Nebraska Public Power District
Nebraska's Energy Leader

NLS2000083
September 21, 2000

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Gentlemen:

Subject: Emergency Plan Implementing Procedures
Cooper Nuclear Station, NRC Docket 50-298, DPR-46

Pursuant to the requirements of 10 CFR 50, Appendix E, Section V, "Implementing Procedures," Nebraska Public Power District is transmitting the following Emergency Plan Implementing Procedures (EPIPs):

EPIP 5.7.1	Revision 27	"Emergency Classification"
EPIP 5.7.17	Revision 24	"Dose Assessment"

Should you have any questions concerning this matter, please contact me.

Sincerely,

R. L. Zipfel
Emergency Preparedness Manager

/nr
Enclosures

cc: Regional Administrator w/enclosures (2)
USNRC - Region IV

Senior Resident Inspector w/enclosures
USNRC

NPG Distribution w/o enclosures

A045

Cooper Nuclear Station
P.O. Box 98 / Brownville, NE 68321-0098
***Telephone:** (402) 825-3811 / **Fax:** (402) 825-5211*
http://www.nppd.com

Correspondence Number: NLS2000083

The following table identifies those actions committed to by the District in this document. Any other actions discussed in the submittal represent intended or planned actions by the District. They are described to the NRC for the NRC's information and are not regulatory commitments. Please notify the NL&S Manager at Cooper Nuclear Station of any questions regarding this document or any associated regulatory commitments.

COMMITMENT	COMMITTED DATE OR OUTAGE
None	

CNS OPERATIONS MANUAL EPIP PROCEDURE 5.7.17 DOSE ASSESSMENT	USE: REFERENCE ⊛ EFFECTIVE: 9/8/00 APPROVAL: SORC OWNER: R. L. ZIPFEL DEPARTMENT: EP

1. PURPOSE

1.1 This procedure provides a means of dose projection based on meteorological and radiological conditions using the CNS-DOSE Computer Program.

1.2 This procedure provides a manual backup method for Step 1.1.

1.3 This procedure provides a method for rapid gross estimation of core damage based on in-containment high range radiation monitor readings for primary containment LOCA events.

2. PRECAUTIONS AND LIMITATIONS

2.1 Actual dose rates will vary as a function of:

[ ] 2.1.1 The total curies released.

[ ] 2.1.2 Release rate.

[ ] 2.1.3 The duration of the release.

[ ] 2.1.4 The isotopic mixture of the release.

[ ] 2.1.5 Meteorological conditions.

2.2 Update and refine dose calculations upon significant changes in one or more of the above parameters.

2.3 Should a release occur which necessitates rapid decision making concerning the recommendation of protective actions, the guidance contained in Procedure 5.7.20 should be followed.

2.4 Attachment 7 should be used to estimate core damage only in cases where the high range in-containment radiation monitors are exposed to coolant or steam (i.e., only for primary containment LOCA situations). For other accident sequences, utilize the Post-Accident Sampling System (PASS) and Core Damage Assessment Program (CORDAM).

3. REQUIREMENTS

3.1 Ensure following equipment and materials are available, as needed:

[ ] 3.1.1 COMPUTERIZED DOSE PROJECTION (CNS-DOSE)

[ ] 3.1.1.1 Computer terminals.

[ ] 3.1.1.2 Computer printers.

[ ] 3.1.2 MANUALLY CALCULATED DOSE PROJECTION

[ ] 3.1.2.1 Environs map.

[ ] 3.1.2.2 χ/Q isopleths.

[ ] 3.1.2.3 Scientific calculator.

3.2 A release of airborne radioactive material has occurred or has the potential of occurring.

3.3 Release Rate Determinations shall be conducted using Procedure 5.7.16 when KAMAN monitors are inoperable.

[ ] **NOTE 1** - When PMIS data used by CNS-DOSE is unavailable or "unhealthy", refer to Attachment 5 for alternate sources of data.

[ ] **NOTE 2** - If the user is not familiar with the use of PMIS, Attachment 6 is referred to for detailed instructions on access and selected use of PMIS.

4. COMPUTER DOSE PROJECTION (CNS-DOSE)

4.1 To start the dose projection program on a PMIS terminal, enter the turn-on code "DOSE" on a terminal logged into either the Primary or Backup System.

4.2 The dose projection program can also be run on a non-PMIS terminal. However, this is reserved for personnel having access to an account on the computer and familiar with its use. To start the dose projection program on a non-PMIS terminal, on either PMIS computer, log in to an account that has privileges to run PMIS software and run program [NPPD.EXECUTE]NPDOSEZ.

4.3 Each time the program is started or the "New Sample" option is selected, new data will be loaded into the program. Verify that Field 1 correctly indicates the origin of the release and the data displayed is "healthy" and correct.

4.4 Estimate the duration of release (consult with Operations and/or Engineering for this time estimate) in hours. If the estimated duration of release cannot be determined, use the 4 hour default value.

4.5 Determine if SGT is in the effluent stream and if it is functional. Consult with Radiological, Operations, and Engineering personnel for this determination, if available.

[ ] **NOTE** - The Iodine to Noble Gas ratio is very dependent on the answer to the core degraded question and has a significant impact on the resultant dose projection calculations. The core is considered to be degraded if any of the listed conditions are met OR if they were met and have subsequently dropped below the condition threshold. The answer to the core degraded question is coordinated between Radiological Protection, Chemistry, Operations, and Engineering, if available.

4.6 Determine if the core is degraded (fuel cladding loss) as indicated by any of the following conditions:

[ ] 4.6.1 SJAE reading ≥ 15,000 mrem/hr.

[ ] 4.6.2 Reactor Coolant Sample > 300 μCi/gm Dose Equivalent I-131.

[ ] 4.6.3 Primary Containment Monitor (Drywell Hi-range Radiation Monitor) reading > 2500 Rem/hr.

[ ] 4.6.4 Reactor water level below 0" FZ (Fuel Zone).

[ ] 4.6.5 Indication of fuel overheat.

4.7 DETERMINE IF RELEASE BYPASSES SECONDARY CONTAINMENT

[ ] 4.7.1 If release bypasses secondary containment (i.e., direct venting of drywell or a release from the Turbine Building), then enter Y.

[ ] 4.7.2 If release does not bypass secondary containment, then enter N.

4.8 Make corrections or changes, as necessary.

4.9 Use the RETURN key to accept data and move to the next field.

4.10 Press the RESULTS option to display the dose projections.

4.11 Select either the PRINT or HARD COPY option to make a hard copy of the results.

4.12 Select the "New Sample" or "Edit" option to return to the previous display and obtain new data or make additional changes.

4.13 Exit the program by entering "Q" or pressing the "CANC" key on PMIS terminals.

4.14 Select the "Help" option for additional program operational information.

5. HAND-CALCULATED DOSE PROJECTION (CENTERLINE)

[ ] **NOTE** - This method reflects the methodology used in the CNS-DOSE Program. It gives only downwind dose values for plume centerline at distances of 1, 2, 5, and 10 miles from the site. For calculating doses at specific receptor locations, the method in Section 7 is used.

5.1 Obtain release rate from effluent KAMAN monitor digital readout in µCi/sec and record value in Block 1 on Attachment 3. If KAMAN is inoperable, complete appropriate attachment of Procedure 5.7.16 and record the noble gas release rate value (µCi/sec) in Block 1 on Attachment 3.

[ ] **NOTE** - The answer to the question concerning the status of the Standby Gas Treatment System has a significant impact on the resultant dose projection calculation. The answer to this question is coordinated with Radiological, Operations, and Engineering personnel, if available.©

5.2 Determine if SGT is in the effluent stream.

[ ] 5.2.1 If SGT is in the effluent stream, enter 0.01 in Block 2 of Attachment 3.

[ ] 5.2.2 If SGT is not in the effluent stream, enter 1 in Block 2 of Attachment 3.

[ ] **NOTE** - The Iodine to Noble Gas ratio is very dependent on the answer to the core degraded question and has a significant impact on the resultant dose projection calculations. The core is considered to be degraded if any of the listed conditions are met OR if they were met and have subsequently dropped below the condition threshold. The answer to the core degraded question is coordinated between Radiological Protection, Chemistry, Operations, and Engineering, if available.

5.3 Determine if the core is degraded (fuel cladding loss) as indicated by any of the following conditions:

[ ] 5.3.1 SJAE reading ≥ 15,000 mrem/hr.

[ ] 5.3.2 Reactor Coolant Sample > 300 μCi/gm Dose Equivalent I-131.

[ ] 5.3.3 Primary Containment Monitor (Drywell Hi-range Radiation Monitor) reading > 2500 Rem/hr.

[ ] 5.3.4 Reactor water level below 0" FZ (Fuel Zone).

[ ] 5.3.5 Indication of fuel overheat.

[ ] 5.3.6 If core is degraded, obtain the Iodine to Noble Gas ratio from Table 1 of Attachment 3 and enter that value in Block 3 of Attachment 3.

[ ] 5.3.7 If core is not degraded, enter 1.86E-7 in Block 3 of Attachment 3.

5.4 Obtain the Noble Gas energy factor (MeV/dis) based on time since reactor shutdown in hours from Table 2 on Attachment 3 and enter this value in Block 4 on Attachment 3.

5.5 Obtain the wind speed in miles per hour (mph) from PMIS or MET recorders in the Computer Room and record the value in Block 5 of Attachment 3.

[ ] 5.5.1 If the release is from the ERP, use wind speed at the 100 meter level. Default is 13 mph.

[ ] 5.5.2 If the release is from any other source, use the wind speed at the 10 meter level. Default is 8 mph.

5.6 Determine the atmospheric stability class (A→G) from PMIS or the MET System and record in Block 6 on Attachment 3. If the stability class cannot be obtained from PMIS or Met System, use D as the default value and record this in Block 6 of Attachment 3.

5.7 DETERMINE IF RELEASE BYPASSES SECONDARY CONTAINMENT

[ ] 5.7.1 If release bypasses secondary containment (for example, direct venting of drywell or a release from the Turbine Building), then enter 1 in Block 7 on Attachment 3.

[ ] 5.7.2 If release does not bypass secondary containment, then enter 0.5 in Block 7 on Attachment 3.

5.8 Obtain TEDE Noble Gas Dose Conversion Factor from Table 3 of Attachment 3 and record in Block 8 on Attachment 3.

5.9 Obtain TEDE Iodine Dose Conversion Factor from Table 3 of Attachment 3 and record in Block 9 on Attachment 3.

5.10 Obtain CDE Iodine Dose Conversion Factor from Table 3 of Attachment 3 and record in Block 10 on Attachment 3.

5.11 Compute TEDE "sub-calculation" value and record in Block 11 of Attachment 3.

$$\frac{[(\text{Block 1})(\text{Block 4})(\text{Block 8})] + [(\text{Block 1})(\text{Block 2})(\text{Block 3})(\text{Block 7})(\text{Block 9})]}{(\text{Block 5})}$$

5.12 Using the appropriate release point (ERP or other) and stability class (Block 6), obtain the mixing factors (χ/Qs) for distances 1, 2, 5, and 10 miles from Table 4 on Attachment 3 and record in Block 12 of Attachment 3.

5.13 Compute the TEDE dose rate for each distance and record values in Block 13 on Attachment 3.

(Block 11) x (Block 12)

5.14 Estimate the duration of the release (consult with Operations and/or Engineering for this time estimate) in hours and record value in Block 14 on Attachment 3. If the estimated duration of release cannot be determined, use 4 hours as a default value.

5.15 Compute integrated TEDE doses for each distance and record values in Blocks 15 on Attachment 3.

(Block 13) x (Block 14)

5.16 Compute CDE "sub-calculation" value and record in Block 16 of Attachment 3.

$$\frac{\text{(Block 1)(Block 2)(Block 3)(Block 7)(Block 10)}}{\text{(Block 5)}}$$

5.17 Compute the CDE dose rate for each distance and record values in Block 17 on Attachment 3.

(Block 16) x (Block 12)

5.18 Compute the CDE dose for each distance and record values in Block 18 on Attachment 3.

(Block 17) x (Block 14)

5.19 Refer to Procedure 5.7.1 to determine if an emergency should be declared due to radiological effluent (dose rate or integrated dose to a member of the public) calculated at or beyond 1 mile.

5.20 Refer to Procedure 5.7.20 to determine if any protective action recommendations should be made to off-site authorities.

5.21 Recalculate dose projections whenever conditions change significantly.

5.22 Record name, time, and date at the bottom of Attachment 3.

6. HAND-CALCULATED DOSE PROJECTION (NON-CENTERLINE)

6.1 Obtain release rate from effluent KAMAN monitor digital readout in µCi/sec and record value in Block 1 on Attachment 1. If KAMAN is inoperable, complete appropriate attachment of Procedure 5.7.16 and record the noble gas release rate value (µCi/sec) in Block 1 on Attachment 1.

[ ] **NOTE** - The answer to the question concerning the status of the Standby Gas Treatment System has a significant impact on the resultant dose projection calculation. The answer to this question is coordinated with Radiological, Operations, and Engineering personnel, if available.

6.2 Determine if SGT is in the effluent path.

[ ] 6.2.1 If SGT is in effluent path, enter 0.01 in Block 2 on Attachment 1.

[ ] 6.2.2 If SGT is not in effluent path, enter 1 in Block 2 on Attachment 1.

[ ] **NOTE** - The Iodine to Noble Gas ratio is very dependent on the answer to the core degraded question and has a significant impact on the resultant dose projection calculations. The core is considered to be degraded if any of the listed conditions are met OR if they were met and have subsequently dropped below the condition threshold. The answer to the core degraded question is coordinated between Radiological Protection, Chemistry, Operations, and Engineering, if available.

6.3 Determine if the core is degraded (fuel cladding loss) as indicated by any of the following conditions:

[ ] 6.3.1 SJAE reading ≥ 15,000 mrem/hr.

[ ] 6.3.2 Reactor Coolant Sample > 300 µCi/gm Dose Equivalent I-131.

[ ] 6.3.3 Primary Containment Monitor (Drywell Hi-range Radiation Monitor) reading > 2500 Rem/hr.

[ ] 6.3.4 Reactor water level below 0" FZ (Fuel Zone).

[ ] 6.3.5 Indication of fuel overheat.

[ ] 6.3.6 If core is degraded, obtain the Iodine to Noble Gas ratio from Table 1 of Attachment 1 and enter that value in Block 3 on Attachment 1.

[ ] 6.3.7 If core is not degraded, enter 1.86E-07 in Block 3 on Attachment 1.

6.4 Determine the energy factor (MeV/dis) based on time since reactor shutdown in hours and Table 2 on Attachment 1, and enter value in Block 4 on Attachment 1.

6.5 Obtain the wind speed in miles per hour (mph) from PMIS or MET recorders in the Computer Room and record the value in Block 5 on Attachment 1.

[ ] 6.5.1 If the release is from the ERP, use wind speed at the 100 meter level. Default is 13 mph.

[ ] 6.5.2 If the release is from any other source, use the wind speed at the 10 meter level. Default is 8 mph.

6.6 Determine the wind direction (from) in degrees from PMIS, MET, or direct observation and record in Block 6 on Attachment 1.

6.7 Determine the atmospheric stability class (A→G) from PMIS or the MET System and record in Block 7 on Attachment 1. If the stability class cannot be obtained from the PMIS or MET System, use D as the default.

6.8 DETERMINE IF RELEASE BYPASSES SECONDARY CONTAINMENT

[ ] 6.8.1 If the release bypasses secondary containment (for example direct venting of the drywell or a release from the Turbine Building), then enter 1 in Block 8 on Attachment 1.

[ ] 6.8.2 If the release does not bypass secondary containment, then enter 0.5 in Block 8 on Attachment 1.

6.9 Obtain TEDE Noble Gas Dose Conversion Factor from Table 3 of Attachment 1 and record in Block 9 on Attachment 1.

6.10 Obtain TEDE Iodine Dose Conversion Factor from Table 3 of Attachment 1 and record in Block 10 on Attachment 1.

6.11 Obtain CDE Iodine Dose Conversion Factor from Table 3 of Attachment 1 and record in Block 11 on Attachment 1.

6.12 Obtain the mixing factor (χ/Q) for the receptor point or location.

[ ] 6.12.1 Record location or receptor point ID at the top of Attachment 1.

