalated based on the potential loss or loss of additional barriers per EAL Section 3.0.

DISCUSSION

Symptom based criteria from the Emergency Operating Procedures Critical Safety Function Tree (CFST) Monitoring are integrated into this EAL. The CFSTs are contained as a tab to the ECG. The intent of using CFST status in this EAL is to simplify the identification of the EAL threshold criteria monitored in the Control Room. The EAL threshold of >78% (75% adverse) CNTMT sump level is consistent with the CFST criteria.

EAL - 3.3.3.a
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DEVIATION

None

REFERENCES

NUMARC NESP-007, PC7
EOP-TRIP-1
EOP-FRCE-1
EOP-FRCE-2
EOP-Setpoint Doc (T.07, T.08)

3.0 Fission Product Barriers

3.3 Containment Barrier

3.3.3 CONTAINMENT ISOLATION

3.3.3.b

IC Loss of Containment Barrier = 2 POINTS

EAL

UNISOLABLE leakage OUTSIDE Containment as indicated by one of the following:

- Downstream pathway to the environment exists
- Radiation monitor, area temperatures, flow or sump level

AND

Containment or system isolation is required due to any one of the following:

- Safety Injection
- Containment pressure greater than 4 psig
- Valid CNTMT Vent Isol Signal

AND

Cannot be ISOLATED from the main Control Room

MODE - 1, 2, 3, 4

BASIS

A high Containment pressure or a Containment Vent Isolation Signal represents a situation that requires the containment to be isolated from the outside environment. The term "valid" is defined as an actual condition that requires CNTMT Vent isolation due to an instrumentation setpoint being exceeded.

This EAL is intended to cover inability to isolate the containment when containment isolation is required. This EAL addresses conditions where RCS or Containment atmosphere is being transported OUTSIDE the Containment. This EAL is associated with an Isolation signal being generated as the result of an RCS Break with a failure of the isolation valves to close or fully close (downstream pathway to the environment) and any other containment failure that results in

EAL - 3.3.3.b

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the containment environment being in direct communications with any areas outside of the containment. Indications (symptoms) of containment failure may be evident without the exact pathway being understood at the time of the failure. If the containment or part of the RCS is required to be isolated and there are valid indications that the containment or system is not isolated, the containment barrier should be considered lost.

UNISOLABLE means the flowpath through all valves in a penetration cannot be immediately stopped from the Control Room. This EAL ALLOWS for valve closure from the Main Control Room to isolate any systems not completely isolated, prior to event classification. Isolation is defined as the closure of ANY valve from the Main Control Room in the system(s) not completely isolated. For example, if the isolation logic fails to cause valve closure, but operator actions implemented in the Main Control Room successfully isolates the containment breach path, then classification under this EAL is not warranted.

The term "to the environment" is intended to include, ANY UNISOLABLE leakage to the environment either directly or via systems that exhaust to the Plant Vent (e.g.; leakage to the Auxiliary Building ventilation system) or directly to any other area outside the containment.

Radiation monitor indications are those that exceed normal release rate indications without a reason to expect another release source, such as a gas decay tank, spill, or fuel-handling problem, and indicate a loss of the containment.

Area temperatures, system flow indications or rising sump level indications outside the containment may also indicate a loss of the containment. If the containment barrier is lost without a loss of the fuel barrier, effluent radiation readings may not increase significantly, however, unexpected area temperatures, flow rates, or sump increases outside of the containment may provide the indications that the containment atmosphere is no longer isolated.

Barrier Analysis

Containment Barrier has been lost.

ESCALATION CRITERIA

This event will be classified and/or escalated based on the potential loss or loss of additional barriers per EAL Section 3.0.

DISCUSSION

Technical Specification 3.6.3 "Containment Isolation Valves" was used to determine the signals required for Containment isolation. Any reference to Main Steam Isolation or Steam Generator Blowdown Isolation is covered under the Containment Bypass "potential loss" EAL.

Containment or system isolations are associated with systems that are part of the RCS boundary and penetrate the Containment. Isolation requirements for these lines are covered in 10CFR50, App. A, General Design Criteria 55. These systems form a closed loop outside the Containment, and are not open to the environment (e.g. RHR, SI). They are included in this EAL because they represent an extension of the RCS boundary beyond the Containment, and are a potential release path from the RCS to the environment. Without a completed isolation, continuing leakage represents a Primary System discharging outside the Containment (Containment Bypass), including areas in the Auxiliary Building.

Systems are lines that either: 1) connect directly to the Containment atmosphere and penetrate the Containment; or 2) penetrate the Containment and are neither part of the RCS boundary nor connected directly to the Containment atmosphere (e.g. Chilled Water). Isolation requirements for these lines are covered in 10CFR50, App. A, General Design Criteria 56 and 57, respectively. Therefore, this event may potentially connect the RCS or the Containment atmosphere to the environment. Without a completed isolation, continuing flow/leakage represents a release path from the RCS or containment to the environment.