[ ] 6.12.2 Obtain the proper χ/Q isopleth overlay based on stability class and release point.

[ ] 6.12.2.1 Overlays are available in the TSC or EOF for both elevated and ground level releases for each stability class. Use ground level isopleths for all releases which are not from the ERP.

[ ] 6.12.3 Place the isopleth overlay on an Emergency Planning Zone map scaled to 1" per mile. The preferred map is the "Cooper Nuclear Station 20 Mile Plume Exposure" map with sectors, radii, and wind direction labeled. One is posted in the TSC and EOF.

[ ] 6.12.4 Orient the isopleth overlay so the centerline of the isopleth is over the wind direction radius, the open end of the isopleth is downwind, and the asterisk is over CNS.

[ ] 6.12.5 Lightly mark the desired receptor location on the isopleth with a pencil.

[ ] **NOTE** - All χ/Qs have negative exponents.

[ ] 6.12.6 Using the legend in the lower right hand corner of the isopleth overlay, linearly interpolating as necessary, determine a χ/Q value for the receptor site.

[ ] 6.12.7 Record the χ/Q value in Block 12 on Attachment 1.

6.13 Compute TEDE dose rate (rem/hr) and record in Block 13 on Attachment 1.

$$\frac{[(\text{Block 1})(\text{Block 4})(\text{Block 9})]+[(\text{Block 1})(\text{Block 2})(\text{Block 3})(\text{Block 8})(\text{Block 10})]}{(\text{Block 5})} \times (\text{Block 12})$$

6.14 Estimate the duration of the release (consult with Operations and/or Engineering for this time estimate) in hours and record the value in Block 14 on Attachment 1. If the estimated duration of release cannot be determined, use 4 hours as a default value.

6.15 Compute the integrated TEDE dose (rem) and record in Block 15 on Attachment 1.

(Block 13) x (Block 14)

6.16 Compute CDE dose rate (rem/hr) and record in Block 16 on Attachment 1.

$$\frac{(\text{Block 1})(\text{Block 2})(\text{Block 3})(\text{Block 8})(\text{Block 11})}{(\text{Block 5})} \times (\text{Block 12})$$

6.17 Compute CDE dose (rem) and record in Block 17 on Attachment 1.

(Block 14) x (Block 16)

6.18 Record name, time, and date at the bottom of Attachment 1.

7. CORRELATING OFF-SITE SAMPLE RESULTS WITH DOSE PROJECTIONS©

[ ] **NOTE** 1 - This section describes the methodology to be used to correlate CNS-DOSE results (estimated gross iodine concentrations) with gross iodine concentrations sampled in the field.

[ ] **NOTE** 2 - This section is to be used by dose assessment personnel in the EOF once field teams have been dispatched and sample results become available.

[ ] **NOTE** 3 - Initial dose projections (computer and hand-calculated) are based upon assumed radionuclide concentrations until actual concentrations have been measured. Off-site sample results are used to determine a dose correction factor which may be applied to adjust the CNS-DOSE Program.

7.1 CORRECTION FACTOR DETERMINATION USING OFF-SITE SAMPLE DATA

[ ] 7.1.1 Radiological Assessment Coordinator shall:

[ ] 7.1.1.1 Record off-site sample location, time, and gross iodine concentration as determined by field teams in Blocks 1 through 3, on Attachment 4.

[ ] 7.1.1.2 Obtain the CNS-DOSE calculated gross iodine concentration corresponding to the location of the above sample and record in Block 4 on Attachment 4.

[ ] 7.1.1.3 Divide Block 3 by Block 4 to obtain the correction factor (CF) and record the results in Block 5, Attachment 4.

[ ] 7.1.1.4 Report correction factor to the Radiological Control Manager or Chem/RP Coordinator.

[ ] 7.1.2 Radiological Control Manager or Chem/RP Coordinator shall determine if the correction factor shall be applied to dose projections.

[ ] 7.1.2.1 If correction factor is significant, the Radiological Control Manager or Chem/RP Coordinator may apply the CF to adjust the Iodine/Noble Gas ratio used by CNS-DOSE to verify PARs are adequate. See next section.

7.2 APPLYING CORRECTION FACTOR TO CNS-DOSE

[ ] 7.2.1 Apply the correction factor to CNS-Dose using the "Field Adjust" OPTION of CNS-DOSE.

[ ] 7.2.1.1 At the MAIN CNS-DOSE screen, select option "Field Adjust".

[ ] 7.2.1.2 Enter the radius distance from CNS in miles at the prompt (1, 2, 5, and 10 are the only options).

[ ] 7.2.1.3 Enter the gross iodine concentration (in μCi/cc) obtained from the field at the prompt.

[ ] 7.2.1.4 After obtaining new Results from CNS-DOSE, compare new PARs to any PARs previously transmitted to off-site authorities.

a. If PARs have changed, notify the Emergency Director and, if PARs have become more severe, the Emergency Director shall initiate notification of new PARs to off-site authorities.

b. If PARs have not changed, periodically perform this portion of the procedure to compare field iodine concentrations with CNS-DOSE calculated iodine concentrations.

8. CORE DAMAGE ESTIMATE USING IN-CONTAINMENT HI-RANGE RADIATION MONITORS

[ ] **NOTE 1** - Attachment 7 is only used for core damage estimates where the in-containment radiation monitors are exposed to coolant or steam (i.e., only for primary containment LOCA situations). For other accident sequences, utilize the Post-Accident Sampling System (PASS) and Core Damage Assessment Program (CORDAM).

[ ] **NOTE 2** - The release from the core may bypass the containment, be retained in the primary system, or not be uniformly mixed. Therefore, a low containment radiation reading does not guarantee a lack of core damage. The levels of damage indicated by the value in Attachment 7 are considered minimum levels unless there are inconsistent monitor readings.

[ ] **NOTE 3** - Inconsistent monitor readings may be due to the uneven mixing in containment (e.g., steam rising to the top of the dome). It may take hours for uniform mixing.

8.1 The Chem/RP Coordinator or designee, shall perform following steps to determine an estimate of core damage, if decisions must be made which are based on core conditions and PASS results are not available.

[ ] 8.1.1 Obtain highest in-containment hi-range radiation monitor reading from RMA-RM-40A(B), DRYWELL RAD MONITOR, and record in Block 1 on Attachment 7.

[ ] 8.1.2 Complete the calculations on Attachment 7.

[ ] 8.1.3 Report results to the TSC Director.

ATTACHMENT 1 HAND-CALCULATED DOSE PROJECTION (NON-CENTERLINE)

Location or Receptor ID: _____

(1) Noble Gas Release Rate from KAMAN or 5.7.16 (µCi/Sec)	(2) Release Path through SBGT? Yes = 0.01; No = 1	(3) Iodine/Noble Gas Ratio (from Table 1)	(4) Energy Factor (from Table 2)	(5) Wind Speed (mph) from PMIS or MET Defaults ERP = 13; Other = 8	(6) Wind Direction (° from)	(7) Stability Class Default = D	(8) Secondary Containment Bypassed? No = 0.5; Yes = 1

Conversion Factors (from Table 3)	
TEDE Noble Gas	(9)
TEDE Iodine	(10)
CDE Iodine	(11)

Mixing Factor (from Isopleths)
(12)

TEDE Dose Rate (13): _____ (rem/hr)

$$\frac{[(Block\ 1)(Block\ 4)(Block\ 9)]+[(Block\ 1)(Block\ 2)(Block\ 3)(Block\ 8)(Block\ 10)]}{(Block\ 5)} \times (Block\ 12)$$

Duration (Hours) Default = 4 hrs
(14)

TEDE Dose (rem) (Block 13) x (Block 14)
(15)

CDE Dose Rate (16): _____ (rem/hr)

$$\frac{[(Block\ 1)(Block\ 2)(Block\ 3)(Block\ 8)(Block\ 11)]}{(Block\ 5)} \times (Block\ 12)$$

CDE Dose (rem) (Block 14) x (Block 16)
(17)

Name/Time/Date: _____ / _____ / _____

TABLE 1 - IODINE TO NOBLE GAS RATIO VS. TIME SINCE SHUTDOWN

TIME SINCE SHUTDOWN (hrs)	IODINE/NOBLE GAS RATIO	
	NON-DEGRADED CORE	DEGRADED CORE
$t < 1$	1.86 E-7	2.71 E-1
$1 \leq t < 2$	1.86 E-7	3.57 E-1
$2 \leq t < 4$	1.86 E-7	3.41 E-1
$4 \leq t < 10$	1.86 E-7	2.81 E-1
$10 \leq t < 30$	1.86 E-7	2.30 E-1
$30 \leq t < 100$	1.86 E-7	1.65 E-1
$100 \leq t$	1.86 E-7	1.40 E-1

TABLE 2 - ENERGY FACTORS

TIME SINCE SHUTDOWN (hrs)	ENERGY FACTOR (MeV/dis)
$t < 1$	0.75
$1 \leq t < 2$	0.60
$2 \leq t < 4$	0.40
$4 \leq t < 10$	0.25
$10 \leq t < 30$	0.15
$30 \leq t < 100$	0.09
$100 \leq t$	0.07

TABLE 3 - DOSE CONVERSION FACTORS

	NON-DEGRADED CORE	DEGRADED CORE
TEDE Noble Gas	1.48 E-3	9.19 E-4
TEDE Iodine	8.77 E-2	2.98 E-2
CDE Iodine	2.04 E 0	4.96 E-1

ATTACHMENT 2	TRANSIT TIMES AND EFFECTIVE AGES OF NOBLE GASES AT RECEPTOR SITES

1. Effective Age is defined as time elapsed (hrs) since shutdown. For off-site locations, the effective age of the isotopic mixture may be obtained through summarizing following components:

1.1 The effective age at the time of release onset.

1.2 The transit time from the release point to the receptor site (refer to Section 2 below).

2. CALCULATION OF TRANSIT TIME FROM THE RELEASE POINT TO THE RECEPTOR LOCATION

2.1 Estimate the downwind distance (miles) to the receptor location.

2.2 Divide the distance in miles by the 100m meter level wind speed (mph) to determine the plume transit time.

(1) RECEPTOR SITE DOWNWIND DISTANCE (miles)	(2) 100 METER LEVEL WIND SPEED (mph)	(3) PLUME TRANSIT TIME (hrs) (1) ÷ (2)

3. DETERMINATION OF EFFECTIVE AGES AT RECEPTOR SITES

(1) EFFECTIVE AGE OF MIXTURE AT TIME OF RELEASE ONSET (hrs)	(2) TRANSIT TIME FROM RELEASE POINT TO RECEPTOR LOCATION (hrs)	(3) EFFECTIVE AGE OF ISOTOPIC MIXTURE AT RECEPTOR LOCATION (hrs) (1) + (2)

Name/Time/Date: _____ / _____ / _____

ATTACHMENT 3 HAND-CALCULATED DOSE PROJECTION (CENTERLINE)

(1) Noble Gas Release Rate from KAMAN or 5.7.16 (µCi/Sec)	(2) Release Path through SBGT? Yes = 0.01; No = 1	(3) Iodine/Noble Gas Ratio (from Table 1)	(4) Energy Factor (MeV/dis) (from Table 2)	(5) Wind Speed (mph) from PMIS or MET Defaults ERP = 13; Other = 8	(6) Stability Class Default = D	(7) Secondary Containment Bypassed? No = 0.5; Yes = 1

Conversion Factors (from Table 3)	
TEDE Noble Gas	(8)
TEDE Iodine	(9)
CDE Iodine	(10)

TEDE Sub-Calculation (11): _____

$$\frac{[(Block\ 1)(Block\ 4)(Block\ 8)]+[(Block\ 1)(Block\ 2)(Block\ 3)(Block\ 7)(Block\ 9)]}{(Block\ 5)}$$

Mixing Factors (from Table 4)	
1 Mile	(12)
2 Mile	(12)
5 Mile	(12)
10 Mile	(12)

TEDE RATE (rem/hr) (Block 11 x Block 12)	
1 Mile	(13)
2 Mile	(13)
5 Mile	(13)
10 Mile	(13)

Duration (hours) Default = 4 hrs
(14)

TEDE Dose (rem) (Block 13 x Block 14)	
1 Mile	(15)
2 Mile	(15)
5 Mile	(15)
10 Mile	(15)

CDE Sub-Calculation (16): _____

$$\frac{[(Block\ 1)(Block\ 2)(Block\ 3)(Block\ 7)(Block\ 10)]}{(Block\ 5)}$$

CDE Rate (rem/hr) (Block 16 x Block 12)	
1 Mile	(17)
2 Mile	(17)
5 Mile	(17)
10 Mile	(17)

CDE Dose (rem) (Block 14 x Block 17)	
1 Mile	(18)
2 Mile	(18)
5 Mile	(18)
10 Mile	(18)

Name/Time/Date: _____ / _____ / _____

TABLE 1 - IODINE TO NOBLE GAS RATIO VS. TIME SINCE SHUTDOWN

TIME SINCE SHUTDOWN (hrs)	IODINE/NOBLE GAS RATIO	
	NON-DEGRADED CORE	DEGRADED CORE
$t < 1$	1.86 E-7	2.71 E-1
$1 \leq t < 2$	1.86 E-7	3.57 E-1
$2 \leq t < 4$	1.86 E-7	3.41 E-1
$4 \leq t < 10$	1.86 E-7	2.81 E-1
$10 \leq t < 30$	1.86 E-7	2.30 E-1
$30 \leq t < 100$	1.86 E-7	1.65 E-1
$100 \leq t$	1.86 E-7	1.40 E-1

TABLE 2 - ENERGY FACTORS

TIME SINCE SHUTDOWN (hrs)	ENERGY FACTOR (MeV/dis)
$t < 1$	0.75
$1 \leq t < 2$	0.60
$2 \leq t < 4$	0.40
$4 \leq t < 10$	0.25
$10 \leq t < 30$	0.15
$30 \leq t < 100$	0.09
$100 \leq t$	0.07

TABLE 3 - DOSE CONVERSION FACTORS

	NON-DEGRADED CORE	DEGRADED CORE
TEDE Noble Gas	1.48 E-3	9.19 E-4
TEDE Iodine	8.77 E-2	2.98 E-2
CDE Iodine	2.04 E 0	4.96 E-1

TABLE 4 - PLUME CENTERLINE X/Q'S (MIXING FACTORS)

RELEASE POINT	STABILITY CLASS	A	B	C	D	E	F	G
ERP (ELEVATED)	1 MILE	2.87E-6	6.04E-6	1.17E-5	8.35E-6	1.03E-6	2.35E-11	1.31E-23
	2 MILE	7.94E-7	1.78E-6	4.55E-6	8.21E-6	4.98E-6	8.12E-8	5.62E-13
	5 MILE	1.50E-7	3.42E-7	1.18E-6	3.77E-6	4.66E-6	1.09E-6	5.67E-9
	10 MILE	4.51E-8	1.03E-7	4.58E-7	1.82E-6	3.13E-6	1.44E-6	4.00E-8
OTHER THAN ERP (GROUND LEVEL)	1 MILE	3.01E-6	6.90E-6	1.73E-5	5.10E-5	1.09E-4	3.07E-4	7.67E-4
	2 MILE	8.03E-7	1.84E-6	5.15E-6	1.78E-5	3.86E-5	1.09E-4	2.71E-4
	5 MILE	1.50E-7	3.44E-7	1.21E-6	4.98E-6	1.25E-5	3.52E-5	8.81E-5
	10 MILE	4.51E-8	1.03E-7	4.63E-7	2.07E-6	6.43E-6	1.81E-5	4.52E-5

1. CORRECTION FACTOR DETERMINATIONS USING OFF-SITE SAMPLING DATA

(1) SAMPLE LOCATION	(2) SAMPLE TIME	(3) FIELD GROSS IODINE CONCENTRATION (µCi/cc)	(4) CNS-DOSE IODINE CONCENTRATION (µCi/cc	(5) CORRECTION FACTOR (CF) (3) ÷ (4)

Name/Time/Date: _____/_____/_____

3. Route completed form to Emergency Preparedness Department.

NOTE 1 - When the normal source of 100M/60M/10M meteorological data is not available, or is "unhealthy", use the next available "healthy" source in the order of preference of 100M, 60M, 10M.

NOTE 2 - If the user is not familiar with the use of PMIS, Attachment 6 is referred to for detailed instructions on access and selected use of PMIS.

NOTE 3 - The Turn-On-Code "VALUE" is used to display single point values and qualities.

NOTE 4 - The Turn-On-Code "MET" is used to display most meteorological point values and stability classes.

PMIS POINT ID	DESCRIPTION	ALTERNATE SOURCE
MET001	100M LVL SIGMA THETA (15 MIN AVE)	MET Chart Recorder
MET004	100M LVL TEMPERATURE	MET Chart Recorder
MET005	DELTA TEMPERATURE (100M-10M)	MET Chart Recorder
MET006	100M LVL WIND DIR. (15 MIN AVE)	MET Chart Recorder
MET007	100M LVL WIND SPEED (15 MIN AVE)	MET Chart Recorder
MET009	60M LVL SIGMA THETA (15 MIN AVE)	MET Chart Recorder
MET012	60M LVL TEMPERATURE	MET Chart Recorder
MET013	DELTA TEMPERATURE (100M-60M)	MET Chart Recorder
MET014	60M LVL WIND DIR. (15 MIN AVE)	MET Chart Recorder
MET015	60M LVL WIND SPEED (15 MIN AVE)	MET Chart Recorder
MET017	10M LVL SIGMA THETA (15 MIN AVE)	MET Chart Recorder
MET020	10M LVL TEMPERATURE	MET Chart Recorder
MET021	DELTA TEMPERATURE (60M-10M)	MET Chart Recorder
MET023	10M LVL WIND DIR. (15 MIN AVE)	MET Chart Recorder
MET024	10M LVL WIND SPEED (15 MIN AVE)	MET Chart Recorder
MET027	PRECIPITATION (15 MIN PERIOD)	MET Chart Recorder
MET028	10M TWR SIGMA THETA (15 MIN AVE)	MET Chart Recorder
MET029	10M TWR TEMPERATURE	MET Chart Recorder
MET030	10M TWR WIND DIR. (15 MIN AVE)	MET Chart Recorder
MET031	10M TWR WIND SPEED (15 MIN AVE)	MET Chart Recorder
N8000	RX BLDG EFFLUENT FLOW AVE	
N8001	TURB BLDG EFF HI RAD MON AVE	
N8002	TURB BLDG EFF NORM RAD MON AVE	
N8003	TURB BLDG FLOW AVE	
N8004	AOG & RW EFF HI RAD MON AVE	
N8005	AOG & RW EFF NORM RAD MON AVE	
N8006	RX BLDG EFF RAD MON AVE	
N8007	AOG & RW BLDG EFF FLOW AVE	
N8010	ERP HI RAD MON AVE	
N8011	ERP NORMAL RAD MON AVE	
N8012	ERP FLOW AVE	
N8013	SGT FLOW TO ERP AVE	

1. PLANT MANAGEMENT INFORMATION SYSTEM (PMIS)

   1.1 The PMIS System (PMIS) is a set of programs and hardware provided by NPPD that make use of VMS functions and additional peripherals (Data Concentrators) which provides access to plant parameters.

2. PMIS COMPUTERS

   2.1 PMIS computers share a common set of peripherals (disk drives, tape drives, terminals, etc.) and software.

3. VMS OPERATING SYSTEM

   3.1 The VMS Operating System (VMS) is the host operating system for the PMIS computers. It is a set of programs that interface with the computer hardware and peripherals, and allows the computers to recognize and process commands.

4. PMIS MODES

   4.1 PMIS has three operational modes, Primary, Primary/Backup, and Backup, and will operate on either computer in one of the three modes. A computer with PMIS operating in either the Primary or Primary/Backup Mode is referred to as the Primary System and the one with PMIS operating in the Backup Mode is referred to as the Backup System.

   4.2 The Primary and Primary/Backup Modes provide full PMIS capabilities, consisting (in part) of data acquisition and conversion, data display, data archiving, alarm processing, self monitoring, and many other functions that perform specialized calculations and displays.

   4.3 The Backup Mode monitors the Primary System, transfers information necessary to keep the Backup System files and tables up-to-date, and automatically changes to the Primary Mode when a loss of the Primary System is detected (referred to as a FAILOVER). Although many functions are available on the Backup System, their use is discouraged because the lack of real-time data results in the display of inaccurate information (CNS-DOSE is an exception).

5. PMIS ACCESS

   5.1 Access to PMIS is gained through graphic display terminals, printer/plotters, and printers.

5.2 The terminals and printers are selectively connected to either computer through a switching device controlled by PMIS. At system start or during a FAILOVER, all terminals and printers are switched to the Primary System. However, the SWITCH position may be changed at any time after that.

6. SCREEN FORMAT

6.1 When a terminal is under control of PMIS (instead of VMS), the screen display will be in a standard format consisting of four areas, OCA, GGDA, SSA, and FKA.

6.2 The OCA (Operator Communication Area) consists of the top two (one and two lines on the screen. This area is generally used to prompt-for and receive user inputs and display advisory and warning messages. In addition, some displays that require only one or two lines of screen use the OCA for display. Also (though technically not part of the OCA), the current date and time (updated once a second) is displayed at the right side of the screen on lines 1 and 2.

6.3 The GGDA (General and Graphic Display Area) consists of lines 4 through 47 and is used for most displays. In addition, some displays (chiefly functions requiring significant editing) also prompt-for and receive user inputs in the GGDA.

6.4 The SSA (SPDS Status Area) consists of lines 45 through 48 and contain four boxes that represent (by color code) the status of the SPDS (Safety Parameter Display System), which is a software system that monitors selected plant parameters and determines overall plant safety status.

6.5 The FKA (Function Key Area) consists of the bottom two (50 and 51) lines of the screen. The FKA is used to indicate which of the definable function keys (left hand keypad) are enabled. It also indicates the status of the local hardcopy device (Versatec printer/plotter), which mode PMIS is in, the Plant Mode, and whether or not a PMIS "event" has occurred.

7. PRINTER/PLOTTER

7.1 The printer/plotter provides full screen reproduction. It is activated by pressing the green "HARD COPY" key on the right hand keypad. The single printer/plotter located in an area (Control Room, TSC, EOF, etc.) is shared by all terminals in the area regardless of which computer the terminal is connected to.

8. PRINTER

8.1 The printers are connected to a specific computer and are generally accessed when a "...PRINT..." option is selected and a "logical name" is entered.

9. LOGICAL NAME

9.1 Printers and terminals are usually referenced by "logical names", in the format of TT00, TT01, etc. (IDTs), and LA00, LA01, etc. (printers). The "logical name" for a device can usually be found on a tag on the device.

10. CONTROL-RESET

10.1 This is a command to perform a "hard reset" of the terminal and is accomplished by pressing the CTRL and RESET keys at the same time. It causes the screen to clear and resets the internal parameters to the default settings. This is basically a "master clear" and has the same effect as turning the power off and on.

11. IDE FIELD

11.1 User input to PMIS Programs is through an open IDE (Interactive Data Entry) field on the terminal. An open IDE field is denoted by a yellow box that appears in the OCA or GGDA area. Anything typed on the keyboard will be echoed in the box. Erasing or back-spacing is accomplished with the DEL key. All entries into an IDE field must be terminated by a carriage return (white RETURN key - "<CR>") unless the field is overfilled or a function key is pressed (the terminal automatically adds a carriage return in those cases).

12. TURN-ON-CODE

12.1 The Turn-On-Code (TOC) is the mechanism by which commands are issued to PMIS. This is a one to eight character code which is interpreted by PMIS and a corresponding command is issued.

13. PMIS DATABASE

13.1 All plant parameters (or additional data based on plant or PMIS parameters) that are processed by PMIS SYSTEM are defined in the PMIS DATABASE, which is a file that specifies the origin of the data, the frequency at which it is processed, the type of processing to be performed, etc. Each parameter is referred to as a "point" and is identified by a one to eight character name or POINT-ID (PID).

14. PMIS DATA PROCESSING

14.1 Some PMIS points are processed by scanning plant sensors (through the Data Concentrator) while others are calculated based on the values of previously processed points or PMIS parameters. All points values are then assigned a quality code stored in the Current Value Table (CVT).

14.2 Data in the CVT is considered to be "real-time" and representative of current plant and system conditions.

14.3 At regular intervals (and other special circumstances) point values are also stored in an Archive File, which provides ~ 24 hours of on-line historical information.

15. PMIS DATA ACCESS

15.1 All point values in the CVT and Archive File are accessed by the POINT-ID.

16. QUALITY CODES

16.1 The Quality Code, assigned when point values are assigned, represents the general status and "health" of the point, and determines how it is used by PMIS Programs. The following is a list of PMIS quality codes and related information.

CODE	DESCRIPTION	COLOR	HEALTH
UNK	Value unknown - not yet processed	White	Bad
DEL	Processing has been disabled	Magenta	Bad
INVL	Data concentrator error	Magenta	Bad
RDER	Data concentrator error	Magenta	Bad
OIC	Data concentrator error	Magenta	Bad
BAD	Outside instrument range	Magenta	Bad
STAG	Point failed stagnation check	Magenta	Bad
UDEF	Undefined (spare)	Magenta	Bad
REDU	Fails redundant point check	Magenta	Bad
HALM	Above high alarm limit	Red	Good
LALM	Below low alarm limit	Red	Good
HWRN	Above high warning limit	Yellow	Good
LWRN	Below low warning limit	Yellow	Good
ALM	State/Change-of-State alarm	Red	Good
SUB	Value has been substituted	Blue	Good
DALM	Alarm checking has been disabled	Green	Good
NCAL	Value cannot be calculated	White	Good
INHB	Alarm inhibited by cut-out point	Green	Good
GOOD	Passes all other checks	Green	Good

16.2 Not listed above is quality code OSUB (Operator Substituted), which is treated the same as SUB, and indicates that the value was substituted within that program. OSUB is not used in the CVT.

17. PMIS LOGIN

17.1 If the current date and time is displayed in the OCA and is being updated about once a second:

17.1.1 If "ENTER PASSWORD..." is displayed on line 2, press the RETURN key.

17.1.2 If "SELECT FUNC. KEY OR TURN ON CODE..." and an open IDE field is displayed on line 2, the IDT is logged into PMIS. No further action is necessary.

17.1.3 If a display is operating, press the CANC key.

17.1.4 If terminal does not respond or does not meet any of the above criteria, press XOFF key (so that the light in the key is on). The terminal should automatically be reset (screen clears and the bell sounds) after about 30 seconds, and either the "ENTER PASSWORD..." or "...TURN-ON-CODE..." prompt should be displayed. Refer to the applicable previous step for more instruction.

17.2 If the current date and time is NOT displayed or is displayed but is not being updated:

17.2.1 Perform a CONTROL-RESET, wait at least 10 seconds, and press the RETURN key. If the date and time appear and began updating, refer to the previous (date and time updating) step.

17.2.2 If a "$" is displayed at the left of the screen, enter "LO" and press the RETURN key. After the "...LOGGED OFF..." message is displayed, press the RETURN key again.

17.2.3 After "NPPDA::" or "NPPDB::" followed by "Username:" (on the next line) is displayed, enter "PMIS" and press the RETURN key. A welcome message followed by "PMIS LOGGED OUT..." will be displayed. Do not press any keys for 5 minutes or until the PMIS login display appears. When the "ENTER PASSWORD..." prompt is issued, refer to the previous (date and time updating) step and login to PMIS.

17.3 If neither of the above criteria is met or the specified sequence of events does not occur, contact the Nuclear Information Services (NIS) Department for assistance.

18. ACTIVATING A TURN-ON-CODE

18.1 If a display is currently operating in the area of the screen that the desired TOC requires, press the CANC key.

18.2 When "SELECT FUNC. KEY OR TURN ON CODE..." is displayed followed by an open IDE field, enter one of following:

18.2.1 A TOC (i.e., "GRPDSP" -- activates the Group Display Program. The program will then prompt the user for a display name).

18.2.2 A TOC followed by a space and optional text (i.e., "GRPDSP ARM1" -- activates the Group Display Program and displays the group "ARM1" without further user input. Note that optional text is recognized by only selected TOCs).

18.2.3 Press one of the programmable function keys on the right hand key pad or top row of function keys (i.e., blue "GROUP DISP" key -- functions the same as the first example).

18.3 Refer to the FKA for the function keys that are enabled and their descriptions. Use other options as provided by each program.

18.4 To exit a program, use the specified exit option (if provided) or press the CANC function key.

19. DETERMINING TO WHICH SYSTEM A TERMINAL IS CONNECTED

The PMIS System to which a terminal is connected is indicated by the "CONSOLE =..." on the bottom line of the FKA as follows:

CONSOLE = PRIMARY -- Connected to the Primary System operating in the Primary Mode.

CONSOLE = PRIM/BAC -- Connected to the Primary System operating in the Primary/Backup Mode.

CONSOLE = BACKUP -- Connected to the Backup System.

CONSOLE = UNKNOWN -- PMIS is in a transition or unknown state.

20. SWITCHING A DEVICE TO THE OTHER SYSTEM

20.1 On a terminal located in the same area as the device to be switched and connected to either PMIS System, activate the TOC "SWITCH".

20.2 A list of all devices that can be switched from that terminal will be displayed. Included will be their logical names, description, and the CPU to which the device is connected.

20.3 To switch a device, press function key F1 and then enter the logical name at the prompt.

20.4 If the device is a terminal, a RESET will be performed and it will be logged off PMIS.

20.5 If the device being switched is a terminal other than the one running SWITCH, both are connected to the same system and a TOC is currently active, a message will be displayed to that effect, and the user will be asked if it is to be switched anyway. If the answer is not YES, the device is not switched.

NOTE - This attachment is only used for core damage estimates where the in-containment radiation monitors are exposed to coolant or steam (i.e., only for primary containment LOCA situations). For other accidents sequences, utilize the Post-Accident Sampling System (PASS) and Core Damage Assessment Program (CORDAM).

(1) HIGHEST DRYWELL RAD MONITOR READING (RMA-RM-40A,B)	(2) 100% CORE MELT FACTOR	(3) CORE MELT FRACTION (1) ÷ (2)	(4) PERCENT CORE MELT (3) x 100	(5) PERCENT CLAD FAILURE (4) x 10
	2.44E+6			

Report the results of the core damage estimate (Blocks 4 and 5) to the TSC Director.

Name/Time/Date: _____ / _____ / _____

1. DISCUSSION

1.1 This procedure covers dose projection. Dose projection represents calculation of an accumulated dose at some time in the future if current conditions continue.

1.2 The CNS-DOSE Computer Program is a software application operated on the PMIS computers. It makes use of current meteorological and radiological data from PMIS and manually entered data to perform dose projection for the area surrounding CNS. CNS-DOSE is the primary method of dose projection.

1.2.1 The PMIS Computer System consists of two computers operating in a Primary and Backup Mode. Historical data may be obtained from either system; however, current data may be obtained only from the Primary System.

1.2.2 Personal unfamiliar with the operation of PMIS should reference procedures governing the operation of PMIS or refer to Attachment 6.

1.3 The manual dose projection methods in this procedure are intended to be used when CNS-DOSE is unavailable. Where possible, data used is from the same source as that used by the computer programs. The hand calculations are divided into two sections. Section 5 is intended to be used by the on-shift personnel for centerline dose projections. Section 6 is intended for dose assessment personnel in projecting non-centerline values.

1.4 The correlation methodology as described in Section 8 provides EOF dose assessment personnel with a means of correlating field team iodine concentration data with CNS-DOSE projected iodine concentration. Such a correlation is necessary to determine if initial Protective Action Recommendations (PARs) were adequate to protect the health and safety of the public.

1.5 Containment radiation level provides a measure of core damage, because it is an indication of the inventory of airborne fission products (i.e., noble gases, a fraction of the halogens, and a much smaller fraction of the particulates) released from the fuel to the containment (refer to NEDO-22215, Pages 1 and 2).

2. REFERENCES

2.1 CODES AND STANDARDS

2.1.1 NRC Regulatory Guide 1.109, Revision 1, October 1977, Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR50, Appendix I, Iodine Inhalation Dose Factors.