DEVIATION

None

REFERENCES

NUMARC NESP-007, PC3
EOP-TRIP-1
OP-AR.ZZ-0003(Q)
SGS Technical Specifications

3.0 Fission Product Barriers

3.3 Containment Barrier

3.3.4 RCS LINE BREAK/CONTAINMENT BYPASS

3.3.4.a

IC Potential Loss of Containment Barrier = 1 POINT

EAL

Unisolable, Faulted Steam Generator OUTSIDE of containment as indicated by S/G pressure dropping in an uncontrolled manner or completely depressurized

AND

Affected S/G tubes are intact

MODE - 1, 2, 3, 4

BASIS

S/Gs, which have unisolable faults outside of containment, will require feed isolation and secondary side dryout in order to stop the resultant excessive RCS cooldown rate. This subsequent dryout will result in significant thermal stress and differential pressures across the tube sheet and greater risk of a Steam Generator Tube Rupture (SGTR) on an already faulted S/G. As such, this event is considered to be a precursor to a more serious event and will lead to at least an Unusual Event classification.

This EAL excludes S/G depressurization events that are a direct result of EOP directed operator action. The term "dropping in an uncontrolled manner or completely depressurized" is defined consistent with the EOP definition of a Faulted S/G. "Unisolable" is defined as a condition where isolation is not possible from the Control Room such as a pipe rupture with no accessible isolation valves, a stuck open safety or relief valve, etc. (excluding minor valve leakage).

Unisolable faults, such as a steam generator safety sticking open at power or an unisolable MS-10, may be considered a potential loss of a containment barrier based on the principle stated in the Introduction & Usage section of the Event Classification Guide, "The Emergency

EAL - 3.3.4.a
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Coordinator should classify and declare an emergency before an Emergency Action Level (EAL) is exceeded if, in the EC's judgment, it is determined that the EAL will be exceeded." Smaller unisolable steam leaks may be considered under this EAL, if in the judgment of the OS, the plant must be shutdown and a Safety Injection initiated in order to place the reactor in a safe condition.

Barrier Analysis

Containment Barrier has been potentially lost.

ESCALATION CRITERIA

This event will be classified and/or escalated based on the potential loss or loss of additional barriers per EAL Section 3.0.

DISCUSSION

This EAL was added to the Fission Product Barrier Table 3.0 as a Containment Bypass "Potential Loss" to ensure that all unisolable steam or feedwater break events, where the fault is outside of the Containment are at least classified as an Unusual Event. The "potential loss" category (1 point) was selected to ensure that further challenges to other Fission Product Barriers result in Emergency Classifications consistent with current philosophy.

The Containment Barrier section was selected since Technical Specifications Section 3.6.3 "Containment Isolation Valves" requires both Main Steam Isolation and Steam Generator Blowdown Isolation. Therefore, failure of any Main Steam Isolation valve to close upon demand and whose flowpath cannot be isolated by the closure of a valve from the Control Room represents a potential loss of containment integrity. Valves specifically included in this EAL as Main Steam Isolation valves are:

1. MS 167, MSIV
2. MS 7, MSIV drain
3. MS 18, MSIV Bypass
4. MS 10, SG PORV
5. GB 4, SG Blowdown

The Containment Bypass sub-section was selected based upon the leakage being non-radioactive steam or feedwater with concerns for RCS integrity appropriately classified under the RCS Barrier section.

Steam generator tube ruptures are not considered a potential loss of containment barrier by definition due to the limited radiation releases (below Tech Specs) assumed in the SGTR accident analysis based on plant design. A SGTR would, by itself, be a potential loss of the RCS barrier.

EAL - 3.3.4.a
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DEVIATION

This EAL was added due to a Containment Bypass concern.

REFERENCES

NUMARC NESP-007, PC7

EOP-TRIP-1

EOP-LOSC-1

OP-AB.STM-0001 (Q)

3.0 Fission Product Barriers

3.3 Containment Barrier

3.3.4 RCS LINE BREAK/CONTAINMENT BYPASS

3.3.4.b

IC Loss of Containment Barrier =2 POINTS

EAL

Primary to Secondary Leakage > Tech Spec Limits

AND

Prolonged, direct secondary leakage to the environment

MODE - 1, 2, 3, 4

BASIS

Primary to Secondary leakage greater than Technical Specifications along with indication of prolonged secondary side leakage outside the Containment indicates a Steam Generator (S/G) tube leak that is discharging directly to the environment. "Prolonged" is defined as an unisolable rupture (excluding minor valve leakage) of a steam or feed line outside of Containment, or a stuck open safety or relief valve on a secondary system connected to the steam side of the leaking S/G.

The term "direct secondary leakage to the environment" is intended to include all flow paths of contaminated secondary coolant to the environment either directly or via systems which exhaust to the Plant Vent (e.g.; leakage to the Auxiliary Building ventilation system) with the following exception: If the procedure in effect requires steaming the leaking S/G to the main condenser, the Condenser Air Ejector (R15) pathway is excluded from this EAL provided the release is both controlled and monitored.

For Steam Generator Tube Rupture (SGTR), this EAL is used in conjunction with the RCS Barrier SGTR EALs to ensure proper classification if the Ruptured S/G is also faulted outside of Containment.