2.1.2 NRC Regulatory Guide 1.111, July 1977, Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors.

2.1.3 NRC Regulatory Guide 1.145, August 1979, Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants.

2.1.4 Health Physics Journal, November 1981, Noble Gas Dose Rate Conversion Factors.

2.1.5 ICRP 59, Working Breathing Rate.

2.1.6 EPA 400-R-92-001, May 1992, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.

2.2 DRAWINGS (MAPS)

2.2.1 NPPD Drawing CNS-MI-102, Atmospheric Dispersion Model (EPM2) Special Receptor Points, 10 Mile Radius.

2.2.2 NPPD Drawing CNS-MI-03, Preselected Radiological Sampling and Monitoring Points in the Vicinity of Cooper Nuclear Station, 10 Mile Radius.

2.2.3 NPPD Drawing 2.2 (P3-A-45), Revision 1, Cooper Nuclear Station Site and Property Boundary, 1 Mile Radius.

2.2.4 Cooper Nuclear Station 50 Mile Emergency Planning Zone, Revision 2, 50 Mile Radius.

2.3 VENDOR MANUALS

2.3.1 General Electric Corporation, NEDO-22215, Procedures for the Determination of the Extent of Core Damage Under Accident Conditions.

2.3.2 CNS Number 0984, PMIS Operator's Manual - SAIC Document 502-85500107-72.

2.4 PROCEDURES

2.4.1 Emergency Plan Implementing Procedure 5.7.1, Emergency Classification.

2.4.2 Emergency Plan Implementing Procedure 5.7.16, Release Rate Determination.

2.4.3 Emergency Plan Implementing Procedure 5.7.20, Protective Action Recommendations.

2.5 MISCELLANEOUS

2.5.1 NRC Inspection Report 89-35.

2.5.2 © NRC Inspection Report 91-12, Emergency Preparedness Annual Inspection Report. Affects Section 7 and NOTE prior to Step 5.2.

2.5.3 NRC Inspection Report 92-14, Emergency Preparedness Annual Inspection Report.

CNS OPERATIONS MANUAL EPIP 5.7.1 EMERGENCY CLASSIFICATION	USE: REFERENCE ⊛ EFFECTIVE: 9/5/00 APPROVAL: SORC OWNER: J. B. PERGERSON DEPARTMENT: EP

1. PURPOSE

This procedure provides the formal set of threshold conditions necessary to classify an event at CNS into one of the four emergency classifications described in NUREG-0654 and the CNS Emergency Plan.

2. PRECAUTIONS AND LIMITATIONS

[ ] 2.1 The steps required by this procedure are in addition to the steps required to maintain or restore the station to a safe condition.

[ ] 2.2 If conflicts in personnel assignments or sequence of actions arise, first priority will be given to maintaining or restoring the station to a safe condition.

3. REQUIREMENTS

[ ] 3.1 An Emergency Operation Procedure has been initiated; or

[ ] 3.2 An unusual occurrence has taken place at or near the site.

4. CLASSIFICATION AND DECLARATION

[ ] 4.1 After recognition of an off-normal event, Shift Supervisor shall:

[ ] 4.1.1 Compare the event to EALs in Attachments 1 and 5.

[ ] 4.1.2 If more than one EAL of different classification levels is reached, i.e., an EAL for ALERT or an EAL for SITE AREA EMERGENCY, select EAL for most severe emergency classification.

[ ] 4.1.3 If the event appears to meet an EAL, refer to Attachment 2 for further explanation and guidance.

[ ] 4.1.4 If it is determined that an EAL is met:

[ ] 4.1.4.1 Assume Emergency Director responsibilities until relieved by another qualified Emergency Director.

[ ] 4.1.4.2 Declare the emergency.

[ ] 4.1.4.3 Record the emergency class, time of declaration, and EAL number in the Shift Supervisor's Log.

[ ] 4.1.4.4 Enter Procedure 5.7.2 and perform the actions directed.

[ ] 4.1.4.5 Continue to monitor and re-evaluate emergency classification per this procedure until the event is terminated.

[ ] 4.1.5 When relieved of Emergency Director duties by another qualified Emergency Director located in the EOF, the Shift Supervisor shall no longer be responsible for performance of actions specified in this procedure or Procedure 5.7.2.

[ ] 4.1.5.1 The Emergency Director may direct the Shift Supervisor to perform specific actions, such as activation of emergency alarm, which can only be performed from the Control Room.

[ ] 4.1.5.2 The Shift Supervisor shall bring to the attention of the Emergency Director, changing plant conditions which may affect the emergency classification.

5. CLASSIFICATION GUIDANCE

[ ] 5.1 Four standardized emergency classes have been established; they are:

[ ] 5.1.1 NOTIFICATION OF UNUSUAL EVENT

[ ] 5.1.1.1 This classification is comprised of events in progress, or which have occurred, that indicate a potential degradation of the level of safety of the station. These types of events may progress to a more severe emergency classification if they are not mitigated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.

[ ] 5.1.2 ALERT

[ ] 5.1.2.1 This classification is comprised of events in progress, or which have occurred, that involve an actual or potentially substantial degradation of the safety level of the station. At this classification level, minor releases of radioactivity may occur or may have occurred. Any releases expected to be limited to small fractions of EPA Protective Action Guideline exposure levels.

[ ] 5.1.3 SITE AREA EMERGENCY

[ ] 5.1.3.1 This classification is comprised of events in progress, or which have occurred, which involve actual or potential major failure of plant functions needed for protection of the public. Releases are not expected to exceed EPA Protective Action Guidelines, except near the Site Boundary.

[ ] 5.1.4 GENERAL EMERGENCY

[ ] 5.1.4.1 This classification is comprised of events in progress, or which have occurred, that involve actual or imminent substantial core degradation or melting with a potential for the loss of primary containment integrity. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.

[ ] 5.2 Possible events are divided into eight categories which are intended to bracket the Initiating Conditions listed in NUREG-0654, Revision 1, Appendix 1, as further defined and revised by Reference 3.3.6. The eight categories are:

[ ] 5.2.1 Radiological.

[ ] 5.2.2 Fission product barrier threat or loss.

[ ] 5.2.3 Operational.

[ ] 5.2.4 Power or alarms.

[ ] 5.2.5 Fire; flammable or toxic material.

[ ] 5.2.6 Security.

[ ] 5.2.7 Natural phenomenon.

[ ] 5.2.8 Other hazards.

[ ] 5.3 Prompt recognition of the occurrence of one or more initiating events may prevent the situation from progressing to a classification of greater severity.

[ ] 5.4 An emergency may warrant classification as a result of a combination of two or more events. Ensure each abnormal condition is evaluated against classification criteria.

[ ] 5.5 The EAL Matrix (Attachments 1 and 5) is designed to assist in quickly locating the appropriate category of accident. The matrix is <u>not</u> to be used independently of the rest of the procedure when making classification decisions.

[ ] 5.6 For classification purposes, grams, CCs, and milliliters are equivalent.
1 μCi/gm ~ 1 μCi/cc ~ 1 μCi/ml

6. RECLASSIFICATION

[ ] 6.1 An emergency may escalate to a higher classification if station conditions deteriorate or as a result of a combination of two or more events.

[ ] 6.2 An emergency may be initially classified at one class and, upon further investigation or after corrective actions, may be reclassified or terminated.

[ ] 6.3 If any GENERAL EMERGENCY has been declared, consultation with state authorities and the NRC should occur prior to reclassification or termination of the event.

[ ] 6.4 Compare changing station conditions with the Emergency Action Levels in Attachment 2 and reclassify, as necessary.

Emergency Class	NOUE	Alert
Radiological	1.1.1 Uncontrolled, unmonitored radiological release of liquid outside the Protected Area. 1.1.2 Offsite Dose Assessment Manual (ODAM) limits exceeded as indicated by a HIGH-HIGH alarm on a gaseous effluent radiological monitor which cannot be cleared within 30 minutes.	1.2.1 Loss of control of radioactive material resulting in area radiation exceeding 1000X normal (or expected) levels within the Protected Area. Normal is determined by trend recorder or other relevant data. 1.2.2 Gaseous effluent radiological monitors indicate a release rate ten times the Offsite Dose Assessment Manual (ODAM) limits, without indication of fuel cladding loss.
Fission Product Barrier Threat or Loss	2.1.1 Steam Jet Air Ejector radiation monitor reads > 1.5 E+3 mrem/hr or an increase of 3.0 E+2 mrem/hr within a 30 minute period. 2.1.2 Coolant sample activity exceeds 4 µCi/gm DOSE EQUIVALENT I-131. 2.1.3 Any operational RCS pressure boundary LEAKAGE; or unidentified LEAKAGE exceeds 5 gpm; or total LEAKAGE exceeds 30 gpm averaged over a previous 24 hour period; or unidentified LEAKAGE increase of more than 2 gpm within the previous 24 hour period in MODE 1.	2.2.1 Loss of fuel cladding or Primary Coolant Boundary fission product barriers (refer to Attachment 3 for indication).
Operational	3.1.1 Inability to meet the Action Statement associated with a Technical Specification Limiting Condition for Operation (LCO).	3.2.1 Fuel handling accident on the refueling floor with release of radioactivity to secondary containment as indicated by HIGH alarm on refueling floor ARM #2, CAM, or Reactor Building ventilation monitor. 3.2.2 Evacuation of Control Room required or anticipated with control of shutdown systems established from local stations. 3.2.3 Complete loss of capability to place or maintain the plant in MODE 4 or 5. 3.2.4 Failure of Reactor Protection System (RPS) to initiate and complete a scram which brings the reactor subcritical.
Power or Alarms	4.1.1 Loss of ALL offsite power sources to vital busses "F" and "G" for greater than 15 minutes. 4.1.2 Unplanned loss of most or all safety system annunciators.	4.2.1 Loss of all AC power (on and offsitesources) to vital busses "F" and "G" during MODE 4 or 5. 4.2.2 Loss of all DC power sources resulting in loss of all ECCS capability for < 15 minutes. 4.2.3 Unplanned loss of most or all safety system annunciators with a transient in progress.
Fire Flammable Toxic	5.1.1 Any fire within the Protected Area which takes longer than 10 minutes to extinguish. 5.1.2 Report or detection of toxic or flammable gases that could enter the Protected Area in amounts that will affect the health of plant personnel or can effect normal operation of the plant.	5.2.1 A fire with a potential to cause degradation of a plant safety system required to be OPERABLE. 5.2.2 Report or detection of toxic or flammable gases within a Vital Area in concentrations that will be life threatening to plant personnel or will affect the safe operation of the plant.
Security	6.1.1 Security threat, attempted entry, or attempted sabotage.	6.2.1 On-going security compromise.
Natural Phenomenon	7.1.1 Ground motion > 0.01g as indicated by Control Room seismic monitoring panel. 7.1.2 River level greater than 899' or less than 867'. 7.1.3 Tornado touching down within the Owner Controlled Area. 7.1.4 Sustained wind speed > 74 mph.	7.2.1 Ground motion > 0.1g as indicated by Control Room seismic monitoring panel. 7.2.2 River level > 902' or < 865'. 7.2.3 Tornado touching down within the Protected Area. 7.2.4 Sustained wind speed greater than 95 mph.
Other Hazards	8.1.1 Aircraft crash within the Protected Area. 8.1.2 Explosion within the Protected Area. 8.1.3 Failure of a turbine rotating component causing an automatic reactor scram with release of radioactivity to the Turbine Building or which potentially affects safety systems. 8.1.4 Other conditions existing which in the judgement of the Emergency Director warrant declaration of an Usual Event.	8.2.1 Aircraft striking structures within the Protected Area. 8.2.2 Missile impact, from whatever source, within the Protected Area. 8.2.3 Known explosion damage to the facility affecting plant operation. 8.2.4 Turbine failure causing casing penetration which creates serious radiological concerns or damages plant safety systems. 8.2.5 Other conditions existing which in the judgement of the Emergency Director warrant declaration of an Alert.

Site Area Emergency	General Emergency
1.3.1 Radiological gaseous effluent releases resulting in Total Effective Dose Equivalent (TEDE) projection at or beyond the Site Boundary of > 0.1 REM. 1.3.2 Radiological gaseous effluent releases resulting in Committed Dose Equivalent (CDE) (thyroid) projection at or beyond the Site Boundary of > 0.5 REM.	1.4.1 Radiological gaseous effluent releases resulting in Total Effective Dose Equivalent (TEDE) dose at or beyond the Site Boundary of 1 REM. 1.4.2 Radiological gaseous effluent releases resulting in Committed Dose Equivalent (CDE) (thyroid) dose at or beyond the Site Boundary of 5 REM.
2.3.1 Degraded core with a possible loss of coolable geometry as indicated by: A.1 Greater than or equal to 20% gap activity as determined by Chemistry. OR A.2 Primary Containment radiation monitors read > 1.0 E+4 REM/hr. AND B.1 High core plate Dp for the corresponding core flow. OR B.2 Inability to insert in-core detectors. 2.3.2 Known loss of coolant accident greater than makeup capacity. 2.3.3 Loss of any TWO fission product barriers. The fission product barriers are defined as follows (refer to Attachment 3 for indication): A. Fuel Cladding. B. Primary Coolant Boundary. C. Primary Containment.	2.4.1 Loss of any TWO of THREE fission product barriers AND the potential exists for loss of the THIRD. The fission product barriers are defined as follows (refer to Attachment 3 for indication): A. Fuel Cladding. B. Primary Coolant Boundary. C. Primary Containment.
3.3.1 Major damage to irradiated fuel or fuel pool water level below the top of the spent fuel. 3.3.2 Evacuation of the Control Room accompanied by the inability to locally control shutdown systems within 15 minutes. 3.3.3 Complete loss of all available means to place or maintain the plant in MODE 3. 3.3.4 Failure of the Reactor Protection System (RPS), including Alternate Rod Insertion (ARI), to bring the reactor subcritical.	3.4.1 Failure of the Reactor Protection System (RPS) or alternate rod insertion or SLC to bring the reactor subcritical which could result in a core meltdown with subsequent containment failure likely. 3.4.2 Other plant conditions exist, from whatever source, which make a release of large amounts of radioactivity in a short time possible (e.g., any core melt situation).
4.3.1 Loss of all AC power (on and offsite sources) for more than 15 minutes with the Reactor in MODE 1, 2, or 3. 4.3.2 Loss of all DC power sources required for ECCS operation for more than 15 minutes. 4.3.3 Inability to monitor a significant transient in progress.	4.4.1 Total loss of all AC power (on and offsite sources) with the inability to keep the core covered.
5.3.1 Fire compromising the functions of safety systems.	5.4.1 Any major internal or external fire substantially beyond the design basis which could cause massive common damage to plant systems.
6.3.1 Imminent loss of physical control of the station.	6.4.1 Loss of physical control of the station.
7.3.1 Ground motion > 0.1g as indicated on the Control Room seismic monitoring panel AND reports of major plant damage. 7.3.2 Sustained wind speed > 100 mph. 7.3.3 Flood which renders multiple ECCS systems inoperable when they are required to be OPERABLE. 7.3.4 Low river level which results in complete loss of the Service Water System.	7.4.1 Any major natural phenomenon substantially beyond the design basis which could cause massive common damage to plant systems.
8.3.1 Aircraft crash affecting vital areas with the plant in MODE 1, 2, or 3. 8.3.2 Missile or explosion damage to safe shutdown equipment with the plant in MODE 1, 2, or 3. 8.3.3 Other conditions existing which in the judgement of the Emergency Director warrant declaration of a Site Area Emergency.	8.4.1 Other conditions existing which in the judgement of the Emergency Director warrant declaration of a General Emergency (i.e., any core melt situation).

CLASSIFICATION **EAL: 1.1.1**

NOUE

TEXT

Uncontrolled, unmonitored radiological release of liquid outside the Protected Area.

APPLICABILITY

ALL

EXAMPLE

Unisolable leak from a condensate storage tank into the discharge canal.

MEMO

The actual dose is generally not the primary concern; it is the degradation in plant control implied by the fact that the release was not isolated. To be conservative, it is to be assumed that any radiologically contaminated liquid released offsite in an uncontrolled, unmonitored fashion has the potential to exceed RETS limits. Therefore, any uncontrolled, unmonitored release of radioactive liquid outside the Protected Area will meet this EAL.

REFERENCES

NUREG-0654: N.02

CLASSIFICATION **EAL: 1.1.2**

NOUE

TEXT

Offsite Dose Assessment Manual (ODAM) limits exceeded as indicated by a HIGH-HIGH alarm on a gaseous effluent radiological monitor which cannot be cleared within 30 minutes.

APPLICABILITY

ALL

EXAMPLE

Turbine Building KAMAN alarms. "TG BLDG VENT HIGH-HIGH RAD" annunciator is received. Release is verified, but cannot be stopped.

MEMO

The HIGH-HIGH alarm in the text of this EAL refers to the normal range KAMAN. Each gaseous effluent stream has two alarm setpoints. Under normal circumstances, the high alarm will come in first allowing operator action to stop or reduce the release. The HIGH-HIGH alarm is set at (or near) the RETS release rate limit. Because the RETS limit (being based on a yearly continuous dose projection) is extremely conservative, the 30 minute delay in verifying the alarm and attempting to clear it is justified.

Reduce power or isolate systems as appropriate. If alarm is valid, and release cannot be reduced to below RETS release rate limits or terminated in 30 minutes, declare.

REFERENCES

NUREG-0654: N.02

CLASSIFICATION **EAL: 1.2.1**

ALERT

TEXT

Loss of control of radioactive material resulting in area radiation exceeding 1000X normal (or expected) levels within the Protected Area. Normal is determined by trend recorder or other relevant data.

APPLICABILITY

ALL

EXAMPLE

Radiography source becomes uncoupled and lost. RP survey indicates direct radiation has increased by > 1000 times.

MEMO

By themselves, indications of increased levels of radiation only meet the **NOUE** class description; however, when combined with "loss of control" a higher classification is warranted. Non-essential personnel should be assembled offsite. Additional manpower or other resources will likely be needed. The ALERT classification is appropriate.

The operative phrase in this EAL is "loss of control". Combined with this is the phrase "or expected levels". For most plant evolutions increases of radiation can be estimated, most within a factor of 1000. If, in the judgement of those concerned, control has been lost, AND radiation levels increase beyond 1000X normal or expected levels, declare.

REFERENCES

NUREG-0654: A.06

NUREG-0654: A.12

CLASSIFICATION **EAL: 1.2.2**

ALERT

TEXT

Gaseous effluent radiological monitors indicate a release rate ten times the Offsite Dose Assessment Manual (ODAM) limits without indication of fuel cladding loss.

APPLICABILITY

ALL

EXAMPLE

Operating at 100% power AOG is lost. ERP KAMAN reading goes to 1.13 E+7 μCi/sec.

MEMO

This ERP KAMAN reading will exceed ten times the ODAM instantaneous limit. Rely on the PMIS "ten times ODAM Limit Exceeded" flag.

If there are any indications that the fuel cladding is not intact (fuel has been uncovered, SJAE monitors > 1.5 E+4 mrem/hr, PASS sample, Primary Containment radiation monitors > 2.5 E+3 REM/hr, or other) the iodine component will result in a higher dose and may also warrant a higher classification.

NOTE - Radiation release resulting in an ALERT is an EOP entry condition.

REFERENCES

NUREG-0654: A.15

CLASSIFICATION **EAL: 1.3.1**

SITE AREA EMERGENCY

TEXT

Radiological gaseous effluent releases resulting in Total Effective Dose Equivalent (TEDE) projection at or beyond the Site Boundary of > 0.1 rem.

APPLICABILITY

ALL

EXAMPLE

ARW KAMAN reads 5 E+6 μCi/sec. With default wind speed (8 mph) and stability class (D), Standby Gas Treatment is not in the release path, the core is not degraded, secondary containment is bypassed, and the reactor not shutdown, an integrated dose for 4 hours at one mile of > 0.1 REM TEDE is projected.

MEMO

If a release greater than license limits is under way, or suspected, and any dose assessment model or methodology indicates a Site Boundary integrated TEDE dose of > 0.1 rem, classify and follow applicable procedures. This is the conservative response. Conservative is defined as that action which yields the greatest possible protection of the public from radiological consequences.

This EAL is related to integrated dose; therefore, the estimated length of release is critical to obtain an accurate integrated dose projection. As conditions change, dose projections should be re-calculated.

REFERENCES

NUREG-0654: S.13

CLASSIFICATION **EAL: 1.3.2**

SITE AREA EMERGENCY

TEXT

Radiological gaseous effluent releases resulting in Committed Dose Equivalent (CDE) (thyroid) projection at or beyond the Site Boundary of > 0.5 REM.

APPLICABILITY

ALL

EXAMPLE

ERP KAMAN reads 2 E+6 μCi/sec. The core has been uncovered (dose assessment question on core degraded = YES). SBGT is not in the path. The reactor has been shutdown for 30 minutes and secondary containment has been bypassed. With default wind speed (13 mph) and stability class (D), a CDE dose > 0.5 rem over 4 hours is projected.

MEMO

If a release greater than license limits is under way, or suspected, and any dose assessment model or methodology indicates a Site Boundary integrated CDE dose of > 0.5 rem, classify and follow applicable procedures. This is the conservative response. Conservative is defined as that action which yields the greatest possible protection of the public from radiological consequences.

REFERENCES

NUREG-0654: S.13

CLASSIFICATION **EAL: 1.4.1**

GENERAL EMERGENCY

TEXT

Radiological gaseous effluent releases resulting in Total Effective Dose Equivalent (TEDE) dose at or beyond the Site Boundary of 1 REM.

APPLICABILITY

ALL

EXAMPLE

Turbine Building KAMAN reads 2 E+8 μCi/sec. With default wind speed (8 mph) and stability class (D), Standby Gas Treatment is not in the release path, the core is not degraded, secondary containment is not bypassed, the release is expected to last 4 hours, and the reactor not shutdown a TEDE dose > 1 REM is projected at or beyond one mile.

MEMO

If a release greater than license limits is under way, or suspected, and any dose assessment model or methodology indicates a Site Boundary TEDE dose of 1 rem or greater, classify and follow applicable procedures. This is the conservative response. Conservative is defined as that action which yields the greatest possible protection of the public from radiological consequences.

NUREG-0654 requires that a GENERAL EMERGENCY be declared when EPA Protective Action Guidelines are projected to be exceeded offsite.

Automatic MINIMUM Protective Action Recommendation (PAR) at a General Emergency is evacuation for 2 mile radius and 5 miles downwind in at least 3 sectors, the remainder of 10 mile Emergency Planning Zone should go indoors and monitor EAS/EBS.

REFERENCES

NUREG-0654: G.01

CLASSIFICATION **EAL: 1.4.2**

GENERAL EMERGENCY

TEXT

Radiological gaseous effluent releases resulting in Committed Effective Dose (CDE) (thyroid) dose at or beyond the Site Boundary of 5 REM.

APPLICABILITY

ALL

EXAMPLE

Turbine KAMAN reads 2.6 E+6 μCi/sec. The core has been uncovered (dose assessment question on core degraded = YES). With wind default wind speed (8 mph) and stability class (D), Standby Gas Treatment is not in the release path, secondary containment is bypassed, the reactor is not shutdown, and the release is expected to last 4 hours, a CDE dose at or beyond 1 mile is projected to be > 5 REM.

MEMO

If a release greater than license limits is under way, or suspected, and any dose assessment model or methodology indicates a Site Boundary CDE dose rate of 5 rem/hr or greater, classify and follow applicable procedures. This is the conservative response. Conservative is defined as that action which yields the greatest possible protection of the public from radiological consequences.

NUREG-0654 requires that a GENERAL EMERGENCY be declared when EPA Protective Action Guidelines are projected to be exceeded offsite.

Automatic MINIMUM Protective Action Recommendation (PAR) at a GENERAL EMERGENCY is evacuation for 2 mile radius and 5 miles downwind in at least 3 sectors, the remainder of 10 mile Emergency Planning Zone should go indoors and monitor EAS/EBS.

REFERENCES

NUREG-0654: G.01

CLASSIFICATION **EAL: 2.1.1**

NOUE

TEXT

Steam Jet Air Ejector radiation monitor reads > 1.5 E+3 mrem/hr or an increase of 3.0 E+2 mrem/hr within a 30 minute period.

APPLICABILITY

ALL

EXAMPLE

RM-150A reads > 1.5 E+3 mrem/hr.

MEMO

These numbers correspond to some fuel damage. They do not reflect a LOSS of the fuel cladding.

REFERENCES

NUREG-0654: N.03A

CLASSIFICATION **EAL: 2.1.2**

NOUE

TEXT

Coolant sample activity exceeds 4.0 μCi/gm DOSE EQUIVALENT I-131.

APPLICABILITY

ALL

EXAMPLE

Rx coolant sample results indicate 5.0 μCi/gm DOSE EQUIVALENT I-131.

MEMO

0.2 μCi/gm DOSE EQUIVALENT I-131 is the Tech Spec limit. The limit may be increased up to 4.0 μCi/gm DOSE EQUIVALENT I-131 or less for a maximum of 48 hours to allow a reasonable time for temporary coolant activity increases (iodine spikes or crud bursts) to be cleaned up with the normal processing systems. If at any time the DOSE EQUIVALENT I-131 > 4.0 μCi/gm DOSE EQUIVALENT I-131, it must be determined at least once every four (4) hours and all the main steam lines must be isolated with 12 hours. See LCO 3.4.6 for details.

REFERENCES

NUREG-0654: N.03B

Tech Spec 3.4.6

NOTE - For purposes of reactor coolant samples:
1 μCi/ml ~ 1μCi/cc ~ 1μCi/mg dose equivalent I-131

CLASSIFICATION **EAL: 2.1.3**

NOUE

TEXT

Operational RCS pressure boundary LEAKAGE; or unidentified LEAKAGE exceeds 5 gpm; or total LEAKAGE exceeds 30 gpm averaged over a previous 24 hour period; or unidentified LEAKAGE increase of more than 2 gpm within the previous 24 hour period in MODE 1.

APPLICABILITY

MODE 1, 2, or 3.

EXAMPLE

Sump integrators indicate leakage from the primary coolant boundary of 7 gpm unidentified.

MEMO

This leak rate constitutes entry into a LCO; however, this case will not wait for inability to meet associated action statement(s); therefore, declare a NOUE upon confirmation of the leak rate.

REFERENCES

NUREG-0654: N.05

CLASSIFICATION **EAL: 2.2.1**

ALERT

TEXT

Loss of Fuel Cladding or Primary Coolant Boundary fission product barriers (refer to Attachment 3 for indication).

APPLICABILITY

Per Technical Specifications

EXAMPLE

Reactor Recirculation pump seizure leading to fuel cladding failure.

PASS sample results show > 300 μCi/gm DOSE EQUIVALENT I-131.

OR

Loss of Coolant Accident.

MEMO

Refer to Attachment 3 for indications of lost fission product barriers to ensure that only one barrier is lost. Loss of two barriers is a SITE AREA EMERGENCY (EAL: 2.3.3), loss of two barriers with the potential loss of the third is a GENERAL EMERGENCY (EAL: 2.4.1).

This EAL does not apply to failures of safety relief valves to seat during low pressure testing.

REFERENCES

NUREG-0654: A.01
NUREG-0654: A.04
NUREG-0654: A.05
NUREG-0654: A.09
NUREG-0654: N.06

CLASSIFICATION **EAL: 2.3.1**

SITE AREA EMERGENCY

TEXT

Degraded core with a possible loss of coolable geometry as indicated by:

A.1 ≥ 20% gap activity as determined by Chemistry.

OR

A.2 Primary Containment radiation monitors read > 1.0 E+4 REM/hr.

AND

B.1 High core plate Dp for the corresponding core flow (see EAL: 2.3.1A).

OR

B.2 Inability to insert in-core detectors.

APPLICABILITY

ALL

EXAMPLE

Drywell radiation monitors read 2 E+4 REM/hr following a transient. Traversing In-Core Probes cannot be inserted by any machine into the reference channel.

MEMO

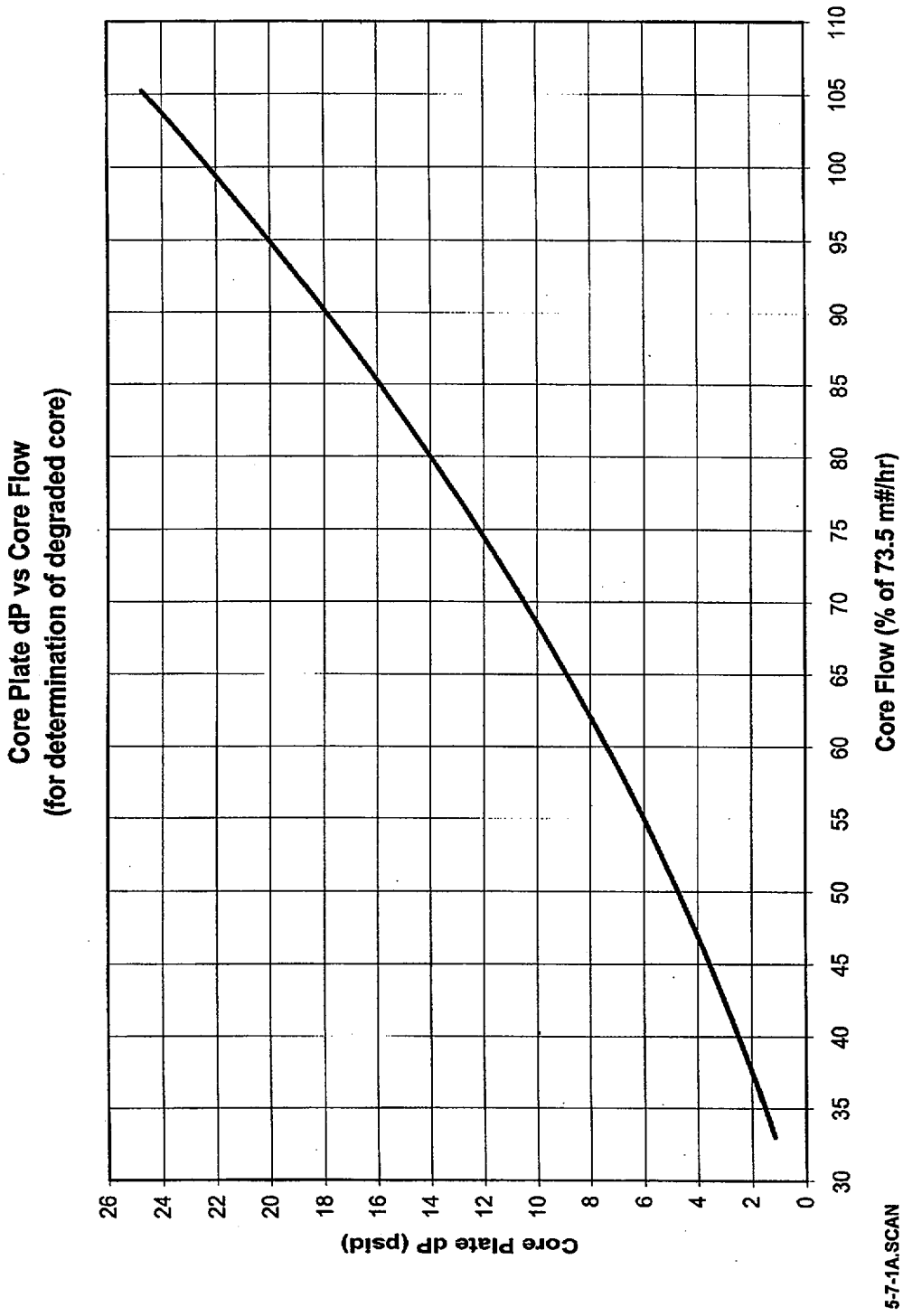
Could lead to further core degradation due to overheating.

Reference Dp vs. core flow chart, ... 2.3.1A (next page)

REFERENCES

NUREG-0654: S.02

EAL: 2.3.1A


Core Plate dP vs Core Flow
(for determination of degraded core)
Core Plate dP (psid)
26
24
22
20
18
16
14
12
10
8
6
4
2
0
Core Flow (% of 73.5 m#/hr)
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
5-7-1A.SCAN

CLASSIFICATION **EAL: 2.3.2**

SITE AREA EMERGENCY

TEXT

Known loss of coolant accident greater than makeup capacity.

APPLICABILITY

ALL

EXAMPLE

LOCA greater than RCIC capacity with HPCI inop and inability to depressurize.