EAL - 3.3.4.b
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Barrier Analysis

Containment Barrier has been lost.

ESCALATION CRITERIA

This event will be classified and/or escalated based on the potential loss or loss of additional barriers per EAL Section 3.0.

DISCUSSION

The primary intent of this EAL is to ensure, in conjunction with the RCS Barrier "Loss" SGTR EAL, that Ruptured S/Gs that are also faulted outside of Containment are classified as at least a Site Area Emergency. The threshold for establishing the bypass of Containment was intended to be a prolonged release of radioactivity from the Ruptured S/G directly to the environment.

The secondary purpose of this EAL is to classify S/G tube leak events, which exceed Technical Specification limits, but do not exceed the RCS Barrier SGTR thresholds. If a prolonged release occurs from a S/G during a leak, only an Unusual Event would be declared based on the "Loss" of the containment barrier.

DEVIATION

None

REFERENCES

NUMARC NESP-007, PC4

3.0 Fission Product Barriers

3.3 Containment Barrier

3.3.4 RCS LINE BREAK/CONTAINMENT BYPASS

3.3.4.c

IC Loss of Containment Barrier =2 POINTS

EAL

LOCA conditions

AND

CNTMT Press. OR Sump Level NOT rising as expected

MODE - 1, 2, 3, 4

BASIS

The threshold conditions require that a Loss of Coolant Accident (LOCA) is known to be occurring. Such events are accompanied by release of energy and inventory from the RCS to the Containment (CNTMT), and should result in pressure and sump level rise in the Containment. Failure of CNTMT Pressure or Sump Level indications to rise as expected following a known LOCA is an indication of a Containment Bypass situation.

Barrier Analysis

Containment and RCS Barriers have been lost.

ESCALATION CRITERIA

This event will be classified and/or escalated based on the potential loss or loss of the Fuel Clad Barrier per EAL Section 3.1.

DISCUSSION

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A LOCA is expected to result in CNTMT pressure rise to $\gt 4$ psig. This leak rate should result in the accumulation of RCS inventory in the CNTMT Sump as well as a CNTMT SUMP PMP START OHA as the level rises. A lack of expected CNTMT Sump level response or CNTMT pressure not rising indicates that the Containment Barrier has been bypassed.

DEVIATION

None

REFERENCES

NUMARC NESP-007, PC2
EOP-TRIP-1
EOP-LOCA-6, LOCA Outside Containment
OP-AR.ZZ-0003(Q)

3.0 Fission Product Barriers

3.3 Containment Barrier

3.3.5 CONTAINMENT RADIATION LEVELS

IC Potential Loss of Containment Barrier = 1 POINT

EAL

R44A or R44B > 2000 R/hr

MODE - 1, 2, 3, 4

BASIS

A Containment High Range Monitor (R44) reading in excess of 2000 R/hr indicates significant Fuel Clad damage, well in excess of that corresponding to a loss of the RCS and Fuel Clad barriers. The value corresponds to a release of approximately 20% of the gap region. Regardless of whether Containment is challenged, this amount of activity in Containment, if released, could have severe consequences and it is prudent to treat this as a potential loss of the Containment Barrier.

Barrier Analysis

Containment Barrier has been potentially lost, the Fuel Clad and RCS Barriers have been lost.

ESCALATION CRITERIA

N/A

DISCUSSION

This calculation is based upon a calculation of 20% Clad Damage as it relates to R44 measured Dose Rate values. This calculation was prepared by the Nuclear Fuels Group and is on file with Emergency Preparedness under file title DS1.6-00XX "Verification of Emergency Action Levels for Event Classification" date 1/26/95.

DEVIATION

None

EAL - 3.3.5
Rev. 05

REFERENCES

NUMARC NESP-007, PC5

NUREG-1228 - Source Term Estimation During Incident Response to Severe Nuclear Power Plant Accidents

Calculation by Nuclear Fuels file title DS1.6-00XX "Verification of Emergency Action Levels for Event Classification"

3.0 Fission Product Barriers

3.3 Containment Barrier

3.3.6 EMERGENCY COORDINATOR JUDGMENT

3.3.6.a/ 3.3.6.b

IC Potential Loss (= 1 POINT) or Loss of Containment Barrier (= 2 POINTS)

EAL

ANY condition, in the opinion of the EC, that indicates EITHER
a Potential Loss OR Loss of the Containment Barrier

MODE - 1, 2, 3, 4

BASIS

This EAL allows the Emergency Coordinator (EC) to address any factor not otherwise covered in the Fission Product Barrier Table to determine that the Containment barrier has been lost or potentially lost. A complete loss in the ability to monitor the Containment barrier should be considered a "Potential Loss" of that barrier

Barrier Analysis

Containment Barrier has been lost or potentially lost.

ESCALATION CRITERIA

This event will be classified and/or escalated based on the loss or potential loss of additional barriers per EAL Section 3.0.

DISCUSSION

None

DEVIATION

None

EAL - 3.3.6.a/ 3.3.6.b
Rev. 05

REFERENCES

NUMARC NESP-007, PC8