MEMO

This EAL is a combination of loss of one fission product barrier (RPV) and other major failures. It therefore meets the class description for SITE AREA EMERGENCY of NUREG-0654.

Follow Emergency Operating Procedures (EOPs). If all means to maintain level in the reactor fail, declare.

REFERENCES

NUREG-0654: S.01

CLASSIFICATION **EAL: 2.3.3**

SITE AREA EMERGENCY

TEXT

Loss of any TWO fission product barriers. The fission product barriers are defined as follows:

A. Fuel Cladding.

B. Primary Coolant Boundary.

C. Primary Containment.

APPLICABILITY

Per Technical Specifications.

EXAMPLE

Steam line break outside primary containment without isolation from the Control Room.

OR

100 gpm leak into Primary Containment following fuel failure (> 300 μCi/gm DOSE EQUIVALENT I-131).

OR

Primary Containment isolation failures allowing a direct flow path to the environment such as failures of both MSIVs to close with open valves downstream to the turbine or to the condenser.

MEMO

TWO, and only two, fission product barriers must meet the criteria for being considered lost. If there is only one barrier lost, see EAL: 2.2.1. If there is the potential for loss of the third barrier a GENERAL EMERGENCY shall be declared on EAL: 2.4.1.

See Attachment 3 for indications of loss or potential loss of fission product barriers.

REFERENCES

NUREG-0654: S.04

CLASSIFICATION **EAL: 2.4.1**

GENERAL EMERGENCY

TEXT

Loss of any TWO of THREE fission product barriers AND the potential exists for the loss of the THIRD. The fission product barriers are defined as follows:

A. Fuel Cladding.

B. Primary Coolant Boundary.

C. Primary Containment.

APPLICABILITY

Per Technical Specifications.

EXAMPLE

LOCA with core damage and drywell pressure is nearing design pressure, OR two MSIVs on the same steam line cannot be isolated from the Control Room and chemistry data trends indicate fuel cladding is deteriorating.

MEMO

Automatic MINIMUM Protective Action Recommendation (PAR) at a GENERAL EMERGENCY of evacuation for 2 mile radius and 5 miles downwind in at least 3 sectors, the remainder of 10 mile Emergency Planning Zone should go indoors and monitor EAS/EBS.

See Attachment 3 for indications of loss or potential loss of fission product barriers.

REFERENCES

NUREG-0654: G.02

NUREG-0654: G.06

CLASSIFICATION **EAL: 3.1.1**

NOUE

TEXT

Inability to meet the action statement associated with a Technical Specification Limiting Condition for Operation (LCO).

APPLICABILITY

Per Technical Specifications.

EXAMPLE

Following discovery that one of the 125 volt batteries is inoperable, the battery was not restored to OPERABLE status within 2 hours, nor was MODE 3 achieved within the following 12 hours.

MEMO

Declaration of **NOUE** is warranted by failure to meet the action statement of a Limiting Condition for Operation (LCO). This constitutes a condition outside that analyzed by Technical Specifications. The **NOUE** may not be terminated until the action statement has been met. This varies; reference the Tech Specs.

REFERENCES

NUREG-0654: N.08

NUREG-0654: N.09

NUREG-0654: N.15

CLASSIFICATION **EAL: 3.2.1**

ALERT

TEXT

Fuel handling accident on the refueling floor with release of radioactivity to secondary containment as indicated by HIGH alarm on refueling floor ARM #2, CAM, or Reactor Building ventilation monitor.

APPLICABILITY

ALL

EXAMPLE

Dropped fuel bundle, bubbles appear near the impact zone, ARM #2 alarms.

MEMO

For major damage, see EAL: 3.3.1.

REFERENCES

NUREG-0654: A.12

CLASSIFICATION

EAL: 3.2.2

ALERT

TEXT

Evacuation of Control Room required or anticipated with control of shutdown systems established from local stations.

APPLICABILITY

ALL

EXAMPLE

Electrical fire in the Control Room causes evacuation. ASD accomplished.

MEMO

Do not delay alternate shutdown. Declare ALERT and note time. Make required notifications as soon as possible. If control of shutdown systems cannot be accomplished within 15 minutes, EAL: 3.3.2 applies.

This EAL does not say that all actions associated with ASD shall be completed in order to avoid the higher EAL pertaining to Control Room evacuation (EAL: 3.3.2). If the reactor successfully scrams, level and pressure are being controlled, and no impediments to the associated ASD activities are being encountered, this emergency classification is appropriate. If impediments are being encountered in completing critical ASD functions and more than 15 minutes expire, EAL: 3.3.2 is met.

REFERENCES

NUREG-0654: A.20

CLASSIFICATION **EAL: 3.2.3**

ALERT

TEXT

Complete loss of all capability to place or maintain the plant in MODE 4 or MODE 5.

APPLICABILITY

Irradiated fuel in the vessel.

EXAMPLE

Loss of both LPCI Subsystems following a scram from startup.

MEMO

Loss of MODE 4 capability while at power would be adequately covered by Tech Specs, but does not warrant an ALERT.

Follow appropriate procedures. Attempt alternate means of cooling if required. If all means to place or maintain the reactor < 212°F fail, declare. Monitor plant for indications of other EAL thresholds.

REFERENCES

NUREG-0654: A.10

CLASSIFICATION **EAL: 3.2.4**

ALERT

TEXT

Failure of Reactor Protection System (RPS) to initiate and complete a scram which brings the reactor subcritical.

APPLICABILITY

Reactor critical.

EXAMPLE

RPS initiated scram with half the control rods not full in (hydraulic lock caused by an undrained scram discharge volume). Continued power generation.

MEMO

A failure of RPS in this EAL is a failure of either the automatic trip systems or the manual scram pushbuttons to initiate and complete a scram which brings the reactor subcritical. If ARI also fails, see EAL 3.3.4. Subcritical is defined as all but one rod full-in, all rods inserted to or beyond Position 02, OR a qualified Reactor Engineer has determined reactor will remain subcritical under all conditions without boron injection.

REFERENCES

NUREG-0654: A.11

CLASSIFICATION **EAL: 3.3.1**

SITE AREA EMERGENCY

TEXT

Major damage to irradiated fuel or fuel pool water level below the top of the spent fuel.

APPLICABILITY

ALL

EXAMPLE

Shipping cask head dropped on spent fuel. Several fuel bundles prepared for shipment (de-channeled) are crushed.

MEMO

Major fuel damage is defined as "affecting more than ten irradiated fuel bundles". It is anticipated that no fuel handling accident associated with normal fuel handling could cause this EAL to be met. Only large objects (such as fuel shipping casks) dropped on fuel, or uncovery of the fuel could meet this EAL.

REFERENCES

NUREG-0654: S.10

CLASSIFICATION **EAL: 3.3.2**

SITE AREA EMERGENCY

TEXT

Evacuation of the Control Room accompanied by the inability to locally control shutdown systems within 15 minutes.

APPLICABILITY

ALL

EXAMPLE

Electrical fire in the control room causes evacuation. Shutdown systems are not responding properly from the ASD panel.

MEMO

An ALERT should have been declared on EAL: 3.2.1 upon evacuation of the Control Room. When local control cannot be achieved in 15 minutes, a SITE AREA EMERGENCY shall be declared.

REFERENCES

NUREG-0654: S.18

CLASSIFICATION **EAL: 3.3.3**

SITE AREA EMERGENCY

TEXT

Complete loss of all available means to place or maintain the plant in MODE 3.

APPLICABILITY

MODE 1, 2, or 3.

EXAMPLE

Shutdown margin cannot be maintained.

MEMO

Could lead to fuel cladding failure.

Carefully monitor plant parameters for indications of fission product barrier loss. Attempt alternate means of heat removal. If all means of heat removal fail, declare. Escalation of this EAL to a General Emergency is based on actual or imminent substantial core degradation or melting with potential for loss of primary containment.

REFERENCES

NUREG-0654: S.08

CLASSIFICATION **EAL: 3.3.4**

SITE AREA EMERGENCY

TEXT

Failure of the Reactor Protection System (RPS), including Alternate Rod Insertion (ARI), to bring the reactor subcritical.

APPLICABILITY

Reactor critical.

EXAMPLE

Low reactor water level scram with hydraulic lock on all the north HCUs. Half the rods remain un-inserted. Continued power generation.

MEMO

If any scram signal and initiation of ARI fails to bring the reactor subcritical, a SITE AREA EMERGENCY based on this EAL exists.

Subcritical is defined as all but one rod full-in, all rods inserted to or beyond Position 02, OR a qualified Reactor Engineer has determined reactor will remain subcritical under all conditions without boron injection.

Escalation of this EAL to a GENERAL EMERGENCY is based on actual or imminent substantial core damage or melting with potential for loss of primary containment.

REFERENCES

NUREG-0654: Appendix 1, SITE AREA EMERGENCY, Step 9.

CLASSIFICATION **EAL: 3.4.1**

GENERAL EMERGENCY

TEXT

Failure of the Reactor Protection System (RPS) or alternate rod insertion or SLC to bring the reactor subcritical which could result in a core meltdown with subsequent containment failure likely.

APPLICABILITY

Reactor critical.

EXAMPLE

All methods to shut down the reactor fail.

MEMO

Subcritical is defined as all but one rod full-in, all rods inserted to or beyond Position 02, OR a qualified Reactor Engineer has determined reactor will remain subcritical under all conditions without boron injection or cold shutdown boron per EOPs cannot be injected. All methods to shut down the reactor have failed. If heat sink is lost fuel will eventually be degraded or melt. Loss of heat sink will also degrade the Primary Containment integrity.

Automatic MINIMUM Protective Action Recommendation (PAR) at a GENERAL EMERGENCY of evacuation for 2 mile radius and 5 miles downwind in at least 3 sectors, the remainder of 10 mile Emergency Planning Zone should go indoors and monitor EAS/EBS.

REFERENCES

NUREG-0654: G.06A

CLASSIFICATION **EAL: 3.4.2**

GENERAL EMERGENCY

TEXT

Other plant conditions exist, from whatever source, which make a release of large amounts of radioactivity in a short time period possible (e.g., any core melt situation).

APPLICABILITY

ALL

EXAMPLE

Event in progress or which has occurred, that involves actual or imminent substantial core degradation or melting with the potential for the loss of Primary Containment integrity.

MEMO

Attempt to classify under more specific EALs. If none apply and the potential for large releases or core melt exists, declare.

Automatic MINIMUM Protective Action Recommendation (PAR) at a GENERAL EMERGENCY of evacuation for 2 mile radius and 5 miles downwind in at least 3 sectors, the remainder of 10 mile Emergency Planning Zone should go indoors and monitor EAS/EBS.

REFERENCES

NUREG-0654: G.04

NUREG-0654: G.06

CLASSIFICATION **EAL: 4.1.1**

NOUE

TEXT

Loss of ALL offsite power sources to vital busses "F" and "G" for > 15 minutes.

APPLICABILITY

ALL

EXAMPLE

Tornado drops all lines feeding the plant. Diesel generators start and load properly.

MEMO

None.

REFERENCES

NUREG-0654: N.07

CLASSIFICATION **EAL: 4.1.2**

NOUE

TEXT

Unplanned loss of most or all safety system annunciators.

APPLICABILITY

Reactor critical.

EXAMPLE

Complete failure of all annunciators while at power.

MEMO

If a transient is also in progress, see EAL: 4.2.3.

REFERENCES

NUREG-0654: A.14

CLASSIFICATION

EAL: 4.2.1

ALERT

TEXT

Loss of all AC power (on and offsite sources) to vital Busses "F" and "G" during MODE 4 or 5.

APPLICABILITY

MODE 4 or 5.

EXAMPLE

Loss of all offsite AC power while in MODE 4 or 5. DGs fail to start.

MEMO

Being in MODE 4 or 5, reduces the risk for core damage or other fission product barrier challenge caused by the loss of power.

See EAL: 4.3.1 for loss of power when the reactor is hot.

REFERENCES

NUREG-0654: A.07

CLASSIFICATION **EAL: 4.2.2**

ALERT

TEXT

Loss of all DC power sources resulting in loss of all ECCS capability for < 15 minutes.

APPLICABILITY

ALL

EXAMPLE

Loss of all DC buses for 5 minutes.

MEMO

The initiating condition for extended loss of DC references "vital" DC. CNS interprets this to refer to 125 and 250 VDC, as only these DC sources power and/or control ECCS Systems.

See EAL: 4.3.2 for extended loss.

REFERENCES

NUREG-0654: A.08

CLASSIFICATION **EAL: 4.2.3**

ALERT

TEXT

Unplanned loss of most or all safety system annunciators with a transient in progress.

APPLICABILITY

Reactor critical.

EXAMPLE

Complete failure of all safety system annunciators while at power and a transient is in progress.

MEMO

Similar to EAL: 4.1.2 except this EAL includes a transient in progress.

The USAR definition of "transient" is an abnormal operational transient includes the events following a single equipment malfunction or a single operator error that is reasonable expected during the course of planned operations. Power failures, pump trips, and rod withdrawal errors are typical of the single malfunctions or errors initiating the events in this category.

Loss of all annunciators in the Control Room would also likely be classifiable under an EAL for loss of DC.

REFERENCES

NUMARC/NESP-007: SA4

CLASSIFICATION **EAL: 4.3.1**

SITE AREA EMERGENCY

TEXT

Loss of all AC power (on and offsite sources) for more than 15 minutes with the Reactor in MODE 1, 2, or 3.

APPLICABILITY

MODE 1, 2, or 3.

EXAMPLE

Tornado drops all lines feeding the plant while at power. Both diesel generators fail to start and cannot be started within 15 minutes (i.e., Station Blackout > 15 minutes).

MEMO

Either RCIC or HPCI, are capable of injecting water to the vessel independent of AC power. Loss of all other means to inject water to the vessel for an extended period of time meets the class description for SITE AREA EMERGENCY listed in NUREG-0654.

REFERENCES

NUREG-0654: S.06

CLASSIFICATION **EAL: 4.3.2**

SITE AREA EMERGENCY

TEXT

Loss of all DC power sources required for ECCS operation for more than 15 minutes.

APPLICABILITY

ALL

EXAMPLE

Loss of all DC buses for 25 minutes.

MEMO

Loss of various DC sources not only causes loss of DC powered equipment, but also the loss of indicators and/or controls for steam driven pumps. AC from inverters could also be lost.

REFERENCES

NUREG-0654: S.07

CLASSIFICATION **EAL: 4.3.3**

SITE AREA EMERGENCY

TEXT

Inability to monitor a significant transient in progress.

APPLICABILITY

ALL

EXAMPLE

Complete failure of all annunciators while at power, a significant transient in progress, and inability to monitor key parameters via other instrumentation.

MEMO

Similar to EAL: 4.2.3 except this EAL includes the inability to monitor the transient using redundant instrumentation.

A significant transient includes responses to automatic or manually initiated functions, such as; scrams, runbacks involving > 25% thermal power changes, ECCS injections, or thermal power oscillations of 10% or greater.

REFERENCES

NUMARC/NESP-007: SS6

CLASSIFICATION **EAL: 4.4.1**

GENERAL EMERGENCY

TEXT

Total loss of all AC power (on and offsite sources) with the inability to keep the core covered.

APPLICABILITY

ALL

EXAMPLE

HPCI and RCIC fail during a station blackout. Level drops below 0" (FZ).

MEMO

Failure to keep the core covered combined with a loss of all AC indicates failure of steam driven pumps. Without cooling the core will degrade, Primary Containment could heat up and potentially fail.

Automatic MINIMUM Protective Action Recommendation (PAR) at a GENERAL EMERGENCY of evacuation for 2 mile radius and 5 miles downwind in at least 3 sectors, the remainder of 10 mile Emergency Planning Zone should go indoors and monitor EAS/EBS.

REFERENCES

NUREG-0654: G.06A

CLASSIFICATION **EAL: 5.1.1**

NOUE

TEXT

Any fire within the Protected Area which takes longer than 10 minutes to extinguish.

APPLICABILITY

ALL

EXAMPLE

Fire brigade is unable to extinguish a fire in the turbine lube oil reservoir room within 10 minutes from receipt of report or alarm in the Control Room.

MEMO

Time is measured from the time the report or alarm of a fire is received in the Control Room.

REFERENCES

NUREG-0654: N.10

Meacham to ERO, "Clarification of Certain Emergency Action Levels (EALs)", CNSS900421 August 7, 1990.

Telecon Krumland/Hayden to Spitzberg (NRC IV), "EAL Interim Guidance - Memo", August 22, 1990.

CLASSIFICATION **EAL: 5.1.2**

NOUE

TEXT

Report or detection of toxic or flammable gases that could enter the Protected Area in amounts that will affect the health of plant personnel or can effect normal operation of the plant.

APPLICABILITY

ALL

EXAMPLE

Bulk hydrogen delivery truck regulator fitting is broken during unloading and cannot be isolated.

MEMO

Certain spills or releases may require notification of EPA or other agencies.

REFERENCES

NUREG-0654: N.14D

CLASSIFICATION **EAL: 5.2.1**

ALERT

TEXT

A fire with a potential to cause degradation of a plant safety system required to be OPERABLE.

APPLICABILITY

ALL

EXAMPLE

A fire in NE Reactor Building 903' during Power operations with the potential to damage cables.

MEMO

This EAL is intended to apply to a fire which could directly affect any (one or more) plant safety system(s). Implicit in this interpretation is that plant conditions are such that the potentially affected safety system should be OPERABLE. For example, during MODE 4 or 5, HPCI is not required to be OPERABLE. Therefore, a fire in the HPCI Room would not necessarily threaten a required safety system. A large fire in the same area, however, that constituted a threat to the "B" and "D" RHR Pumps would meet the threshold for this EAL.

The threshold of the EAL would also be met if, while at power, a fire occurred in the HPCI Room which threatened the OPERABILITY of the system. This is true even if HPCI was inoperable at the time (under the required Technical Specification LCO), since HPCI should be OPERABLE while at power.

On the other hand, a small fire (e.g., a smoldering rag or burning piece of paper), which does not constitute a threat to a safety system, does not meet the intent of this EAL.

REFERENCES

NUREG-0654: A.13

Meacham to ERO, "Clarification of Certain Emergency Action Levels (EALs)", CNSS900421, August 7, 1990.

CLASSIFICATION **EAL: 5.2.2**

ALERT

TEXT

Report or detection of toxic or flammable gases within a Vital Area in concentrations that will be life threatening to plant personnel or will affect the safe operation of the plant.

APPLICABILITY

ALL

EXAMPLE

CO_2 pre-discharge alarm on DG Room #1 received. Personnel evacuate room out different doors. Upon exit, all personnel cannot be accounted for.

MEMO

To meet the class description for an ALERT, the condition must indicate an actual or potential substantial degradation of the level of safety of the plant (NUREG-0654, Appendix 1) or be life threatening to personnel.

If personnel are not in the affected area nor required to enter, or must remain in the affected area but have adequate protection (to safely operate or shutdown the plant), this EAL is not met.

REFERENCES

NUREG-0654: A.18D

CLASSIFICATION **EAL: 5.3.1**

SITE AREA EMERGENCY

TEXT

Fire compromising the functions of safety systems.

APPLICABILITY

ALL

EXAMPLE

A fire in the Cable Spreading Room affecting the function of HPCI while required to be OPERABLE.

MEMO

This EAL applies to a fire which compromises the active function (e.g., low pressure injection or automatic depressurization) of a safety system or multiple safety systems.

In reviewing EAL: 5.2.1 and 5.3.1, it is important to note that EAL: 5.2.1 covers the potential for degradation of nuclear safety, while EAL: 5.3.1 is recognition that an actual degradation has occurred. Additionally, the statements made regarding system OPERABILITY for EAL: 5.2.1 also apply to EAL: 5.3.1.

This EAL is intended to apply to a fire which could directly affect any (one or more) plant safety system(s). Implicit in this interpretation is that plant conditions are such that the potentially affected safety system should be OPERABLE. For example, during MODE 4 or 5, HPCI is not required to be OPERABLE. Therefore, a fire in the HPCI Room would not necessarily threaten a required safety system. A large fire in the same area, however, that constituted a threat to the "B" and "D" RHR pumps would meet the threshold for this EAL.

REFERENCES

NUREG-0654: S.11

Meacham to ERO, "Clarification of Certain Emergency Action Levels (EALs)", CNSS900421, August 7, 1990.

CLASSIFICATION **EAL: 5.4.1**

GENERAL EMERGENCY

TEXT

Any major internal or external fire substantially beyond the design basis which could cause massive common damage to plant systems.

APPLICABILITY

ALL

EXAMPLE

A fire in Critical Switchgear Rooms, where both rooms are involved, result in loss of CS, RHR, SW, etc.

MEMO

Automatic MINIMUM Protective Action Recommendation (PAR) at a GENERAL EMERGENCY is evacuation for 2 mile radius and 5 miles downwind in at least 3 sectors, the remainder of 10 mile Emergency Planning Zone should go indoors and monitor EAS/EBS.

REFERENCES

NUREG-0654: G.07

CLASSIFICATION **EAL: 6.1.1**

NOUE

TEXT

Security threat, attempted entry, or attempted sabotage.

APPLICABILITY

ALL

EXAMPLE

A credible bomb threat.

MEMO

As determined by the Security Contingency Plan or procedures.

REFERENCES

NUREG-0654: N.12

CLASSIFICATION **EAL: 6.2.1**

ALERT

TEXT

On-going security compromise.

APPLICABILITY

ALL

EXAMPLE

Armed intruders within the Protected Area.

MEMO

As determined by the Security Contingency Plan or procedures.

REFERENCES

NUREG-0654: A.16

CLASSIFICATION **EAL: 6.3.1**

SITE AREA EMERGENCY

TEXT

Imminent loss of physical control of the station.

APPLICABILITY

ALL

EXAMPLE

Large number of armed intruders in the station.

MEMO

None.

REFERENCES

NUREG-0654: S.14

CLASSIFICATION **EAL: 6.4.1**

GENERAL EMERGENCY

TEXT

Loss of physical control of the station.

APPLICABILITY

ALL

EXAMPLE

Armed intruder(s) in the Control Room.

MEMO

Automatic MINIMUM Protective Action Recommendation (PAR) at a GENERAL EMERGENCY is evacuation for 2 mile radius and 5 miles downwind in at least 3 sectors, the remainder of 10 mile Emergency Planning Zone go remain indoors and monitor EAS/EBS.

REFERENCES

NUREG-0654: G.03

CLASSIFICATION **EAL: 7.1.1**

NOUE

TEXT

Ground motion > 0.01g as indicated by Control Room seismic monitoring panel.

APPLICABILITY

ALL

EXAMPLE

Minor tremor.

MEMO

Attempt to rule out "false" causes for alarm (i.e., heavy equipment operation).

REFERENCES

NUREG-0654: N.13A

CLASSIFICATION **EAL: 7.1.2**

NOUE

TEXT

River level > 899' or < 867'.

APPLICABILITY

ALL

EXAMPLE

Flood, river level 900' MSL.

MEMO

Flood of record per USAR is 900.8'.

REFERENCES

NUREG-0654: N.13B

CLASSIFICATION **EAL: 7.1.3**

NOUE

TEXT

Tornado touching down within the Owner Controlled Area.

APPLICABILITY

ALL

EXAMPLE

Tornado striking north Training Building.

MEMO

Consider performing assembly and accountability after danger has passed. If tornado touches down within the Protected Area, see EAL: 7.2.3.

REFERENCES

NUREG-0654: N.13C

CLASSIFICATION **EAL: 7.1.4**

NOUE

TEXT

Sustained wind speed > 74 mph.

APPLICABILITY

ALL

EXAMPLE

Severe sustained winds from a thunderstorm. MET indicates sustained winds of 80 mph.

MEMO

CNS' version of "hurricane" listed in NUREG-0654 initiating condition.

These are sustained winds, not gusts.

REFERENCES

NUREG-0654: N.13D

CLASSIFICATION **EAL: 7.2.1**

ALERT

TEXT

Ground motion > 0.1g as indicated by Control Room seismic monitoring panel.

APPLICABILITY

ALL

EXAMPLE

Earthquake.

MEMO

This EAL is the Operating Basis Earthquake (OBE) for CNS per the USAR.

Check the plant for damage. If major damage is evident, see EAL: 7.3.1.

REFERENCES

NUREG-0654: A.17A

CLASSIFICATION **EAL: 7.2.2**

ALERT

TEXT

River level > 902' or < 865'.

APPLICABILITY

ALL

EXAMPLE

Ice jam upstream causes river level to drop below 865'.

MEMO

These levels equate to "near design levels" specified in NUREG-0654 initiating condition. This could result in "potential substantial degradation" to safety systems as found in the ALERT class description of NUREG-0654.

REFERENCES

NUREG-0654: A.17B

CLASSIFICATION **EAL: 7.2.3**

ALERT

TEXT

Tornado touching down within the Protected Area.

APPLICABILITY

ALL

EXAMPLE

Tornado striking Security, Craft Change, and the NRC/Ambulance Buildings.

MEMO

Ensure tornado has passed before conducting assembly and accountability.

REFERENCES

NUREG-0654: A.17C

CLASSIFICATION **EAL: 7.2.4**

ALERT

TEXT

Sustained wind speed > 95 mph.

APPLICABILITY

ALL

EXAMPLE

MET indicates sustained winds of 96 mph.

MEMO

Equates to "hurricane winds beyond design basis level" specified in NUREG-0654 initiating condition.

These are sustained winds, not gusts.

REFERENCES

NUREG-0654: A.17D

CLASSIFICATION **EAL: 7.3.1**

SITE AREA EMERGENCY

TEXT

Ground motion > 0.1g as indicated on the Control Room seismic monitoring panel AND reports of major plant damage.

APPLICABILITY

MODE 1, 2, or 3.

EXAMPLE

Visible crack on Drywell following an earthquake.

MEMO

This EAL represents the Safe Shutdown Earthquake (SSE) from the USAR. The SSE for CNS is 0.2g. CNS has no active instrumentation beyond 0.1g. The SSE level will be assumed to have been reached if the 0.1g annunciator is received combined with reports of major plant damage, until the seismic monitor tapes have been read. The seismic monitor tapes will record up to 1.0G. See Procedure 4.12.

Obtain a hard copy of the event data from seismic instrumentation tapes per Procedure 4.1.2. The seismic tapes will read up to 1G.

Peak acceleration recorders (scratch pens) should be retrieved for analysis.

REFERENCES

NUREG-0654: S.15A

CLASSIFICATION **EAL: 7.3.2**

SITE AREA EMERGENCY

TEXT

Sustained wind speed > 100 mph.

APPLICABILITY

MODE 1, 2, or 3.

EXAMPLE

Sustained MET indicates wind speed of 100 mph.

MEMO

This is a sustained wind speed, not gusts.

CNS instrumentation only goes to 100 mph, not beyond.

REFERENCES

NUREG-0654: S.15C

CLASSIFICATION **EAL: 7.3.3**

SITE AREA EMERGENCY

TEXT

Flood which renders multiple ECCS Systems inoperable when they are required to be OPERABLE.

APPLICABILITY

MODE 1, 2, or 3.

EXAMPLE

HPCI quad flooded (affecting HPCI and RHR function).

MEMO

The SITE AREA EMERGENCY class description refers to plant functions needed to protect the public. If systems were impacted, but not needed, CNS would maintain the ALERT.

REFERENCES

NUREG-0654: S.15B

CLASSIFICATION **EAL: 7.3.4**

SITE AREA EMERGENCY

TEXT

Low river level which results in complete loss of the Service Water System.

APPLICABILITY

All

EXAMPLE

SWPs cavitate due to low river level.

MEMO

Service water is always needed as the ultimate heat sink for the plant. Its loss meets the class description for SITE AREA EMERGENCY found in NUREG-0654.

Follow the procedures for maximizing water level in E Bay. This EAL is complete loss. Service Water operation which does not meet Tech Specs, but provides some cooling should be classified as an ALERT on EAL: 7.2.2.

REFERENCES

NUREG-0654: S.15B

CLASSIFICATION **EAL: 7.4.1**

GENERAL EMERGENCY

TEXT

Any major natural phenomenon substantially beyond the design basis which could cause massive common damage to plant systems.

APPLICABILITY

ALL

EXAMPLE

Earthquake which causes immediate, massive, and obvious damage to many plant systems.

MEMO

Automatic MINIMUM Protective Action Recommendation (PAR) at a GENERAL EMERGENCY is evacuation for 2 mile radius and 5 miles downwind in at least 3 sectors, the remainder of 10 mile Emergency Planning Zone should go indoors and monitor EAS/EBS.

REFERENCES

NUREG-0654: G.07

CLASSIFICATION **EAL: 8.1.1**

NOUE

TEXT

Aircraft crash within the Protected Area.

APPLICABILITY

ALL

EXAMPLE

Small aircraft crashes within the Protected Area, but does not strike any structures.

MEMO

An airplane crash must be within the Protected Area to meet the NOUE classification description of NUREG-0654.

REFERENCES

NUREG-0654: N.14A

CLASSIFICATION **EAL: 8.1.2**

NOUE

TEXT

Explosion within the Protected Area.

APPLICABILITY

ALL

EXAMPLE

Gasoline storage tank explodes.

MEMO

An explosion includes all sudden, violent, and rapid releases of energy. "Detonation" and "Deflagration" are releases of chemical energy which qualify as "Explosions". Also included is the rapid release of mechanical energy, i.e., pressure.

The source or location of the explosion must be within the Protected Area to meet the NOUE class description of NUREG-0654. An explosion on the Owner Controlled Area (OCA) does not meet the NOUE class description of NUREG-0654.

The rapid release of mechanical energy may result in the generation of a missile (see EAL: 8.2.2).

REFERENCES

NUREG-0654: N.14C

CLASSIFICATION **EAL: 8.1.3**

NOUE

TEXT

Failure of a turbine rotating component causing an automatic reactor scram with release of radioactivity to the Turbine Building or which potentially affects safety systems.

APPLICABILITY

ALL

EXAMPLE

Low pressure rotor fails. Radioactivity is released to the Turbine Building prior to MSIV closure.

MEMO

A reactor scram (from whatever cause) does not meet the **NOUE** class description unless there is an associated release of radioactivity or safety systems are potentially affected.

If the radiological release is considered to be serious or safety systems are actually degraded, see EAL: 8.2.4.

REFERENCES

NUREG-0654: N.14E

CLASSIFICATION **EAL: 8.1.4**

NOUE

TEXT

Other conditions existing which in the judgement of the Emergency Director warrant declaration of an Unusual Event.

APPLICABILITY

ALL

EXAMPLE

Event in progress or which has occurred, that indicate a potential degradation of the level of safety of the station. The event may progress to a more severe emergency classification if it is not mitigated.

MEMO

For events of minor safety significance, but which warrant notification of authorities. Attempt to classify under more specific EALs. If none apply, declare under this one.

REFERENCES

NUREG-0654: N.15

CLASSIFICATION **EAL: 8.2.1**

ALERT

TEXT

Aircraft striking structures within the Protected Area.

APPLICABILITY

ALL

EXAMPLE

Aircraft striking the Elevated Release Point (ERP).

MEMO

None.

REFERENCES

NUREG-0654: A.18A

CLASSIFICATION **EAL: 8.2.2**

ALERT

TEXT

Missile impact, from whatever source, within the Protected Area.

APPLICABILITY

ALL

EXAMPLE

Helicopter drops unknown objects onto the Turbine Building roof.

MEMO

"Missile" is not defined by NUREG-0654. It is assumed that any large projectile is a missile.

REFERENCES

NUREG-0654: A.18B

CLASSIFICATION **EAL: 8.2.3**

ALERT

TEXT

Known explosion damage to the facility affecting plant operation.

APPLICABILITY

ALL

EXAMPLE

Hydrogen explosion in hydrogen seal oil pump (Iron Horse) room causing turbine trip.

MEMO

An explosion includes all sudden, violent, and rapid releases of energy. "Detonation" and "Deflagration" are releases of chemical energy which qualify as "Explosions". Also included is the rapid release of mechanical energy, i.e., pressure.

The rapid release of mechanical energy may result in the generation of a missile (see EAL: 8.2.2).

An explosion affecting operation could also have caused damage not yet discovered which could be of safety significance.

REFERENCES

NUREG-0654: A.18C

CLASSIFICATION **EAL: 8.2.4**

ALERT

TEXT

Turbine failure causing casing penetration which creates serious radiological concerns or damages plant safety systems.

APPLICABILITY

ALL

EXAMPLE

Portion of the turbine rotor penetrates casing. Other failures result in serious radiological concerns.

MEMO

Extension of EAL: 8.1.4. Turbine casing penetration alone does not meet the ALERT class description of NUREG-0654.

Serious radiological concerns would also likely be classifiable under other EALs.

REFERENCES

NUREG-0654: A.18E

CLASSIFICATION **EAL: 8.2.5**

ALERT

TEXT

Other conditions existing which in the judgement of the Emergency Director warrant declaration of an ALERT.

APPLICABILITY

ALL

EXAMPLE

An event in progress, or which has occurred, that involved an actual or potentially substantial degradation of the safety level of the station. Minor releases of radioactivity may occur or may have occurred.

MEMO

Attempt to classify under other more specific EALs. If none apply, declare on this one.

REFERENCES

NUREG-0654: A.19

CLASSIFICATION **EAL: 8.3.1**

SITE AREA EMERGENCY

TEXT

Aircraft crash affecting vital areas with the plant in MODE 1, 2, or 3.

APPLICABILITY

MODE 1, 2, or 3.

EXAMPLE

Airplane crash into 1001' (Reactor Building 5th floor) while at power.

MEMO

None.

REFERENCES

NUREG-0654: S.16A

CLASSIFICATION **EAL: 8.3.2**

SITE AREA EMERGENCY

TEXT

Missile or explosion damage to safe shutdown equipment with the plant in MODE 1, 2, or 3.

APPLICABILITY

MODE 1, 2, or 3.

EXAMPLE

A high pressure nitrogen cylinder is dropped and its valve assembly is sheared off, it becomes a "missile" damaging several HCUs.

MEMO

An explosion includes all sudden, violent, and rapid releases of energy. "Detonation" and "Deflagration" are releases of chemical energy which qualify as "Explosions". Also included is the rapid release of mechanical energy, i.e., pressure.

The rapid release of mechanical energy may result in the generation of a missile (see EAL: 8.2.2).

REFERENCES

NUREG-0654: S.16B

CLASSIFICATION **EAL: 8.3.3**

SITE AREA EMERGENCY

TEXT

Other conditions existing which in the judgement of the Emergency Director warrant declaration of a SITE AREA EMERGENCY.

APPLICABILITY

ALL

EXAMPLE

Events in progress or have occurred, which involve actual or potential major failure of plant functions needed for the protection of the public.

MEMO

Attempt to classify under other more specific EALs. If none apply and there is actual or likely major failures of plant equipment needed for the protection of the public, declare on this one.

REFERENCES

NUREG-0654: S.17

CLASSIFICATION **EAL: 8.4.1**

GENERAL EMERGENCY

TEXT

Other conditions existing which in the judgement of the Emergency Director warrant declaration of a General Emergency (i.e., any core melt situation).

APPLICABILITY

ALL

EXAMPLE

Event in progress or which has occurred, that involves actual or imminent substantial core degradation or melting with a potential for the loss of Primary Containment integrity.

MEMO

Attempt to classify on other more specific EALs. If none apply and there is the possibility of release of large quantities of radioactive material in a short period of time, declare under this one.

Automatic MINIMUM Protective Action Recommendation (PAR) at a GENERAL EMERGENCY is evacuation for 2 mile radius and 5 miles downwind in at least 3 sectors, the remainder of 10 mile Emergency Planning Zone should go indoors and monitor EAS/EBS.

REFERENCES

NUREG-0654: G.07

BARRIER	POTENTIAL LOSS (1)	LOSS (2)
Fuel Cladding	1. 1500 mrem/hr on SJAE monitor (RM-150A,B) [EAL: 2.1.1]. 2. Main steam line radiation monitor ≥ 1200 mrem/hr. 3. Drywell Radiation Monitor > 250 REM/hr only valid under LOCA conditions. 4. Coolant sample activity > 4.0 µCi/gm DOSE EQUIVALENT I-131 [EAL: 2.1.2].	1. 15,000 mrem/hr on SJAE monitor (RM-150A,B). 2. Reactor Coolant sample > 300 µCi/gm DOSE EQUIVALENT I-131. 3. Drywell Radiation Monitor > 2500 REM/hr only valid under LOCA conditions. 4. Reactor water level below 0" (FZ).
Primary Coolant Boundary	1. Operational RCS pressure boundary LEAKAGE; or unidentified LEAKAGE exceeds 5 gpm; or total LEAKAGE exceeds 30 gpm averaged over a previous 24 hour period; or unidentified LEAKAGE increase of more than 2 gpm within the previous 24 hour period in MODE 1.	1. Reactor water cannot be maintained above 0" (FZ). 2. Drywell pressure > 2 psig with Primary Containment cooling operating. 3. Primary coolant leak > 50 gpm. 4. Safety or Relief valve stuck open after mechanical lift.
Primary Containment OPERABILITY	1. Primary Containment pressure > 25 psig and increasing. 2. Loss of all cooling capabilities. 3. Hydrogen concentration > 4%. 4. Unexplained drop in Drywell pressure or rise in nitrogen makeup.	1. Inability to isolate primary containment. 2. Loss of Primary Containment structural integrity. 3. Drywell pressure ≥ 56 psig. 4. Hydrogen concentration > 15%.

(1) Applies to classification only when combined with two actual losses, or if a separate EAL is indicated by a bracketed [ ] EAL #.

(2) Single fission product barrier loss (Fuel Cladding or Primary Coolant Boundary) is an ALERT, loss of two barriers (any two) is a SITE AREA EMERGENCY, loss of two barriers with potential for loss of the third barrier is a GENERAL EMERGENCY.

NOTE 1 - An emergency class may be declared on a potential loss or on an actual loss, but equating multiple potential losses to an actual loss is not acceptable. That is, two potential losses do not equal one actual loss. Only when a potential loss is combined with the actual loss of two barriers does the potential loss of the barrier change an emergency classification (i.e., from a SITE AREA EMERGENCY to a GENERAL EMERGENCY).

NOTE 2 - Paragraph numbers below correspond to those in the table on the previous page.

FUEL CLADDING - POTENTIAL LOSS

1. The number for SJAE (1500 mrem/hr) is obtained by calculating backwards through Attachment 1 of Procedure 5.7.16 assuming a combined SJAE flow of 100 cfm.

   It should be noted that 1500 mrem/hr at the SJAE is very unlikely and could occur only with a failure to isolate main steam. Therefore, an indication of fuel damage will likely be seen first by MSL radiation monitors.

2. The main steam line monitor value (1200 mrem/hr) is an approximation of the lowest setpoint for the 3 x NORMAL 100% power alarm. This setpoint (according to I&C Calibration Procedure) is calculated such that the alarm point would be reached by the fission products released by a design basis rod drop accident.

3. Derived from Attachment 7 of Procedure 5.7.17. This attachment in turn comes from NEDO 22215. This value (250 REM/hr) approximates 0.1% fuel cladding failure. At this level, the "core degraded?" question in the dose assessment models will be answered NO.

4. From NUREG-0654 Initiating Condition Appendix 1, Notification of Unusual Event, Step 3.b, Required Reactor Water Coolant Analysis.

FUEL CLADDING - LOSS

1. The number for SJAE (15,000 mrem/hr) is obtained by calculating backwards through Attachment 1 of Procedure 5.7.16 assuming a combined SJAE flow of 100 cfm. This yields an approximate curie-content of 600,000 μCi/sec.

   It should be noted that 15000 mrem/hr at the SJAE is very unlikely, and could occur only with a failure to isolate main steam. Therefore, an indication of fuel damage will likely be seen first by MSL radiation monitors.

2. From NUREG-0654, Initiating Condition Appendix 1, ALERT, Step 1.b, requires reactor water coolant analysis.

3. Derived from Attachment 7 of Procedure 5.7.17. This attachment in turn comes from NEDO-22215 and is only valid for LOCA conditions. This number (2500 rem/hr) approximates 1% fuel cladding failure. At this level, the "core degraded?" question in the dose assessment models will be answered YES.

4. Cladding integrity cannot be guaranteed if fuel is not covered with water. Note this EAL says below 0" (FZ). If level is intentionally lowered to 0" (FZ) (but not below) per EOPs, this EAL does not apply. If level falls below 0" (FZ) accidentally, even for a short time, this EAL does apply and the barrier shall be declared lost.

PRIMARY COOLANT BOUNDARY - POTENTIAL LOSS

1. Technical Specification leak rate limit.

PRIMARY COOLANT BOUNDARY - LOSS

1. If water level is inadvertently dropped below the top of fuel (as noted by Number 4 under FUEL CLADDING LOSS), then it shall be assumed that fuel cladding damage could have occurred, and the fission product boundary of cladding must be assumed lost. If, in addition, the water level cannot be returned and maintained above 0" (FZ), then the primary coolant boundary shall also be assumed to be lost. These two single fission product barriers lost equate to EAL: 2.3.2 (Known loss of Coolant Accident Greater Than Makeup Capacity) which is a SITE AREA EMERGENCY.

2. It does not take a large leak in the primary system to cause an increase in Drywell pressure. But, this is one of the first direct indicators available for the loss of the Primary Coolant Boundary fission product barrier.

3. From NUREG-0654, Initiating Condition, Appendix 1, ALERT, 5.

4. From NUREG-0654, Initiating Condition, Appendix 1, Notification of Unusual Event, 6.

PRIMARY CONTAINMENT - POTENTIAL LOSS

1. Represents a degrading trend representative of loss of control of some parameter affecting containment pressure. At this value (approximately half that of the loss value) the potential exists for loss.

2. Primary containment's design temperature is 281°F. Loss of all cooling capabilities may result in approaching this design limit.

3. Derived from NUREG/BR-0150, RTM-93 Table on page B-19. This is the beginning of the flammability region for a dry atmosphere.

4. Indicates a possible leak from primary containment.

PRIMARY CONTAINMENT - LOSS

1. From NUREG-0654, Initiating Condition Appendix 1, ALERT, 4.

2. Number 1 Loss indicator, above, refers to Primary Containment Isolation System (i.e., valves and associated logic). This indicator is intended to expand upon PCIS to include any indication that the containment's integrity is not intact. Also, valves other than PCIS may be used to isolate containment and restore the barrier.

3. 56 psig is the design pressure for containment. At or above this pressure, the containment is to be considered lost.

4. Derived from NUREG/BR-0150, RTM-93 Table on page B-19. This is the beginning of the detonation region for a dry atmosphere.

ISOLATION VALVE FAILURES

To help ensure consistent classification of fission product barrier loss due to failure of isolation valves, the following statements concerning isolation valve pairs apply:

1. Both valves in a line must fail.

2. The failing valves must fail to auto close on a group initiation signal.

3. The valves must also fail to close from the control switch in the Control Room. The timeliness of the Operator's recognition of the auto-close failure is not an issue in the determination of the barrier loss, that is, the barrier is not to be considered lost if the Operator has not yet tried to close the valves with the control switch.

4. If an Operator must leave the Control Room to close a valve, the barrier(s) shall be considered lost until a valve can be closed manually.

5. If the line penetrates PC and also communicates with the RPV, then two barriers are to be considered lost (EAL: 2.3.3 - SITE AREA EMERGENCY).

6. If either of the valves in a line are subsequently closed manually, then the barrier is to be considered restored and the emergency may be reclassified, as appropriate.

7. Valves other than PCIS may be used to isolate containment and restore the barrier.

A special case exists concerning SDV vent and drain valves when a scram occurs. When a scram occurs, these valves are supposed to close. While the scram inlet and outlet valves remain open (before the scram is reset) the water/steam isolated by these valves communicates directly to the reactor. The design fission product barriers (RPV and PC) have effectively "moved" from the scram valves to the vent and drain valves. If these valves fail, they therefore meet the criteria for loss of two of three fission product barriers (EAL: 2.3.3 - SITE AREA EMERGENCY).

A special case also exists concerning operation of HPCI and RCIC to support Emergency Operating Procedures (5.8 series). If HPCI or RCIC were to isolate on high temperature during operation to support the EOPs, the EOPs allow you to install jumpers to bypass the isolation and restart the system. This is allowed even if a leak from the steam supply is causing the high temperature condition. If a leak does in fact exist and the isolation valves are opened, this would constitute a loss of two fission product barriers (EAL: 2.3.3 - SITE AREA EMERGENCY). These barriers would be Reactor Coolant System and Primary Containment. The justification for the loss of the barriers is that you are releasing steam from the Reactor Coolant System to the atmosphere of the secondary containment. If the valves were reclosed, the fission product barriers would once again be considered intact.

Another issue was raised concerning the loss of a barrier due to local leak rate testing results. Local leak rate test results are not applicable to these EALs and valve position (i.e., can the valve be closed) will be the sole basis for declaring a barrier lost.

Information contained in Attachment 1, EAL Matrix, and Attachment 3, Fission Product Barriers-Indication of Loss Table, may be reformatted and placed on HARDCARDS similar to EOP Flowcharts. These EAL HARDCARDS will be controlled per this attachment. This information will be word for word but may be formatted differently using different font sizes or color backgrounds to assist the visual presentation.

Each EAL HARDCARD will be labeled with a EAL HARDCARD Revision data box that will list the latest revision and the date of the revision of the HARDCARD. This data will match the information below:

EAL HARDCARD Revision Data		
Procedure	HARDCARD Revision #	Date of last HARDCARD revision
EPIP 5.7.1, Attachment 5	Rev 0	4/17/00

It is not necessary that the HARDCARD revision number be revised with each revision of this procedure. However, if the HARDCARD is revised, or, if Attachment 1 or 3 are revised, then Attachment 5 must be revised to reflect the new EAL HARDCARD Revision Data with the new information.

EAL HARDCARD distribution will be made to following locations:

EAL HARDCARD Locations:
1. Control Room
2. Simulator
3. Emergency Operations Facility
4. Technical Support Center
5. Alternate Emergency Operations Facility
6. Emergency Preparedness Office

1. REFERENCES

1.1 TECHNICAL SPECIFICATION

1.1.1 Section 3.6, Containment Systems.

1.2 CODES AND STANDARDS

1.2.1 10CFR 50.72, Immediate Notification Requirements for Operating Nuclear Power Reactors.

1.2.2 NPPD Emergency Plan For CNS.

1.2.3 NUREG-0654, Revision 1, Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants.

1.2.4 NUREG/BR-0150, Volume 1, Revision 3, November 1993, Response Technical Manual.

1.2.5 Environmental Protection Agency EPA 400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, May 1992.

1.3 PROCEDURES

1.3.1 Instrumentation Operating Procedure 4.12, Seismic Instrumentation.

1.3.2 Emergency Plan Implementing Procedure 5.7.2, Shift Supervisor EPIP.

1.3.3 Emergency Plan Implementing Procedure 5.7.16, Release Rate Determination.

1.3.4 Emergency Plan Implementing Procedure 5.7.17, Dose Assessment.

1.4 MISCELLANEOUS

1.4.1 NRC Inspection Reports: 87-25, 88-29, 91-27, 92-14, and 93-24.

1.4.2 Letter CNSS900421 from Meacham to ERO, dated August 7, 1990, Clarification of Certain Emergency Action Levels (EALs).

1.4.3 Telecon Krumland/Hayden to Spitzberg (NRC IV), dated August 22, 1990, EAL Interim Guidance.

1.4.4 Telecon Hayden/Dean to Terc (NRC IV), dated April 22, 1992, Spent Fuel EAL 3.3.1.

1.4.5 Letter NSD940202 from G. R. Smith to G. R. Horn, Commitments from 1/31/94 Enforcement Conference.

1.4.6 Memorandum from Richard L. Emch, Jr., Acting Chief of Emergency Preparedness Branch, Division of Radiation Safety and Safeguards, Office of Nuclear Reactor Regulation, to James H. Joyner (Region 1), William E. Cline (Region 2), John A. Grobe (Region 3), and Blaine Murray (Region 4), dated July 11, 1994. Subject: Branch Position on Acceptable Deviations to Appendix 1 to NUREG-0654/FEMA-REP-1.

1.4.7 NEDC 00-099, Core dp vs. Flow Curve for Determination of Degraded Core.